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The JOURNAL of GEOGRAPHY

VOLUME III. JANUARY, 1904 NUMBER 1

An illustrated monthly magazine devoted to the interests of teachers of geography in elementary, secondary, and normal schools

Edited by **RICHARD E. DODGE**, Professor of Geography, Teachers College, Columbia University, New York City, and **EDWARD M. LEHNERTS**, Professor of Geography, State Normal School, Winona, Minnesota

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FIG. 4 *Maple, Gilmanton, N. H., looking north.*

The JOURNAL *of* GEOGRAPHY

VOL. III. JANUARY, 1904 No. 1

WIND EFFECTS

BY MARK S. W. JEFFERSON
Professor of Geography, State Normal College, Ypsilanti, Mich.

THE following study is the outcome of attempts to improve the teaching of climates by basing climatic features more and more on weather or other concrete phenomena. We may regard climate as ideal and weather as concrete, just as spheres are ideal and balls are concrete. In teaching geometry, a good deal of difficulty arises from lack of specific effort on the teacher's part to help the beginner's mind to the ideal and abstract conceptions dealt with. And climate, as taught in many schools, amounts to little more than words to be memorized, because of utter lack of grounding in the real. The facts of the weather are real, concrete, and observable everywhere. If these facts are observed and studied, the features may be learned that characterize our climate. The drawing of inferences from the facts, however, involves mental processes in which the beginner needs training. The reasoning process should carry conviction. How often we hear a young thinker say, "Yes; I see that; but it does not seem as if it could be so." Familiarity with the inductive method is needed to give faith in it, and there is especial need of every possible test of the results. For this reason it is desirable to come to our conclusions by as many roads as we can find.

Supposing it is desired to get the student to believe in our westerly winds as an important climatic feature. We may work along three lines:

1. Observe the weather vane and after some months find which wind has blown oftenest.

2. Study the weather map and make out on it the procession of highs and lows to eastward.

3. Look at the trees that have grown exposed to the force of the winds for indication of thrust in one direction rather than in others.

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FIG. 1. *Yellow birch on west slope of Grant Hill, Gilmanton, N. H., looking north by east.*

FIG. 2. *Laurel near Cabañas fortress, Havana, looking west.*

Of the two pictures given, the first is a yellow birch in the Belknap Mountains in New Hampshire. The trunk is a little inclined to the west, owing to the common gravitative creep of the soil downhill, but the growth of the branches suggests a strong eastward movement of the air, although there was no wind at the time of the exposure. The whole tree makes one think of the hill as a wind-swept height. Such trees are not infrequently represented from mountains.* One thinks of westerly storms as driving these trees out of shape. So of

FIG. 3. *Laurel, Central Park, Havana, looking west.*

the windward side of the volcanic Caribbees, Hill says, "The trade wind sweeps them with such ferocity that the vegetation all bends in a cringing position towards the land."†

The laurel of the second view stands over the road from Cabañas fortress. There is no especial reason for speaking of violent winds here. The tree is near sea level, though exposed to the trade winds heightened in the daytime by the heating of the land. The "ferocity" of the trades, in Mr. Hill's language, is suggested rather by the striking effect than by the winds themselves. The trades are strong rather than violent. From this same point, by the entrance to Havana harbor, an avenue called the Prado leads off a little west of south, and down

* Chun, *Aus den Tiefen des Weltmeers*, p. 160. The pines near Cape Town.

† Hill, *Cuba, Porto Rico*, etc., p. 328.

this again are seen many notable examples of the one-sided growth of the vegetation. This is well shown in the laurels and framboyanes of the Central Park at the end of the Prado. Figure 3 is typical.

But continuity of direction in even moderate winds leaves record as definite and unmistakable as mountain storms. Our prevalent westerly winds are recorded in the growth of the maples from New England to Michigan. When the tree is in leaf the result is a one-sided growth, well displayed in Figure 4, while in the twig the effect is still clearer, as in the absolutely typical example from Ypsilanti, Figure 5.

About Ypsilanti the white poplar points its branches in unison down the wind, as does a fine example of the same tree in the Boston Public Garden. Figure 6 is a poplar at Ypsilanti.

FIG. 5. *Maple at Ypsilanti, looking north.*

The distinction between constant and prevalent winds enters largely into the difference between the climates of the trades and westerly wind belts, which between them occupy the greater portion of the earth. In the trades are clear skies, even temperatures, and winds always in the same quarter, rising and falling with some swing in

FIG. 6. *White poplar, Ypsilanti, looking north.*

direction at the shore; in the westerlies, spells of fine and spells of stormy weather, with winds veering and backing through all the points of the compass. To teach this properly, we must begin with the westerlies about us. But the westerlies are only an average, only an excess of one wind direction over others, and a difficulty for beginners lies at this point.

Suppose that we have gathered observations like those of the accompanying table, the percentages of the whole year that the wind is in each direction, at Detroit, for instance.

DURATION OF EACH WIND DIRECTION IN PERCENTAGES OF THE WHOLE YEAR

	Latitude	N	NE	E	SE	S	SW	W	NW	Calm
Boston	42°	8	9	10	4	7	20	23	19	0
Detroit	42°	5	15	9	7	5	31	13	15	0
San Francisco	38°	6	4	3	8	8	38	23	9	1
Dodge City	38°	13	15	5	24	18	6	4	15	0
Key West	25°	9	22	28	22	6	5	2	6	0
Santiago, Cuba	20°	18	28	4	10	17	10	2	4	7
Santo Domingo	18°	46	9	4	18	7	2	1	11	2
San Juan, P. R.	18°	1	8	39	36	6	5	1	2	3
Barbados	13°	1	30	48	19	1	1	0	0	0
Curaçao	12°	0	9	79	11	1	0	0	0	0

That is, for 59 per cent of the time the wind at Detroit is either in the NW, W, or SW. Yet a fact that always looks very large to a beginner is that the wind is NE as often as NW, and oftener than it is west. Moreover 59 per cent is only a little more than half the time. If he has access to the other numbers, he may find some reassurance in the data for Boston and San Francisco, but he will be certain to seize on Dodge City as giving the whole case away. Here is a place in the latitude of the westerlies with more east winds than west! All that this means is that concrete details have a reality that

FIG. 7. *Cocoanut palms at Santa Cruz, Danish West Indies, looking northwest.*

is not possessed in like degree by the conclusions drawn from them. If, however, we can now confirm these conclusions in any way, we shall strengthen the reasoning process. A map of the United States on which are laid down the average directions of all the winds at all places adds definiteness here. But as the effects of an excess of one wind direction are absolutely real and definite, the evidence of the trees that have been influenced by it in their growth is of the greatest value in teaching.

Spells of cyclonic and anti-cyclonic weather should be watched as they go by, with the help of the daily weather map, though they have not for the beginner so much reality.

That *tempera:e zone* is a misnomer for the belt of westerly winds has long been known. Probably there is nothing characterizes these regions so sharply as their winds, prevailing westerly, but interrupted by winds from all other compass points in succession. Nothing will give a better notion of trade-wind weather than an absence of these fluctuations. Figures such as those for Curaçao and Barbados in the table may be contrasted with the figures for Boston or Detroit to get this idea. It is easier to grasp the average conditions in the trades since they occur daily. The other points for which wind directions are given in the table, however, have their average less distinct. Local influences such as the direction of the coast line are plainly influential here. What approach to these facts could be more real than such pictures as Figure 7?

Where sea and land breezes alternate, the excess in strength of the sea breeze comes out well in the growth of trees along shore. In some way, it is desirable to get the picture of these effects into the pupil's mind. A need for an explanation will then arise.

All this is antipodal to the method by which climates were taught first, and the weather never reached in teaching it all. As a result, the ideal thing, climate, existed in our minds as a lot of disconnected phrases that burdened the memory and left no more definite conceptions than that the Nile rose in summer or winter—one did not certainly remember which. The naming our zone *Temperate* seems only to rest on the climatic conception of our average temperature, some 60°, which sounds mild and temperate. Yet the actual weather could hardly be less temperate, ranging through temperatures from 100° to – 40°. Nowadays we like to look for vigor and bracing for deeds in these immoderate ranges. It is in the belt of westerlies, with weather in spells, that civilization is taking the greatest strides in history, and there it seems likely to make others.

Civilization began in Babylonia and Egypt, in the belt that on sea is characterized by trade winds. It failed there, to try again in Mediterranean countries, on the border of the trade and westerly belts. There, too, a few centuries of progress ended in the shock with barbarism and collapse. With the revival of learning came men who accomplished things in the belt of westerlies, and there has been more of human progress in a few hundred years than in all the long past of the race.

Spain, the land that lay across the border of the belts, lingered in power into the dawning of the new epoch. The trade winds bore Columbus to America almost irresistibly, when once his mind was made up to go. Clear skies with fair and balmy winds accompanied him all across the Atlantic. There was no obstacle to his progress but the fear of the great unknown ocean that opened out wider and wider before them day after day. Down the coast of Africa to the Canaries and Cape Verde, and thence straight across to the Antilles, the unfailing breezes wafted hordes of Spanish conquistadores to Mexico and Peru. The return was less easy, but any Spaniard who could buy a vessel and get together a crew became at once a sea captain and made his way to the new world of gold and opportunities.

A little farther north, where the English lived, other winds blew. The Englishman that crossed the Atlantic did so in the face of violent gales. Only seamen dared repeat the trip. Presently, when the Invincible Armada appeared in the English Channel, and the English came out in their trim seafaring ships, snug and stanch and well-handled, as the Spanish ships were not and could not be, the wind had only to rise to destroy Spain's pretense at naval power forever. The English had been to the best of schools of seamanship. The Spanish had lived by a tranquil sea, with all this schooling omitted. In Asia, India has given promise, but a better fulfillment seems reserved for Japan, and, perhaps, China, in the westerlies. In the new world, too, all the early hopes were founded on the trade-wind countries in the West Indies, Mexico, and Peru. To-day's fulfillment is all beyond in the westerly belt, here in our country, in Chile, and the Argentine Republic, as in South Africa, New Zealand, and southern Australia.

The typical wind effect is not an inclination of the trunk. The willow often has its trunk inclined to the east and its western branches fairly over the base of the tree. But this may be in some part due to the softness of the wet ground that this tree affects, which may yield somewhat to the force of the wind pulling on the roots. On the St. Clair Flats, Michigan, the delta of the St. Clair River, willows have been planted along the banks of the United States ship canal, and here and there about the buildings along the banks of natural channels. These willows, by their wind effect, enable the traveler to follow the windings of the canal as readily as a compass in hand. The electric road from Port Huron to Detroit, on the land just to the west of the St. Clair River and Lake, touches at the town of Algonac on the Flats and then, to continue to Detroit, has to make a long detour to west and north. During a first trip over the line, while the motor rendered the compass useless, the growth of the Lombardy poplars along the roadside seemed unintelligible. Upon examining a map, however, it became clear that they all showed an admirable wind effect to NE. The Lombardy poplar often grows erect in the wind.

In orchards, too, the trunks are usually inclined when the ground beneath is cultivated, so that in the Michigan Fruit Belt it is the custom to set out the trees with a lean to the southwest, that they may be straightened by the wind. Here again it is possible that the cultivation softens the ground so as to allow the inclination in question.

FIG. 8. *Willow, Ypsilanti, looking south.*

No trees in groves show really typical wind effects, since the outer trees protect those within. In dense forest growth this causes light effects to acquire especial importance. The outer trees develop strongly in every direction away from the center, and those within reach up vertically for the light, pruning away the lower branches by failing to nourish them and their leaves. The best trees to examine are those that have grown in isolated fields, or in open order along roadsides. The typical effect is a bending or inclining of the twigs to leeward, and for this reason the best season for these studies is after the fall of the leaf. When trees are leaved out the main effect is a one-sidedness of the top. Not every tree standing alone has grown alone. Southern Ontario has many single trees, elms, and others, along the line of the Michigan Central Railroad, which seem exceptionally regular in growth. Their naturally pruned trunks and the abundant stumps about, however, indicate that these trees grew in a wood and were protected from the wind. Most trees that grow in the open branch from near the ground up, and by this they may be known.

The results of this modification of free growth are individual with each kind of tree. Cottonwoods in the country about Ypsilanti seem to grow uninfluenced by the wind, however exposed their situation. Figure 9 is a fair example. Yet all the cottonwoods in the Boston Public Garden, though less exposed to the wind than many of the trees at Ypsilanti, incline their branches off distinctly to the east. In the West Indies the royal palm stands vertical and columnar, though in this case, strangely enough, the newest leaf, rolled into a tight cane at the summit of the tree, leans slightly against the wind, as if some force that availed to keep the trunk upright against the wind-thrust, bent this tender shoot over backward. In the picture, Figure 10, the

FIG. 9. *Cottonwood at west end of Cross Street bridge, Ypsilanti, looking north.*

leaves are actually driven to one side by the trade wind which is blowing, and the new leaf or penacho of each tree is inclined to the northeast, from which direction the wind was blowing. This was found to be an almost invariable rule with thousands of these trees examined this

FIG. 10. *Royal palms near Cardenas, Cuba, looking northwest.*

summer in Cuba. While the cottonwood, at least about Ypsilanti, is thus resistant to wind effects, its cousin, the white poplar, shows them in a high degree. Indeed, while a careful observer has no difficulty in distinguishing the two trees, a novice would ask no better guide than the degree in which they yield to the influence of the wind.

In the poplar, curves are strongly developed. On the east side of the tree, the branches form curves concave to the ground. On the west, vertical lines would cut not a few branches in two points with the curve between concave to the east, so strongly are they bent to leeward as they grow. (See Figure 6.) In this case it is a branch effect rather than a twig effect, while the individuality of the poplar comes out in the curve. The Ypsilanti poplars show these forms, even when poorly exposed to the wind, and reference has already been made to the one in the Boston Public Garden.

The maple succeeds better in rearing its greater branches vertically into the air. There is a distinct curving here, too, in the more slender branches, but much less in degree. The maple runs to slender and hair-like twigs, and the development of the twigs is almost horizontal on the east side of the tree and vertical on the west, as if they had been combed upward on one side and outward on the other. (See Figure 5 and the tailpiece.) Maples give excellent wind effects everywhere that I have observed them. If there are any about Dodge City, Kansas, it would be of interest to know how they grow.

Elms, too, are available for observation through a wide stretch

FIG. 11. *Elm, southwest corner of Boston Common looking north across Boylston Street.*

of this country. The elm branches grow longer to eastward than to westward, which enables the slender ends to hang nearer the ground on the east. The trunk stands almost invariably to west of the mid tree-top. A fine example stands near the old burial ground on Boston Common. The twig effect on the elm is not unlike that of the maple, but the greater length of the pendulous end twigs takes away the appearance of combing upward on the west side. The tips of the lower limbs on both sides hang directly downward, but toward the top of the tree the effects are almost identical with those observed on the maple. The crown of the elm, however, is flat. The Boston elm was photographed in September while still in leaf. Figure 12 is an example in twig. A photograph of the same tree from the west is quite symmetrical.

FIG. 12. *Elm at Ypsilanti, looking north.*

The oak and the hickory show the same excess in length of eastern over western branches, and the eastern ones also usually spring out more nearly horizontally. This appears very well in Figures 13 and 14, which are typical. Occasionally the oak shows a curving of its branches, but the type is stiff, crooking a little on either side of straight lines. The hickory branch is excessively crooked. Another crooked branched tree is the sycamore, or buttonwood, as shown in the tail-piece. But the crooks of the sycamore are rather in the smaller twigs, and the twigs are more of the combed type, as in the maple, having a considerable approach to parallelism, while the twigs of the hickory present a mere tangle. The wind effect on the hickory is thus a matter of one-sidedness, dependent on length of branch. In the sycamore it is equally evident in the direction of the twigs.

The black walnut also usually shows a greater development of top to leeward. A tulip tree east of the soldiers' monument in Boston

FIG. 16. *Arbor vitaes at the Mausoleo, Cardenas, looking south.*

this sort by standing in the middle of a street that runs north and south and looking along the street. It will be found in this country that the meeting of the branches overhead is well to east of the middle of the road. The Charles Street mall of Boston Common offers a good illustration. The Ceiba or silk cotton tree is regarded by the Cubans as their national tree. It grows alone in the plains, with trunk rising naked a considerable height to the thick top which is always strongly developed to leeward.

Our pines and spruces commonly grow in woods or clusters and so are little affected by the winds. Even in the New Hampshire hills only exceptional examples were found. Creole pines may be seen planted in the gardens about Havana showing admirable effects. The arbor vitaes (thuyas) in the garden at Cardenas all lean to westward. But this garden is a new one, commemorating with its monument the dead of the recent war. So the trees have probably been planted within the last four or five years, and may have been simply pushed to one side before the roots got a firm hold on the ground. It is curious that the wind-thrust on these trees has been from the east, as in all cases near the shore at Cardenas, while the northeast side of each tree has a blighted look, as if the branches on that side had been killed by some storm from the northeast. Something of this blighted look may be seen in the picture.

In fact, both east and northeast winds prevail in northern Cuba. From an examination of the records of the United States Weather

Bureau at Havana for the years 1900, 1901, and 1902, it appears that the wind is in the east fifteen hours a day and in the northeast the rest of the time. This is true summer and winter. The seasonal differences are slight. But it appears that the greatest force is during the time that the northeast wind is blowing, so that five or six more miles of wind go by during the briefer period. It is from 11 A. M. to 7 P. M. that the Brisa blows, when the sun has heated up the ground. It is, therefore, to be regarded as a true sea breeze. Occasionally a land breeze springs up during the night. At other times it merely falls off in velocity and settles back into the east. The following table gives the data for every other hour:

AVERAGE WIND DIRECTION AND VELOCITY AT HAVANA, 1900, 1901, AND 1902

	A. M.						P. M.					
Time	1	3	5	7	9	11	1	3	5	7	9	11
Direction	E	E	E	E	E	NE	NE	NE	NE	NE	E	E
Miles per hour	7.7	7.3	7.2	7.4	10.1	13.2	15.1	16.6	15.5	12.6	10.3	8.9

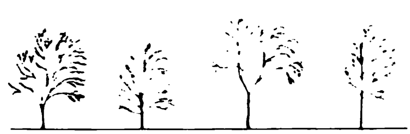
FIG. 17. *White birch on the west slope of Baldface, Gilford, N. H., looking north-northwest.*

The east wind has an average velocity of 8.4 miles an hour; the northeast, 14.6. The vegetation suggests the northeast winds for most points between Havana and Cardenas, but shore places at Cardenas and Matanzas indicate easterly winds. Such studies may afford a method of determining prevalent winds in regions meteorologically unexplored.

Light effects on tree growth are of much interest in connection with these wind studies. Trees tend to grow strongly toward the light. A singular example of an elm on the flood plain of the Huron, south of Ypsilanti, with a strong top growth to the northwest, was found to have alongside it the stump of a cut-away mate that had prevented it from developing to eastward. But more has been attributed to light effect than observation warrants. White poplars may be found close to the west of a house, but growing strongly toward it. Such observations as have been made seem to justify the statement that light usually has less effect on trees fairly exposed to the wind than the wind does. When they work in opposite directions the light effect is masked by that of the wind. It is not certain that the direct sunlight has more influence on tree growth than the diffused light of the sky. If it were, east and west rows of trees should have a greater development to the south. Is this observed?

An interesting persistence of wind effect is seen in Figure 17. Apparently hillside creep has caused the trunk to lean downhill, as the earth yielded beneath it. As there was free exposure to light and wind the twigs have continued to grow over to eastward. There is no sign of a stump or branch lost from the east side.

I believe school teachers who are willing to go out-of-doors will find value in observations like these.



A SCHEME OF GEOGRAPHY*

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THERE is a certain profit in looking forward to the time when the Earth and its inhabitants shall have been so well studied that if all then known about them were put in print, the volumes thus formed would include the whole content of geography. The material there gathered might be arranged following either one of two

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plans. According to one plan, everything about a certain country would be brought together; this would make a treatise on regional geography. According to the other plan, all things of the same kind would be brought together; this would constitute a treatise on systematic geography. Under either plan, convenience would be served by adopting some reasonable scheme that might be invented for the arrangement of the parts into which the subject might be divided. Under regional geography, for example, the arrangement might be according to the continents and their political subdivisions. Under systematic geography, the arrangement might follow the usual order of globe, atmosphere, oceans, lands, inhabitants. Under each plan, use would be made of the other as a secondary guide. All the items under Mexico in a regional treatise should follow a systematic order of presentation; while all examples of a certain kind of lakes in a systematic treatise should follow a regional order of presentation.

A complete geographical treatise, regional or systematic, would be inconveniently bulky. Abbreviated editions would be in demand, and they might be abbreviated in several ways. In one way, unimportant or inconspicuous items would be omitted, and important or conspicuous items retained, wherever or whatever they might be. In another way, remote items might be omitted and home items retained. In a third way, difficult items would be omitted and elementary items retained. Thus hand books and school books would be developed.

There can be little doubt that the abbreviated or simplified editions would gain in value with the approach to completeness of the treatises on which they were based, as well as with the competence of their authors. A hundred years ago the best geographies were necessarily silent concerning the then extensive unexplored parts of the world. To-day the best geographies contain a much larger body of information than their predecessors, but they are still silent concerning many of the more advanced problems of geography. A hundred years hence there may be still much to learn, but great progress will by that time have been made in the more philosophical phases of geography, to which attention is not yet sufficiently directed. It is with the object of calling attention to some of these phases that this note is written.

The direction in which geographical progress is to be made in the next hundred years may perhaps be forecast from the direction of progress in the last hundred. Geography used to be a "study of the Earth and its inhabitants." Items were brought together in great number; they were described more or less empirically; but there was no sufficient effort made to explain and to correlate them. Correlation was greatly promoted by Ritter and his followers. Geography then became, not simply a study of independent items, but a study of the Earth and its inhabitants in their mutual relations. With the advance of science in general, the description of geographical items became more and more explanatory; but progress in the larger problems of correlation was retarded for half a century by the prevalence of a teleological philosophy, and until this was replaced by the doctrine of evolution, the modern phase of geography could not be reached.

In its present modern phase, geography is essentially concerned with the rational correlation of the items that fall under its two parts: on the one hand, the items of inorganic conditions that constitute the physical environment of living forms; and on the other hand, the items of organic response made by living forms to their environment. The first of these two parts is commonly called physical geography. In the United States this term is coming to be condensed into physiography.* The second part has no name; it includes certain phases of political and commercial geography, and it goes much further than either, because it is concerned with all forms of life instead of only with man and what is useful to him. It will here be called ontography; the main root of the word corresponding to that of paleontology, and the termination agreeing with that of physiography and of geography.

Thus understood, geography is concerned with the combination of physiography and ontography; that is, with the correlation between inorganic environment and organic response. Individual items, such as the course of an ocean current, the path of a valley, the area of a forest, the population of a village, fall under the physiographic or the ontographic division of the subject, and must there be studied as carefully and rationally as possible; but they will fail to attain a truly geographic quality as long as they are treated independently, instead of being brought into proper correlation with their fellows. The physiographic items, regarded as elements of controlling environment, must be associated in thorough-going geographical work with the ontographic responses that they have evoked. The ontographic items, regarded as responses to environing conditions, must be associated with the physiographic controls by which they have been governed. The course of a current will affect the distribution of living forms or

* Thus employed, physiography is not directly concerned with astronomy and geology, or with physics and chemistry, as it has come to be, unfortunately, in my opinion, in England.

the lines of navigation; the path of a valley will determine the location of roads and villages; the area of a forest is the response to land form, climate, and soil; the population of a village depends on many environing factors.

No full measure of geographical treatment will be reached by the student who restricts his work either to the inorganic or to the organic half of the subject. Those who wish to train themselves to be fully equipped geographers should gain not only the capacity, but also the

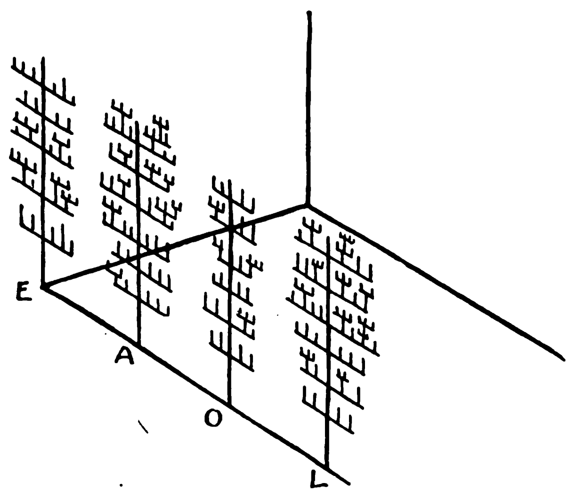

FIG. 1.

habit of giving due attention to ontography and physiography combined. The best geographical works to-day clearly enough exhibit the beginning of this double consideration of their subject, but they usually fall short of carrying the treatment thoroughly and uniformly over all aspects of the subject, and they commonly fail to show that their plan of treatment has been adopted in accordance with a sufficiently comprehensive view of geography as a whole. It is still usual in the best modern books to find many facts described as if they were lonesome, individual occurrences, instead of members of a recognized class, and to find their description closed before they have been systematically correlated with their responses or their controls.

The quality of geography, as a whole, may be presented and emphasized by a simple graphic device that experience has shown to have some value. Imagine the four frameworks, *E*, *A*, *O*, *L*, Figure 1, to stand in a vertical plane over the line *EL*, and to contain compartments for all the topics of systematic physiography under the larger headings of the Earth as a globe, the atmosphere, the oceans, and the lands. The compartments may be taken to represent types, with respect to which actual examples are classified. It may be briefly pointed out, although it is not intended to delay here in explaining all the practical value of this part of the device, that the observer is greatly aided in his work if he carries mentally into his field of study a well-arranged framework on which the types that embody the results of all previous investigations are carefully defined and arranged; for there can be no question that the habitual treatment of every observed physiographic item as far as possible as a member of a known class, is a most practical and serviceable aid in field observation and record. The framework must not be imagined to represent a rigid and unchangeable scheme; it should be elastic and adjustable, constantly modified in response to accepted suggestions for improvement as investigation progresses.

Physiography is, to-day, relatively well developed; and the classification of its parts representable in a framework is fairly well advanced, although, for that matter, there is yet by no means so general an agreement among physiographers, with respect to the systematic subdivision and arrangement of the items with which they have to deal, as there is among botanists and zoölogists with respect to the systematic classification of plants and animals. Some physiographers, for example, treat rivers and oceans in one division apart from the lands; others treat oceans and coasts together, before the lands have been studied; but both these plans are fortunately unusual. Ontography, on the other hand, has hardly any recognized scheme of treatment; it has still to be systematically studied. The framework on the farther side of Figure 2, by which a classification of organic responses is here roughly indicated, must therefore be taken for the present as suggesting what may yet be done rather than as representing what has already been done in this direction.

Even the limits of ontography are not yet agreed upon, and in considering with historians, zoölogists, and botanists how far this division of geography may be reasonably extended, it is sometimes the case that one encounters certain indications of jealousy and accusations of trespass. Here, however, as in other sciences, it is not so much the object studied as the relation in which it is studied that determines its place in a scientific classification. The same object may be studied in its varied relations under several different sciences.

Surely history, zoölogy, and botany make use of geographical items so often that there can be little ground of just complaint if geography finds occasion to examine facts that are commonly associated with these other divisions of knowledge.

The most reasonable method of determining the limits of ontography seems to be the following: Select certain examples of undoubtedly ontographic facts, and then, under the principle of continuity, follow the lead of the classes to which these facts belong as far as they can be traced; otherwise the limits must be arbitrary or conventional. Thus there will be found certain facts that are indisputably and centrally ontographic, while others are peripheral, and are more or less shared with other sciences; but in the latter case all the sciences concerned are equally trespassers. These abstract considerations may be illustrated to advantage by some concrete examples.

The location of a village at the head of a bay on the sea-coast must be considered by every one to be a geographic item, and, according to the plan here presented, it will fall under the ontographic half of the subject. In old-fashioned geography, such an item would have been empirically stated, without explanation of its meaning; in more modern geography, it would be rationally described as an example of a class of responses in which man's way of doing things is determined by his physiographic surroundings. Need having arisen of interchange between land and sea (this itself being an important ontographic matter), the coast line gains importance because it separates two kinds of activities; and protected points on the shore line, such as bay heads. become of exceptional importance, because here the interchange between the two kinds of activities can be effected with the least difficulty. Now, the essential quality of this item is that certain organic inhabitants of the Earth have found it to their advantage to be guided in certain actions by the conditions of their inorganic environment. Hence, under the principle of continuity, every other item in which an organism is thus guided to act in certain ways is also of an essentially ontographic quality. It matters not whether the organism is man, animal, or plant, whether the action is conscious or unconscious, whether it is of great or little importance; the essential feature is that the item must involve a response or reaction of organism to environment. It is only by adopting an arbitrary limit for ontography, and hence also for geography, that anything narrower than this broad definition can be regarded as indicating its field.

The whole content of ontography, thus broadly defined, is not known, because its field has not yet been carefully examined; but enough is already known to show that the subject is of great and varied interest. It may be reviewed in two ways: All kinds of items found in the physiographic framework may be examined as to their responses in the organic world; or all kinds of organisms may be examined to see how far their structures, actions, and distribution are responses to physiographic controls. For example, in response to the important physiographic control of gravity, one finds the development of dorsal and ventral structures in many animals; those which escape this control are the minute organisms that are wafted about in the atmosphere, and the jelly-like organisms that float indifferently in one attitude or another in water. Again, one finds many details of bony structure and muscular arrangement adapted to support the body against the pull of its weight. The habit of building walls vertical, and of grading railroads nearly horizontal come under the same control. Even language is affected indirectly, as in such adjectives as grave and upright, in their figurative meanings. On the other hand, one finds in the growth of trees the responses to many controls—to gravity and the search for ground water in the growth of the roots; to gravity and the search for light and air in the growth of the stem; to form of land surface and depth and character of soil, as well as to various elements of climate in the determination of distribution.

It is evident that in most cases the responses above mentioned are not the result of the immediate adjustment of organism to environment, but of a gradual adjustment through long periods of past time, perpetuated through inheritance, provided the controlling conditions and need of adjustment still persist. The use of oxygen in respiration, universal in all plants and animals, is a case in point. This habit must be taken as indicating the presence of free oxygen in the ocean (dissolved) or in the atmosphere since the earliest geological periods from which fossils are preserved; the habit persists because the need and the opportunity still endure. The fur of many land mammals is a response to climatic controls; but in the marine mammals, that are in all probability descended from fur-bearing ancestors, the fur is replaced by blubber. Examples of more immediate adjustment are chiefly found in actions, as when horses and cattle on the western semi-arid plains of the United States wear paths from pasturing uplands to watering-places in the valleys, and yet here, as before, habit formed through long inheritance is the mainspring of action.

The classification employed in the ontographic framework may, in view of what has now been said, be imagined to follow either one of two plans. In one plan, all the responses to one kind of control are gathered in a single compartment, and there would be as many ontographic as physiographic compartments; this plan is followed in Figure 2. In the other plan, each compartment would correspond to a kind of organism, and there would be as many compartments as might be needed to contain the subdivisions of the vegetable and animal kingdoms. Whichever plan is adopted, there can be little doubt that when

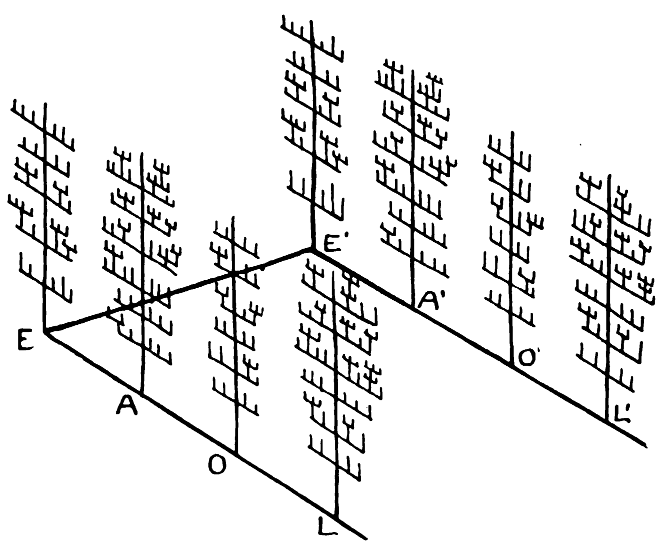

FIG. 2.

ontography is as well developed as physiography, geography will be greatly advanced. That stage of the development of our subject may be represented in Figure 3, in which the correlation of physiographic and ontographic items is indicated by lines that stretch across from one framework to the other, the first of the above-mentioned two plans for ontographic classification being here again illustrated. The conscious recognition and discussion of the correlations thus indicated graphically by the cross-lines is indispensable for the full development of modern geography.

It should be noted in passing, but for the present only in the briefest manner, that there are innumerable correlations to be found also among the items of each framework, considered alone. For example, London markets are to-day supplied with meat products from

Argentina and Australia, where herds of cattle and flocks of sheep find cheap pasture on broad plains fit for few other uses than grazing: these are correlations among items on the ontographic framework. On the other hand, the cliffs of Cornwall result from the interaction of waves driven by winds excited by sunshine and of currents involved in tides excited by lunar attraction, on the rocky structures exposed

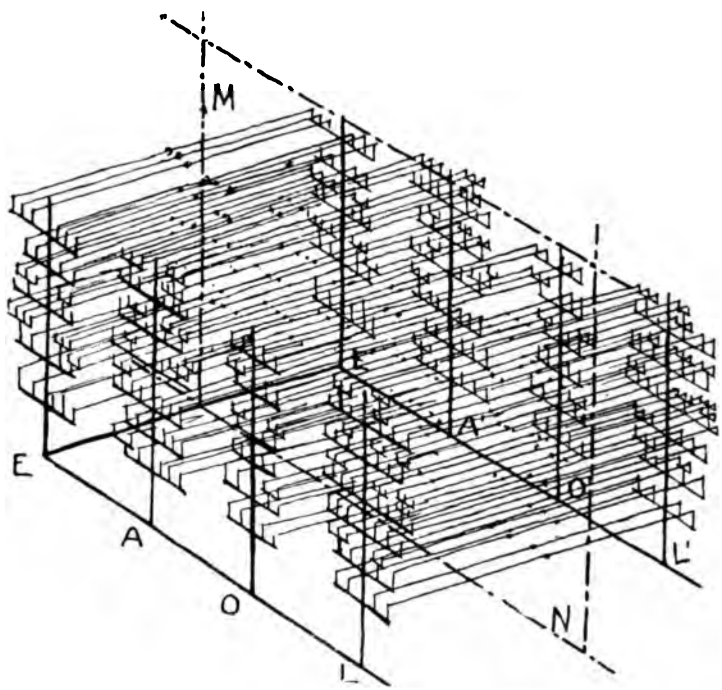

FIG. 3.

along the present coast line by crustal movements. Again, in a maturely dissected region, such as the Piedmont belt of North Carolina, one may recognize the wonderfully delicate interdependence of hillside slopes, soil creep, stream wash, and river work that is involved in the thoroughly organized condition of the drainage systems there established. Both these examples exhibit correlations of items on the physiographic framework. None of these correlations are, however, shown in the diagrams, for fear of too great a confusion of lines. With this digression, we may return to the consideration of Figure 3.

Imagine now a vertical plane, *MN*, parallel to the planes of the two frameworks and midway between them. This new plane will be intersected by all the cross-lines of correlation, and the summary of all the points of intersection may be taken to exhibit the whole content of systematic geography. The plane may be shifted towards one of the other frameworks, if it is desired to give greater emphasis to one or to the other part of geography, but the well-balanced geographer will doubtless prefer to hold a plane midway in a position as here indicated. In case the biological classification of ontographic items were adopted, the lines of correlation would not be parallel; a group of lines would radiate from each kind of physiographic control in the framework to all of its ontographic responses, and various lines from numerous kinds of controls would be focused on the kind of organism in the further framework that responded to them.

It was stated above that this graphic device has been found by experience to have some value in indicating the compound nature of geography, as it is here defined, and in illustrating the relation of its parts. It has a further value, namely, an aid in the practical analysis of a geographer's work. If, in the course of exploration or other study, an item of physiographic nature is found, the geographer must at once seek to place it in its proper relation to all other physiographic items, and to discover all the ontographic responses that it has excited. If an ontographic item is discovered, its physiographic controls must be sought for. The correlations between the two must be studied out.

This may seem so simple, so manifest, that it is hardly worth the saying; yet if any standard work on geography is examined and analyzed, it will be found far from complete in the sense of completeness here indicated. The work undoubtedly will give, more or less explicitly, many examples of correlation between controlling environment and responding organism, and it will thus confirm more or less clearly the compound nature of geography here exposed; but it will be only by way of rare exception that both phases of the subject are systematically presented, and that the correlations between them are consciously and completely analyzed. Exploration, in so far as matters of occurrence and location are concerned, has now been well advanced; exploration, in so far as thorough analysis of cause and effect, is concerned, still affords plentiful opportunity for the investigator. There can be little question that studious observation and thorough record will be greatly aided when some such method of analysis as is here indicated shall have become familiar and habitual.

A few illustrations may be given to exhibit the breadth of geography, when it is expanded by the due consideration of its many parts. One is taken from an account of the oasis of Suf, in the Algerian Sahara, by Brunhes of Freiburg. This observer points out a relation between the sandy surface of the oasis and the character of the people, as follows: Every walking animal leaves its track in the sand, and from this follows an extraordinary skill on the part of the natives in tracking men and beasts; individual footprints can be recognized and followed through a confusion of crossing trails, where the untrained eye of a European would be unable to distinguish one track from another. As a result, theft is said to be less common in the sandy Suf than in the stony oases; the thief is so surely tracked and found that thieving is unprofitable.

Another example is furnished by Lugéon of Lausanne, who describes the relation between villages and alluvial fans in the higher valleys of the Alps. The fans offer the best sites for occupation; nearly every fan has its own village, each with its own organization, and the distribution of villages depends closely upon the distribution of fans. As most of the fans are of small area, most of the villages must be of small size. An earlier writer has instanced the development of these small village communities as illustrating the innate spirit of independence in the Swiss people; But Lugéon points out that small communities necessarily result from the small fans, and then aptly inquires whether the spirit of independence is not more probably a consequence than a cause of the subdivision of village communities.

Instances of this sort might be given in great number. Baku, the petroleum port on the arid shores of the Caspian, has rapidly grown to a population of something like one hundred fifty thousand souls in consequence of the discovery and exploitation of rock oil near by. So large a population needs an abundant water-supply, not easily to be had in a region of so dry a climate as that of western Asia. Water could be brought at a considerable expense from a river over fifty miles away, but capitalists hesitate to undertake the construction of so long an aqueduct for a city whose population will mostly move away when the oil-wells give out; hence, at present, the local supply from wells of unsatisfactory quality is supplemented by distillation from the brackish Caspian, oil fuel being very cheap, and an ingenious system of boiling and condensation producing four pounds of distilled water for one pound of fuel. Nowhere else in the world is a distillery run on so large a scale and with so temperate an object! And who shall say that Baku's rapid growth and uncertain life, as well as its peculiar water-supply, are not ontographic items?

It is not intended to assert that all the examples of cause and consequence that might be given are established beyond dispute, but rather that they show the importance of making a thorough collection, a careful analysis, and a systematic classification of all such examples in order to carry forward the development of geography and to discover its entire content. Evidently errors may be made in speculations of this kind; for example, it does not seem safe to follow the statement of a famous geographer to the effect that the (supposed) taciturnity of the American Indian resulted from the darkness of the forest in which he lived. It is on the careful analysis of abundant observations, rather than on the refusal to speculate as to cause and consequence, that geography will thrive.

It is desirable that geography should be presented, even to beginners, as a subject involving the correlation of physiographic and ontographic items. When the globular form of the Earth is taught, that is the time to point out how largely the modern development of commerce results from the nearly level form that a globe alone possesses. When the size of the Earth is taught, that is the time for telling about the effects of its size in isolating savage races, and thus producing differences of language and customs, as well as for showing how greatly modern means of transportation and communication have overcome the earlier effects of isolation. With the form and rotation of the Earth there should be immediately associated the modern habit of laying out the boundaries of unsurveyed territories, as in North America, Australia, and Africa, along the meridians and parallels; and so on through the whole subject. Thus the young student may be thoroughly infected with the idea of correlation, and from such an introduction to geography he may more probably contribute afterwards to its advancement than if he has been taught in the old-fashioned empirical way, or in the more modern method of imperfectly developed correlation.

The most important steps towards the fuller development of geography, therefore, seem to be: First, the formation of the habit of looking for correlations of physiographic and ontographic items; and, second, the development of a well-considered classification of all items, physiographic and ontographic, so that all may be considered in reference to their fellows.

GEOGRAPHICAL NOTES

Some Facts About Panama.—The commerce of Panama amounts to about three million dollars per annum; its population to about three hundred thousand, and its area to 31,571 square miles, or nearly equal to that of the State of Indiana. These figures are the latest available data on commerce, population, and area. Those of commerce are from the reports of the United States consuls at Panama and Colon, which have just been received, and not yet published; those of population are based upon the latest official estimate, which shows the population in 1881, and was based upon the census of 1871; while the figures of area are from accepted geographical authorities and are those of the area of the "Department of Panama" of the Colombian Republic. The principal ports are Panama, on the Pacific coast, and Colon, on the Atlantic side, and these ports are visited annually by more than one thousand vessels, which land over one million tons of merchandise and nearly one hundred thousand passengers, chiefly for transfer over the Panama Railway, forty-seven miles in length, connecting the Pacific port of Panama with the Atlantic port of Colon.

Colon, or Aspinwall, as it is sometimes called, has a population of about three thousand persons. The city of Panama has a population of about twenty-five thousand. It was founded in 1519, burned in 1671, and rebuilt in 1673, while Colon is of much more recent date, having been founded in 1855.

The population, which, as already indicated, amounts in number to about three hundred thousand, is composed of various elements—Spanish, Indian, Negro, and a limited number of persons from the European countries and the United States, especially those engaged in commerce and transportation, and the operation of the Panama railway. A considerable number of the population is composed of persons brought to the isthmus as laborers for the construction of the canal, and of their descendants. Since the abolition of slavery in Jamaica, a considerable number of blacks and mulattoes have settled on the isthmus as small dealers and farmers, and in some villages on the Atlantic side they are said to be in the majority, and, as a result, the English language is much in use, especially on the Atlantic side. Some of the native population have retained their customs, speech, and physical type, especially those in the western part of the province, and claim to be descendants of the natives found in that section by the Spaniards when they discovered and conquered the country.

Of the commerce of Panama, the United States supplies a larger share than any other country. The importations at the port of Colon during the fiscal year ended June 30, 1903, as shown by the report of the United States consul, amounted to $952,684, of which $614,179 was from the United States, $119,086 from France, $118,322 from England, $76,386 from Germany. The figures of the fiscal year 1903 show a considerable increase from those of 1902, in which the value of the imports at Colon were $776,345. Of the $614,179 imports from the United States at Colon in 1903, $200,744 was dry goods, $189,333 provisions, $59,890 coal, $38,642 lumber, $32,900 kerosene, $30,400 liquors, and $31,940 hardware. The value of the importations from the United States in 1903 exceeded those of 1902 by about one hundred sixty thousand dollars. The exports to the United States from Colon in 1903 amounted to $173,370, of which $75,432 was bananas, $54.960 cocoanuts, $12,472 turtle shells, $9,400 ivory nuts, $6,460 hides, and $5,924 coffee.

From the port of Panama the exports to the United States in the fiscal year 1903 amounted to $193,342, of which $56,767 was hides, $49,974 india rubber, $27,805 cocobolo nuts, $16,598 ivory nuts, $13,372 deerskins, and $6,908 coffee. The consul at Panama states that the imported articles come mostly from England, Germany, France, Italy, and the United States, but gives no statistics of the imports.

Panama is connected with San Francisco by a weekly steamer schedule operated by the Pacific Mail Steamship Company, and with Valparaiso by a weekly steamer schedule operated by the Pacific Steam Navigation Company and South American Steamship Company. Two passenger and two freight trains leave Panama daily for Colon, and Colon daily for Panama. The time for passenger trains over the forty-seven miles of railway is three hours.

From Panama there is one cable line north to American ports, and one to the south. The actual time consumed in communicating with the United States, and receiving an answer, is stated by the consul to be usually about four hours. There are also cable lines from Colon to the United States and Europe.

The money of the country is silver, the rate of exchange having averaged during the past year about 150 per cent.—*Bureau of Statistics, Department of Commerce and Labor.*

The Ship Canals of the World.—The ship canals of the world are nine in number, as follows:

(1) The Suez Canal, begun in 1859 and completed in 1869.

(2) The Kronstadt and St. Petersburg Canal, begun in 1877 and completed in 1890.

(3) The Corinth Canal, begun in 1884 and completed in 1893.

(4) The Manchester Ship Canal, completed in 1894.

(5) The Kaiser Wilhelm Canal, connecting the Baltic and North Seas, completed in 1895.

(6) The Elbe and Trave Canal, connecting the North Sea and Baltic, opened in 1900.

(7) The Welland Canal, connecting Lake Erie with Lake Ontario.

(8 and 9) The two canals, United States and Canadian, respectively, connecting Lake Superior with Lake Huron.

THE SUEZ CANAL

The Suez Canal is usually considered the most important example of ship canals, though the number of vessels passing through it annually does not equal that passing through the canals connecting Lake Superior with the chain of great lakes at the south. In length, however, it exceeds any of the other great ship canals, its total length being ninety miles, of which about two-thirds is through shallow lakes. The material excavated was usually sand, though in some cases strata of solid rock, from two to three feet in thickness, were encountered. The total excavation was about 80,000,000 cubic yards under the original plan, which gave a depth of twenty-five feet. In 1895, the canal was so enlarged as to give a depth of thirty-one feet, a width at the bottom of 108 feet, and at the surface of 420 feet. The original cost was $95,000,000, and for the canal in its present form slightly in excess of $100,000,000. The number of vessels passing through the canal in 1870 was 486, with a gross tonnage of 654,915 tons; in 1875, 1,494 vessels, gross tonnage, 2,940,708 tons; in 1880, 2,026 vessels, gross tonnage, 4,344,519 tons; in 1890, 3,389 vessels, gross tonnage, 9,749,129 tons; in 1895, 3,434 vessels, gross tonnage, 11,833,637 tons; and in 1900, 3,441 vessels, with a gross tonnage of 13,699,237 tons. The revenue of the canal is apparently large in proportion to its cost, the *Statesman's Yearbook* for 1901 giving the net profits of 1899 at 54,153,660 francs, and the total amount distributed among the shareholders 51,538,028 francs, or about 10 per cent of the estimated cost of $100,000,000.

The canal is without locks, being at the sea level the entire distance. The length of time occupied in passing through the canal averages about eighteen hours. By the use of electric lights throughout the entire length of the canal, passages are made at night with nearly equal facility to that of the day. The tolls charged are 9 francs per ton net register, "Danube measurement," which amounts to slightly more than $2 per ton United States net measurement. Steam vessels passing through the canal are propelled by their own power.

THE KRONSTADT AND ST. PETERSBURG CANAL

The canal connecting the Bay of Kronstadt with St. Petersburg is described as a work of great strategic and commercial importance to Russia. The canal and sailing course in the Bay of Kronstadt are about sixteen miles long, the canal proper being about six miles and the bay channel about ten miles, and they together extend from Kronstadt, on the Gulf of Finland, to St. Petersburg. The canal was opened in 1890 with a navigable depth of 20½ feet, the original depth having been about nine feet; the width ranges from 220 to 350 feet. The total cost is estimated at about $10,000,000.

THE CORINTH CANAL

The next of the great ship canals connecting bodies of salt water, in the order of date of construction, is the Corinth Canal, which connects the Gulf of Corinth with the Gulf of Ægina. The canal reduces the distance from Adriatic ports about 175 miles and from Mediterranean ports about 100 miles. Its length is about four miles, a part of which was cut through granitic soft rock and the remainder through soil. There are no locks, as is also the case in both the Suez and Kronstadt Canals already described. The width of the canal is seventy-two feet at bottom and the depth 26¼ feet. The work was begun in 1884 and completed in 1893 at a cost of about $5,000,000. The average tolls are 18 cents per ton and 20 cents per passenger.

THE MANCHESTER SHIP CANAL

The Manchester Ship Canal, which connects Manchester, England, with the Mersey River, Liverpool, and the Atlantic Ocean, was opened for traffic January 1, 1894. The length of the canal is 35½ miles, the total rise from the water level to Manchester being sixty feet, which is divided between four sets of locks, giving an average to each of fifteen feet. The minimum width is 120 feet at the bottom and averages 175 feet at the water level, though in places the width is extended to 230 feet.

The minimum depth is twenty-six feet, and the time required for navigating the canal, from five to eight hours. The total amount of excavation in the canal and docks was about 45,000,000 cubic yards, of which about one-fourth was sandstone rock. The lock gates are operated by hydraulic power; railways and bridges crossing the route of the canal have been raised to give a height of seventy-five feet to vessels traversing the canal, and an ordinary canal, whose route it crosses, is carried across by a springing aqueduct composed of an iron caisson resting upon a pivot pier. The total cost of the canal is given at $75,000,000. The revenue in 1901, according to the *Statesman's Yearbook*, was £621,128, and the working expenses, £483,267. For the half year ending June 30, 1900, the canal yielded £16,488 toward paying the £112,500 of interest which the city of Manchester has to pay on the capital invested in the enterprise. The freight-paying tolls on the canal amounted to 1,487,841 tons in the half year, an increase of 12 per cent over that of the corresponding period of the preceding year.

THE KAISER WILHELM CANAL

Two canals connect the Baltic and North Seas through Germany, the first, known as the Kaiser Wilhelm Canal, having been completed in 1895 and constructed largely for military and naval purposes, but proving also of great value to general mercantile traffic. Work upon the Kaiser Wilhelm Canal was begun in 1887, and completed, as above indicated, in 1895. The length of the canal is sixty-one miles, the terminus in the Baltic Sea being at the harbor of Kiel. The depth is 29½ feet, the width at the bottom seventy-two feet, and the minimum width at the surface 190 feet. The route lies chiefly through marshes and shallow lakes, and along river valleys. The total excavation amounted to about 100,000,000 cubic yards, and the cost to about $40,000,000. The number of vessels passing through the canal in 1900 was 21,571, with a tonnage of 4,282,258, and the dues collected amounted to 2,133,155 marks.

SHIP CANALS CONNECTING THE GREAT LAKES OF NORTH AMERICA

Three ship canals intended to give continuous passage to vessels from the head of Lake Superior to Lake Ontario and the St. Lawrence River are the Welland Canal originally constructed in 1833 and enlarged in 1871 and 1900; the St. Marys Falls Canal at Sault Ste. Marie, Mich., opened in 1855 and enlarged in 1881 and 1896, and the Canadian Canal at St. Marys River, opened in 1895. In point of importance, measured at least by their present use, the canals at the St. Marys River by far surpass that of the Welland Canal, the number of vessels passing through the canals at the St. Marys River being eight times as great as the number passing through the Welland, and the tonnage of the former nearly forty times as great as that of the latter. One of the important products of the Lake Superior region, iron ore, is chiefly used in the section contiguous to Lake Erie, and a large proportion of the grain coming from Lake Superior passes from Buffalo to the Atlantic coast by way of the Erie Canal and railroads centering at Buffalo. The most important article in the westward shipments through the Sault Ste. Marie canals, coal, originates in the territory contiguous to Lake Erie. These conditions largely account for the fact that the number and tonnage of vessels passing the St. Marys River canals so greatly exceed those of the Welland Canal.

The Welland Canal.—The Welland Canal connects Lake Ontario and Lake Erie on the Canadian side of the river. It was constructed in 1833 and enlarged in 1871 and again in 1900. The length of the canal is twenty-seven miles, the number of locks twenty-five, the total rise of lockage 327 feet, and the total cost about $25,000,000. The annual collection of tolls on freight, passengers, and vessels averages about $225,000 and the canal is open on an average about two hundred and forty days in a year.

The Sault Ste. Marie Canals.—The canals of Sault Ste. Marie, Mich., and Ontario, are located adjacent to the falls of the St. Marys River, which connects Lake Superior with Lake Huron, and lower or raise vessels from one level to the other, a height of seventeen to twenty feet. The canal belonging to the United States was begun in 1853 by the State of Michigan, and opened in 1855, the length of the canal being 5,674 feet, and provided with two tandem locks, each being 350 feet in length and seventy feet wide, and allowing passage of vessels drawing twelve feet, the original cost being $1,000,000. The United States Government, by consent of the State, began in 1870 to enlarge the canal, and by 1881 had increased its length to 1.6 miles, its width to an average of 160 feet, and its depth to sixteen feet; also had built a single lock 515 feet long and eighty feet wide, with a depth of seventeen feet on the sills, which was located 100 feet south of the State locks. The State relinquished all control of the canal in March, 1882. In 1887 the State locks were torn down and replaced by a single lock 800 feet long, 100 feet wide, and a depth of twenty-two feet of water on the sills. This lock was put in commission in 1896. The canal was also deepened to twenty-five feet. The Canadian canal, 1⅛ miles long, 150 feet wide, and twenty-two feet deep, with lock 900 feet long, sixty feet wide, with twenty-two feet on the miter sills, was built on the north side of the river during the years 1888 to 1895. The number of vessels passing through the United States canal in 1902 was 17,588, and through the Canadian canal 4,204. In 1900 the number of vessels passing through the United States canal was 16,144, and through the Canadian canal 3,003, showing an increase of 1,200 in the number of vessels passing through the Canadian canal, and a slight decrease in the number through the United States canal, the increase in the number passing through the Canadian canal having been due to the development of the Michipocoten district. The tonnage passing through the United States canal in 1902 was: Registered tonnage, 27,408,021 tons; in 1901, 22,222,334 tons, against 20,136,782 in the year 1900; the freight tonnage in 1901 was 25,026,522 tons, against 23,251,539 tons in 1900. The Canadian canal shows: Registered tonnage in 1902, 4,547,561; in 1901, 2,404,642 tons, against 2,160,490 in 1900. A marked contrast between the business of the St. Marys Falls and Welland Canals is found in a comparison of their figures for a term of years. The number of vessels passing through the Welland Canal in 1873 was 6,425, and in 1899, 2,202, a reduction of more than one-half in the number of vessels. The number of vessels passing through the St. Marys Falls Canal in 1873 was 2,517, and in 1902, through the American and Canadian canals, 22,659. —*Bureau of Statistics, Department of Commerce and Labor.*

Dalny, The Township.—The township of Dalny comprises an area of 75 square versts (21,000 acres), and during the current year it is proposed to purchase an additional tract of 25 square versts (7,000 acres) on the northwest of the township.

The lands forming the township of Dalny were purchased in 1899 by the Chinese Eastern Railway Company from the local inhabitants at a price fixed by a committee of appraisers. On these grounds were formerly several small Chinese villages, the inhabitants of which were principally devoted to agriculture and fishing.

The city of Dalny is picturesquely situated in an extensive valley which slopes gently down to the deep and well-protected bay of Talienwan, and is surrounded on three sides by a range of hills rising to a height of 800 feet. It is divided into three parts—The Administration City, the European and Commercial City, and the Chinese City.

Administration City.—The Administration City borders on the harbor and bay and is 108 acres in extent. All space in the administration quarter is reserved for the use of the Chinese Eastern Railway Company and its officials. In this section are the residences and offices of the governor and other officials of the railway company. There are over 200 buildings erected, besides a large area of temporary structures for minor employes and workmen.

Among the principal buildings are one hundred and twelve handsome brick and stone residences, the Administration Building, the port office, the seagoing-service office, the Greek church and school buildings, the railway company's hospital (for one hundred and eighty-six patients), the post, telegraph, and telephone offices, the Service Club and Concert Hall, the Yacht Club, Hotel Dalny, the Russo-Chinese Bank, police office and jail, the electric plant, machine shops, and the principal stores and shops.

The city is supplied with water and electric lights throughout, and has an adequate police force and fire brigade, which extends also to the Commercial City.

The permanent buildings of Dalny are at present confined almost entirely to the Administration quarter.

European and Commercial City.—The European and Commercial City, which has an area of 1,100 acres, borders on the harbor and extends to the range of hills on the south and east.

Along many of the principal avenues and streets of the Commercial City a large number of shops, stores, hotels, and dwelling-houses have been built for the accommodation of both the large native population and foreigners. Most of these buildings, however, are only temporary. They are put up on the company's land with permission of the city authorities, and are to be removed in case the lots upon which they are built are sold or leased.

The most central part of the Commercial City is Nicholas place, from which ten avenues branch. Around this circle (which is 700 feet in diameter) it is intended that the public buildings, banks, hotels, and office buildings shall be erected. Nicholas place is connected with the piers and shipping quarter by Moscow avenue, which is to be the main business thoroughfare of the city.

The residential section is to be on the elevated ground of the European City.

Chinese City.—The Chinese quarter is separated from the Administration and European cities by the town park and nurseries, which are upon the site of an old Chinese village.

Climate of Dalny.—The climate of Dalny is agreeable, healthful, and dry. According to the weather bureau of Dalny, the temperature in winter for the last four years has not been below 19° C. (3° F. below zero). During very severe winters the bay becomes frozen, but ice breakers are to keep the channel and harbor open for navigation.

Building the City.—In the construction of the city thousands of Chinese laborers are daily engaged in the enormous excavations, the making of streets and roads, and the completion of the work on the harbor. Numerous steam and tram lines are used for the conveying of earth and stone and for filling in the piers and water front.

The harbor is the scene of the greatest activity at present. The small harbor has been dredged to a depth of 18 feet, and the pier for coast steamers (which has been in use for over a year) is nearly completed and has a railroad to its end.

The work on the large dry dock is progressing rapidly; the cofferdam is built and the excavation well under way. This dry dock is to be 630 feet long, 88 feet wide, and 28 feet in depth, and will cost about 1,800,000 rubles ($927,000).

The eastern side of the large pier for ocean steamers is completed and in use nearly to its end; on the west side the walls are nearing completion, and one of the iron wharves for light-draft vessels is built. Three railway tracks connecting with the main line and two storage warehouses, with a floor area of 19,600 square feet each, are completed. This pier is 1,925 feet long and 350 feet wide, and has a depth of water of from 18 to 28 feet, and when completed will contain seven railway tracks and nine large warehouses.

One can judge from this splendid pier how thoroughly and substantially the construction of the harbor is being done. The foundation is laid with 50-ton concrete blocks and the walls finished with the best of dressed granite.

For the outside pier, the foundation only is laid. The wharf between the two piers is completed and in use. The foundation of the breakwater is finished for a distance of 2,800 feet and the sea wall along St. Petersburg quay is built.

Work Accomplished.—

Area of port territory filled in, square yards	6,800,000
Dredged from harbor, cubic yards	3,166,000
Earth excavated, cubic yards	12,916,000
Stone brought by rail, cubic yards	375,412
Stone brought by sea, cubic yards	882,210

Length of streets made, yards	77,000
Streets macadamized, yards	20,300
Sidewalks made, miles	6
Suburban roads made, miles	14

Railway Service.—The branch railway connecting Dalny with the main line of the Chinese Eastern Railway at Nangalin was built and formally operated by the engineers in charge of the construction of Dalny. At the beginning of the current year this branch road was given over to the control of the main line, and Dalny was connected by daily service of through trains with Port Arthur, Harbin, and Manchuria. Prior to this, the Manchurian trains did not come to Dalny, passengers and freight being transferred at Nangalin. Besides the Manchurian service, there are now two daily trains between Dalny and Port Arthur and two weekly express trains between Dalny, Moscow, and St. Petersburg.

On February 21, 1903, the first passenger express train from St. Petersburg and Moscow arrived at Dalny, and the weekly Trans-Siberian express service was inaugurated. The demand for passages on this quick and comfortable route became so great that another train was soon added.

The Trans-Siberian express leaves Dalny on Tuesdays and Saturdays, making a trip to Moscow—a distance of 5,375 miles—with a change of cars at Manchuria Station and Baikal, in thirteen and one-half days. The "train de luxe" is a solid vestibuled train, composed of coaches of the International Sleeping Car and Express Train Company, having first and second class compartments and sleeping car and dining car.—*Consular Reports*, September, 1903.

The Bagdad Railway and German Commerce in Asia Minor.—There exists to-day a railroad from Constantinople to Konieh, in Asia Minor, which is called the Anatolian Railway. It has branches to Smyrna and Angora. German financiers have succeeded in getting a concession from Turkey to continue this route from Konieh to Bagdad, and eventually through to Koeit, on the Persian Gulf. A corporation for the purpose of building the road has been formed in Constantinople, under the name of the Imperial Ottoman Bagdad Railway Company, with a capital of $3,000,000. Its president is one of the managers of the German Bank in Berlin. The Anatolian line to Konieh will not be merged into the larger concern, but its coöperation with the new enterprise has been assured. The approximate cost of the railroad is $90,000,000, and it will be about 1,800 miles in length.

It is claimed that when the enterprise is completed it will bring India three days nearer London. It will shorten, by fourteen days, the journey by camel train from Aleppo to the valley of the Lower Euphrates, where almost every square mile of land has its interesting ruin or hidden treasure. Speaking of the country between the Euphrates and Tigris, the Chemnitzer Tageblatt says: The railway will pass through one of the oldest and richest countries in the world. The most fruitful part of what was once ancient Mesopotamia is that part of the country between Urfa and Mosul. So regular and plentiful are the rains that out of every six or seven harvests only two fall short. In other portions of the country rain is not so frequent, and the soil must be nurtured by irrigation. The land is adapted to raising wheat, barley, rice and cotton. A territory as large as Saxony and Italy together will be opened up to German markets.

To find the shortest way to India is an achievement which has occupied the attention of European commercial nations since the earliest times. The highway built by the Persian satraps, the success of Vasco da Gama in finding a water way around Africa, and the construction of the Suez Canal mark epochs in the development of European commerce with India. The construction of the Bagdad Railway will probably be fraught with equally great results, as it will not only serve as a connecting link between the Black Sea and the Persian Gulf, but it will tap a large territory which in recent times has been of practically no value to the commercial world at large.—*Consular Reports*, August, 1903.

A Plan Which Interested a Geography Class.—While teaching in a graded country school, I found the pupils looked upon geography as a most uninteresting subject of study. I had, from a child, been fond of the study of this subject and determined that if it were possible I would awaken in these children a love for geography.

I found little trouble in interesting the first, second, and third grade children, but found it more difficult with the fourth grade. The pupils had been using the text-book alone for their material of study. I examined the text and found it was not a poor one, but that the children had grown tired of using it as a reader and reciting from it in the same manner every day. I decided upon another plan of study.

In the neighborhood of the school was a natural clay bed. The children of this class and I went there one afternoon and modeled a number of objects until each child was interested and knew it would not be impossible for him to model a large ball or globe. We chose the best of the clay, and cleaned it from any sticks or lumps. Each child carried home with him enough clay to form a globe nine inches in diameter. The children were instructed how to make their globes solid, how to place them to dry, and how, finally, with their mother's permission, to bake them in their mother's ovens.

While the globes were drying, the children prepared papier mache. This was done by tearing paper into very small pieces and cooking. After the paper had been cooked and had cooled, most of the water was poured off and the paper kneaded with the hands until it became a smooth pulp. Each child prepared his own papier mache and brought it to school in a clean cloth.

Some time was then spent in studying the relief maps of the different continents and modeling them from their papier mache. None were allowed to dry, but the pulp was returned damp to the cloth.

When the globes had been dried and baked and were brought to school, the large globe on the teacher's desk was studied and carefully compared with the ones they had made. The globe was studied in order to learn the relative positions of the continents, the relative amounts of land and water, and, finally, in a very general manner, allowing the pupils to speak of anything about the globe that appealed to them.

Many of the globes were good in shape, solid, and free from cracks. They were heavy and not easy to handle, but the pupils were delighted with them, and protested they were not "too heavy." After the material had been prepared, the study of the book and globe made, we were ready for the final work. The children placed their globes on their desks and drew the zone lines and a few meridians. They then, after careful measurement, drew an outline of each continent in its proper place. They then put the papier mache on, and modeled the continents in relief. This was allowed to dry, and when the globe was completed, each pupil had a relief map of the world. Of course the bare clay represented the water and the papier mache the land. The water was not the regulation "blue," and as we had no water colors we managed to be content with a dull brown.

Now, of course, this work was not done in a day, week, nor month, nor was it allowed to drag along until pupils grew despondent of seeing the end of their labors, but it did take time and thought on the part of both teacher and pupil. But the device proved a success in interesting the pupils in the study of geography.—*The Intelligence.*

Addition to the List of Geographical Societies of America.—The list of Geographical Societies published in the September, 1903, number of the JOURNAL OF GEOGRAPHY failed to include mention of the Geographical Society of the Pacific, one of the oldest societies. Through the courtesy of Professor Davidson of the University of California, I am able to add a notice.

THE GEOGRAPHICAL SOCIETY OF THE PACIFIC

The Geographical Society of the Pacific was organized March 16, 1881, by citizens interested in the geography and exploration of the western coast of America, and of the islands and lands adjacent to the Pacific. The purpose of the society is to gather geographical information for publication, to conduct lectures by travelers and explorers, to publish material of interest to geographers, and to form a library of geographical works, maps, and charts. The society was incorporated January 5, 1892. It has a well-chosen library of books and charts, and exchanges publications with 135 home and foreign geographical societies. Meetings are held monthly and bulletins are published. The membership of the societies consists of fellows, associates, honorary and corresponding members. Honorary members are chosen on account of their distinction in the science of geography, and not more than two of them are elected in one year. Corresponding members are chosen from those who have added to the advancement of geography, and not more than three of them are elected in one year. Associates, corresponding, and honorary members have no voice in the management of the society. There is provision made for junior members. Boys and girls under age are admitted as junior members at one-half rates. The annual dues are $6.00. Any fellow of the society may be given a life fellowship on the payment of $100. Persons who have rendered valuable service to the society for ten years may be given life fellowship without fees. Any fellow who shall have paid his dues continuously for twenty years may become a life member without further payment of dues. The society has rooms at 419 California Street, San Francisco. The president is Professor George Davidson, of the University of California.—*J. Paul Goode.*

Current Articles on Commerce and Industry:

SEPTEMBER

Argentina, Opportunities in, *Bradstreet's*, September 26.
Boston: City Characters (Illus.), *World To-Day*.
Canal; Proposed Forth-Clyde Ship Canal, *Cons. Report*.
China, The Building of Dalny (Illus.), *World To-Day*.

Copper Converting (Illus.), *Sci. Am.*, September 26.
Cotton Crop of To-Day (Illus.), *Rev. of Revs.*
Cotton Problem in the South (Illus.), *World To-Day.*
Cuba, Commercial, in 1903, *Mo. Summary of Commerce and Finance*, August.
Forest Planting in the U. S., *Miss. Valley Lumberman*, September 11 and 18.
German-American, The, *Mahin's Mag.*
Gun Making (Illus.), *World's Work.*
Italy: Thirty Years of Progress, *World's Work.*
Macaroni Wheat Question, *Bradstreet's*, September 19.
Mexico, The American Influence in (Illus.), *World's Work.*
Mexico, Pulque and Mescal of (Illus.), *Sci. Am.*, September 19.
Potters and Their Products (Illus.), *Clay Worker*, September.
Railroad Accidents in America and Europe, *World's Work.*
Railroad Engineering, Modern Feats of (Illus.), *World's Work.*
Rice, Cultivation of in the United States, *Jour. of Geography.*
Rice Culture in the Philippines, *Mo. Summary of Commerce of the Philippines*, May.
Silk, Artificial, *Sci. Am. Supp.*, September 19.
Storms, Frosts, and Their Effect on Business, *Paint, Oil, and Drug Rev.*, September 16.
Sugar Discovery in the Beet, *Bradstreet's*, September 12.
Tea-Raising Methods, *Comm. Bull. and N. W. Trade*, September 19.
Timber Standing in the Country, *Miss. Valley Lumberman*, September 18.
Time (Illus.), *Jour. of Geography.*

OCTOBER

Alaska as an Investment, *Sci. Am. Supp.*, October 24.
Alaska, the Rich Empire of the North (Illus.), *World's Work.*
Americanizing Scotland's Industries, *Cons. Report.*
Canada: Turning Back to the Dominion, *Success.*
Chicago at the End of a Century (Illus.), *World To-Day.*
Cleveland (Illus.), *World's Work.*
Coal-Mining in the United Kingdom (Illus.), *Engineering Mag.*
Colombia and the Panama Canal (Illus.), *Engineering Mag.*
Diamond Mining in the Kimberley Field (Illus.), *Engineering Mag.*
Fisheries Commission, Work of (Illus.), *Sci. Am.*, October 24.
Garbage Disposal at Baltimore (Illus.), *Sci. Am.*, October 31.
Geography and History, *Jour. of Geography.*

Holland: Reclaiming an Ocean Bed (Illus.), *McClure's.*
Immigrants: Where They Settle (Illus.), *World's Work.*
Industrial Schools in Germany, *Sci. Am. Supp.*, October 17.
Inventions, Epidemics in, *Trade-Mark Record.*
Iron and Steel Production of the World, *Cons. Report.*
Irrigation Question, A Phase of, *Bradstreet's*, October 3.
Japan, Foreign Commerce of, *Cons. Report.*
Java Petroleum Districts (Illus.), *Sci. Am.*, October 10.
Lumber Transportation (Illus.), *Sci. Am.*, October 17.
Metal-Working, The Modern Craft of (Illus.), *Sci. Am. Supp.*, October 3.
Municipal Reform and Social Welfare in New York (Illus.), *Rev. of Revs.*
Newspaper: Development of the Daily (Illus.), *Mahin's Mag.*
North Sea Fisheries, *Sci. Am. Supp.*, October 3.
Philadelphia (Illus.), *World To-Day.*
Salt Mining and Manufacture (Illus.), *Sci. Am. Supp.*, October 3.
South, a Seaboard Gateway of the West (Illus.), *World's Work.*
Sugar Supply of the United States, *Sci. Am. Supp.*, October 17.

NOVEMBER

Beet Sugar Making, *Comm. Bull. and N. W. Trade*, November 28.
Camphor, Artificial (Illus.), *Sci. Am.*, November 21.
Camphor Industry of Formosa, *Sci. Am.*, November 21.
Cane-Sugar Production of the World, *Crop Reporter.*
Chicago: How a Great City Is Fed (Illus.), *World To-Day.*
Coal-Mining Industry in the United Kingdom (Illus.), *Engineering Mag.*
Corn-Growers (Illus.), *World's Work.*
Cost of Living, *Bull. of Bureau of Labor*, November.
Country Merchant Come to Town, *World's Work.*
Cuba, *Cons. Report.*
Dairy Farming (Illus.), *Country Life in Am.*
Denver: Character Sketches of Cities (Illus.), *World To-Day.*
Galveston's Great Sea Wall (Illus.), *Rev. of Revs.*
Kimberley Diamond Mines (Illus.), *Engineering Mag.*
Labor Boss: The Trust's New Tool, *McClure's.*
Linseed Oil, Making of, *Paint, Oil, and Drug Rev.*, November 25.
Louisiana Purchase, *Bradstreet's*, November 7.
Moseley's Industrial Inquiry, *Cons. Report.*
New Zealand, Labor Conditions in, *Bull. of Bureau of Labor.*

Onion-Seed Farm in California (Illus.), *Sci. Am.*, November 7.

Panama, Commerce of, *Hide and Leather*, November 21.

Post Office and the People (Illus.), *World's Work.*

Printing Methods, Modern (Illus.), *Sci. Am.* (Special Number). November 14.

Rubber Tree of Central America (Illus.), *Sci. Am. Supp.*, November 28.

Russian Absorption of Asia (Illus.), *World's Work.*

Savings Banks, The Romance of, *Success.*

Scientific Research and Chemical Industry, *Sci. Am. Supp.*, November 14 and 21.

Tea-Growing in India, *Sci. Am. Supp.*, November 14.

Textile Industry of Philadelphia, *The Manufacturer*, November 16.

GEOGRAPHICAL QUERIES

A CLEARING HOUSE FOR GEOGRAPHICAL WANTS AND DOUBTS

IT is hoped this department will prove of practical benefit to teachers of geography, opening a way for the solving of the many geographical problems which are constantly met with in the classroom. All questions received will be answered by specialists in the various methods of geographical work. We invite inquiries, criticisms, suggestions, and discussions. Address all communications for this department to: EDWARD M. LEHNERTS, *Winona, Minn.*

(5) As I am an old reader of the JOURNAL OF GEOGRAPHY and of its two parent magazines, I trust you will pardon me for troubling you with a question. To what extent and in what ways do forests influence climate? In your JOURNAL for April, 1902, in the excellent article entitled "Certain Persistent Errors in Geography," Mr. Henry Gannett positively affirms that forests have absolutely no influence on rainfall. I cannot see the reason for his statement; and hence my question, which I hope you will find worthy of a reply.

A. H. G., South Bend, Ind.

Every one of our readers, old and new, is cordially invited—yes, even urged—to send us any geographical question that is giving trouble. Your letter is therefore more than welcome, and we gladly reply as fully as our space permits.

In the article you refer to, Mr. Gannett exposes and condemns in a vigorous and effective manner certain widespread geographical misconceptions including the popular belief that the removal of forests greatly decreases the rainfall. He does not, however, raise the question whether forests have any appreciable influence on climate. This question has been discussed for yea's, and much time has been given to its study; but most of the conclusions reached would seem apparent even without any elaborate investigation.

It is a matter of common observation, particularly on sunny summer days, that the ground and the air under the trees are cooler than the soil and the air in the open field; and this effect is not only noticeable by day, but by night as well, as every one will testify who is acquainted with the cool, d mp evenings and nights of our wooded areas. This lowering of the temperature is caused by the shading of the ground and by the increased evaporation and radiation from the leaves, which present an enlarged surface for these processes, transpire large amounts of water, and possess a radiating power equal to that of soot. Of course, the effect is increased with the size and the number of the trees, the density of the foliage, and the extent of the forest. Moreover, the kind of trees, whether deciduous or evergreen, makes a considerable difference, especially in our northern latitudes in the spring season. In the deciduous woods on the shaded northward slopes of the bluffs about Winona, the snow in spring lasts from one to three weeks longer than in the open fields; but in the evergreen forests of northern Minnesota, especially on northward slopes, snow and ice remain until the beginning of summer. The Indians even claim that they can find ice in the dense cedar swamps of that section at any time during the summer and fall. In general, forests retard the melting of the snow in spring and thus lower the temperature, favor frosts, and delay the approach of warmer weather.

The following tables taken from Hann's Handbook of Climatology give interesting data regarding the influence of forests on temperature:

MEAN TEMPERATURE OF VIENNA CITY, COUNTRY, AND FOREST, 1851-1880 ALTITUDE ABOVE SEA LEVEL THE SAME IN ALL CASES. CENTIGRADE SCALE.

	January	April	July	October	Year
Vienna City	−1.2°	10.0°	20.4°	10.5°	9.7°
Vienna Country	−1.5°	9.6°	19.8°	10.1°	9.2°
Vienna Forest	−1.5°	9.0°	19.2°	9.6°	8.8°

VIENNA FOREST COMPARED WITH VIENNA COUNTRY, 1875-1884. THE FIGURES SHOW HOW MUCH COLDER IT WAS IN THE FOREST. CENTIGRADE SCALE.

	7 a. m.	2 p. m.	9 p. m.	Mean
In Winter	0.8°	0.0°	0.8°	0.6°
In Summer	1.1°	0.2°	2 3°	1.4°

On our western prairies nearly every farmhouse has its grove of trees to serve as a protection against cold winds and drifting snows. This illustrates another important effect of forests, namely, the breaking of the force of winds and the checking of air currents. Partly because of this diminished air movement and partly because of the coolness due to the stoppage of the sunshine by the leaves, the forest keeps the air under its cover relatively moist; and since cool, moist, and quiet air does not favor evaporation, and since this process is still further retarded by the protective and water-holding capacity of the forest floor, it is not surprising to learn that observers find the annual evaporation within the forest to be about one-half of that in the open field. This leads to the conservation of the water supply, one of the most important of forest influences. Rain water is retained; evaporation is decreased; surface flow-off and underground circulation are regulated; stream flow is controlled; excessive erosion and floods are prevented; and many other beneficial effects are produced.

Wherever a forest has been considerably reduced in area, changes in the water supply have occurred; in certain cases, wells, springs, and small streams have become intermittent and even permanently dry. Extensive reforestation, on the other hand, has been known to again bring water to the well and to re-establish the spring and the stream flow. Some observers, believing these effects to be due to changes in the amount of rainfall, concluded that extensive deforestation always caused a corresponding decrease in the annual precipitation. It is, however, perfectly clear that such a conclusion is not safe since the forest influences mentioned in the preceding paragraph are in themselves adequate causes.

The question whether forests increase the annual rainfall has been answered in the affirmative by many careful observers and students, including Blanford,[1] Müttrich,[2] Hettner,[3] Hann,[4] and many others; but their answer is based on data and methods of investigation which cannot be adequately set forth here because of lack of space.

The earliest and most untrustworthy data are those obtained by the historical method. Ancient history and literature give illustrations

[1] H. F. Blanford: "The Influence of the Indian Forests on the Rainfall," *Journ. Asiat. Soc. Bengal*, LVI, Part II, 1887, pages 1–15.

[2] A. Müttrich: "Ueber den Einfluss des Waldes auf die Grösse der atmosphärischen Niederschläge," *Das Wetter*, IX, 1892, pages 46–48, 68–71, 90–96.

[3] A. Hettner: *Regenvertheilung, Pflanzendecke, und Besiedelung der tropischen Anden*, 1893, Berlin.

[4] J. Hann: *Handbuch der Klimatologie*, English Translation by R. DeC. Ward, 1903, The Macmillan Co., New York.

of forested and well-watered regions which have since become deforested and arid; but such data are imperfect and unreliable, and, even in cases where former humidity and present aridity are authenticated facts, the change can be shown to be due not to a decrease in the rainfall but to changes in distribution and circulation of the rain after it has fallen, or to dry winds no longer checked and modified by the former forest barrier.

A second and more satisfactory source of data is furnished by meteorological records; and these point to three definite conclusions: That about 9 per cent more rain falls over a forest than over open fields in the immediate vicinity; that the precipitation is somewhat greater in the tree-covered areas as compared with the treeless districts of a given region, and that in cases of reforestation the precipitation has increased with the increasing forest growth. Recent writers, however, especially in America, have shown a disposition to question these conclusions; and some have gone so far as to deny that forests have any appreciable influence on rainfall. Professor Cleveland Abbe[5] of the United States Weather Bureau has clearly shown that the great mass of meteorological data is not reliable, so far as this problem is concerned, since rain gauges in open places catch less rain than they should, owing to the influence of the stronger wind. Wherever the gauges have been properly corrected in accordance with Professor Abbe's suggestion, there has been found no appreciable difference in the amount of rainfall over the forest and over the open land; and it is now generally conceded that the facts at hand do not prove conclusively that forests increase rainfall.

As regards climate, then, forests tend (1) to lower the mean temperature of the air; (2) to check air movement; (3) to increase its relative humidity; (4) to equalize day and night temperatures and to make seasonal extremes less severe; (5) to favor frosts and fogs, and, some say, clouds and rain; and (6) to increase the healthfulness of the locality by decreasing the number of disease-producing organisms in the air, the water, and the soil. In short, the influence of the forest on the local climate is considerable, but its effect on the general or regional climate is not appreciable. E. M. L.

[5] C. Abbe: "Determination of the True Amount of Precipitation and Its Bearing on Theories of Forest Influences," Bulletin No. 7, 1892, Forestry Division, U. S. Dept. of Agriculture, pages 175–185.

EDITORIAL

SIGNS OF THE TIMES

THE beginning of a new year is a favorable time to summarize the results, the successes of the past, and estimate the direction thought and action will probably take in the future in our chosen field of work.

At no period during the last decade has there been a time when the signs of the times were more encouraging than they are now. Geography teaching is slowly but surely improving. The subject is receiving increasing emphasis in normal schools, in secondary schools, and at teachers' institutes, and teachers are seeking enlightenment and help in the subject constantly. In spite of all setbacks and the persistence of ultra conservatism in some cities and states, in spite of the unnaturalness of geography as still taught in the larger number of rural schools, there is good reason to be optimistic and not pessimistic as to the future of the subject.

Among the evidences of progress in elementary school geography since the "renaissance," which dates from the appearance of Frye's first book in 1894, may be noted more logical, more usable text-books, and a greater emphasis of the causal idea and the phenomena of the home environment. Writers of texts for elementary schools now adopt a plan of procedure whereby the subject is modified to fit the pupil, instead of the pupil being wholly molded to fit the text. The better text-books now contain fewer unessential points, fewer imaginary, untruthful illustrations, better maps (though in this regard there is still great room for improvement), references to collateral reading for teachers and pupils, and are in general more geographical than their predecessors.

In the secondary field there are several excellent texts, and laboratory and field work have come to stay. The fact that geography has been accepted as an entrance requirement by several colleges has stirred many secondary schools to better work in the subject. Broadly considered, perhaps the most satisfactory progress in geography within the decade has been in this field.

In normal and training schools, on the other hand, the subject is in a very unsatisfactory position. There are many normal schools in which geographers have been employed as leaders in the work, and it is needless to say that this group of schools has led the way in reform in the training of teachers of geography. In a large number of the normal schools, however, geography is still stagnant, and in this field there is the greatest need for improvement.

The progress in the higher institutions has not been as great in proportion as in the lower institutions. In many colleges and universities geography does now have a place, but in many others it is unknown or given a mere foothold. Even where geography is taught it is not commonly related to the work of other departments, such as history and sociology, as it should be, and hence the success is not as great as it might readily be. The teachers for the secondary and normal schools must come from the colleges and universities largely, and the demand for such trained teachers is far in excess of the supply.

One of the most favorable evidences of progress is the fact that the public and educational officers are alive to the worth of geography as a subject of culture and training. This is well illustrated by the increasing number of teachers of all grades of work who seek opportunities to secure better training in geography through teachers' classes or summer schools. The success of the Cornell Summer School of Geography in 1903 is the best test of the increasing demand by teachers for better training in geog aphy we have had, and it is most encouraging.

Progress has been made, and is going to be made rapidly in the next few years. Faddism in methods of teaching is passing away; rural school geography is being strengthened through the introduction of agriculture and geographical nature study; better courses of study are being adopted in elementary schools; laboratory work is being introduced into secondary and normal schools; and the text-book is not always followed slavishly now. In our zeal for better things, however, we are in danger of forgetting that pupils must be taught to study and think, to apply their knowledge in daily life, and that the easiest way to the goal is not always the best. If, ten years hence, those who have been pupils in this decade do not know the facts and principles of geography necessary for an understanding of current affairs, it will be a good indication that the pendulum has swung too far and that in our endeavor to make things interesting we have failed to give the best discipline and training.

REVIEWS

Field and Laboratory Exercises in Physical Geography. By James F. Chamberlain. Size 10 x 8. Pp. 127. New York: American Book Company, 1903.

While the teaching of Physical Geography through the laboratory is no longer in the experimental stage, the use of this method is necessarily restricted to those few whose training has been of a nature to enable them to organize this line of work for themselves.

For the great majority, the need of a laboratory manual is an imperative one and each new contribution to the field is eagerly welcomed, not only by the teacher of many subjects, whose training is inadequate to meet the situation unaided, but also by the specialist who is desirous of seeing Physical Geography taught according to the best method.

The book noted above seems well adapted to meet the needs of the situation. The exercises, sixty-nine in number, touch upon the various departments of the subject: "The Earth as a Globe," "The Atmosphere," "The Ocean," "The Lands," and "Life," and are fairly well proportioned. More space, however, should have been devoted to the lands through the study of topographic sheets illustrating typical land forms.

The exercises generally are elementary in character, easily within the comprehension of pupils of the upper grammar grades or of the first year of a high-school course.

The sequence of the topics treated usually is logical though in some cases a rearrangement should be made as, for nstance, in the case of exercises thirty-one and thirty-three where the study of "isobars" follows that of "cyclonic areas."

Many of the problems presented do not fall properly either in field or in laboratory work, for their solution lies in the library alone. While this work is valuable, it should not be confounded with laboratory work.

The manual serves a double purpose, outline maps and blank pages for recording observations accompanying the problems.

The book will, without doubt, be found helpful in offering suggestions, and should be used from this standpoint rather than as an infallible guide.

C. B. K.

RECENT PUBLICATIONS

Special Method in Geography. From the Third through the Eighth grade. By Charles A. McMurry. New edition. Pp. xi and 217. New York: The Macmillan Company, 1903.

A new and much-enlarged edition of Dr. C. A. McMurry's well-known book on geography teaching. Very detailed in its suggestions, and especially adapted to the Tarr & McMurry geographies. Would have been more readily usable if accompanied by an index. To be reviewed later.

Waterways of Westward Expansion, *being Volume IX of Historic Highways of America.* By Archer Butler Hulbert. Pp. 220. Cleveland, Ohio: The Arthur H. Clark Company, 1903.

This book deals particularly with the Ohio River and its tributaries, and is fuller and more complete than most of its predecessors in the series. Contains three reproductions of old maps. Valuable especially to the student of American history as related to its geography.

Indians of the Painted Desert Region. By George Wharton James. Pp. xxi and 267. Boston: Little, Brown & Company, 1903.

An attractive and readable book on the Indians of Arizona and New Mexico, by a well-known writer on Indians. Well illustrated. To be reviewed later.

Descriptive Geography from Original Sources: Australia and Oceanica. By F. D. and A. J. Herbertson. Pp. xxvi and 221. London: Adam and Charles Black, 1903.

The last of the several volumes devoted to the different continents and prepared by Dr. and Mrs. A. J. Herbertson. Like the preceding volumes, this volume contains an excellent introductory chapter, bibliography, and index. The material is well selected, well illustrated, and very usable. The volume is excellent for supplementary use in the higher grammar grades of American schools.

Around the Caribbean and Across Panama. By Francis C. Nicholas. Boston and New York: H. M. Caldwell Company, 1903.

An interesting account of an explorer's adventures in the region indicated by the title. Written by an authority and well illustrated.

Elementary Geography. By Charles F. King. Pp. vi and 220. Boston: Lothrop Publishing Company, 1903.

An elementary geography by an experienced and well-known teacher. Descriptions of excursions and imaginary journeys are made the means of imparting both general and regional facts. Excellent illustrations, some being colored. Illustrations of animals especially fine. Maps are somewhat crude and proper names are not always spelled correctly. To be reviewed later.

NEWS NOTES

The New Republic of Panama.—Early in November the State of Panama, hitherto a part of Colombia, seceded and established a new republic known as Panama, and on November 6th this republic was recognized as a new nation by the Government of the United States. The action taken by the inhabitants of Panama was primarily due to the fact that Colombia had stood in the way of allowing the United States to build the Panama Canal. The inhabitants of Panama, having been paying large amounts in taxes to Colombia, felt that they had not been duly considered by Colombia and that their business interests had been sacrificed; hence their action.

Meeting of National Educational Association in 1904.—It has been decided to hold the 1904 meeting of the National Educational Association at St. Louis during the latter part of June or the early part of July. The various features of the exposition will be made the chief topics of the papers and discussions, and thus the meeting will be centered about the exposition. Details as to time of meeting and the attention to be given to geography will be announced in the JOURNAL as the plans mature.

Newest and Best Text-Books

IN

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J. Paul Goode

The JOURNAL *of* GEOGRAPHY

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THE GEOGRAPHY COURSE IN THE CHICAGO NORMAL SCHOOL

PART I

BY FRANK W. DARLING AND ELIZABETH SMITH
Of the Chicago Normal School, Chicago, Illinois

THE organization of all courses in the Chicago Normal School is adapted to the well-defined conditions peculiar to the school. The fact that the Chicago Normal School stands at the head of the Chicago school system to prepare graduates of the Chicago schools to be teachers in the same system, gives the school the advantage of limitations which normal schools do not often enjoy. All entering students have had equal and practically the same chances for preparation in the Chicago schools All graduates must be especially trained to meet the conditions peculiar to the Chicago schools. Hence the course in geography, here presented deals only with these known conditions of entrance and attempts to meet these known conditions of demand, but at the same time it aims to give such a preparation for general teaching that the students may be well prepared to teach in other environments than those prevailing in the Chicago Public Schools.

It is assumed that a student entering the Chicago Normal School has had all of the strictly academic study of geography that is necessary to allow of his treating the subject-matter as the acquired building material with which he works. The course in geography is entirely a professional study of the subject and it is found that the students do get a better review of the subject-matter of geography by approaching it from the standpoint of the teacher than those, with equal preparation, did under the previous course, by a simple academic study. The professional study is divided into two distinct divisions:

1. The study of the subject from the point of view of the subject-matter alone, with the conscious aim of discovering the organization

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inherent in the subject-matter. This procedure must include a close scrutiny of the different parts of the subject-matter to discover the relations existing between the parts as applied in the study of certain wholes. Such is the intent of the first year's work as outlined.

2. The study of the subject from the point of view of the child with the conscious aim of adapting the subject-matter to the growing consciousness of the child. This must include a psychological study of the child to determine his ability for mastering and his mental processes of comprehending certain parts of the subject-matter at certain ages. Incidentally it also includes the discovery of the disciplinary value of the subject. Such is the intent of the second year's work as outlined.

After this preparation, as outlined, each student is given a chance to practice teaching the subject in one of the grades for six weeks. This teaching work is done under the direct supervision of the regular grade critic teacher and the geography department.

FIRST YEAR OF GEOGRAPHY

(Fourteen weeks, five fifty-minute periods weekly.)

I. INTRODUCTION

A. *A Consideration of What Geography Is; viz.*, "A study of the earth in its relation to life."
   1. Earth factors determining life conditions.
      a. Climate.
      b. Structure.
      c. Examples showing the influence of these factors.

B. *Educational Value of such a Study of Relations.*
   1. Discipline.
   2. Culture.

II. THE EARTH AS A WHOLE

A. *Shape.*
   1. Proofs.
      a. A person moving north or south sees stars rise and set at an equally progressive rate.
      b. The sun rises westward at the same rate.
      c. Ships sailing with equal speed disappear in all directions at the same rate.
      d. The shadow of the earth cast upon the moon during a lunar eclipse is always circular.
   2. Results.
      a. The pull of gravity is nearly the same all over the earth, hence:

(1) The moving of weights is easy.
(2) The atmosphere at sea level is of the same density.
Most men are adjusted to living under such a density.
(3) The earth has a comparatively level surface, hence:
(*a*) There is a wide distribution of organic species.
(*b*) Communication is easy.

b. We have the terms "up" and "down."
c. The curvature of the earth has to be taken into account in digging canals.

B. *Size in its Relation to Man's Life.*

1. Effect upon the intercourse of savage peoples.
2. Effect of railroads, telegraph lines, etc., in overcoming size.
   a. Free exchange of products and ideas between all parts of the world.

C. *Spheres of the Earth.*

1. Atmosphere.
2. Hydrosphere.
3. Lithosphere.
4. Centrosphere.
5. Relation of spheres in space and comparative mass of atmosphere, hydrosphere, and lithosphere.
6. Interpenetration of atmosphere, hydrosphere, and lithosphere and its effect in furnishing conditions for life.

D. *The Lands.*

1. Arrangement about the North Pole.
   a. Effect of massing of lands in the northern hemisphere upon the distribution of heat.
2. North and south projecting arms.
   a. Effect upon ocean currents and distribution of heat.
3. Division into continents and islands.
   a. Effect upon life in the development of species.
   b. General triangular shape of continents.
   c. Size of continents and effect upon the development of life.
   d. Formation of the continents.
      (1) Diastrophism.
      Effect upon the surface.
      (2) Vulcanism.
      Formation of igneous rocks and surface forms.
      (3) Gradation.
      Formation of mantle rock, sedimentary rock, and surface forms.

E. The Oceans.

1. General arrangement and comparative size.
2. Relation to life.
   a. Sources of food, moisture, and means of cheap communication.

F. Movements of the Earth.

1. Rotation.
   a. Proof of rotation.
      (1) Deflection of falling bodies.
      (2) Foucault's pendulum.
      (3) Flattening at the poles.
   b. Results of rotation.
      (1) Gives a unit of time—the day.
      (2) Directions—points of compass.
      (3) Latitude and longitude.
      (4) Standard time.
      (5) International Date Line.
2. Revolution.
   a. Sun's apparent movement among the stars.
   b. The year.

G. Distribution of Heat on the Earth's Surface.

1. Nature of heat.
2. Modes of transference.
3. Measuring of heat—thermometer.
4. Sources of heat.
   a. Solar.
   b. Terrestrial
5. Distribution of heat due to slant of sun's rays.
   a. Distribution as observed in Chicago.
      (1) Daily distribution as shown by weather records kept by pupils.
      (2) Cause of daily distribution.
         (a) Comparison of angle of sun's rays received in the morning and at noon (by use of skiameter); at night.
         (b) Comparison of amount of surface covered by noon and morning rays. (By use of ski meter.)
         (c) Effect of rotation.
      (3) Yearly distribution as shown by change of seasons.
      (4) Cause of yearly distribution.
         (a) North and south apparent movement of the sun and its distance from our zenith at different seasons. Effect upon angle of sun's rays.

(*b*) Varying length of day. Place of sunrise and sunset and length of sun's path at the
Winter solstice.
Summer solstice.
Equinoxes.

b. Distribution on the earth as a whole.
(1) Region of vertical rays and greatest heat.
(2) Region of oblique rays.
(3) Cause of vertical and oblique rays.
(*a*) Comparative size of earth and sun and distance between them.
(*b*) Practical parallelism of all rays received from the sun.
(*c*) Effect of curved surface of the earth upon the angle which rays make with the surface.
(4) Shifting of vertical rays.
(*a*) Earth's orbit, shape, distance from the sun.
(*b*) Plane of the orbit.
(*c*) Attitude of the earth as regards this plane.
(*d*) Conditions of heat and light if axis were vertical to this plane.
(*e*) Amount of inclination of axis necessary to carry rays 23½° north and south of the equator.
(*f*) Fixed direction of North Pole.
(*g*) Combined effect of revolution, and inclination and parallelism of axis.
(5) Location of vertical rays and twilight circle at
(1) Winter solstice.
(2) Summer solstice.
(3) Equinoxes.
(*a*) Consequent length of day and distribution of heat.

c. Location and definition of zones of insolation, tropics, polar circles.

d. Visualization of sun's position at noon at different places on the earth's surface at
(1) Summer solstice
(2) Winter solstice.
(3) Equinoxes.

6. Winds.
a. Composition and pressure of the atmosphere.
b. Measuring pressure—barometer.
c. Changes in density and pressure.

d Movement as a result of difference of pressure.
e. Direction of movement from high to low pressure areas.
f. General circulation of the atmosphere.
(1) Region of greatest heat on earth's surface.
(*a*) Effect upon density and pressure of air.
(2) Formation of
(*a*) Trades.
(*b*) Belt of equatorial calms—doldrums.
(*c*) Antitrades
(3) Effect of rotation of the earth.
(*a*) Deflection of air currents.
(*b*) Circumpolar whirl.
(*c*) Low pressure areas at the poles.
(*d*) High pressure at about 30° north and south latitudes.—Horse latitudes.
(*e*) Westerlies.
(4) Effect of migration of vertical rays.
(*a*) Shifting of wind belts.
(*b*) Deflection of trade winds as they cross the geographical equator. Terrestrial monsoons.
g. Effect of land and water surface on general circulation due to
(1) Unequal heating of land and water.
(*a*) Continental monsoons.
(2) Obstruction of land.
h. Effect of winds upon the formation of ocean currents.
i. Effect of winds upon the distribution of heat
j. Summary as to the distribution of heat on earth's surface by a study of isothermal charts.

H. Rainfall.
1. Presence of moisture in the air.
a. Relation to heat.
b. Relation to bodies of water.
c. Humidity.
(1) Measuring amount of,—hygrometer.
2. Conditions causing rainfall.
a. Chilling of the air due to
(1) Ascending currents at region where the sun's rays are vertical—zenithal rains
(2) Storms.
(3) Mountain deflection
(4) Latitude.

3. Measuring amount of rainfall.
   a. Rain gauge.
   b. Average annual rainfall of Chicago.
   c. Average annual rainfall necessary for agriculture.
4. Distribution through the year.
   a. Relation to vegetation.
   b. Relation to agriculture.
5. Rainfall of different wind belts.
   a. Effect of highlands upon distribution.
   b. Effect of cyclonic storms.
6. Study of rainfall map and summary as to distribution of rainfall.

I. Vegetation Zones.

1. Factors essential to plant growth.
2. Distribution of plants in Chicago environment.
   a. Typical areas.
      (1) Sand dunes.
      (2) Swamps.
      (3) Prairies.
      (4) River valleys
3. Geographical distribution of plants; control by temperature.
   a Heat belts
      (1) Polar cold caps bounded by isotherm of 50° for the hottest month which marks the northern limit of trees and most hardy cereals.
      (2) Hot belt bounded by the annual isotherm of 68° which marks the limits of palms.
      (3) Temperate belt.
   b. Tundras and barren lands of polar cold caps. Characteristic plants — mosses, ichens, dwarf birches, stunted berry-bearing bushes, bright colored flowers, gentians, anemones, etc. Animal life and people studied in relation to the environment.
   c. Distribution of vegetation in the temperate belt in relation to moistures.
      (1) Temperate forests, coniferous and deciduous.
      (2) Steppe lands.
      (3) Deserts.
      Influence of the different areas upon the animal life and upon man's mode of life.
   d. Distribution of vegetation in the hot belt in relation to moisture.

(1) Tropical forests.
(2) Savannahs.
(3) Deserts.

Influence of the different areas upon the animal life and upon man's mode of life.

III. NORTH AMERICA

A. Position on the Globe.
1. Position in the northern hemisphere.
2. Position in relation to oceans and other continents
3. Advantages of position between densely peopled regions of Europe and Asia.

B. General Shape and Size.
1. Advantage of wide extent in temperate belt.
2. Advantages of extent in latitude.

C. Physical Features.
1. Arrangement of highlands.
2. Comparison of highlands as to extent, height, and general appearance.
3. Drainage areas as formed by slopes of highlands.
   a. Atlantic.
   b. Great Lakes.
   c. Gulf of Mexico.
   d. Pacific.
   e. Great Basin.
   f. Hudson Bay.
   g. Arctic.
4. Lowlands in part formed from debris washed down from highlands.

D. Glaciation.
1. Valley glaciers
   a. Location.
   b. Origin.
   c. Movement.
   d. Work.
2 Continental glaciers.
   a. Present—Greenland Antarctic.
   b. Ancient—North American ice sheet.
      (1) Centers of ice accumulation.
      (2) Extent.
      (3) Work done in Canada and New England.

(4) Work done in Northern Mississippi Basin region.

(5) Origin of Chicago plain, topographic features and its influence upon the growth of a great city.

E. *Climate.*

1. Winds.
   a. Part of continent in each belt.
   b. Effect of seasonal shifting of belts
2. Temperature.
   a. Part of continent in different heat belts
   b. Effect of winds and ocean currents on east and west coasts.
   c. Comparison of interior with coasts.
3. Rainfall.
   a. Distribution in relation to highlands.
   b. Effect of cyclonic storms.
   c. Influence of the Gulf of Mexico.

F. *Life.*

1. Part of continent in different vegetation zones.
2. Influence of the above distribution upon the industrial life of the continent.

IV. PHYSIOGRAPHIC REGIONS OF THE UNITED STATES

Lake and Prairie Plains.
New England Upland.
Atlantic Coastal Plain.
Piedmont Belt.
Appalachian Ranges.
Allegheny Plateaus.
Gulf Coastal Plain.
Alluvial Plain of the lower Mississippi.
Ozark Mountains.
Great Plains.
Rocky Mountains.
Columbia Plateau.
Colorado Plateau.
Basin Ranges.
Pacific Mountains and Valleys.

NOTE:—The lake and prairie plains are first studied because the students are within this environment. Next, the New England plateaus are studied as a contrasted glaciated area. Each region is studied according to the general plan outlined below for the lake and prairie plains.

A.. Lake Plains and Prairie Plains; the Northern Glaciated Part.

1. Location and extent.
* Characteristic features.
   - *a* Level or undulating surface. Low hills of glacial origin.
   - *b.* Drained and terraced lake beds.
   - *c.* Young valleys, falls akes
   - *d.* Glacial soils.
3. Climate
   - *a.* Great range of temperature.
   - *b.* Length of growing season from four to six months.
   - *c.* Rainfall from twenty to forty inches.
4. Industrial regions.

   Forest areas.
   Wheat region.
   Corn belt.
   Iron region.
   Coal regions.
   - *a.* Location and extent of each.
   - *b* General characteristics of the industry.
   - *c.* Amount and value of the products.
   - *d.* Markets.
   - *e* Allied industries.
   - *f.* Amount and value of industries as to states.
5. Important centers.
6. Trade routes.

   Great Lakes.
   Mississippi River.
   Railroads.

V. POLITICAL DIVISIONS

Organization of the whole as seen through study of the political divisions.

NOTE:—Each pupil is required to make a sand model and a chalk modeled relief map of the whole continent and of the different physiographic regions

No one text-book is used for students are referred to different texts found in the library and in the geography room.

During the study of the earth as a whole weather records are kept and regular observations of the sun's position made

(*To be concluded.*)

MAP MAKING AND MAP READING

BY ROBERT MARSHALL BROWN
Of the State Normal School, Worcester, Massachusetts

INTRODUCTION

IT was the privilege of the writer, during the past summer, to conduct a number of field excursions in geography with North Carolina teachers. At the outset, many of the teachers expressed the desire to undertake map making out of doors. Every one of the teachers had followed, to the best of her ability, the directions which her own school text-book and the supplementary books had yielded for mapping the schoolroom or school yard. They were not sure, however, that the result of their conscientious endeavors was the desirable one, nor were they sure why the books were insistent upon this exercise. Furthermore they were not certain when this work was done that any more in this line was demanded of them. They were not on familiar ground. A similar uncertainty exists among teachers generally, for nearly all are in doubt as to the advisability of even trying map drawing in school work.

The present condition is, in part, the result of lack of clearness and completeness in the statement of what is desired, and is a good illustration of the unfortunate period which often follows the promulgation of new ideas, between the time of a teacher's schooling and her assuming a teacher's responsibilities, when the medium for the transmission of the ideal of reform does not adequately enlighten. The best thing concerning map drawing has not been said. Along many lines of map work there are differences of opinion, and hence it is not strange that the teacher hesitates. The present article is not written to cover the whole field of map exercises, but to present certain helpful points in reference to a few fundamentals. The writer assumes the responsibility of no new ideal, but insists on a more careful plan and longer training in order to realize as far as possible the old. Its specific aim is to aid a number of teachers who have in times past sought aid, and it has been submitted for publication only in the belief that there is a general desire for help in this direction. No attempt will be made to divide the work according to the demands of the grades, but all of the suggestions are applicable to the work of the elementary schools.

FIRST STEPS

The first duty of a teacher is to lead the pupils to realize that the map is a reproduction, to scale, of a portion of the earth. This is not altogether a simple task. The present-day judgment concerning the best method by which this idea may be inculcated finds its expression in the directions for map drawing in most elementary books on geography. The steps are three—reproduction, reproduction to scale, and an oriented reproduction to scale. The first introduces the child to symbols and may easily represent a lesson in drawing. A very crude rectangle, as a sign for the schoolroom, is the temporary goal. The second has for its object the sense of proportion. The third combines the sense of direction and location. Finished work cannot be expected during this stage, but the essentials should be strongly emphasized. Here may be ingrained neatness and care without which no success in map work may be attained. A very poor drawing in the elementary stage may be made with neatness and care.

SCALE

Passing over the elementary drill on the scale which is well discussed in many books, let us turn to another phase of the subject. Every map made by the pupils should have a scale appended. As a map of a locality, it is imperfect without one. Some maps used in the schools, such as the Mercator projections, because of an increase in the scale with an increase in latitude, do not lend themselves readily to an expression of distance or size. The scale may be stated in two ways, either by the number of feet or miles represented by one inch of the reproduction, or by stating the fractional part the reproduction is to the area itself. The former is the common method in school atlases to-day, and the scale is often expressed by a line segmented to the proper lengths. The latter is the method used by government surveys. The topographic maps of the United States Geological Survey, for instance, have their scale expressed as $\frac{1}{62500}$, $\frac{1}{125000}$, etc. The interpretation is simple. One inch, foot, or metre on the map is equivalent to 62,500 inches, feet, or metres on the surface of the earth. It expresses at once a ratio between the reproduction and the actual. It has a value beyond its simplicity. It is expressed in a universal language. The unit of measurement may be different as it is in the various nations, the language may be a strange one, but the fraction stating the scale of a map allows but one interpretation.

In mapping a school yard, using the pace as a unit of measurement, the scales of the maps of twenty pupils would tend to confuse rather than enlighten, and the teacher who has to correct the reproductions has no basis for comparison. In pacing, the pupil should be taught to walk naturally. To try to lengthen the step to a yard is wearisome, often impossible for children, and certainly ungainly; and in much such pacing the steps are unconsciously shortened. Each pupil may ascertain the length of his natural step by walking over a measured distance a number of times and dividing the number of steps taken into the entire distance. This will serve as a unit of measurement for all out-of-door mapping. The transformation to the fractional scale is not difficult and may serve as a lesson during the mathematics period. It seems best to urge the use of this scale on all maps constructed by the pupils.

COMPASS

The reproduced school yard is not complete without a symbol for orientation. The ordinary one in use is an arrow pointing towards the geographical pole. It is possible that the meridian line has been found by the sun, and a mark on the ground, or a chalk line on the bricks, exists as the class's determination of the north and south line. The introduction of the compass, in its proper time, on this line, will show the deviation between the geographical and magnetic meridians, and a second line across the first, parallel with the compass needle, will mark the direction of the magnetic pole. In the corner of the map may then be added, pointing in the proper directions, these two lines.

When the pupils are fairly sure of the meaning of orientation, a useful exercise may be given by passing out papers with the compass indicated and allow them to draw the map of the yard. On the ordinary atlas maps, meridians serve the office of the needle. The transformation from reading a map with a compass to reading a map with projected meridians has been slighted. The idea that up on the map is north, and right is east, introduces an error from which even the teachers of geography are not free. Pupils are not corrected for ignoring the meridian lines of a map. Many pupils are not taught to see them. Without the meridians, what is below is south. A distorted idea is thus gained. Take the map of North America, and, without consultation, let the teacher state for herself, or allow the pupils to tell, what city in the United States lies almost north of Havana. Few pupils are loath to name a city west of Albany, and in a gathering of half a dozen teachers, one with hesitation answered Buffalo. A few problems of this nature will show how essential is an emphasis on the meridian lines of a map, especially far to the east and west of the centrally-projected meridian. This difference between a map with a compass symbol and some meridian-marked maps should be fixed upon the attention as early as possible.

SYMBOLS

Map reading is an interpretation of symbols. From the very beginning of geography, the introduction of symbols is proper. "Conventionalization and symbolization seem to be an inborn trait of the human family." *

The first maps should be the means of introducing a few symbols. No generally accepted list of symbols for use is published. Text-books vary somewhat in the points, emphasized slightly up to this time. The topographic maps of the United States Geological Survey may be taken for a standard. At some time in the grade a familiarity with these maps is advisable, for the legend is simple and easy. There seems to be no argument against the use of a few of their conventional signs. In a district map, where roads, bridges, brooks, and buildings are used and plotted, some legend is demanded; the one that is to be used later, if within the comprehension of the pupil, is the proper one.

Writing on the maps should not be encouraged when the symbol is definite. The writing of "street" on the symbol for the same, "river" on its symbol, defeats the use of the sign language. If the sign is there, the word is superfluous. As long as a universal sign language for maps has not been accepted, a legend must be appended to every exercise. Some elementary books use as a symbol for "tree" a printed outline of a tree. Two objections may be raised to such kinds of symbols. In the first place the printed outline takes more room than the space marked out for the tree according to the scale of the map, and again it will not be easy to persuade the child that it is a symbol, not a picture; that the house cannot be pictured by its outline, a bridge by the same method; that a stone wall or a fence cannot be introduced in a similar way; that a pictorial plan is not a map.

Water and culture lines should be started early in the work. As soon as possible the relief lines should be begun. Reading relief from contour lines is a habit to be cultivated.

CROSS-SECTION

The topographic maps are superior to most maps in ordinary use. The maps are contoured for every 20, 50, or 100 feet of vertical height. The idea of contour lines is best obtained from a field exercise. If a locality is selected in which a hill rises sharply from a level base, the problem may be easily expounded. The base will be the zero line. For every foot of height, if the hill be low, a pebble may be placed on the slope. A line of pebbles around the hill will mark, then, the foot

* Redway, *New Basis of Geography*, page 139.

contour line. In mapping, plot the pebble lines as one would were they roads. While still in the field, a cross-section may be started. Standing to one side where a view of the hill, sharply outlined, may be had, sketch the outline. Then, by pacing, make the outline to scale. The steps to the drawing of a cross-section of one or two portions of a topographic map are then simple. A little of such work should be done; a great deal is a waste of time.

Cross-sections should always be drawn with the vertical scale and horizontal scales alike. The transposition of a 1500-foot contour to the scale of $\frac{1}{62500}$ should be practiced until it is made easily. One or two well-selected cross-sections will fix the insignificance of the irregularities of the earth. A section of the ocean depths from the mouth of the Amazon to Libreville in the French Congo, along the equator, is an excellent choice. The distance is approximately 60° of arc. With a 12-foot radius the irregularities of the ocean floor do not appear. The width of the thinnest line is then too wide to show the ocean depth.

A FEW ILLUSTRATIONS

For a first exercise in mapping—the preliminary consideration of scale being understood—the remnant of a hill was used. The locality was selected because the slope was prominent. The emphasis of the exercise was placed on compass readings and contour lines. Four points, *A*, *B*, *C*, and *D* (Figure 1), were selected as the corners of the area.

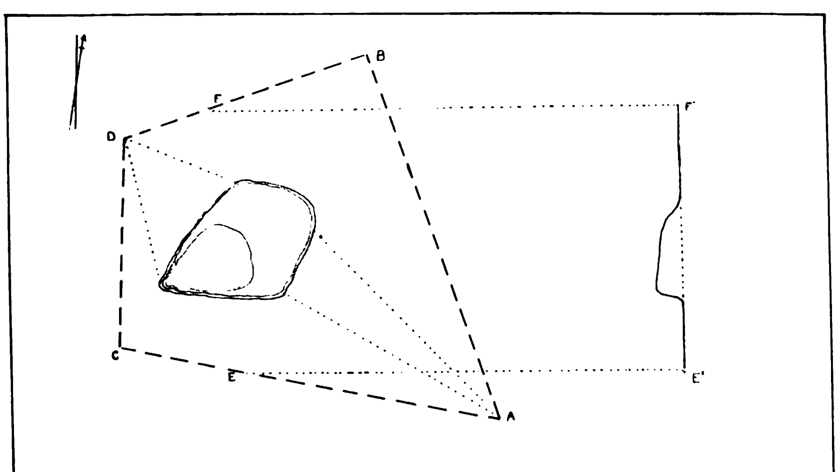

FIG. 1. *Map and cross-section of a hill. Scale, 1/500. —— Contour lines; interval three feet.*

The data, obtained by the pupils, were as follows:

From *A* *C* is N 80° W. 53 paces.
B is N 20° W. 53 paces.
SE base of hill is N 60° W. 34 paces.
NE base of hill is N 45° W. 36 paces.

From *D* *B* is N 70° E. 36 paces.
C is due S. 28 paces.
NW base of hill is S 70° E. 17 paces.
SW base of hill is S 15° E. 20 paces.

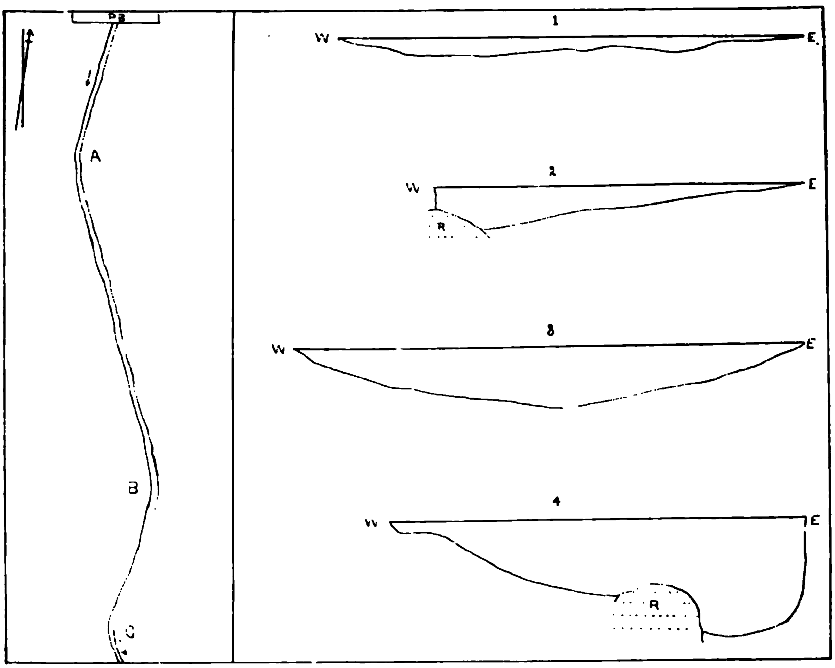

FIG. 2. *Map and cross sections of brook. Scale of map,* $\frac{1}{400}$. *Scale of section,* $\frac{1}{10}$.
R *rock* P B *park bridge.*

Stations *B* and *C* are used to check the above readings. The contour lines may then be plotted from the stations at the base of the hill. The height is an average estimation, and the horizontal distances between the contours are determined in the same way. A cross-section is then added.

Another exercise, Figure 2, was undertaken along a neighboring brook. All distances along the brook were paced. All measurements of the width and depth of the brook were measured accurately.

Data:

From Bridge (P. B.) brook runs S 12° W. 19 paces to Bend *A*.
From Bend *A* brook runs S 15° E. 45 paces to Bend *B*.
From Bend *B* brook runs S 20° W. 12 paces to Bend *C*.
From Bend *C* brook runs S 20° E, and on.

1. Cross-section in straight reach between *A* and *B*, depth expressed in cm., readings every 10 cm. from west to east.

0 1.4 3.6 3.5 3 2 2.8 2.5 1 0

Current swift.

2. Same at Bend *C*.

5 (*rock*) 9 8.7 5.3 4.4 3.6 2.9 1.2 0

3. Same in straight reach between *B* and *C*.

0 5.8 7.8 10.4 11.5 12.4 12.2 10.5 9.5 7 4.9 0

Current slow.

4. Same at Bend *B*.

2. 2.5 8.6 11.5 14.3 16 12.8 (*rock*) 26 25 19.9 (*undercutting*)

A third exercise, Figure 3, was conducted along a strip of coast.

Data:

From *A* (*rock*) beach runs N 12° E.
Beach runs S 20° E to S 70 paces.
From *S* to *B* (*rock*) line runs S 45° W. 107 paces.
From *B* to *T* E. 57 paces.
From *T* to *C* (*rock*) S. 30 paces.
From *C* rock extends west 13 paces.
From *C* shore runs E to *D* (*rock*) and on.

In this exercise, as in the others, the data were supplemented by rough sketches and some attempt was made to incorporate into the maps the ideas expressed in the free-hand outline. Thus the slight irregularities in the curved coast line between *A* and *B* were observed and mapped.

INFERENCES FROM EXERCISES

The journey to the brook opened a number of interesting problems. These may be considered in papers presented by the pupils. It is very evident that in the bends of the stream one kind of cross-section obtains, while in the straight reaches the section was of a different type. Notes were made concerning the swiftest part of the current in each section; that this swiftest line of flow crossed the channel was among the conclusions. That is hardly a safe principle that would apply all the results of an investigation of 150 feet of a single stream to all streams. It is better to leave a few problems unsettled until further investigation and observation allow a definite answer. Thus, from the stream measurement, it seems to be a natural deduction that the swifter parts of brooks have a shallower flow of water than the

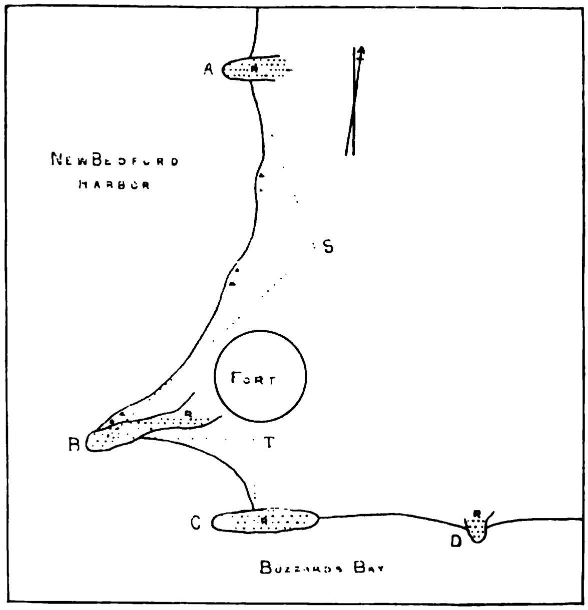

FIG. 3 *Map of coast-line. Scale,* 1/1250. R *rock.*

slower portions. Some problems will be presented that can not be solved, either because of lack of time or because of insufficient data. It may be convenient to some members of the class to investigate the brook further and to present a more comprehensive report on one or more problems. At least it is well to leave the exercise in such a way that, either as an investigator of the physics of rivers, or as a casual observer, the pupil may approach a stream, not in the belief that all its ways are known, but with the inspiration from knowing something of its history, and the enthusiasm which the hope of discovery begets.

The conclusion from the shore map should be treated in a similar manner. A reserve of judgment is advised. In regard to the location studied, let the statements be definite. At the Fort (Figure 3), the salients are rocks, and between them the beaches are curved. That all salients are rocks might be a next step. Between *A* and *B* bunches of shore grass catch the sand and cause slight irregularities in the curve of this beach. The case is so evident in the field that it is remarked upon by a pupil. Perhaps, then, some other things besides rocks mark the salients of a coast. An island in the harbor, showing the white line of a sand spit, reënforces the statement. At a later period these may enter the discussion and be investigated. For the present we know that rocks form salients, and are one cause at least for the irregularities of coast lines.

MAP DRAWING

Before map reading is perfected, a conception of the error of the maps in constant use is necessary. It has been the general printed opinion that exercises in map projections, although ideally a desirable part of a child's knowledge, are best not considered in the grades. There are many things in projections that mature minds only can grasp; at the same time there are some elementary considerations in the subject which should be properly delegated to the geography teaching in the schools below the Secondary. The study of a globe follows naturally the construction of the maps of limited areas. The child may believe, as the human race did in its infancy, that the earth is flat. The introduction to a spherical earth at this time repeats the race history. At some later time in the grades the spherical maps and the flat maps must be considered in comparison. There is no better way than to have the child construct two or three types.

A Mercator map is not beyond the child's comprehension. With little difficulty, a figure, like Figure 4, may be made. The pupils should

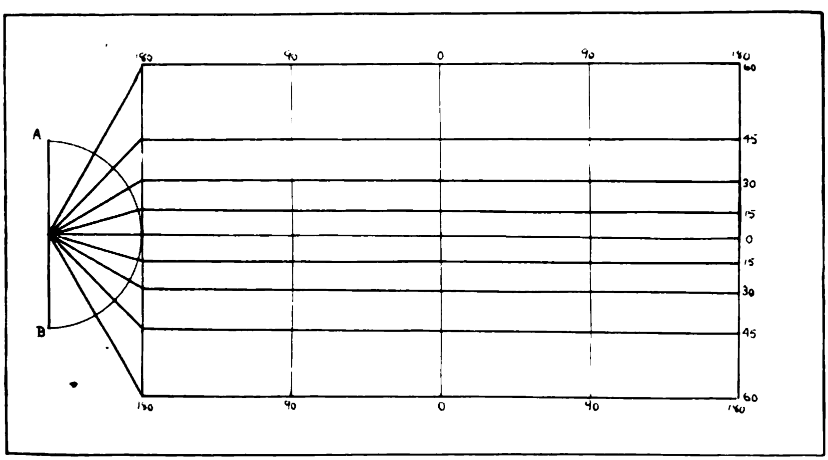

FIG. 4. *Construction of Mercator Projection.*

have the small hand globes. If the diameter, AB, is made equivalent to the diameter of the globe, the later comparisons are more obvious. The equator of the map should equal in length the circumference of the globe. When the diagram is made the map may be begun. It is not necessary to complete the whole map of the world, but enough of it must be undertaken to show the distortion. It may be advisable to plot points only, as Cape Farewell and Christiania on the 60th parallel. Compare the plotted distance with the true. In like manner take locations nearer the equator. Then the latitudinal distortion may be proved in a similar manner, or a teacher may consider it wise to construct a map of North America after having plotted thirty or forty points around its coast. Here may be emphasized at the same time the preliminary steps of great circle directions. An investigation of the shortest distance between Mt. McKinley, Alaska, and St. Petersburg, on the globe, and on the Mercator projection, will easily show that the latitudinal direction is not the desirable one in point of distance.

Constructions of other projections would consume too much time. If, however, blank outlines of one or two projections in common use be furnished the pupil, a similar use may be made of them. It is advisable to have the circumference of the globe and the circumference of the projection alike at first, as direct comparisons may then be made without the confusion of a change of scale.

The plotting of points from a globe is beneficial, furthermore, because the pupil must say to himself the latitude and longitude of the localities plotted, a thing that map copying does not make necessary.

MAP READING

"Teaching words before ideas has the same effect as teaching a map without associating it with that which it represents. The problem of how to lead children to use maps properly, that is, to make a map a means of developing thought power, is an exceedingly serious and important one. All directions and suggestions, therefore, should tend toward this one purpose." So said Francis W. Parker.*

Stress has been laid, up to this time, on the construction of maps; not, however, as an end in itself, but as a means of acquiring some of the habits of map reading. If, in its proper time, there should be added to this foundation the knowledge of the wind belts and the ocean currents of the earth, a great deal of the text of a geography may be discovered by the pupil. In order that this work may be carried on safely, the best maps should be employed. A more intelligent understanding of geographic relationships may be attained from an increasing use of questions demanding judgment and reason. Further expansion of this would only repeat what has already been printed in this JOURNAL.†

* *How to Study Geography*, page 92.

† *Journal of Geography*, Vol. I, "The Use of Maps in the Teaching of Geography," page 97, 1903.

INDUCTIVE METHOD OF TEACHING CHANGE OF SEASONS

BY R. S. HOLWAY
Of the University of California

CAN grammar school pupils determine the causes of the change of seasons by their own observations and by experimental study of possible solar systems? Several years' trial with students in secondary schools has entirely convinced me that for them this method of studying change of seasons is thoroughly practicable and satisfactory. Recently I have had a senior in the University of California try the plan in her practice teaching in an eighth grade class under the usual public school conditions Apparently these children master the main ideas as readily as do adult students. While the work was not carried so far as it would be with older students, the account below

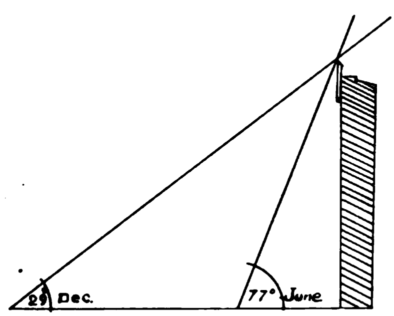

Fig. 1

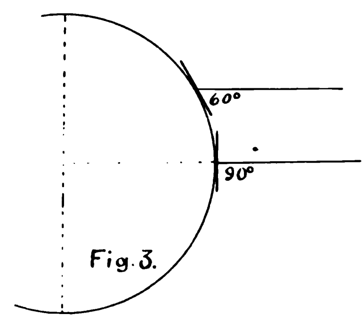

Fig. 3.

will show, I think, that this eighth grade learned more and reasoned more than the average grammar school student does by studying the text.

I will present the work substantially in the order that it was given, and the headings of the paragraphs will constitute an outline of the lessons.

Observation of a shadow cast by the sun at noon. Beginning the first part of September a peg was fastened in the sill of one of the south windows and the point of the shadow of this peg at noon was marked on the floor below. (See Fig. 1.) The window was raised to get clearer sunshine. Various predictions were made by the children in answer to a question as to whether the point of the shadow would come to the same point on the floor the next day at noon. As they watched the marked lengthening of the shadow during the week following, many of the class expressed great surprise.

In response to questions they answered readily that the sun must be getting lower in the sky each noon to produce a longer shadow. They also assigned this as a probable cause of the winter's cold.

Space covered on different parts of a sphere by the same beam of sunshine. Through a hole in a piece of cardboard sunshine was allowed to fall on the surface of a g obe and the varying area covered was noted. The deduction is easily made that the heating effect of sunshine is greater the nearer the rays come to being perpendicular to the surface.

What the gyroscope teaches about rotating bodies. The gyroscope shown in the figure was made by mounting a six-inch sewing machine wheel on ball bearings in the fork of an old bicycle. (See Fig. 2.) With a stout string one can spin it so fast that it will run for nearly five minutes. The great advantage that this gyroscope has over the one commonly

FIG. 2. *Home-made gyroscope*

sold to high schools are its simplicity, the ball bearings, and the greater weight. Taking it in the hand when the wheel is rotating rapidly one feels a wonderfully strong resistance when an attempt is made to *change the direction of the axis of the whirling wheel.* It may be carried around the room without feeling this resistance, if the axis is kept parallel to its first position. This experience enables the children really to appreciate the primary fact underlying the change of seasons, namely that the earth because it is a whirling body keeps its axis constantly in the same direction. The gyroscope can also be suspended by a cord and carried around in a circular orbit. If properly balanced, it will twist its supporting cord and keep its axis constant in direction. The children easily perceive the point of the experiment and a little questioning will lead them so to phrase their ideas that they will be available in future work.

Description of a planet with its axis perpendicular o the plane of its orbit. All the children were familiar with the idea of an earth going around a sun and so they were asked to carry an earth with a vertical axis around a sun—a circular orbit being used. They at once located vertical sunshine at the equator of such an earth and saw that it would be constantly on that line. Day and night were correctly explained but with little interest—the problem having evidently been long solved The elevation of the sun at noon for a man at different latitudes requires some drill, especially as to the meaning of horizon. A card held on the globe at the equator and slid toward the pole is a great help. They finally saw (Fig. 3) that a man going north 30° from the equator would tip his horizon 30° and that hence the sun that is 90° high at the equator is only 60° high in lat. 30°. The teacher must remember here in drawing any diagram that the sun is not close at hand, as in the concrete illustration, but at such a great distance that its rays are sensibly parallel. The children must be led to see that this man has no change in noon elevation of the sun and hence no change of seasons during the year.

Does our earth have its axis perpendicular to the plane of its orbit? The children were next told that they were to answer a question about our own earth entirely from their own observations. The statement of the question above brought a look of surprise that they could be expected to know anything about our big earth without the help of books. But in a few seconds one could see the flash of intelligence come first in one face and then in another, until soon the majority of the class were wildly eager to answer. They referred to the varying length of the noon shadow and said they *knew* our earth could not have its axis perpendicular to the plane of its orbit. In the class this fall this part of the work was particularly enjoyable, for one boy had but recently remarked that "only the wise men" could study out such things as the text-book tells about the change of seasons.

Description of an earth with its axis tipped. A globe rotating on an axis inclined 10° from the perpendicular was next assigned to be carried around a central sun. It is well to have the sun in the center of the room and to use a large orbit. Here, of course, some of them had to be reminded of the gyroscope before they would keep the axis of the rotating earth constant in direction. As soon as that was done they saw that vertical sunshine varied from 10° north to 10° south of the equator, making a torrid zone. It is a more difficult problem to work out the noon elevation of the sun for a man living at (say) 30° north latitude. But with care they saw that the noon elevation would vary from 70° to 50° during the year.

Is our earth an earth with its axis ilted? This question is readily answered by a reference to the changing noon shadow. It is really answered too readily for of course, as original work upon the part of the children their proper answer is merely that it may be. In due time the children should be led to see that while they have worked out a scheme that may be true for our solar system, yet they have not fully proved that it is the scheme.

Does a planet with its axis inclined have summer and winter? This is a variation of the work already done, but if their attention has been centered upon the changing noon elevation of the sun, the children may not realize that they have been studying change of seasons. The question about summer and winter serves to correlate their recent observations with their past experiences of summer's heat and winter's cold.

If the axis of a planet is tipped 15°, what zones of sunshine result and what are their boundaries? The torrid zone and its limits are seen at once. Usually it requires some more time to establish the changing conditions of sunshine in passing from the frigid into the temperate zone.

Care must be taken that the children really grasp the relation of the amount of tip of the axis to the width of the torrid zone and to the varying noon elevation of the sun. Work well done here will prevent confusion in the future.

Can you measure for yourselves the inclination of the axis of our earth? If the preceding work has been well done by presenting each problem in various forms and with several inclinations for the axis of the earth, the children will see that the shadow of the peg in the window-sill gives them an answer to this question. If the pupils have not measured angles they must be given simple protractors and made to measure various angles for practice. The elevation of the sun can be measured by putting the protractor on the floor with its center at the point of the shadow, and seeing where the line of sunshine cuts the protractor. Another way is to draw the triangle of the height of the peg, the floor, and the line of the sunshine at the board and to measure the proper angle at the board. (See Fig. 1.) The children will at first say that it will take a year to measure for our earth—that they must get the lowest noon elevation of the sun in December and the highest in June. This is of course the best way but if the height can be had in December or June and at one of the equinoxes, the problem can be solved. It is well to consult the almanac and to note that the fall equinox was September 24 in 1903 and that the winter solstice was December 22. As the Berkeley class has not carried the work through a season, I will give figures obta ned in another school. Highest elevation of sun in June.

77°, lowest noon elevation in December, 29°—difference, 48°. This gives of course 24° for the inclination of the axis of our earth. Ordinarily, perhaps, the result will not be so accurate as this Thinking out the problem is the valuable part of the work. although care should be taken to get the very best result possible.

It may be granted at once that this method will take more time than to commit the ordinary text to memory or to explain directly the change of seasons. Our real object, it must always be remembered, is to develop thinking, self-reliant boys and girls, and to accomplish this we can afford to take time. Necessarily, little details have been omitted in this brief description of the plan of work. Any teacher interested can easily add them. It may possibly be well to remind teachers who begin this work at the December solstice that the increase in elevation of the sun is very slow for the first two weeks. The lack of a gyroscope should not deter any one from attempting to teach the subject by this method. Any top stands upright when it is spinning rapidly and can not be upset by any moderate blow. When it is not spinning it is almost impossible to balance the same top so that it will stand upright even for a second. Again, if one holds the wheel of a bicycle (taken from the frame) by the ends of its short axle he will find it hard to change the direction of the axis if the wheel is whirling. Either the top or the wheel illustrates the same point as the gyroscope.

In the observation work that is carried along with these lessons the children will have noticed the change in the time of sunrise and of sunset and will have correctly given the short day as one cause of winter. They should also be required to show with the globes that an earth with a vertical axis has always and everywhere equal days and nights, and that an earth with its axis inclined has days and nights of varying length.

MEDIÆVAL TRADE AND TRADE ROUTES*

BY C. RAYMOND BEAZLEY, M. A.,
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IN the development of the world's commerce and trade routes, history meets geography very closely, and the geographical teacher can find in this subject many excellent lessons afforded him by historical research, just as the historical teacher cannot here neglect the suggestions, the conditions, and the limitations of geography. Trade routes

* Abstract of Lectures given at the Oxford Summer Meeting, August, 1903, and reprinted by permission from the *Geographical Teacher*, October, 1903.

can only run where the Earth-surface is favorable; but a sufficient amount of favor is shown by wide tracts of that surface; there is an extensive possibility of choice and change; and historical events have constantly modified, and sometimes revolutionized, the course of the great trade channels. At the same time, history has constantly neglected to consider adequately the mercantile, economic, and geographical elements in man's advance and the evolution of modern society.

If we look for the central principle in the history of the World's exploration, we shall find that commerce, the search for material gain, has been the most permanent, vital, and effective spring of progress. Religion, science, and politics—the missionary spirit, the pilgrim spirit, the spirit of adventure, the colonizing spirit, the scientific spirit, the political spirit—these have all played their part, they have all done much. But none of these has the importance of trade in the opening up of our world, in the development of geographical knowledge. Trade ambitions are the most powerful factor in bringing about a continuous, progressive enlargement of the horizon in making discovery a lasting gain to the race. Trade decadence marks the Dark Ages in Western Europe, more, perhaps, than anything else. Trade revival coincides with, and is a main cause of, that mediæval and modern Renaissance which begins in the eleventh century, on the eve of the Crusades, and has continued ever since.*

The ancient trade routes continue far into the Middle Ages—with changes, it is true, but only changes of masters, of products, of comparative importance. And these trade routes are mostly, both in pre-Christian and in early Christian times, from west to east, or from east to west, moving, like the great mountain ranges, along the length, or longitude, of the old world. The amber trade of the Baltic coast, the fur trade of the northern forests, and the gold, ivory, and slave trades of

* Contrast the permanent, effective discovery of China for Europe, by the mercantile spirit of the Polos, in the thirteenth century, with the comparatively ineffective religious discovery of the Celestial Empire by Nestorian missionaries from A. D. 635 or with the still less effective and permanent diplomatic discovery by Roman envoys in A. D. 166, 284, etc.

Contrast the permanent Columbian discovery of America, so largely inspired by mercantile ambitions, with the transitory discovery by the Northmen in the tenth and eleventh centuries, a discovery mainly adventurous (which essays colonization, but in vain).

Contrast the permanent attempts to circumnavigate Africa, before a settled commercial purpose inspired the enterprise, with the success of the same considered as the opening up of a new trade route of primary value in the thirteenth to the fifteenth centuries.

the East African shore are the chief flank divisions of the great stream of international commerce flowing from Britain and Spain to India and China.

Looking, first, at these trade routes from a Mediterranean or European standpoint, we may instance among the more important the Black Sea way from the Bosporus to Trebizond, and sometimes to other ports of Armenia and Caucasia. This route crossed the isthmus of the Caucasus, traversed the Caspian, and ascended the Amu or Oxus to the rich lands of Western Central Asia (Bukhara, Samarkand. etc.). Another branch of the same route passed over North Armenia and through North Persia, just to the south of the Caspian. In "Sogdiana" it met with other trade routes in profusion; for the Soghd was the true heart of Central Asia, at least from the ninth—probably from the eighth—century, and even in Ptolemy's time (*c.* A.D. 130) it had great mercantile importance. Upon it converged the three great Chinese western tracks, one of the most important routes from India, and various much-frequented roads from Southwest Asia. The Trebizond path of commerce is perennially active; but it is most important in the Mongol era, and for a century after the destruction of Bagdad and the consequent rise of Tabriz (*c.* A.D. 1258–1360).

The Euphrates route, uniting (at Rakka or Callinicum, in Northeast Syria, on the upper course of the great river) with many shorter mercantile ways from the Mediterranean coasts, brought the traveler down to the Persian Gulf, and thence either by sea or land along that dreary south coast of Persia and Baluchistan to the Indus and Sind. By the former. Alexander's fleet returned to Mesopotamia; by the latter, his army.

The north and central Persian routes, skirting the southern edge of the Caspian, or running through Mosul and Northern Mesopotamia, passed through Merv to the Amu and Sogdiana. Till its sack by the Mongols, in the thirteenth century, Merv, "Antiochia Margiana," was one of the chief centers of the trade of upper Asia—from the age of Alexander the Great to that of Genghis Khan.

The Red Sea route, connecting Egypt and the Mediterranean world with India (and at times even with China), by way of Aden and the South Arabian ports, was also important as bringing the products of tropical Africa to the "Roman Sea." By means of this route the horizon of the Ancient World was extended (in the time of Pliny and Ptolemy, *c.* A.D. 50–170) to the Zanzibar Islands and the equator; while the early Moslem traders pushed on still farther along this path to Madagascar, the Mozambique Channel, and Sofala. Here the Europeans, coming from the west, round the Cape of Good Hope, met the Mohammedan traders of the Indian Ocean, whose southward terminus had been Cape Corrientes.

The northern fur and amber trades followed, for the most part, the courses of the rivers which formed the natural highways between Baltic, Euxine, and Mediterranean lands—the Düna or Western Dvina, the Dnieper, the Vistula, the Memel or Niemen, the Dniester, or the Prut. Easy portages, as in the backwoods of North America, connected the upper courses of these streams or their tributaries. This route was also followed by Norse, Danish, and Swedish traders, and travelers to Constantinople, the Mediterranean, and the Holy Land, in the age of greatest Scandinavian activity.

A route of minor importance, but of great historic interest, connected with the main Black Sea avenue of commerce, ran from the lower Danube round the north of the Euxine, thence moving eastward either to the north or south of the Caspian: this was occasionally employed by the Byzantines in their sixth-century intercourse with the Turks, and became of great importance in the Mongol age (thirteenth and fourteenth centuries).

The Tigris route from north to south was not very important before the rise of Bagdad (*c.* A.D. 750). The Freshwater Canal route from the Nile to the Red Sea, connecting the Mediterranean with the Indian Ocean, was, on the other hand, prominent at certain periods of the earlier Middle Ages. The canal, however, was often choked and disused; it was finally abandoned A.D. 767.

Looking at these trade routes from an eastern standpoint, we may distinguish three chief highways between China and the Western World —one running to the north of the Tian Shan, the second to the south of that range, while the third skirted the northern face of the Tibetan Plateau, masked by the Kuenlun Range. All these met at the western extremity of the Great Wall on one side, and in the Sogdiana oasis (Samarkand, etc.) on the other. In Ptolemy's age (second century A.D.), the Græco-Roman merchants who traded with the Silk Land seem to have preferred the second and third of these routes, and especially the Kuenlun way; most Chinese travelers to the west, on the other hand, appear to choose the first, or northern Tian Shan road. From Fergana and Eastern Turkistan the Kuenlun path (the third Chinese road to the west just noticed) threw off an important sidetrack over the Indian Mountains southward into the Indus Valley, where men, passing down the river, reached a seaboard in direct communication with the Persian Gulf, the Red Sea, and the Mediterranean.

The limitations of the Ancient World are always perplexing us; the successes gained by the pre-Christian civilization are constantly suggesting yet greater things unattempted or unachieved. In a sense, perhaps, the light that was in the world proved to be darkness. The Helleno-Roman World, as organized under the Cæsars, was so rich, so self-sufficient, so full of proud contentment, so weary of struggle after many centuries of conflict, that it made little serious effort to explore beyond its own limits. For instance, there was felt no want of a commercial route by water around Africa; the Phœnicians, six hundred years before Christ, claimed the discovery of that waterway; but, in the heyday of old civilization, no adequate attempt was made, under far easier conditions, to repeat the experiment. It could have been successfully carried through, without doubt, under the Julian or Flavian or Antonine emperors; but it had ceased to appeal to practical men, though it still attracted the learned and the imaginative. Again, while the ancient coast and overland routes—by caravan or river boat or coasting vessel—were in good order, even the most adventurous did not seriously think of the great voyage from west to east, "from Spain to India," which was believed in as a theoretical possibility (*e. g.*, by Aristotle), fully eighteen hundred years before it was realized by Columbus and Magellan. The discoveries of the Great Forty Years (1480–1520) were not anticipated in the times of Strabo or of Ptolemy, chiefly because the same suggestions of vital gain did not occur to the sublime self-satisfaction of imperial Rome. The compass and quadrant were then unknown, it may be said, and nautical science was in its childhood. But, if Greek thought and Roman perseverance had given attention to the problems of ocean travel, the progress of later centuries would certainly, in great measure, have been anticipated. But the intellect of the later classical time was interested in the theory of the world—its shape and size—far more than in the practical exploration of the same.

The ancient trade routes, as already noticed, continue far into the Middle Ages almost unaltered; but, as regards the west, their activity decreases, their scale of supply and demand is lowered, their good order and safety are seriously impaired.

In the sixth century A.D., the Byzantines try to divert the overland commerce (from China, India, and Central Asia) away from the Persian routes, which most of that commerce then followed. Two attempts are made with this object: (1) by the Indian Ocean routes, and in alliance with Abyssinia; (2) by the Black Sea and steppe routes, in alliance with the Turks of Sogdiana. Both these attempts had special relation to the silk trade, important both under the Old Empire and in the Middle Ages; this trade had long been in the hands of the Persians as carriers.

The first attempt involved an alliance with Abyssinia, and with the Nestorians of Persia, South India, Sokotra, etc.; it brought about the visit of Nonnosus to the Negus' Court, and the visits of Sopater and Cosmas to Ceylon (before 545); and it produced the valuable writings of Cosmas on the regions of the Indian Ocean, the Red Sea, etc. In these writings there is a great advance on previous Christian knowledge of South Asia and East Africa.

The second attempt involved alliance with the Turks, then ruling in Samarkand and over vast regions north of the Amu (the camps of their khans are always in motion; sometimes they are in the Soghd, or near Kokand, at other times near Lake Balkhash, or in the Lower Altai regions, etc.). This alliance produced many valuable travels between the Bosporus and West Central Asia, and good records of the same. These travels really proved the Caspian to be an inland sea, and not a mere gulf of the Arctic Ocean; but this lesson was not properly drawn except, perhaps, at Constantinople—*e. g.*, St. Isidore of Seville at this very time repeats the old misconceptions. Excellent descriptions of the Turco-Tartar nomades were now given in Greek, recalling Herodotus, Hippocrates, and Strabo. Hence also comes one of the earliest notices of Lake Aral, and of the Rivers Ural and Emba; the better known Volga, Syr-daria or Jaxartes, Don, Dnieper, etc., are clearly described or referred to by the Byzantine historians of the sixth century. This intercourse lasts from 568 to 590 or 595; its central object is to "transfer the sale of silk from the Persians to the Romans"—*i. e.*, it is a commercial object that inspires the whole. Also, under Justinian (before A.D. 565), the secret of silk manufacture is transferred from China to the Byzantine Empire by Nestorian monks, who bring silkworms' eggs in a hollow cane to Syria. This remains the most permanent result of the new Byzantine enterprises. In Western Europe, during all the period of the earlier Middle Ages, commerce is extremely depressed; yet there is occasional surprising evidence of its vitality—*e. g.*, Gregory of Tours tells of merchants going from France to Syria, and of a merchant pilgrim coming from South India to France (about A.D. 550); also of Indian ships coming regularly at the same time to Suez "for the sake of merchandise." Note also the colonies of Syrian traders in Marseilles, Narbonne, Bordeaux, Orleans, Tours, etc., under the Merovingian Kings (sixth–eighth centuries), as well as the commercial prosperity of Venice beginning in the sixth century.

The rise of Islam produces incalculable effects in commerce as in politics. Moslems now control the most important sections of the great international trade routes, and are practically masters of the world's carrying trade. A wonderful development of Indian Ocean trade and trade routes occurs under the early Caliphate, and before A.D. 1000 Moslem traders visit North China, Korea, and Japan. Already in A.D. 700 they are found trading in Canton; in 758 they head serious riots here; in 795 they transfer their main Chinese market from Canton to Khanfu or Hangcheufu, near the mouth of the Yangtse, the greatest Chinese port throughout the Middle Ages. Kala, in the Malay Peninsula, is their chief market in the East Indies. Ceylon is also important, and Arab merchants appear here long before Mohammed; even about A.D. 400. Arab trade colonies, also, on the Malabar coast and in Northwest India, are pictured in glowing colors by early Moslem travelers and geographers before A.D. 1000. Within the Caliphate, the courses of the Tigris and Euphrates and the Persian Gulf routes acquire new and special value, and are indeed primary after the foundation of Bagdad (A.D. 750). Busra, at head of Persian Gulf, Maskat, Siraf, and Kishm, predecessor of Ormuz, close to the mouth of the gulf; Aden, the key of the Red Sea; Jedda, the port of Mecca; Suez, "where Egypt met India;" Mozdishu, on the Somali coast; and the far eastern harbors of Kala and Khanfu, or Hangcheufu, are the chief centers of the ocean trade of Islam down to the Crusading Age. On the other hand, the overland routes are somewhat depressed during the early centuries of Islam; but along the northern frontier of the Caliphate, from the Pamir and the Syr-daria to the Caucasus and the Volga, there is a surprising amount of commerce and a surprising variety of commerce avenues. Those already noticed—the Amu-Caspian-Caucasian-Euxine route, the steppe routes north of the Euxine and the Caspian, the South Caspian or North Persian road—are now of considerable importance, though quite secondary to the great maritime coast tracks of the south. The fur-trade route, running up the course of the Volga into the far north, is also valuable, owing to the passion of rich Moslems for furs; its chief terminus is at Bolgharar (answering to the modern Kazan).

All Moslem trade routes are summarized by Ibn Khordadbeh, about A.D. 880. Great importance is assigned by him not only to the routes noticed above, but also to the North African caravan route, skirting the north edge of the desert, from Morocco to Egypt. He also emphasizes the commercial position of the ports of France and Italy, even then, and of the market town of Rhé or Rai, near Teheran, where Slav, Khazar, and Levantine traders met. He also gives an elaborate account of a

Central European trade route from Southern Germany eastward, running through the Slav lands to the lower Volga, and thence on to Central Asia, India, and China.

The early triumphs of Islam, following on the barbarian invasions, for a time almost stifle the commercial life of western Christendom, and Moslem piracy for a moment apparently completes the destructive work of Moslem conquest. While the East and West Caliphates develop commerce of their own, of immense reach, depth, and volume, the Christian lands outside the Byzantine Empire seem commercially dependent on their more prosperous rivals. But gradually matters alter, the outlook changes, and the central period of the Middle Ages is marked by a mercantile development of decisive character; a new era in trade, as in politics and society, is created; and whatever the other fluctuations of European history, in commerce the Mediæval Renaissance, beginning on the eve of the Crusades, is an abiding and vital force. This steadily grows till Europe arrives at the discovery and trade exploitation of the entire world.

The new European mercantile life really begins as a continuously progressive force in Italy and the south of France during the ninth century—especially at Venice and Amalfi, and to a less degree at Marseilles. This mediæval mercantile life is superior to the ancient commercial activity in claiming greater privileges for the trader, in giving more attention to freedom of trade intercourse, in undertaking more daring and speculative operations, in devoting greater energy to the discovery of new markets. At the conclusion of the Crusading struggle it is evident that the solid results of the religious wars are mainly commercial—a new culture and material prosperity, a vastly extended knowledge, a well-informed and far-reaching ambition, whose results are seen in the great scientific and geographical discoveries of the latest Middle Age.

The Crusading States of the Levant, advanced bases for Christian trade, help the Christian travel-pioneers, especially merchants, to penetrate the inner regions of Asia. Thus Italian and Provençal merchants push up to Aleppo, Damascus, and the Euphrates before A.D. 1200. Some time before 1264 we find a Venetian trader in Tabriz, the North-Persian successor and supplanter of Bagdad. The conquests of the Mongols are first announced to Christendom by European traders in gems and spices who had gone up, about A.D. 1200, from the Syrian coast towards the Euphrates.

New routes and new markets are opened by the Latin capture of Constantinople (A. D. 1204), and the rise of the Mongols (from A. D. 1190).

Venetians are now established as commercial sovereigns on the Bosporus and the Black Sea: their traders penetrate to Kiev, into the heart of Asia Minor, into Persia, into Central Asia, finally, with the Polos, into China, Indo-China, and India.

The Mongols open continental (overland) routes, as they have never been opened before, to Christian trade and travel. The opportunities given by Mongol rulers to European merchants result in that new knowledge of India and China which, above all else, inspires the great geographical discoveries. For Henry the Navigator, Dias, Da Gama, Columbus, Magellan, and the rest are all primarily in search of better and easier ways to Cathay and the Indies. The difficulties of the land routes are well known by the fourteenth century; the value of the objects and regions sought are also thoroughly apparent to the searchers; the first hopes of profitable overland intercourse (raised by the Mongols) have now been completely disappointed; therefore, men seek for maritime, oceanic ways. Hence the circumnavigation of Africa, the western route by voyages of Columbus, the reaching of East Asia by a western course from Europe (by Magellan), the incidental discovery of the unsuspected land-mass of America (by Columbus).

The importance (in the Mongol period) of the Trebizond—Tabriz and Lajazzo—Tabriz routes (from the Black Sea and the Cilician coast to North Persia, and so to China by the way running south of the Caspian) is very notable.

Only second to these come the steppe routes—*e. g.*, from Kiev or the Crimea to the lower Volga, and so to the Mongol capitals and China by tracks running north of the Caspian—while, again, the river routes are not to be forgotten—*e. g.*, the Don-Volga way into the Caspian (crossing over by the Kalach portage from one river to another); also the Amu route. But before the close of the Middle Ages both Mongol and Moslem alliances for commercial purposes are clearly seen to be futile experiments, ending in utter disappointment. Good examples of the latter exist in the attempts of European traders in the twelfth, thirteenth, and fourteenth centuries to reach the Indies through an understanding with the Moslem rulers of Egypt. Some of these are temporarily successful—*e. g.*, the Pisans in A.D. 1175, the Germans about 1240, the Venetians about 1330—but none are permanent.

The routes of the Polos in their two great journeys (1260–1295) give an excellent view of the chief trade avenues in the Mongol period.

I. On the first journey the outward route was: Crimea, Volga, Bukhara, over the dividing mountains by the southern Tian Shan way, over the Gobi to the Great Wall, Kublai's Court at Shangtu. II. On the second journey: Lajazzo, Erzinghian, Mosul, Ormuz, Badakhshan, over the dividing mountains by the Northern Kuenlun way, Great Wall, Pekin, various routes in China (*a*) to Southwest, (*b*) to Southeast, especially to Hangcheufu, the "City of Heaven;" home from Zayton, in Fokien, by the coasts of Indo-China, through the East Indies, along the Coromandel and Malabar coasts to Ormuz, Tabriz, Trebizond, Constantinople. The Red Sea routes are elaborately described in the Polo narrative, but not apparently from first-hand observation. We must notice the importance of the Nile and of Alexandria in international trade even at the close of the thirteenth century.

The persistence, daring, and success of Christian traders, even from the beginning of the Crusading Age, correspond to an ever-increasing weakness and decay in Moslem commerce, which from the seventh to the eleventh century had controlled the world's purse-strings. Commercially, as in some other respects, Islam never recovered from the Mongol convulsion; *cf.* Polo's evidence on the vast superiority of the Chinese ports over Alexandria at the close of the thirteenth century.

So the break-up of the Mongol Empire and the conversion of the Western Tartars to Islam destroy Christian hopes of effective overland trade through Asia. A thorough knowledge, we have seen, now prevails in the west of the riches of South and East Asia. These riches are accordingly sought by the longer but safer maritime routes. The chief stages in this search are the following: In 1270, European discovery in the African islands and off the African coasts begins again with the voyage of Lancelot Malocello to the Canaries; in 1291, we have the first overt attempt to reach India by an ocean voyage round Africa, planned for strictly commercial purposes; in 1341, 1346, 1402, etc., European voyages are repeated among the African islands, and renewed attempts are made to coast on beyond the farthest hitherto known. Valuable discoveries are made among the Canaries, the Azores, and the Madeira group, even before 1351; but permanent, continuous, effective Atlantic exploration only begins under the leadership of Henry the Navigator, 1415–1460; the route around Africa is practically opened up by 1486 (Bartholomeu Dias), absolutely by 1498 (Vasco da Gama). The greatest commercial revolution ever known is produced by this, by the discovery of America in 1492, and by the Ottoman conquest of the Levant, which last dealt a deathblow to Moslem commercial spirit, just as the Ottoman conquest of the Crimea and other coasts of the Black Sea dealt a deathblow to the old Christian trade by this route with Central Asia, China, etc.

GEOGRAPHICAL NOTES

The Production of Sugar in the Hawaiian Islands.—A statement recently received from a high authority in Hawaii by the Bureau of Statistics indicates that about one hundred million dollars of capital from the United States have been invested in Hawaii since the reciprocity treaty of 1876, a large part of this having been so invested since annexation, in 1898. This development, since annexation, in the increased investments in capital from the United States, and its application to irrigation in its highest forms, has resulted in an increase of more than 50 per cent in the sugar production of the islands, the production of 1897 being 562,000,000 pounds; that of 1903, 840,000,000 pounds.

The Hawaiian Islands now stand third in the list of sections producing cane sugar for exportation. Curiously, all of the great cane-sugar exporting spots of the world are islands. Cuba stands at the head of the list, with an annual exportation, under normal conditions, of over two billion pounds; Java next, with an average annual production of one and one-half billion pounds, while the Hawaiian Islands have now nearly reached the one billion mark. China and India are also large producers of cane sugar, but consume practically all of their production, their exportation being small.

Sugar production in the Hawaiian Islands has developed much more rapidly during the last thirty years than in any other cane-producing section of the world. The production in Java grew from 432,320,000 pounds, in 1875, to 1,887,899,000 pounds, in 1903, or less than five times as much in 1903 as in 1875. Cuba has increased its production from 1,736,000,000 pounds, in 1873, to 2,183,000,000, in 1903, while that of Hawaii, as already indicated, has grown from 23,000,000 pounds, in 1873, to 840,000,000, in 1903. Thus, Java's production is now less than five times that of 1873; that of Cuba has increased less than 50 per cent, while that of Hawaii is about thirty-five times as great as in 1873. Meantime, the cane-sugar production of the world has grown from 1,793,000 tons, in 1873, to 4,118,000 tons, in 1903, having about trebled during that period. The beet-sugar production of the world has grown from 1,210,000 tons, in 1873, to 5,520,000 tons, in 1903, being about four and one-half times as much in 1903 as in 1873.

Hawaii's share in supplying the sugar consumption of the United

States has increased very rapidly since the reciprocity treaty of 1876. Prior to that date, sugar imported from Hawaii formed about 1½ per cent of the total importation, while in the fiscal year 1903 Hawaii supplied about 15 per cent of the total brought into continental United States.—*Bureau of Statistics, Department of Commerce and Labor.*

The World's Maritime Statistics.—"Lloyd's Register" for 1903-4 puts the world's mercantile marine, on July 10, 1903, at 29,943 steamships, of 27,183,365 tons, and 12,182 sailing vessels, of 6,459,766 tons.

The principal nations are represented in the following table:

Country	*Tonnage*	*Country*	*Tonnage*
England	16,006,374	Holland	658,845
United States	3,611,956	Denmark	581,247
Germany	3,283,247	Austria-Hungary	578,697
Norway	1,653,740	Greece	378,199
France	1,622,016	Belgium	157,047
Italy	1,180,335	Brazil	155,086
Russia	809,648	Turkey	154,494
Spain	764,447	Chile	103,758
Japan	726,818	Portugal	101,304
Sweden	721,116	Argentine Republic	95,780

Area, Population, and Density of Population of the South American Republics.—

Country	*Area (Kilometers)*	*Population*	*Density of Population per Kilometer*
Argentine Republic	2,894,257	4,094,911	1.41
Bolivia	1,822,350	3,920,207	.99
Brazil	8,361,350	14,668,268	1.75
Colombia	1,203,103	3,001,151	3.26
Chile	658,542	1,816,271	4.56
Ecuador	299,600	1,204,200	4.02
Paraguay	253,100	502,000	1.91
Peru	1,137,000	2,629,663	2.31
Uruguay	178,700	827,485	4.63
Venezuela	1,043,900	2,444,316	2.35
Total	17,851,902	35,108,472	2.72

Manufacture of Ice in Palestine.—There is a small ice plant in Jerusalem, which has been in operation for three years. An oil engine of three horse-power furnishes the power; the freezer is of French manufacture. The sale of ice amounts to about 700 pounds a day, and the capacity of the works is about 1,400 pounds daily. The selling price is 5 cents a kilogram (2.2 pounds). Never before in this country have the inhabitants used ice, or seen it, in fact. The demand at present is limited, but is steadily increasing.

At Jaffa, the seaport of Jerusalem, the ice business was established about 1890 on a small scale and for several years the business was not successful; but, in 1899, as the demand for ice was on the increase, the works were enlarged, and since then have been operated quite successfully. The engine used is of German manufacture; oil is used for fuel. The present daily demand is for about 1,500 pounds, and the capacity of the works is about 4,500 pounds. The price is the same as charged in Jerusalem—5 cents per kilogram. When the works were first established the price was 10 cents per kilogram. The water in Jaffa comes from wells, and, owing to their proximity to the sea, is brackish. The ice is never clear, and when melted leaves considerable sediment. The water used in Jerusalem is rain water, from cisterns, and the ice is like crystal. No natural ice is brought to this country. The demand for ice was first made by the hospitals; the hotels soon after began its use, and now nearly all the foreign residents and many of the wealthy native families are consumers.

Raising Crops in the Far North.—Mr. N. L. Skalosubof, addressing the recent agricultural convention at St. Petersburg, said that many facts may be given to disprove the popular idea that grain will not ripen north of 60° N. Lat. A clergyman at Yugansk, Siberia, 61° N. Lat and 73° 40′ E. Long., is building a mill propelled by wind-power to turn his winter rye and spring wheat into flour. At Masau, on the Pelym River, in 61° N. Lat., a farmer has extended his area under tillage, so that he now raises all the grain required by his large family, and has a surplus to sell. The efforts to raise rye at Berezov in 63° 54′ have been very successful. Still farther north, in 64° 13′, barley, rye, and oats have been grown for a series of years, and yield fifteenfold. Vegetables are raised at the most northern line of Russian settlements—for example, at Obdorsk in 66° 31′, where the successful experiment was first made in 1894.—*Bulletin American Geographical Society*, October, 1903.

Standard Time in South Africa.—The Governments of Cape of Good Hope, Natal, Transvaal, Orange River Colony, Rhodesia, and Portuguese East Africa, having decided to adopt a standard time for railroads, telegraphs, and other public purposes, have agreed that the time shall be that of the meridian 30° E. Long.—that is to say, two hours in advance of Greenwich time. The arrangement took effect from March 1, last.—*Bulletin American Geographical Society*, October, 1903.

Manufacture of Perfumes in Grasse.—The city of Grasse, the most important industrial place of the Riviera, is widely known on account of its perfume manufacture. At present thirty-five concerns making essences of flowers are in operation there. The average consumption of roses for that purpose is about 2,650,000 pounds, and that of orange flowers about 660,000 pounds per year. The annual sale of these essences amounts to $1,000,000. Vallauris has nine such factories.

The most important product of this industry is oil of neroli, made from the flowers of the bitter orange. A kilogram (2.2 pounds) of this oil is worth $60. From the peel of the bitter orange oil of orange is made. The peel of the sweet orange is seldom used for making oil.

The manufacture of essence of roses is also very extensive. The so-called oil of roses is manufactured from the grass *Andropogon schoenanthus*.

The flowers of the large flowered jasmine yield the oil of jasmine. A hectare (2.471 acres) planted with jasmine is said to yield a yearly product worth $3,000, but requires a great deal of work. Filled violets formerly brought from $1 to $2 per kilogram (2.2 pounds); at present, however, they bring only 50 cents. A kilogram of essence of violets is worth from $4.50 to $5.

Oil of geranium is produced from the flowers of *Pelargonium capitatum*. The flowers of the tuberose, of the jonquil, and of a species of narcissus are manufactured into essences; also the leaves of the citronella plant, the root of the *Iris florentina* (violet root) the patchouli flowers, sandalwood, etc.

Fortunately for many places in the Riviera, the consumption of these essences has not decreased in late years.

Although many of these perfumes are bad for the nervous system, others are recognized as antiseptics.

Destruction of Cork Forests in Italy.—While Spain still furnishes 32,800 tons of cork annually, the production of Italy has decreased to 4,000 tons. The value of the Spanish exports of cork amounts to $6,000,000 per year, against less than $250,000 for Italy. Only Sicily and Sardinia are still producing cork to any considerable extent in Italy, while the former great oak forests of Calabria are almost totally destroyed. It seems incomprehensible that this destruction has been permitted. The trees easily reach an age of two hundred years. They yield cork in their thirtieth year and continue to do so every seven years. Seventy-five years ago the English demand for cork was supplied exclusively from Italy. The destruction of the remaining forests goes on uninterruptedly, and nobody seems to try to prevent it or to plant new forests, in spite of the fact that Italy possesses the most favorable climate and soil for the cork oak, the most favorable conditions for its growth being found in the volcanic soil of the peninsula.—*Monthly Consular Reports, December,* 1903.

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(6) Having noticed a tendency in the schools to combine language lessons with the teaching of geography, I would appreciate a statement from THE JOURNAL OF GEOGRAPHY as to where, in its opinion, lies the value of this correlation of one pedagogical subject with another.

M. FAULDS, Aylmer (West), Ontario, Canada.

The function of language is to express thought. Language fulfills its function when it enables the individual to convey to others his states of consciousness. That form which expresses thought most clearly and most concisely is the best form.

Any one who has watched the development of children before they enter school, knows how rapidly they acquire the ability to use language. Early childhood is a period of intense activity. It is a stage of inquiry, of desire to know. The world is rapidly unfolding before the eyes of the child, and he cannot remain passive in the presence of such wonders. Expression becomes a necessity, and hence the power to use language develops rapidly.

To the teacher this fact should be very significant. It is at once associated with the immediate needs and desires of the child, and with his present environment. Why not follow this method in the school? Create a desire to possess, and you have implanted in the mind that which is fundamental in leading to possession. It is evident that this desire will grow out of that in which the child is most deeply interested — his environment — for in this his experiences are bound up.

In the study of geography we are constantly dealing with objects of interest, beauty, use. We are studying processes which influence the daily life of every living thing. Types of the objects are ever before the pupils. The processes by which the world has been and is being shaped are at work upon every hillside and highway, along every stream course, and in the very atmosphere about us.

Geography thus opens an unlimited field for training in the use of language, both oral and written. Let the pupil be taught to express his growing personal experiences in the best form. Mistakes must be discovered, with or without the aid of the teacher, and must be corrected by the pupil. Demand the child's best in all work.

How shall we test the value of the present method of teaching language? I believe that I am quite correct in saying that it is customary to judge the pupil's progress by his record in the language class. It is in connection with geography, history, arithmetic, and other subjects that the test should be made.

Manual training involves the use of the saw, hammer, plane, and other tools. What teacher of manual training would attempt to teach the use of these tools by having his pupils saw, hammer, and plane worthless scraps of lumber month after month and year after year? Children learn how to use these tools by making something. In other words, the tools are used just as they are used in the actual affairs of life — as a means of expression. Does manual training suffer by being taught in a rational manner? Should language be taught by a methc l any less rational?

Language should be taught in connection with geography and all other subjects for the following reasons: (1) Its function is to express our thoughts in terms of these subjects. (2) This method is along the line of the pupil's interest. (3) It makes possible the greatest progress. (4) It furnishes a rational test of the pupil's ability. (5) It makes language a means rather than an end.

J. F. CHAMBERLAIN,
State Normal School, Los Angeles, California,

EDITORIAL

GEOGRAPHY TEACHING IN NORMAL AND TRAINING SCHOOLS

DURING the agitation for better geography teaching in elementary and secondary schools which has been going on now for more than a decade, but little attention has been given to the problem of geography teaching in normal and training schools. Inasmuch as these schools are the source of special training of a large proportion of the teachers employed in elementary schools, especially in cities, this neglect of attention has been most unfortunate. Teachers have been spurred on by new and revolutionary texts, by new and perhaps over detailed courses of study, by constant discussion in the pedagogical journals, and have been urged to make striking changes in their methods of teaching and in the choice of materials to be presented in classroom work, while little attention in a connected way has been given to the improvement of geography training in the professional schools for teachers.

In several of the normal schools, particularly in the western states, the task of training pupil teachers in geography has been entrusted to teachers who have had opportunities of specializing in geography during their academic training. Even these trained leaders have not, however, compared notes and discussed plans of work, as have the teachers in secondary schools. As a result, the normal school teaching of geography in the country at large is at present uneven in method, in point of view, and in results.

Students who have gone through a two years' normal or training course, following a high-school course, ought to have gained that knowledge of geography, and of methods of teaching, which will give them confidence in their work and a feeling of reserve strength beyond the needs of everyday school life. A teacher who must give to her pupils all she knows herself is to be pitied, for she is always liable to be upset by the sagacious question of some active-minded pupil who sees beyond the text and lesson of the day.

A teacher who has had the benefit of a professional training ought to know what is essential and what nonessential in geography for school work; she ought to understand the cross-relations between the several divisions of geography ordinarily separated in a school text; she should be familiar with the best sources of reference and know how to seek new and additional information in atlases, cyclopedias and compendia; and above all she should be able to sift the small amount of accurate and valuable material from the vast abundance of geographical chaff poured forth from the press, and especially from the daily press.

There is no field of school work in which a knowledge of geography is of more immediate value than in the current events class. Any teacher who has not gained from her professional course in geography a knowledge of facts and principles that will be of everyday service and consolation, has been negligent in her work or has been trained in a bad way.

It is for the purpose of showing how these ideals can be obtained that The Journal begins this month the publication of a new series of articles[1] dealing with the geography courses in several of the progressive normal schools of the country. The editors will welcome further contributions to the subject, either in the way of questions or discussions, and it is hoped that the series may be of help and inspiration to all teachers of geography in normal and training schools.

[1] See also, The Journal of Geography, Vol. II., pp. 393, 469, 507.

REVIEWS

The Geography of Commerce. By Spencer Trotter. Size 5 by 7½ inches. Pp. xxiv and 410. New York: The Macmillan Company, 1903.

A crop of books is now appearing on the subject of commercial geography. The *Elementary Commercial Geography* of C. C. Adams was reviewed in these pages recently. The book of Dr. Trotter is similar in scope and purpose.

This is the first volume of Macmillan's Commercial Series. The editor's introduction indicates that the series is to contain two books on geography in relation to industry; namely, one devoted to the physical laws and facts influencing industry, and one developing the "standpoint of men and organizations of men." The author appears to dissent, for on the first page of Chapter I we find the statement that "Geography is used in the following pages in its broad meaning, and includes an account of man and nature, and the interactions which are an outcome of their relationship to each other." We venture to protest that commercial geography is so new a study in American schools, and its aims and methods, its disciplinary value, and its place in the curriculum are all so uncertain, that to split the various viewpoints of the subject apart into separate books will be to introduce the greatest confusion. Furthermore, it must be urged that to divide the subject along the lines proposed will be to prevent the effective juxtaposition of facts within a volume, in the effort to reveal the essential conditions of industry as they arise, partly from the physical environment, partly from the culture, laws, customs and institutions of human society, and become intimately associated in the process of wealth production.

While there is much that is excellent in the book before us, and while the suggested questions and topics and the bibliographies following each chapter give evidence of much careful work, it must be admitted that the text proper is disappointing, both because of an unsatisfactory general plan for the arrangement and balancing of the various topics treated, and because the substance of the individual paragraphs is composed of the more obvious and superficial facts of industry, and these are not sufficiently digested in relation to any body of general principles which the student may seize upon and retain after the specific facts have been forgotten or have become out-of-date.

The photographs with which the book is embellished are excellent; the charts also are correct in principle though by no means striking. The maps are quite ordinary in character; some of them, like the thumb-nail maps on pages 90, 92, 99, and 102, are too small to show much of importance; others are overloaded with data, as illustrated by the map of South America on page 208; while some are decidedly inaccurate, like the map on page 53 comparing the area of European countries with that of the United States.

E. D. J.

Elementary Geography. A Text-book for Children. By Charles F. King. Size 10¼ x 8¼. Pp. vi, 220. 26 maps and numerous illustrations. Boston: Lothrop Publishing Company, 1903.

The author of King's Elementary Geography aims to cover the first two years of geography work. The first section deals with observational home geography—by means of trips to the park, the fields, the hills, and the seashore; elementary concepts of surface, land, and water forms, work of air and water, the weather and the seasons are brought out. Then type forms are taken up. The child's early interests in the particular rather than the general are appealed to by the study of a mountain (Mt. Washington), a river (the Hudson), a prairie, a coast, a cold, a hot, and a temperate country. The earth as a whole is dealt with, and then the continents by means of journeys. The author has used the journey method to add interest and sequence to the work, but he has not fallen into the common error of allowing this method to breed superficiality. Vital and fundamental facts have been emphasized.

Less ground has been covered than in many geographies because it has seemed more important to appeal to the child's interest in the real, the concrete, than to attempt to cover more ground in a general manner. Cities and industries are clearly and concisely described with sufficient detail to keep interest in the reality. Some of us will question the advisability of using the personal element and story form to such an extent, and even the extensive use of the journey method in a text-book, but the book will be interesting to every teacher of geography. The general appearance of the book is noteworthy. The numerous illustrations are clear, attractive, and illuminate the text. The maps are simple and clear. L. W. H.

RECENT PUBLICATIONS

Manual of Geography and Language. By C. E. Mann, Chicago. Pp. 151. Chicago: M. A. Donohue & Company, 1903.

This latest manual of geography contains an outline of a course of geography that has been tested by use, and practical suggestions as to ways of approaching the different subjects accepted as pertinent to the course. The outlines are largely devoted to economic and industrial topics. The book contains some very helpful and suggestive questions for review purposes, but is not particularly new or individual.

Pioneer Spaniards in North America. By William Henry Johnson. Pp. xvi and 381. Boston: Little, Brown & Company, 1903.

An interesting account of explorers like Vespucius, Balboa, Ponce de Leon, Cortés, De Vaca, Coronado, and De Soto, illustrated by many reproductions of old plates and a few of old maps. A good book of reference for teachers dealing with the period of exploration in America.

Handbook of Commercial Geography. By George G. Chisholm. Fourth corrected edition. Pp. xlvi and 639. London and New York: Longmans, Green and Company, 1903.

A revised and much-enlarged edition of a well-known and standard book. A book of reference which may be used as a text in the higher grades of teaching. To be reviewed later.

Precis de Geographie Économique. By Dubois and Kergomard. Second edition. Pp. viii and 837. Paris: Masson et Cie., 1903.

An up-to-date commercial geography arranged by countries. Lacks illustrations and has a meager index. In the treatment of each country the causal idea is well emphasized, and comparisons with similar conditions in other countries are clearly brought out.

Descriptive Chemistry. By Lyman C. Newell. Pp. vi, 590. Boston: D. C. Heath, 1903.

A descriptive chemistry, primarily for teachers and students of chemistry. A valuable book of reference for teachers of geography who wish to know more about the chemical side work of the atmosphere, and water, or about other topics of similar nature.

The Land of Little Rain. By Mary Austin. Pp. xi, 281. Boston: Houghton, Mifflin & Co., 1903.

A book on the desert written by an enthusiastic desert lover who speaks from intimate knowledge. Most highly commended to all who want an adequate presentation of the truth about deserts. To be reviewed later.

The Yellowstone National Park. By Hiram M. Chittenden. Fourth edition. Pp. x, 355. Cincinnati: Robert Clarke Co., 1903.

A revised and enlarged edition of a well-known guide-book to the Yellowstone. To be reviewed later.

The Cause of the Glacial Period. By H. L. True. Pp. xii, 162. Cincinnati: Robert Clarke Co., 1903.

A review of the several theories which have been suggested to account for the glacial period, and followed by a presentation of the author's views. To be reviewed ater.

The Philippine Islands, 1493–1898. Edited and annotated by Emma H. Blair and James H. Robertson. Cleveland: Arthur H. Clark Co., 1903.

Vol. II—1521–1569. Pp. 335.
Vol. III—1569–1576. Pp. 317.
Vol. IV—1576–1582. Pp. 320.
Vol. V—1582–1583. Pp. 321.
Vol. VI—1583–1588. Pp. 325.
Vol. VII—1588–1591. Pp. 320.

The beginning volumes in an inclusive series to cover the history and geography of the Philippine Islands from 1493 to 1898, when Spanish rule ceased. The volumes are translations from original documents, are well arranged and edited, and appear in a pleasing typography and form. Of special value to students of historical geography and should be found in the leading libraries.

The Philippines, a Geographical Reader. By Samuel MacClintock. Pp. 105, with four maps. New York: American Book Company, 1903.

A simple book, dealing briefly with certain of the best-known areas of the Philippines. Well illustrated and timely, but not especially interesting.

New Physical Geography. By Ralph S. Tarr. Pp. xiii, 457. New York: The Macmillan Co., 1904.

A new book in fact as well as in name, by an author whose previous texts for secondary schools have been eminently successful. Especially striking for its many maps and diagrams. Many of the illustrations and some of the diagrams are too indistinct to be helpful. It is eminently practical and will immediately be ranked as one of the less than half-dozen books on physical geography which can be used to advantage in secondary and normal schools. To be reviewed later.

NEWS NOTES

Geography at the Normal School, Trenton, N. J.—Part II of the Second Year Book of the National Society for the Scientific Study of Education is devoted to a consideration of the Relation of Theory to Practice in Education. In this there is given a suggestive outline of the course in geography given to students in the Normal School at Trenton, N. J. Here the plan is for the pupil teacher to go over the subject matter of geography, much in the same order that is followed in the practice school. Thus the course for the normal training students is closely parallel to the course in the practice school, though much more inclusive. A study of this plan, therefore, will give a good idea of the school course of study. The plan followed is somewhat at variance with the usual courses of study for pupil teachers in normal schools, but is suggestive and helpful.

A New Trial for the North Pole.—Commander Peary, the well-known and indefatigable Arctic explorer, has been given three years' leave of absence by the United States Navy and will start in July, 1904, on a new attempt to reach the North Pole from the American side.

Geographical Exhibit to be Held by the Geographical Association of Britain.—The Geographical Association of Britain, of which Dr. A. J. Herbertson is the Honorary Secretary, will hold an exhibition of books, maps, and geographical apparatus in London in January, 1904. This exhibit will be in association with a Conference on School Equipment for the Teaching of Geography, full accounts of which may be expected in the later numbers of the *Geographical Teacher*, of which Dr. Herbertson is editor. By mutual agreement between the editors, contributions to the *Geographical Teacher* which are of value in America are reprinted in this JOURNAL and a similar use is made of the JOURNAL OF GEOGRAPHY in the *Geographical Teacher*.

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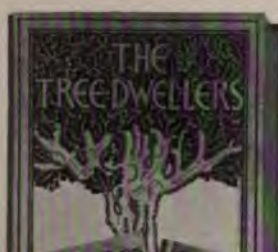

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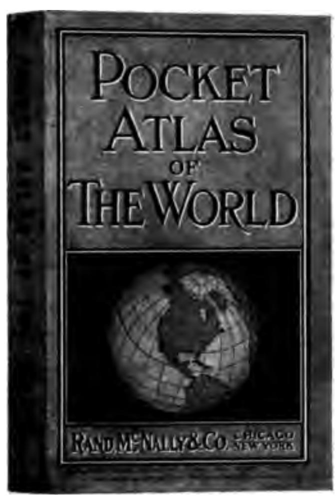

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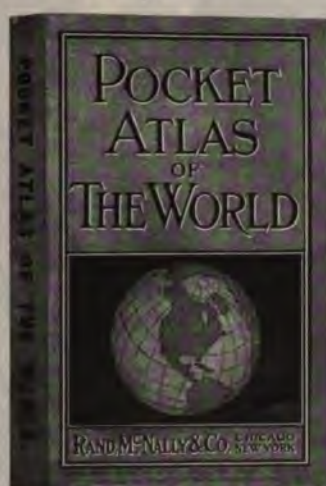

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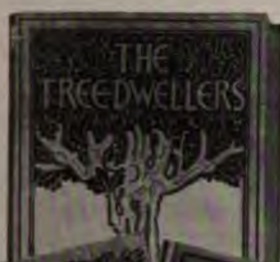

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JACQUES W. REDWAY

The JOURNAL *of* GEOGRAPHY

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THE REPUBLIC OF PANAMA*

BY COL. G. E. CHURCH

ANOTHER turn of the historic kaleidoscope, and this time the *trait d'union* between North and South America is an independent State. What are the physical characteristics, the geographical advantages, the prospective means for existence possessed by this newly fledged commonwealth?

Its southeastern boundary, if the old departmental limits be maintained, will follow the Serrania del Darien, which is the *divortium aquarum* between the basin of the river Atrato and its estuary and the valley of the Tuira, which drains into the Gulf of Panama. The line commences in the little bay of Aguacate or Octavia, in front of point Mazo or Morroquemado, and thence runs north-northeast, then north along the summits which separate the rivers that flow to the Pacific from those which run to the Atlantic. Reaching the headquarters of the Jurado, it turns west towards the heights of Aspave. It then follows, generally in a northeast direction, the divide between the Gulf of San Miguel and the river Atrato, until it reaches the ocean entrance to the Gulf of Uraba, where it diverges northwest to the headquarters of the river Tarena, the course of which, until it empties into the Gulf of Uraba, serves as the most northern section of the boundary in question.†

The frontier with Costa Rica will, according to the award of President Loubet in 1900, start from Cape Mona, on the Caribbean Sea, and enclose, on the north, the basin of the river Tarire (the lower course of which is sometimes called the Sixola), and then, by the watershed between the Atlantic and the Pacific (which is the narrow-crested

* Reprinted from the *Geographical Journal*, December, 1903.

† See Perze, *Geografia Fisica de los Estados Unidos de Colombia*.

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Cordillera of Talamanca), southeasterly to 9 degrees N. lat.; thence, it will take a southerly direction and follow the divide between Chiriqui Viejo and the tributaries of the Gulf of Dulce, and terminate at Point Burica, on the Pacific Ocean.

A great river, the Atrato, flows in a deep gorge northward into the Gulf of Uraba or Darien, and separates the "Occidental Cordillera" of Colombia from the outlying parallel coast range, washed by the waves of the Pacific Ocean, and known as the Sierra de Baudo. This is generally low, its highest peak being only 6,000 feet above the sea. Its average elevation is from 2,600 to 3,300 feet, and its lowest depressions from 1,000 to 1,600. It is a wild chaos of ridges, highlands, and spurs, terribly ravined by torrential rains, thickly forested, and rendered almost impassable by an infinite number of rivers, brooks, and tropical swamps and jungles—a pestiferous region uninviting as a home for man.

In the latitude of the Gulf of Uraba, the extension of the Sierra de Baudo pushes into the Isthmus of Panama, on the Pacific side, as far as the mouth of the river Bayamo or Chepo, where it completely disappears. *En route* it breaks down to give place to the Bay of San Miguel and its tributary river system of the Tuira. Southeast of this bay is a low *massif* called the Altos de Aspave, and northwest of it another culminating height, broadly spurred and counterforted, connected by a transverse ridge with the low range which overlooks the Gulf of Darien.

The Altos de Aspave throws off, to the northeast, the Serrania del Darien, which crosses from the Pacific Coast to the mouth of the Gulf of Uraba. Thence it skirts the Caribbean coast as far as Porto Bello, occasionally, for long distances, rising from the seashore in bold escarpments. Its principal summits are from 500 to 2,700 feet above the sea.

At the Chagres River, that *bête noire* of the Canal Company, the Serrania del Darien completely breaks down, and the summit height between the two oceans is but 300 feet above sea level. With the exception of the interoceanic water-divide in Nicaragua, which is 153 feet, it is the lowest break in the Andean and Rocky Mountain chain between the Straits of Magellan and Northern Alaska.

The orographic system of the western half of the Isthmus of Panama is bolder and better defined than that of the eastern portion. The region has a broad backbone ribbed by numerous counterforts, but occasionally broadening into complex belts of highlands and isolated *cerros*. From the Costa Rica frontier, the range takes the name of

Sierra de Chiriqui, then Veragua, and afterwards is known as the Sierra de Panama. In the first is the extinct volcano of Chiriqui, 11,000 feet* elevation above the sea, but the entire sierra has an average altitude of 6,500 feet. The Sierra de Veragua presents us with the dome of Santiago, which rises to 9,275 feet, while the Tuta reaches 5,000 and the Santa Maria 4,600. The Sierra de Panama seems to be thrown broadcast into disorderly fragments without law or regularity, and its summits nowhere exceed an elevation of 1,600 feet.

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MAP I. THE REPUBLIC OF PANAMA.
Showing the new boundary lines, the route of the Panama railroad, and the proposed route of the Panama canal.

West of Montijo Bay, on the Pacific side, a broad and massive mountain outwork forms the peninsula of Las Palmas, and between that and the Bay of Panama lies the great peninsula of Azuero, which shows a capricious, distinctive orographic system of highlands and sierras. Its bold headlands, which overlook the ocean, rise to an altitude of 3,000 feet.

About 150 short rivers flow to the sea from the northern side of the isthmus, and over double that number drain its Pacific slope. The largest and most important is the Tuira, which rises in the Pirri Mountains just north of the Bay of San Miguel, and empties into this. The Tuira is navigable for river schooners as far up as the first Spanish settlement, Santa Maria del Real; but, owing to the bars, they can not ascend to Pinogava, which is the highest point reached by the tides.

*F. J. Vergara y Velasca, *Nueva Geografia de Colombia.*

During the dry season, the river-bed above tidewater is a succession of rapids, beyond which the river dwindles into a small stream. The marks on the trees indicate a rise of sixteen feet during the wet season, when the volume of water carried by the Tuira and its eleven main tributaries is immense. Its principal affluent is the Chucunaque from the north. It is nearly as large as the Tuira itself.

The Bayamo, or Chepo, rises in the same knot as the Chucunaque, but flows northwest and then west and south until it discharges into the Gulf of Panama. It is about 150 miles long, and it is claimed that 130 miles of its course can be navigated by rafts and small craft. It has a wide estuary, the entrance to which has a bar with but two feet of water at low tide. The remaining streams on the Pacific side are short and torrential, and of little value, even for canoe navigation, except in the immediate vicinity of their mouths.

On the Caribbean slope of Panama there are but two of its many rivers which merit attention, as offering some advantages as commercial outlets for the districts they drain. These streams are the Chagres and the Teliri, known now as the Tarire in the decision of the boundary-line dispute between Colombia and Costa Rica. The Chagres, a historic waterway ever since the discovery of the Isthmus of Panama by Colombo, flows into the Caribbean Sea a little to the west of Porto Bello. It has a bar on which there are 11 feet of water, just outside the Laja reef, through which there is a passage 70 feet wide with 14 feet of water. The Chagres is navigable for boats to within fourteen miles of the Pacific, and is tame or fierce according to the season. In the dry season it is a deep ditch with a few feet of muddy water at the bottom, but when the saturated clouds burst over its drainage area of 1,000 square miles, and pour into it, at times, a uniform depth of seven inches of water in a day, the river rises over forty feet in twelve hours, and carries with it, in its torrential race to the sea, a vast mass of tropical, arboreal rubbish, clay, mud, and detritus which it receives from its swollen tributaries. It will be extremely interesting for the engineering and financial world to watch the coming contest between the Chagres River and the United States Treasury. In comparison to the Chagres, the San Juan River of Nicaragua is a plaything.

The Tarire, the mouth of which is in lat. 9° 34′ 14″ N., runs along the southern base of the great eastern counterfort of the Talamanca-Chiriqui range, through a spacious, undulating wooded valley of 100 to 150 square miles area, having low grounds which are sometimes dry and at others swampy. Its Urén branch rises on the northeast slope of the Pico Blanco, the view from the summit of which is said to be "incomparably more extensive" than that from the crest of the Costa Rica volcano of Irazu. The Tarire is navigable for light-draft steamers for fifteen miles up, but, from the Urén to Gule, there are twenty-six rapids and numerous snags. Boats carrying half a ton of goods ascend to Sapurio, one and one-half miles up the Urén. Between the Tarire and the small river Tilorio farther south is the crooked, narrow, and deep estuary called the Laguna de Sansán, an ancient affluent of the Tilorio, full of sharks, alligators, and fish. It receives a little stream called the Dalni, which drains an impassable swamp. Southeast of and near the Tilorio is the Boca del Drago, one of the entrances to Almirante Bay.*

Panama has many bays and ports on both oceans, but the greater part of them seem to be the undisturbed home of silence and primeval solitude. There is no accessible country behind them which offers an easy field for development. He is a bold pioneer who dares to throw down the gauntlet to nature in Panama. There she displays her forces with magnificent abandon; the very ocean-margin is a wall of vegetation; nearly every swamp, hill, slope, mountain-side, and gorge is densely packed with growth of trees, shrub, vine, parasite, and grasses, forming a tangled jungle, sweating with the effort to maintain existence under the vertical rays of a tropical sun. The view is beautiful from the deck of a vessel, and no wonder that Luiz Colombo selected a part of "Castilla del Oro" as his fairyland, where his imagination might revel to the full, but which, unhappily, could yield him no other satisfaction. Four centuries have passed since he received his grant of ducal Veragua, and although it is within easy touch by sea with North America, it remains as the great Colombo discovered it, and as it was when for centuries it was the buffer region between Aztec and Ingarial civilization, so called. With the exception of bananas, no crop could be planted which would pay for clearing the lands of such a region, and keeping them cleared; and even bananas would not flourish sufficiently well if cultivated at an altitude exceeding 1,500 feet above the sea. However numerous the ports and bays of Panama on the Atlantic side, it is probable that many more centuries must pass before they become of any marked importance as commercial centers.

Starting from the Costa Rica boundary, the first great well-protected sheet of water is Almirante Bay, which in reality is the northwestern prolongation of the Laguna of Chiriqui. Together they form a vast

* See G. E. Church, *Costa Rica Geographical Journal*, 1897.

sheet of water. The former is thirteen miles long from east to west, and varies in breadth from two to thirteen miles. Its many harbors offer secure anchorage to ocean-going ships of the largest class, which may often moor alongside the shore. A low ridge of hills borders its southern side, in some places rising boldly to several hundred feet elevation, and two miles inland, reaching an altitude of 1,700 to 2,000 feet. The bay contains many large and small islands. Its main entrances from the sea are the Boca del Drago and the Boca del Toro, the former very tortuous, but having a depth of nine fathoms of water; the latter offers five fathoms, but the channel is only a quarter of a mile wide, and bordered by coral reefs. The latter entrance gives its name to a small Colombian settlement supported principally by banana cultivation, the product being shipped to the United States.

The Laguna de Chiriqui is thirty-two miles long and twelve wide, narrowing to five miles at its southeastern extremity, and ten at its northwestern. Vessels of any craft may enter it from the ocean by the Boca del Tigre by an 8-fathom channel, and find ample security in fifteen to twenty fathoms of water. The eastern and southern shores are low and swampy for a long distance inland, but at one point a spur of the Veragua range penetrates to within two miles of the southeastern side of the laguna, where it has an elevation of 2,672 feet. The dense forest growth, which occupies the mountain-and-hill slope which surrounds nearly the whole of the Chiriqui laguna, extends upwards nearly to the water-divide between the northern and southern oceans, and, secure in its solitude, nature revels there in all the fantastic display of an exuberant vegetation. But, crossing the *serrania*, there is a marked change; the forests give way to grass lands along the mountain flanks towards the Pacific Coast, and cultivated fields, pastures, and habitations of man indicate that here nature is in a less riotous mood. The distance from the Atlantic to the Pacific, across the district described, is fifty miles. The mountain slopes, owing to the ceaseless erosion of the rain-laden trade winds, are sharper on the Caribbean side than on the Pacific incline, which is also much drier than the former. This is true of the whole isthmus—at least, that part west of the Gulf of San Miguel.

From the Laguna de Chiriqui eastward to the river Chagres, the forbidding coast-line (of coral reef, sandy beach, mangrove swamp, and a few precipitous bluffs) has no sheltered anchorage. A heavy surf breaks continually along nearly the entire shore. To the westward of the Chagres River twenty-five miles, and to the eastward of it as far as Porto Bello, the shore is low and flat, and deadly exhalations from the swamps veil the interior of the country from view.

The so-called Bay of Colon, named in honor of Colombo, who discovered it in 1502, lies just to the east of the mouth of the Chagres River. It is poorly sheltered, and, being open to the north, is exposed to "northers," which frequently blow with such violence that the shipping is forced to run out to sea or seek shelter at Porto Bello. This place, historic in the colonial period of South America, and then the seat of the galeon trade between Spain and the West Coast, is a pestilential port without ventilation, owing to the high hills which enclose it on the north and south and prevent the winds from sweeping away the malignant miasma which continually arises from the swamps on the east. A coral reef skirts the southern shore, and the city and the ruins of the castle of San Jerónimo are situated on the beach in the southeast corner. The width of the entrance to the port is one and one-fourth miles, but it soon narrows to half a mile. The depth of the water gradually increases to seven fathoms. Porto Bello, as a harbor, is the best between Almirante Bay and that of San Blas. In fact, there is no other worth mentioning.

Of San Blas, Commander Selfridge, who surveyed it, says: "It extends in a northeast and southwest direction some twenty miles, and is about ten miles in extreme breadth. It is formed by the cape of San Blas and the outlying islands of the Mulatas archipelago, and is a most magnificent bay, with deep passages, and perfectly protected from the north winds in the dry season. In the northwest corner is an inner harbor formed by a circle of islands, with a passage leading into it. This harbor is magnificent for all purposes required as the great terminus of an interoceanic canal." Gen. E. W. Serrell says of the Bay of Mandinga, which is at the southwest side of the Gulf of San Blas: "The water is eighty feet deep within 100 feet of the shore, and nowhere less than sixty feet deep all the way into the Atlantic Ocean." The width of the isthmus at San Blas, from ocean to ocean, is thirty-seven miles. This is the shortest interoceanic distance on the Western Continent.

From San Blas Bay, for a distance of about eighty miles, is the remarkable belt of cays, islands, and reefs known as the Mulatas archipelago. The cays are sandy and mostly in clusters, but little out of water, and thickly wooded. Between them are found many navigable channels. East of the Mulatas, and as far as Port Escocés, many cays also make the coast navigation dangerous and extremely difficult; but farther towards the Gulf of Uraba, these obstructions cease to exist.

Between Point Sasardi and Point Escocés is a broad line of cays, sheltering what is known as Caledonia Bay, in which are two harbors, the western called Sasardi, and the eastern one known as Caledonia. The former is about three-quarters of a mile in extent, with four to six fathoms of water; and the latter, the entrance to which is obstructed by dangerous shoals, has from eight to nine fathoms at the anchorage. The bold Atlantic frontage of the Serrania del Darien, from the Gulf of Uraba to Porto Bello, is thickly forested, and receives the full force of the northeast trade winds, with a resultant heavy rainfall.

Turning to the Pacific Coast, we find the Gulf of San Miguel, or "Darien of the south," on the eastern side of the great shallow Bay of Panama. At its head is the Bay of San Miguel, which was a great resort for the buccaneers, who reached it from Caledonia Bay in ten days by one of the routes which served for communication between the oceans by the Indian tribes before the discovery of America. The bay is over six miles wide at its mouth. It has plenty of water on its eastern side, but is shallow on its western one. As at Panama, it has a tidal range of twenty feet or more, while Caledonia Bay, on the Caribbean side, like Colon, is almost tideless. Darien harbor, at the head of the gulf or estuary of San Miguel, extends in a southeast direction up to the village of Chupigana, where it receives the Tuira and Savana rivers. Its deep water affords anchorage to the largest ships. Mangrove swamps, backed by thickly wooded hills, are almost continuous along its shores.

The island-filled Bay of Panama, at the head of which is the famous city of the same name, is well known. It commences at Cape Garachina, at the southern entrance of San Miguel, makes a majestic sweep concave to the south, and terminates at Cape Malo, which is the southeast cape of the great peninsula of Azuero. The great distance between the two capes is about 100 miles. The northern part of the bay is shallow, and large ships have their anchorage near the famous island of Taboga, nine miles south of the city of Panama. On this island Pizarro, Almagro, and Luque made their famous contract to discover and conquer the empire of the Incas. The latter was cheated out of his share of the plunder, and Almagro was garroted in prison at Cuzco by the brother of Pizarro. Sailing craft find it extremely difficult to get in or out of the Bay of Panama, but especially out. It is one of the most tedious and difficult bits of navigation in the world. Pizarro was the first to try it, in November, 1525, but, after seventy days, was forced to abandon the effort to leave the bay; and it is still the similar experience of nearly every craft unaided by steam. It is a region of calms, doldrums, vexatious currents, squalls, rains, and tormenting heat.

MAP II. THE PANAMA CANAL STRIP.

The city of Panama is situated on high ground at the foot of Ancon hill, but west of old Panama, which was destroyed by the buccaneers under Morgan in 1673. To the mouth of the river Bayamo, about twenty-five miles, and for another equal distance to the southeast, the coast is flooded, and at low water mud flats are exposed for a distance of three miles from the shore; but farther on, as far as the Gulf of San Miguel, the margin is higher, with occasional small hills. From Panama southwest to the Bay of Parita, on the western side of the Bay of Panama, the coast-line is considerably broken, and alternates between high and hilly ground and low flooded areas, the whole shore-line being generally of mud. The entire shore of the Bay of Parita is flooded land, and has a forbidding mud flat extending from two to three miles out. From this bay to Cape Malo, about forty miles, the coast is well out of water and backed by the highlands of the peninsula of Azuero.

The southern front of this peninsula varies much in character; west of Cape Malo for about twenty-five miles the lowlands soon give place to the escarpments of the *cerros*, which rise to a considerable altitude farther inland, and the remainder of the frontage overlooks the ocean, the mountains, furrowed with gorges, pushing boldly down to the coast. The west side of the peninsula, which partly shelters the Gulf of Montijo, is high ground at times, and at others low with occasional beaches. It has many little bays, with a southwestern exposure, which receive the torrents that descend from the mountains.

The Gulf of Montijo, penetrating north about twenty miles, has an opening of some fourteen miles. The short river San Pedro flows in at its head, and is navigable for small craft about seventeen miles up to the port of Montijo, where there is a little traffic. The gulf has several large and small islands, the principal one, Sabaco, lying off its mouth and completely sheltering it from the south winds.

West and northwest from the Gulf of Montijo, as far as the Bay of David, the coast for the first twenty miles is sharply defined; thence, as far as Espartal Island, many hill spurs push down to the sea; the shore then becomes low and cut by numerous small streams. The whole coast, from Montijo's Gulf to David Bay, has many little bays, most of which are available for vessels of very light draft. The bay last named is filled with cays, reefs, and hilly islands. At its head it receives the river David, which, with its tributaries, drains a vast amphitheater of mountains which abut upon a broad plain surrounding the little port of David near the river delta. The river has its sources in the *serrania* of Chiriqui, and several of its branches drain the southeastern slopes of the great volcanoes of Chiriqui and Horqueta, the latter 6,600 feet elevation. West of the delta of the David, the coast-line bends in a great curve to the south until it reaches Point Burica at the termination of a peninsula formed by a rugged spur of the Chiriqui mountains.

The Pacific coast-line of the Isthmus of Panama is about one-third greater in extent than that of the Caribbean side. There are many islands along both coasts, but those on the Pacific are more numerous and larger than those on the Atlantic.

A thick, dark, primitive forest covers at least three-fourths of the State, and the vegetation in countless forms fights strenuously and ceaselessly with man for possession of the soil. It is nature's favorite tropical hothouse.

The extreme length of Panama, from Colombia to Costa Rica, is about 480 miles, and it varies in width from 37 to 110. Its area is between 33,000 and 34,000 square miles, being more than one-half as large again as its last-named neighbor. About five-eighths of it consists of wild, unoccupied lands, and the remainder is but very rudely utilized by its inhabitants. The population was officially estimated, in 1898, at 340,000, representing such a heterogeneous amalgamation of Spanish, negro, and Indian blood, stirred together by the buccaneers of colonial times, that *white* may, in Panama, be strictly classified as a color. Until I saw a Panama "army" of 150 men at drill, I had no idea that the human form could take such shapes and colors—Proteus would have envied them. And yet these men, like all the Colombians, are first-class fighters, and, well officered, are a foe not to be despised by the best troops ever likely to come into collision with them.

DATA AS TO COST AND ENGINEERING FEATURES OF THE PANAMA CANAL AND COMPARISON WITH THE ESTIMATES FOR THE NICARAGUAN ROUTE

[*Inserted by the Editor.*]

	Panama Route	Nicaragua Route
Cost of Canal as estimated by Isthmian Canal Commission	$144,233,358	$189,864,062
Cost of French Rights	40,000,000	....
Total estimated cost	$184,233,358	$189,864,062
Annual cost of maintenance, estimated	$1,300,000 less than for Nicaragua.	
Length of route	49 miles	186.5 miles
Length of "danger zone" (above tide level)	23.5 miles	176 miles
Time required for passage	11.25 hours	33 hours
Elevation of summit level	90 feet	110 feet
Number of levels to be maintained	2	7
Number of locks required	3	8
Number of dams required	1	1
Terminal harbors	Ready for use	Unbuilt
Construction railway	Ready for use	Unbuilt
Actual work could begin	At once	After 2 years
Rivers to be controlled, as to level	1	2
Lakes to be controlled, as to level	None	1
Flow per second of rivers	75,000 cu. ft.	200,000 cu. ft.
Area of lake		3,000 sq. mi.

TRANSPORTATION

PART I

BY JOHN THOM HOLDSWORTH
Professor of Commercial Geography, Drexel Institute, Philadelphia

NO single part of the whole broad subject of economic geography is more important, more essential to an intelligent understanding of commerce, than transportation; yet strangely enough no part has been so scantily treated by the writers of geography text-books. This series of papers is intended to help in some small way to supply this lack. No attempt will be made to offer an exhaustive study of the theory or philosophy of the science of transportation; the aim will be rather to gather together and make available for teacher and student scattered facts and phenomena directly related to the processes and agencies involved in the movement of the world's great staple products.

After a brief sketch of the historical development of transportation, especial attention will be paid to the problem in our own country, first in its relation to internal or domestic commerce, then in its relation to foreign trade.

The following rough outline will suggest the general plan of treatment:

TRANSPORTATION: AN OUTLINE

Ancient trade routes.
Early canal building in Europe.
Transportation in America:
- The turnpike.
- Canal Era 1825-1837.
  - Contest between canal and railroad.
  - Present status of canals.
  - Commercial canals of United States.
  - Erie Canal.
  - Proposed canals.
  - Canada's waterways.
  - Ship canals of world.
- The Railroad Era.
  - Periods of.

Transportation in America—*Continued*
- Classification.
  - By geographical groups.
  - By financial groups.
- Leading products.
  - The freight service.
- Railway abuses.
- Interstate Commerce Law.
  - The railway problem.
  - Railroad control.
  - Railway clearing-houses.
  - Traffic associations.
- Our Natural Waterways.
- The Great Lakes.
- Isthmian Canal.
- Systems of other countries.

Transportation in America—*Continued*

Merchant Marine.
- History.
- Reasons for decline.
- Remedies.
- Shipping trust.
- Shipping routes.
- Trade of leading ports.
- Comparison with great marine nations.

Great Cable Systems.

Telegraph and Telephone.

Mail service.

Conduits—water, oil, gas.

Transportation is the agency by which the products of one zone or country are brought to another, or by which dissimilar products are exchanged between localities or regions within the same country. It is one of the chief devices by which producer and consumer are brought together. Transportation makes possible (1) the production of articles of necessity, the great staples of trade, where they can be most cheaply produced; (2) the wide distribution of products whose growth is limited by peculiar conditions to certain regions; and (3) the localization of manufactures and other industries where they can be carried on most economically. It is the agency that brings the wheat of Dakota or Hungary to the great flour mills of Minneapolis or Budapest, distributing it in turn to every quarter of the globe as flour. By its aid the giant furnaces of the Pittsburg mills are fed with iron ore from Michigan, Cuba, or Sweden. It makes possible the refining of Luzón sugar in Brooklyn or Philadelphia, and the making of pulp used in our morning paper from timber grown in Northern Ontario. In short, it makes possible that large territorial division of labor which is fundamental to modern industry and trade.

This brief survey from the economist's point of view may serve to suggest how inseparably transportation is linked with the production and distribution of world products. And yet it is quite within the truth to say that transportation is in itself one of the most powerful and complex industries of modern times.

It has been said with truth that a nation's progress, its standard of civilization even, may be judged by its transportation facilities. "'Empires and cities have grown or decayed as they were favorably or unfavorably situated along the great highways of commerce." The triteness of this statement is attested on the one hand by the black smoke-banners of a score of American factory towns that have sprung up over night through the projection of a new railroad branch, and on the other hand by the commercial desolation of one-time thriving cities side-tracked through the shifting of the great routes of trade.

Failure to develop avenues of communication and trade has in all times marked nations and peoples as static or decadent. China, hemmed in largely by nature, secured almost complete isolation for centuries by building the Great Wall and sealing her ports against which the traders of the world thundered vainly for admittance. In the throes of a new birth, the Empire, recognizing the imperative need of better transportation, is granting concession after concession to railway engineers and companies, while a score of open ports invite foreign trade. Whatever Russia's purpose in building the Trans-Siberian Railroad, whether commercial, political, or strategic, this herculean task has focused the gaze of the world upon the Muscovite.

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MAP I. THE TOSCANELLI MAP, 1474

It explains the idea, prevalent at that time, of the size of the world, and how sea merchants sailed, first, east around Africa; and afterwards west, like Columbus in discovering America, in the search for India and the Spice Islands.

The early pages of history reveal that the commerce and civilization of Asia and Europe advanced commensurately with the development of roads and canals. (See Maps I, II, and III.) According to the testimony of the Vedas, the religious books of the ancient Hindus, highways were built by the State connecting the interior with the coast and with adjoining countries. The ancient peoples of Mesopotamia, the first to use domestic animals as beasts of burden, built canals for irrigation purposes and constructed roads leading to their dependencies. The Babylonians not only built highways, canals, and great

Northern Route Controlled by Genoa - - - - - - - - - - *Middle Route* —·—·—
Southern Route Controlled by Venice —·—·—·—

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MAP II. OLD TRADE ROUTES TO INDIA.
The ships and caravans traveling over these routes sought the silks and spices from India and beyond, from the Spice Islands.

irrigation works—they even constructed breakwaters and quays along the Persian Gulf for the encouragement of commerce.

The earliest of the great maritime nations of antiquity, Phœnicia, though depending chiefly upon the sea as a highway, built roads connecting its two great cities, Tyre and Sidon, and constructed caravan routes south to Arabia and east to India and China, which countries sent their products to Tyre to be exchanged for the produce brought by

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MAP III. PORTUGUESE VOYAGE TO INDIA.
An all-water route to India was sought by the Portuguese.

Phœnician vessels from the west. So, too, Egypt and Carthage, each of which attained commercial eminence in this early time, maintained highways leading in all directions.

The great Roman Empire, which embraced every civilized nation then known, and which counted some 120,000,000 people, was covered with a network of roads many of which remain to this day the admiration and wonder of the world. It is estimated that 50,000 miles of these highways, built mainly for military purposes, connected the various parts of the Empire. Over many of them the Government maintained an efficient postal service, using fast couriers.

A survey of the history of the great nations that led in trade and civilization after the downfall of the Roman Empire shows a widening use and growth of the improved transportation facilities. Thus, Emperor Maximilian of Germany established a postal route between Brussels and Vienna, in 1516, and at a later date Frederick the Great, recognizing the need of better means of communication, began the construction of turnpikes and canals on a large scale. Since the organization of the various German States into an Empire, Germany has made vast improvements in her internal communications. She has canalized many of her rivers, and has constructed thousands of miles of artificial waterways connecting all the large rivers and affording cheap transport of raw materials to her great industrial centers. The railway system of modern Germany is highly efficient, being controlled for the most part by the State.

As early as the twelfth century, the Dutch began the construction of canals, which, owing to the flatness of The Netherlands, became the common roadways, as they are to-day. The great commercial cities of Amsterdam and Rotterdam have been made possible by deepening and canalizing the rivers on which they are situated. Similarly, Brussels and Antwerp in Belgium have secured access to the sea. That great advances were made in marine transportation in the sixteenth and seventeenth centuries is attested by the colonial empires built up by the Portuguese, Dutch, Spanish, French, and English.

In 1666 France projected her first artificial waterway, the Languedoc Canal, 148 miles long, connecting the Mediterranean with the Bay of Biscay. To-day France has a splendid system of artificial waterways connecting the headwaters of the three most important rivers, and forming a network over the entire country. Russia, that new candidate for commercial honors, has not only pushed to practical completion the great Trans-Siberian Railway, nearly 5,000 miles in length, linking the Pacific with the Atlantic, but also has under construction one of the greatest of modern canals, connecting the Black Sea with the Baltic. The United Kingdom commenced canal building in 1767, since which time waterways have been dug all over Great Britain to connect the main water courses. Enormous sums have been voted by cities like Manchester and Glasgow to improve their shipping facilities. So, too, on the Continent, Hamburg, Bremen, Rotterdam, Le Havre have made lavish expenditures for dredging, wharfing, and improving their harbors.

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Fig. 1. ANIMALS USED FOR TRANSPORTATION
Long trains or caravans of camels carrying merchandise over a desert region.

On the Western Hemisphere there still remain traces of the wonderful roads built by the Incas of ancient Peru. One of these roads, built of stone, at an elevation of over 12,000 feet, Humboldt estimated to be 2,000 miles long. In its route engineering difficulties that would puzzle the modern engineer were met and successfully overcome. The Spaniards allowed the roads to go to ruin, and they now lie as broken monuments to the skill and enterprise of these wonderful people.

The early settlers of the North American continent depended almost wholly upon the natural water courses for transportation. Heavy forests and the dangers from unfriendly Indians made interior communication difficult; hence the settlements at first clung close to the river courses or to the seaboard. As settlement gradually spread to the interior, roads of inferior sort were made, but these were for local purposes, and road building was left largely to individual exertion. Thus in colonial days it took a week to go from Boston to New York by stage. Many of the earliest wagon roads followed the trails originally made by deer and buffalo through the forest and over the mountain passes, and naturally the railroads at a later date were projected along the same general routes.

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FIG. 2. A TRADING AND WAR VESSEL USED BY THE NORTHMEN.

The history of internal transportation in this country can be divided roughly into three periods:

1. Turnpikes.*
2. Canals.
3. Railroads.

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FIG. 3. A TRADING VESSEL OF THE FIFTEENTH CENTURY.

The first American turnpike was built in Pennsylvania in 1790, and ran from Philadelphia to Lancaster, a distance of sixty-six miles. In the next thirty years that State expended $8,500,000 for such roads. From Pennsylvania the system spread into New York and New England. These roads were constructed and operated by private enterprise and were supported by tolls, which often yielded large profits. They greatly cheapened transportation, and gave reasonable satis-

* "These roads were called turnpikes because at the places where tolls were collected there was placed across tl … consisting of a pole armed with pikes, and so hung as to turn upo … son, p. 13.

faction. In 1807, Gallatin, Secretary of the Treasury, proposed that the Government should undertake the construction of roads and canals on a large and systematic scale. Local jealousies and the opposition of a powerful faction in Congress who did not believe that the Government should carry on internal improvements delayed for many years the active interest of the Government in road making. Only one important national road was actually constructed — the "Old Cumberland Road." This road was begun in 1811 at Cumberland, Md.,

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FIG. 4. THE THOMAS W. LAWSON.

A seven-masted schooner. The largest sailing vessel carrying freight in the world

and continued almost due west in practically a straight line through Maryland, Pennsylvania, Ohio, Indiana, and Illinois to St. Louis. It is said to be the longest straight road ever built by any Government in the world. It was about 700 miles long, and cost nearly $7,000,000.

Along this great "National Pike" a stream of emigration flowed toward the Ohio and Mississippi valleys. Another movement set in farther north toward the prairies of the Great Lakes States. "Pittsburg and Cincinnati, the two main points of transshipment on the southwestern route, had become flourishing business centers, while Buffalo and Cleveland were yet the merest frontier settlements."*

*Hadley, *Railroad Transportation*, p. 29.

THE CANAL ERA, 1825–1837

Toward the close of the eighteenth century, as the people of the new Federal Union became convinced of its permanence, attention was directed to the necessity, in the interests of commerce, of binding together its various scattered parts by a system of canals. General Washington had called attention to the possibilities of a canal westward from the Hudson, and the people of New York had from an early period realized the importance of connecting the Hudson with the Great Lakes.

The Alleghenies, almost unbroken from New York to Alabama, opposed a serious obstacle to the construction of a canal from east to west, but in New York State the Mohawk Valley opened a passage through the chain and suggested a level canal route. In 1810 the Erie Canal Commission was appointed with De Witt Clinton at its head, and a survey was made of the entire route from the Hudson to Lake Erie. Aid was expected from the Federal Government, but at first Madison opposed Federal aid to "internal improvements," and later the War of 1812 stopped all progress. In 1817 New York, through the restless energy of Clinton, decided to go on with the project on her own resources. The whole canal was completed and opened for traffic amid national rejoicing in 1825.

The canal was 378 miles long and 4 feet deep; it had a width of 40 feet at the surface and carried boats of 76 tons burden. The first cost of the canal was $5,700,000, but subsequent enlargements have made the total cost over $50,000,000. The utility of, and the returns from, the canal exceeded the most sanguine expectation. Cities sprang up wherever the canal met a water course, *e. g.*, at Buffalo, Rochester, Syracuse. In 1826, the year after the canal opened, the receipts from tolls were $726,000; in 1833, they had doubled. Tolls were constantly reduced until 1853, when they were only about one-third the original figure, but even then the revenues amounted to over $3,000,000 a year. "The construction of the Erie Canal reduced transportation charges to a little over one-tenth their former figures." *

The opening of the Erie Canal marked the beginning of a mania for canal building.† New York, Pennsylvania, Ohio, Indiana, and Illinois all projected extensive canals, while in many other States private companies commonly aided by the State constructed canals of greater

* Hadley, p. 31.

† Johnston, *Inland Waterways*, p. 31.

or less importance. "In 1834, Pennsylvania had 589 miles of State canals, among them the Central Division Canal 172 miles long, and the Western Division Canal 104 miles long."* In 1832, Ohio opened two important canals, the Ohio Canal from Cleveland to Portsmouth, and the Miami & Erie from Toledo to Cincinnati. The traffic on these canals† reached in 1857 a tonnage of 1,635,774 tons. Indiana completed the Wabash & Erie Canal from the junction of the Miami Canal to Evansville on the Ohio in 1855. The Illinois & Michigan Canal, 102 miles long, from Lake Michigan to LaSalle at the head of navigation on the Illinois, was opened in 1848. It was intended to make this canal deep enough to carry vessels through from the Lakes, a project recently completed by the city of Chicago for sanitary purposes at a cost of $30,000,000.

Besides these great State waterways many canals were constructed and are still operated by private companies. Chief among these were: the Raritan connecting the Delaware River with New York harbor; the Chesapeake & Ohio from Cumberland, Md., to Washington; the Morris Canal across New Jersey; the Delaware & Chesapeake connecting Chesapeake Bay and Delaware Bay; and several canals, mainly in Pennsylvania, for the transportation of coal, *e. g.*, the Delaware & Hudson, Schuylkill, Lehigh, and others.

The panic of 1837 almost completely stopped canal building, and when the country had recovered from that shock, it was felt that the chief means of transportation was to be rail not water. Some local canals, chiefly coal canals, continued a profitable local traffic, but the extension of railroads compelled the steady abandonment of the canals. Only two great systems of water communication — the Great Lakes and the Erie Canal on the north and the Mississippi to the south— have been able to continue in competition with the railroad. It is to be noted, however, that at one time we had 5,000 miles of canal in operation, built at a cost of $150,000,000, and carrying in 1857 traffic amounting to 3,344,000 tons.

* Larrabee, *The Railroad Question*, p. 41.

† Jeans, *Waterways*, p. 195.

(*To be continued in April.*)

THE GEOGRAPHY COURSE IN THE CHICAGO NORMAL SCHOOL*

PART II

BY FRANK W. DARLING AND ELIZABETH SMITH
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SECOND YEAR OF GEOGRAPHY

(Fourteen weeks, five fifty-minute periods, weekly.)

I. THE SUBJECT-MATTER OF GEOGRAPHY

A. Content of Geography: A study of the relations existing between earth and man.

B. Arrangement of the Subject-matter in its Natural Causal Order.

1. Earth.		2. Man.
Topographical conditions. Elevation. Drainage. Soil. Climatic conditions. Temperature. Winds. Rainfall.	Productive conditions. Vegetable. Animal.	Industrial conditions. Social " Commercial " Locative " Political "

C. Relations of Cause and Effect Existing between these Factors.

1. Tracing the effect of each factor in determining the ultimate conditions of life in typical regions; as, a tropical forest region; a savanna region; a desert region; a tundra region; some temperate regions.

II. THE CHILD'S ATTITUDE OF MIND TOWARD THE SUBJECT-MATTER OF GEOGRAPHY

A. Dependent on Stages of Mental Development.

1. Discussion of child's mental growth from observation and theory.
2. Determination of characteristics of childhood at widely differing ages and then in the different grades.

*Continued from the JOURNAL OF GEOGRAPHY, Vol. III., No. 2, February, 1904, page 64.

3. Naming of stages.
   a. Stage of gathering conceptions. Characterized by sense perception of simple wholes.
   b. Stage of relating conceptions. Characterized by natural tendency to compare and relate the simple conceptions with each other.
   c. Stage of constructing conceptions. Characterized by ability to put together the conceptions gathered through the senses and to construct a new whole distant from sense perception.
4. Discussion to determine relation of stages.
   a. No distinct demarcation, but gradual growth of one into another.
   b. When one stage is attained it continues throughout life of individual.
   c. Determination of the grades in which teacher should count on average child maturing to each stage and formulate work accordingly.
      (1) Gathering conceptions in grades I–II.
      (2) Relating conceptions in grades III–IV.
      (3) Constructing conceptions in grades IV. to the end.

B. Dependent on Child's Environment.

1. City child and his conceptions.
   a. Mainly concerning subject-matter noted under I, *B*, 2. "Man," and end at products of industry.
   b. Necessity of supplementing his knowledge with conceptions of natural phenomena.
2. Country child and his conceptions.
   a. Mainly concerns subject-matter noted under I, *B*, 1; natural phenomena, products, and simple industrial processes.
   b. Necessity of supplementing his knowledge with conceptions of social, commercial, and political conditions.

III. THE ARRANGEMENT OF A PSYCHOLOGICAL COURSE FOR THE GRADES

A. Determining Factors in Arranging Subject-matter for Different Grades.

1. Child's mental ability as indicated in II, *A*.
2. Child's environment as indicated in II, *B*.
3. The causal order of arrangement inherent in the subject-matter as indicated in I, *B*.
4. General aim and motive for teaching geography.
   a. As indicated by the content I, *A*.
   b. Mental discipline of constructive development.

5. Number of years the average child attends school.*

B. Relation One Grade's Work should Bear to Another.

1. Unity of purpose in course as a whole.
   - *a.* Continuity only broken into grades because of arrangement of school year.
2. Necessity for each grade having a special aim and accomplishment, but in harmony with the purpose of the course as a whole.
3. Each grade's work a whole in itself, but also a base for the upper grade's work and growing out of the previous grade's work.

C. Relation of Geography to Other Subjects in the Curriculum.

1. Grouping of subjects.
   - *a.* Language group: Reading; writing; composition; grammar.
   - *b.* Art group: Manual construction; drawing; music; literature.
   - *c.* Number group: Number perception; number relation; algebra, etc.
   - *d.* Science group: Nature study; geography; history.
2. Disciplinary value of each group.
   - *a.* Each contains a part especially adapted to child's ability in each stage.
   - *b.* Some one part of each worthy of special emphasis because of social demand.

D. Analysis of the Science Group to Ascertain the Importance of and the Emphasis on Geography.

1. Nature study or gathering of single conceptions through sense perception especially emphasized in grades I–III.
2. Geography or study of man's earth relation especially emphasized in grades III–VII.
3. History or study of effects of man's relation to earth seen through man's relations to each other especially emphasized in grades VII–VIII.

E. Analysis of Geography Itself to Ascertain Its Importance and Determine the Divisions of Its Subject-matter to Correspond to the Different Stages of Child's Ability.

1. Divisions of subject-matter inherent in subject-matter with order determined by child's ability.
   - *a.* Must have conceptions of objects and conditions in immediate environment in order to

*In Chicago this is an important factor. In the schools of the foreign and overcrowded districts of the city a large per cent of the pupils drop out before the fifth grade and a majority before the sixth grade is finished.

(1) understand relations of objects and conditions in immediate environment. This is essential in order to

(2) comprehend simple and complex conditions and relations in regions distant from immediate environment.

2. Arrangement of these divisions of subject-matter by grades dependent on stages of child's ability in different grades.

a. Conception of immediate environment with simplest relations in grades I and II, as:

(1) Physical and climatic conditions.

(*a*) Directions; time; heat; clouds; rocks; soils, etc.

(2) Products seen in home, market, and field.

(*a*) Harvest crops; domestic animals; wool; fruits; lumber, etc.

b. Interrelation of these immediate conditions as causal to an organized geographical whole, in grade III.

(1) Relations observable between abstract parts of the local center:

(*a*) Parts of the city: Residence portion; productive portion; manufacturing portion; trade portion; shipping portion.

(*b*) Transportation means.

(*c*) Products as relating center to surrounding regions: Shelter; food; clothing.

(*d*) Organization: Commercial; social; political.

c. Simplest conditions and relations in regions distant from immediate environment, in grade IV.

(1) Relations of immediate environment to distant regions leading to a conception of the world as a whole.

(*a*) Northern North America; Mexican Plateau; Amazon Basin; La Plata Basin; Congo Basin; Sahara Desert; Eastern Eurasia, etc.

(*b*) Summary in Earth's physical and climatic relations.

d. More detailed conditions and relations in regions distant from immediate environment, in grades V–VII.

(1) Physical, climatic, productive, industrial, social, locative, and political relations in related regions of continents.

(*a*) North America; South America; Eurasia; Africa; Australia.

e. Relations of great regions to each other, in grade VIII.

(1) Physical relations, climatic relations, productive relations, commercial relations, and political relations of the earth as a whole.

IV. METHODS OF TEACHING AS APPLIED TO SUBJECT-MATTER DETERMINED FOR EACH GRADE

A. *Environment Study.* Aim, as determined in III, *E*, to give conceptions of objects and conditions in child's immediate environment, and show the simple relations existing between these and the child.

1. First grade.
   a. Subject-matter: The physical and climatic conditions.
   b. Order and choice of the subject-matter.
      (1) Determined by child's natural contact.
      (2) Determined by season of year for economy of effort.
      (3) Determined by necessity for continuity.
   c. Essentials of presentation:
      (1) Awaken child's interest by showing a motive for knowledge of the topic.
      (2) Observation of the object or condition.
      (3) Bring out relations, of the object or condition, to the child.
      (4) Relations, of the object or condition, to other objects and conditions.
      (5) The next topic for study determined by an intimate relation with the one being studied, and by so doing strengthen:
         (*a*) Sense of relation in child, and
         (*b*) The continuity of the subject-matter.

NOTE:—Together with the discussion of each grade's work the class (1) observes a recitation in each grade, (2) writes a plan for teaching some topic in the grade, (3) collects materials (drawings, pictures, maps, specimens, etc.) for teaching the topic.

2. Second grade.
   a. Subject-matter: The products seen in home, market, and field.
   b. and c. Same as in first grade.

B. *Geography of the Local Center.* Aim, as determined in III, *E*, to bring out the relations of objects and conditions studied in the first and second grades as causal to the organization of a geographical center. Incidental aim: The construction and interpretation of maps.

1. Third grade.
   a. Order and choice of the subject-matter.
      (1) Determined by child's natural contact: Conditions of community in which he lives.

(2) Determined by continuity inherent in the subject-matter.
  (*a*) Because of relations to locations in the city.
  (*b*) Because of causal order as indicated in I, *B*.
(3) Statement of order.
  (*a*) Directions in schoolroom and community. Making of drawings and plats according to horizontal directions.
  (*b*) Study conditions along the most direct thoroughfare to the business center, making map of same.
  (*c*) Physical features, slope, drainage, etc.
    Modeling of surface in sand.
  (*d*) Parts of city and relation of parts: Retail and wholesale, manufacturing and shipping, residence, farm, or suburb portion. Making and interpretation of complete map.
  (*e*) Transportation means.
  (*f*) Products: Shelter, food, clothing; use in home; location of industries in city and reason; how products come to city and from where.
  (*g*) Organization: Need of each working to supply another's need. Need of organizing to supply lights, protection, etc. Study of organization of fire department, etc. Need of political organization to select heads over all. Need for and determination of city limits.

b. Essentials of presentation.
(1) Procedure from that easily observed by child to that more distant.
(2) Observation by excursion work.
(3) Stimulate spirit of inquiry outside of the school.
(4) Make use of each individual's observations throughout year.
(5) Presentation of subject-matter not as isolated facts, but related, and in relations are found causes for location, etc.
(6) For making and interpretation of maps:
  (*a*) First drawing of a whole seen at once.
  (*b*) By easy gradations build on to map of thoroughfare map for whole city.
  (*c*) Mark directions on map and hang on north wall for first comprehension of map directions.

C. *Superficial Study of the World as a Whole*. Aim, as determined in III, *E*, to bring out (1) relation of child's community to distant regions, (2) physical, climatic, productive, and life conditions in the distant region. (3) Incidental aims: The comprehension of land forms. To gain a conception of the shape and climatic conditions of the earth.

1. Fourth grade.
   a. Order and choice of the subject-matter.
      (1) Determined by intimacy and evidence of relation of the distant region to the child's environment.
      (2) Determined by simplicity of relations within the region.
      (3) Determined by necessity of selecting such regions that the whole may represent typical conditions in earth's climatic belts.
      (4) Statement of order:
         (*a*) The sphere as a whole: Relative size; shape; surface.
         (*b*) Distant land masses; as: Use and appearance of seal skin; use of fur coats to animals; determination of kind of climate seals must live in; life and appearance of seal; appearance of country, physical and climatic conditions; land form of plain and island; productive conditions; social conditions; chalk relief of northern North America on blackboard-globe; direction and distance from child's home.
         (*c*) Summary and determination of location of hot, cold, and temperate regions of the earth.
   b. Essentials of presentation:
      (1) In presenting shape of earth:
         (*a*) Avoid use of symbol until after child strives for it by attempting to determine shape from the earth itself.
         (*b*) Sizes and distances must be in terms of things experienced by child.
      (2) In presenting distant regions:
         (*a*) Distant region introduced by a product familiar to child, and one in itself, to some extent, characterizing conditions in the region.
         (*b*) Conditions must be imaged, not memorized. Use of pictures, etc.
         (*c*) Land form should be studied when it forms a part of the region studied, and there shown as affecting the life of the region and its form represented by pictures, sand model, etc.
         (*d*) By representation of relief on slated globe relation of land masses may be shown.

(3) In presenting earth's climate:

(*a*) By reviewing conditions of climate and life in each region, showing relation of tropical, polar, and temperate regions, climatic conditions of earth will be brought out.

D. Intensive Study of Regional Geography, or Continental Geography.

Aim: To apply in every specific instance the relations existing between topographic, climatic, productive, industrial, social, locative, and political conditions that—

(1) The reasoning power of the child may be developed through his self-activities or original effort.

(2) The facts learned may be seen as something more than arbitrary facts, as: reasons for location, products, etc.

(3) The child may image conditions in distant regions through the comparison with conditions he has sensed.

1. Fifth, sixth, and seventh grades.

a. Order of arrangement of the continents.

(1) Determined by child's contact and association.

(2) Determined by simplicity and unity of relations in each.

(3) Determined by importance of each in commerce and current events.

(4) Statement of order of arrangement:

(*a*) North America and important islands: Fifth grade; because of child's natural association.

(*b*) South America: Sixth grade; because of simplicity and unity of relations, especially topographic, climatic, and productive, and because of the growth of intimate associations.

(*c*) Eurasia, Africa, and Australia: Seventh grade; (Eurasia 30 weeks, Africa 7 weeks, Australia 3 weeks), because of complexity of arrangement in Eurasia and its great commercial importance, it is left till more mature age of child.

b. Order of arrangement of subject-matter in continent study.

(1) Determined by causal order as stated in aim and in I, *B*.

(2) Determined by natural deductive and inductive reasoning from image of the whole to study of the parts in detail and synthesis of the parts into a detailed whole.

(3) Statement of order of arrangement of subject-matter.

(*a*) Continent as a whole.

Physical basis of topography in relief.

Means: Sand model, chalk model, interpretation of relief map.
Division into natural topographic regions.
Climate of continent as a whole and climatic belts dependent on location of continent and its topographic regions.
Life belts of continent as a whole dependent on topographic regions and climatic belts.
(b) Topical study of each topographical region to bring out more in detail the physical, climatic, productive, industrial, social, and locative relations.
(c) Political divisions of continent in which a review of the essential characteristics of each region is built into continent as a whole.
c. Discussion of methods of presentation.

E. *Extensive Study of Regional Geography; World Relations.* Aim: To show world relations existing between its parts, especially as influencing conditions in child's home country. Incidental aim: A review of geography of the United States, especially through the commercial and political relations.

1. Eighth grade.
a. Order of presentation of the subject-matter.
(1) Determined by the natural causal order.
(2) Determined by the importance of the relation of the different regions upon the home region.
b. Statement of the order of presentation of the subject-matter.
(1) Physical relations:
(a) The earth as a whole. Primary highlands. Great slopes and drainage areas.
(b) The earth as a planet. Movements, inclination, and division of time.
(2) Climatic relations: Temperature and seasons; winds, rainfall.
(3) Life relations: Tropical forest, Savanna, Desert, Temperate, Sub-arctic, and Tundra belts.
(4) Commercial relations of other regions with United States. Of other regions with each other. Routes, etc.
(5) Political relations of great powers, dependencies, and protectorates.
c. Discussion of methods of presentation.

Laboratory work accompanying the second year's work. Done outside of the regular class periods.

I. Picture library: Collecting, mounting, and classifying pictures.

II. Reference library: Collecting, classifying, and binding of articles from periodicals.

III. Picture drawing: Chalk modeling of geographical forms. Blackboard drawing of pictures.

IV. Map making.

A study of the development of map making.

Sand modeling.

Chalk modeling.

Making of one papier-maché model.

Study of map projections.

Making diagramatic outlines of continents indicating parallels and meridians to determine relative sizes and distances.

GEOGRAPHICAL NOTES

Controlling Sand Dunes in the United States and Europe.—In many parts of the United States there are areas of drifting sand which are of much economic importance from the fact that they not only are useless for agricultural purposes, but may seriously encroach upon valuable property. These areas, known as sand dunes, consist of hills of sand which, when bare of vegetation, readily shift from place to place when acted upon by the wind, and are then called wandering or shifting dunes. Such dunes occur along sandy shores of the ocean, of the Great Lakes, or even along our large rivers, notably the Columbia River in Washington and Oregon. These dunes are formed from the sand which is washed up during the tides, storms, or high water in case of rivers. The sand soon dries, is blown in the direction of the prevailing winds, and forms drifts in the same manner as snow. The drifts may attain the size of hills, in some cases as much as 200 feet in height. Continuous winds blow the sand over the brow, and the whole dune thus moves slowly but irresistibly forward, covering whatever is in its track—fields, forests, ponds, rivers, buildings. The direction of the prevailing winds determines whether dunes will be formed along a sandy coast. On Lake Michigan dunes are found at various places along the south and east shore, but none along the west shore. It is interesting to note that the dunes in this region are probably the largest and highest to be found on the continent, and are scarcely exceeded by any in Europe.

In nature sand dunes are not formed where the conditions will allow a covering of vegetation; consequently they are not found in warm regions, or only exceptionally, as the long vegetative season allows opportunity for a covering to become established; but in northern regions, where vegetation lies dormant for a considerable portion of the year, the severe winter storms may prevent such covering from forming.

The chief areas of shifting dunes to be found along the Atlantic Coast are on Cape Cod, in the vicinity of Provincetown; Southern New Jersey, near Avalon and Stone Harbor; Cape Henlopen, near Lewes, Delaware; Cape Henry, Virginia, and less extensive, though quite troublesome, dunes at Currituck, North Carolina; Isle of Palms, near Charleston, South Carolina; and Tybee Island, near Savannah, Georgia.

Sand dunes occur at various places along the Pacific Coast, as Ventura, Monterey, and Mendocino counties, California, and the coast of Oregon. The latter are minimized by the moist climate. Extensive and exceedingly troublesome dunes are found along the Columbia River in Oregon and Washington from The Dalles to Riparia. The sand is brought down during the floods and blown about during the long dry summers. Here the conditions as to rainfall are reversed, the rain coming in the winter and the dunes forming during the dry summer.

More or less successful efforts have been made at various times to "fix" the dunes and thus prevent the serious injury which they cause to valuable property.

In order to attack these problems more intelligently, the writer was sent by the Department of Agriculture to investigate the methods used in Europe, where work of this character has engaged the attention of the various Governments for fifty years or more, and where the efforts in fixation or reclamation have been more successful than anywhere else in the world.

For this purpose typical dune areas in Holland, Denmark, Prussia, and France were visited. In all cases the reclamation is carried on by the general government, sometimes assisted by the local government, as private individuals are unable to bring to bear upon the problem sufficient means or continuity of purpose.

The fundamental principle of dune fixation is to cover the sand with a layer of any material which will prevent the access of the wind to the surface, and thus prevent drifting. The kind of covering used depends upon climatic conditions and the availability and cost of material. The aim is, when possible, to produce a forest, as this is permanent, and, moreover, if properly managed, yields an income. However, a forest can not be produced with certainty upon a surface of drifting sand, and it is therefore necessary to temporarily fix the sand in some other manner. Although any covering of inert material, such as chips, gravel, brush, etc., would answer the purpose, economic factors have reduced the preliminary methods of fixation to these: (1) transplanting beach grass; (2) covering with heather; (3) covering with a network of sand hedges.

(1) Many plants have been tried, but the most satisfactory is beach grass (*Ammophila arenaria* Link). This grass grows naturally upon the sand dunes of the north Atlantic Coast of Europe as far south as Morocco, and of America as far south as North Carolina, and also along our Great Lakes. This is the grass which was used in reclaiming the land which is now Golden Gate Park in San Francisco. It has also been imported at various other points along the Pacific Coast. To fix the sand the grass is transplanted in spring or fall and set two or three feet apart in the sand. The blowing sand is caught and held by the grass, but it has the power to grow up through the accumulated sand, and thus, with care to replant where necessary, it becomes a permanent covering. As a forest can not be established close to the ocean, a strip a few rods wide must be permanently fixed in this manner.

(2) In localities where heather is abundant this is cut with brush scythes and laid upon the surface of the sand. It is held in place by a little sand thrown over the edge of each layer.

(3) Where neither beach grass nor heather is available, or where the conditions are especially severe, sand hedges are used. These consist of rows of cut brush or stakes or of cut reeds, which are inserted in the sand in rows or quadrangles, allowing the upper end to project for six inches or more.

After the sand is temporarily fixed by one of these methods, young trees, usually conifers, are transplanted, and the forest soon removes all danger of further shifting. In southwestern France the forest was established by sowing the seed of *Pinus maritima* upon the sand and covering with brush, but this method has not been successful in Northern Europe. In France, and also the Kurische Nehrung, in Prussia, it has been found necessary to form artificially a long barrier dune between the ocean and the forest which protects the latter. This barrier dune is fixed by means of beach grass, but requires constant oversight to keep it in order. During severe storms dangerous breaches are formed, which, if neglected, would soon destroy the dune and seriously injure the forest in its lee. These breaks are mended by sand fences, such as already described, but taller, which rapidly accumulate the sand until the hole is filled.—*National Geographic Magazine*, January, 1904.

Climate of San Francisco.—On the coast of California there is a city justly famed for the abnormalities of its climate. Overcoats and heavy wraps are worn in midsummer, while the lilies bloom in December. From May until September very little rain falls, yet during this period with clock-like regularity great banks of fog march in every afternoon and cover the bare, brown hills. The city of San Francisco, the gateway to the Orient, as it has been termed, is strangely situated with respect to ocean, bay, mountain, and valley. It may perhaps be said of this city that nowhere else can such a strange mixture of marine and continental climates be found. The topography is such that marked contrasts can be found within comparatively short distances. Certainly the climatologist finds in the vicinity of San Francisco so many climatic anomalies that he feels as if he were in fact present in a great natural aero-physical laboratory where daily experiments were being performed on a large scale. In building this meteorological laboratory at San Francisco nature also provided seats wherefrom we can obtain excellent views of the experiments while in progress. From the Weather Bureau station on Mount Tamalpais—elevation of station, 2,373 feet—one looks down on the broad expanse of the Pacific, nearly 20,000,000 square miles of water, to the north, west, and south. From the open roadstead of Drakes Bay, the eye passes over the Sausalito hills to the headlands of Points Bonita and Lobos, marking the entrance to the Golden Gate. This passage plays an important rôle in connection with the winds, temperatures, and fogs of the San Francisco Bay region. At mean tide the area of San Francisco Bay is about 450 square miles.

Far on the eastern horizon, especially on clear winter days, the snow of the Sierra—155 miles distant—can be seen glistening. These mountains vary in height from 8,000 to 14,000 feet.

Extending from the slopes of the Sierra to the Coast Range is a great basin 500 miles long and about 50 miles wide. The Sacramento and San Joaquin rivers, flowing through this basin, unite in Suisun Bay. This great inland basin, surrounded by mountain walls, is connected with the Pacific Ocean by the gate at San Francisco, San Francisco Bay, San Pablo Bay, Karquines Straits, and Suisun Bay. Here, then, is an aero-physical laboratory *par excellence.* Now for the results.

When a native of San Francisco is asked which is the coldest month of the year, he is generally at a loss for an answer; and if asked which is the warmest he may say November. This confusion arises from the comparatively small range of temperature. The mean annual temperature, as determined from the records of the Weather Bureau for thirty-one years, is 56.1° F. May and November have practically the same temperature. The warmest month is September, 60.8°; the coldest, January, 50.2°. The other months have mean temperatures as follows: February, 52°; March, 54°; April, 55°; May, 57°; June, July, and August, 59°; October, 60°; November, 56°; December, 52°.

The highest temperature ever recorded in San Francisco was 100°, on June 29, 1891, and the lowest 29°, on January 15, 1888. Abnormally warm and cold periods last, as a rule, about three days. The mean of the three consecutive warmest days at San Francisco has never exceeded 76.3°. A period of warm weather during the summer months is, as a rule, brought to a close about the evening of the third day with strong west winds, dense fog, and temperatures ranging from 49° to 54°. The mean of the three consecutive coldest days was 40.7°. The greatest daily range of temperature was 43°, on June 29, 1891. This was the date when the temperature reached 100°. The range of temperature was from 100° to 57°. The morning was calm and very warm, while at 5 P. M. the temperature was 80°, and next morning 74°.

In the past thirty years the number of days on which snow has fallen can be counted on ten fingers. Thunderstorms likewise are infrequent, but not altogether unknown. Earthquakes, meaning by this all slight shocks and tremors, average about seven per annum. Little damage has been done by earthquakes during the past fifty years.

The people in San Francisco have long realized that winter and summer are purely relative terms. Thus at any of the ferries on a midsummer day one can see summer fabrics worn with heavy wraps, and it is not unusual to see white duck and sealskin in combination. Visitors to the city should by all means wear heavy wraps or overcoats during the summer afternoon.

The experiments of the observers of the Weather Bureau during the past two years with kites have thrown much light upon the causes of the climatic abnormalities experienced at San Francisco; and, among other things, it has become evident that in summer as we ascend from the ground the temperature rises. For each 155 feet of elevation the temperature is 1° F. warmer, and so on any of the hills or mountains in the vicinity of San Francisco one can find with very little effort the climate best suited for him. In other words, the citizen of the San Francisco Bay section can regulate the temperature to suit himself, having a choice between 55° at sea level and 85° at 2,000 feet above.

With regard to rainfall during the summer months, San Francisco is practically rainless. The average rainfall is about 23 inches, and most of this falls during the months of November, December, January, February, and March. Looking over the records of the past fifty years we find that the year 1898 had but 9.31 inches, while in 1893 there was 38.82 inches. In 1861 there was 38.51 inches.—*Bulletin L, Climatology of California, U. S. Weather Bureau.*

Current Articles on Commerce and Industry.—

JANUARY

Automobiles (Illus.), *Sci. Am.* (*Special Edition*), January 30.

Canada's Ability as a Wheat Producer, *Bradstreet's*, January 9.

Cod-liver Oil of Norway, *Bradstreet's*, January 23.

Colombia: The Government and People and Country (Illus.), *World's Work.*

Corn: The World's Corn King (Illus.), *Export Implement Age.*

Cuba: Commercial Notes, *Consular Rep.*

Engineering Retrospect of 1903, *Sci. Am.*, January 2.

English Walnut in Southern California (Illus.), *Rev. of Revs.*

Erie Canal, Electricity on (Illus.), *Sci. Am.*, January 9.

Germany, Commerce and Industries of, *Consular Rep.*

Hudson Bay: Canada's Undeveloped Empire (Illus.), *World To-Day.*

India: Impressions of the Far East (Illus.), *World To-Day.*

Invention, Connecticut the Home of, *World's Work.*

Japan, Industrial Development in, *Consular Rep.*

Korea, Commerce and Resources of, *Bradstreet's*, January 23.

Locomotive Industry (Illus.), *System.*

Logging in the South, *Miss. Valley Lumberman*, January 22.

Lumber By-products, *Miss. Valley Lumberman*, January 29.

Mississippi: The Great River (Illus.), *World To-Day.*

Oil: New Texan Deposits (Illus.), *Sci. Am.*, January 30.

Oil Industry of the Southwest (Illus.), *Rev. of Revs.*

Panama Canal and Railway Traffic, *Bradstreet's.*

Peach Farm in Michigan (Illus.), *Country Life.*

Philippines: How They Advertise Shoes, *Hide and Leather*, January 30.

those days when accessible sessions of the Congress are held. It is probable that the educational aspects of geography will be made the special subject of one or more sessions, in which contributions will be especially appropriate from experienced teachers of geography in colleges and normal schools. The JOURNAL will publish the plans as they mature and will make special note of any details of particular interest to teachers.

Correspondence regarding membership and general information should be addressed to International Geographic Congress, Hubbard Memorial Hall, Washington, D. C.; regarding the general scientific program of the sessions, to Professor W. M. Davis, Cambridge, Mass.; regarding the educational division of the program, to Professor Richard E. Dodge, Teachers College, New York City.

RECENT PUBLICATIONS

A Laboratory Manual of Physical Geography. Part I, Directions for Teachers; Part II, Laboratory Exercises. By Frank W. Darling and four instructors in the Chicago High Schools. Chicago and Boston: Atkinson & Mentzer, 1903.

The authors have prepared a helpful and suggestive manual of value to all High and Normal School teachers. There is some question as to the advisability of including the study of minerals in Physical Geography as is done here. To be reviewed later.

The Cumberland Road, Being Volume X in the Historic Highways of America Series. By Archer B. Hulbert. Pp. 208. Cleveland, Ohio: The Arthur H. Clark Company, 1904.

The latest volume in the series of Historic Highways of America is much like its predecessors in scope and form. Of interest to all students of the history of geography and the geography of history in the United States.

The Philippine Islands, 1493–1898. Edited and annotated by Emma H. Blair and James A. Robertson. Vol. VIII, 1591–1593, pp. 320, 1903; and Vol. IX, 1593–1597, pp. 329, 1904. Cleveland, Ohio: Arthur H. Clark Company.

These volumes continue the account of the Philippines begun in the other volumes already noted in the JOURNAL, and carry the story to the end of the first century. Many facts are of interest to the general reader, but the series is of particular value to the student of geographical history.

Summary and Outline of Geography Course for the Grades of Chicago Public Schools. Pp. 160. Published by the Board of Education, 1903.

A valuable contribution to educational geography. A well-ordered and sensible course of study. Contains excellent references and is of value to all grade teachers.

The Tree-Dwellers. By Katherine E. Dopp. Pp. 158. Chicago: Rand, McNally & Co., 1903.

The first of a series of books on primitive life, for use as a reader in elementary grades. Pleasing in form and illustration. To be reviewed later.

NEWS NOTES

PRELIMINARY ANNOUNCEMENT

Eighth International Geographic Congress, Washington, 1904.

HUBBARD MEMORIAL HALL,
WASHINGTON, D. C., U. S. A., January, 1904.

The Executive Committee of the Seventh International Geographic Congress held in Berlin in 1899 having voted to convoke its next session in Washington, the National Geographic Society, as the organization responsible for the management of the sessions in the United States, will welcome the Eighth Congress and its friends to the National Capital of the United States in September, 1904.

Geographers and promoters of geography throughout the World, especially members of Geographic Societies and cognate institutions of scientific character, are cordially invited to assemble in Washington, D. C., on September 8, 1904, for the first international meeting of geographers in the Western Hemisphere.

On the invitation of the National Geographic Society, the following Societies join in welcoming the Congress and undertake to coöperate toward its success, especially in so far as sessions to be held in their respective cities are concerned :

The American Geographical Society.
The Geographic Society of Baltimore.
The Geographic Society of Chicago.
The Geographical Society of California.
The Mazamas.
The Peary Arctic Club.
The Geographical Society of Philadelphia.
The Appalachian Mountain Club.
The Geographical Society of the Pacific.
The Sierra Club.
The American Alpine Club.
The Harvard Travellers Club.

Sessions. The Congress will convene in Washington on Thursday, September 8th, in the new home of the National Geographic Society, and will hold sessions on the 9th and 10th, the latter under the auspices of the Geographic Society of Baltimore. Leaving Washington on the 12th, the members, associates, and guests of the Congress will be entertained during that day by the Geographical Society of Philadelphia, and on the 13th, 14th, and 15th by the American Geographical Society in New York, where scientific sessions will be held; on the 16th they will have the opportunity of visiting Niagara Falls (en route westward by special train), and on the 17th will be entertained by the Geographic Society of Chicago; and on Monday and Tuesday, September 19th and 20th, they will be invited to participate in the International Congress of Arts and Science connected with the World's Fair in St. Louis. Arrangements will be made here for visiting exhibits of geographic interest.

Excursions. In case any considerable number of members and associates so desire, a Far-West excursion will be provided from St. Louis to the City of Mexico, thence to Santa Fé, thence to the Grand Canyon of the Colorado, and on to San Francisco and the Golden Gate, where the western Geographic Societies will extend special hospitality; afterward returning by any preferred route through the Rocky Mountains and the interior plains to the eastern ports.

If the membership and finances warrant, the foreign delegates will be made guests of the Congress from Washington to St. Louis, via Baltimore, Philadelphia, New York, Niagara Falls, and Chicago. On the Far-West excursion special terms will be secured, reducing the aggregate cost of transportation with sleeping-car accommodations and meals materially below the customary rates. It may be necessary to limit the number of persons on the Far-West excursion. It is planned also to secure special rates for transportation of foreign members from one or more European ports to New York, provided requisite information as to the convenience and pleasure of such members be obtained in time. Final information on these points will be given in the Preliminary Program of June, 1904.

The subjects for treatment and discussion in the Congress may be classified as follows:

1. Physical Geography, including Geomorphology, Meteorology, Hydrology, etc.
2. Mathematical Geography, including Geodesy and Geophysics.
3. Biogeography, including Botany and Zoölogy in their geographic aspects.
4. Anthropogeography, including Ethnology.
5. Descriptive Geography, including Explorations and Surveys.
6. Geographic Technology, including Cartography, Bibliography, etc.
7. Commercial and Industrial Geography.
8. History of Geography.
9. Geographic Education.

A special opportunity will be afforded for the discussion of methods of surveying and map making, and for the comparison of these methods as pursued in other countries with the work of the Federal and State Surveys maintained in this country.

Membership. Members of the Congress will be entitled to participate in all sessions and excursions, and to attend all social meetings in honor of the Congress; they will also (whether in attendance or not) receive the publications of the Congress, including the daily Program and the final Compte Rendu, or volume of proceedings. Membership may be acquired by members of Geographic and cognate Societies on payment of $5 (25 francs, one pound, or 20 marks) to the Committee of Arrangements. Persons not members of such societies may acquire membership by a similar payment and election by the Presidency. Ladies and minors accompanying members may be registered as associates on payment of $2.50 (12½ francs, or 10 shillings, or 10 marks); they shall enjoy all privileges of members except the rights of voting and of receiving publications.

Geographers and their friends desirous of attending the Congress or receiving its publications are requested to signify their intention at the earliest practicable date in order that subsequent announcements may be sent them without delay, and that requisite arrangements for transportation may be effected. On receipt of subscriptions, members' and associates' tickets will be mailed to the subscribers. The privileges of the Congress, including the excursions and the social gatherings, can be extended only to holders of tickets.

Societies and Delegates. It is earnestly hoped that the Congress of 1904 may be an assemblage of Geographic and cognate Institutions no less than of individual Geographers; and to this end a special invitation is extended to such organizations to participate in the Congress through Delegates on the basis of one for each one hundred members up to a maximum of ten. No charge will be made for the registration of Institutions, though the Delegates will be expected to subscribe as Members; and in order that the list of affiliated Institutions (to be issued in a later announcement) may be worthy of full confidence, the Committee of Arrangements reserve the right to withhold the name of any Institution pending action by the Presidency. The publications of the Congress will be sent free to all Institutions registered. It is especially desired that the Geographic Societies of the Western Hemisphere may utilize the opportunity afforded by this Congress for establishing closer relations with those of the Old World, and to facilitate this, Spanish will be recognized as one of the languages of the Congress with French, English, German, and Italian, in accordance with previous usage; and communications before the Congress may be written in any one (or more) of these languages.

Institutions not strictly Geographic in character, Libraries, Universities, Academies of Science, and Scientific Societies are especially invited to subscribe as members in order to receive the publications of the Congress as issued.

Communications. Members and Delegates desirous of presenting communications before the Congress, or wishing to propose subjects for discussion, are requested to signify their wishes at the earliest practicable date in order that the titles or subjects may be incorporated in a Preliminary Program to be issued in June, 1904. The time required for presenting communications should be stated, otherwise twelve minutes will be allotted. It is anticipated that not more than twenty minutes can be allotted for any communication unless the Presidency decide to extend the time by reason of the general interest or importance of the subject. The Presidency with the complete Organization of the Congress (including Delegates) will be announced in the Preliminary Program of June, 1904.

Program. All papers or abstracts designed for presentation before the Congress, and all proposals and applications affecting the Congress, will be submitted to a Program Committee who shall decide whether the same are appropriate for incorporation in the announcements, though the decisions of this Committee shall be subject to revision by the Presidency after the Congress convenes.

Any proposal affecting the organization of the Congress or the program for the Washington session must be received in writing not later than May 1, 1904. Communications designed to be printed in connection with the Congress must be received not later than June 1, and any abstracts of communications (not exceeding 300 words in length) designed for printing in the General Program to be published at the beginning of the Congress must be received not later than August 1, 1904. Daily Programs will be issued during the sessions.

All correspondence relating to the Congress and all remittances should be addressed: The Eighth International Geographic Congress, Hubbard Memorial Hall, Washington, D. C., U. S. A.

COMMITTEE OF ARRANGEMENTS

W. J. McGee, National Geographic Society, Washington, D. C., *Chairman.*

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John Joy Edson, President Washington Loan & Trust Company, *Chairman*.
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Charles J. Bell, President American Security & Trust Company.

National Educational Association, 1904.—The first of the many important educational meetings to be held at St. Louis in 1904 is the National Educational Association. This convention will be held from June 28 to July 1. Details of the geographical program will be published in the JOURNAL OF GEOGRAPHY when it has been completed. In anticipation of this meeting the JOURNAL will issue, the last of May or early in June, a special number devoted to "The Geography of the Louisiana Purchase." The Purchase has never before been so completely written up from a geographical standpoint.

Bulletin of the American Geographical Society. — The Editors of the JOURNAL note with pleasure a change in plan whereby the *Bulletin* of the American Geographical Society will hereafter be published monthly instead of five times a year. The *Bulletin* is the oldest regular geographical periodical in the country, and represents the oldest and most renowned Geographical Society. The geographical interests of America are so large and so increasing in scope that there is plenty of opportunity for two monthly periodicals devoted primarily to advancing the science of geography. Although the *Bulletin*, like its companion, the *National Geographic Magazine*, will devote a certain amount of attention to educational geography, neither paper will cover the field which the JOURNAL OF GEOGRAPHY and its predecessors have occupied for more than seven years.

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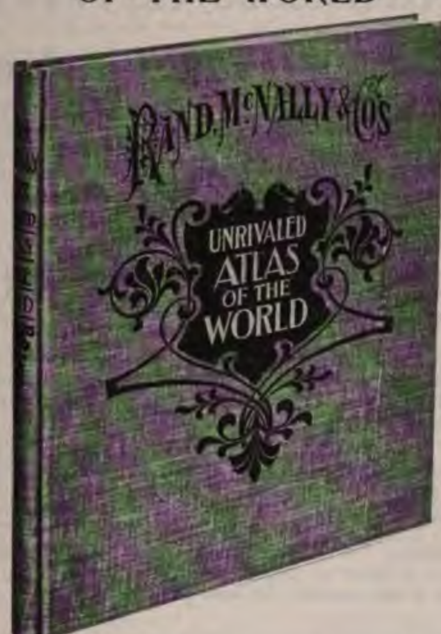

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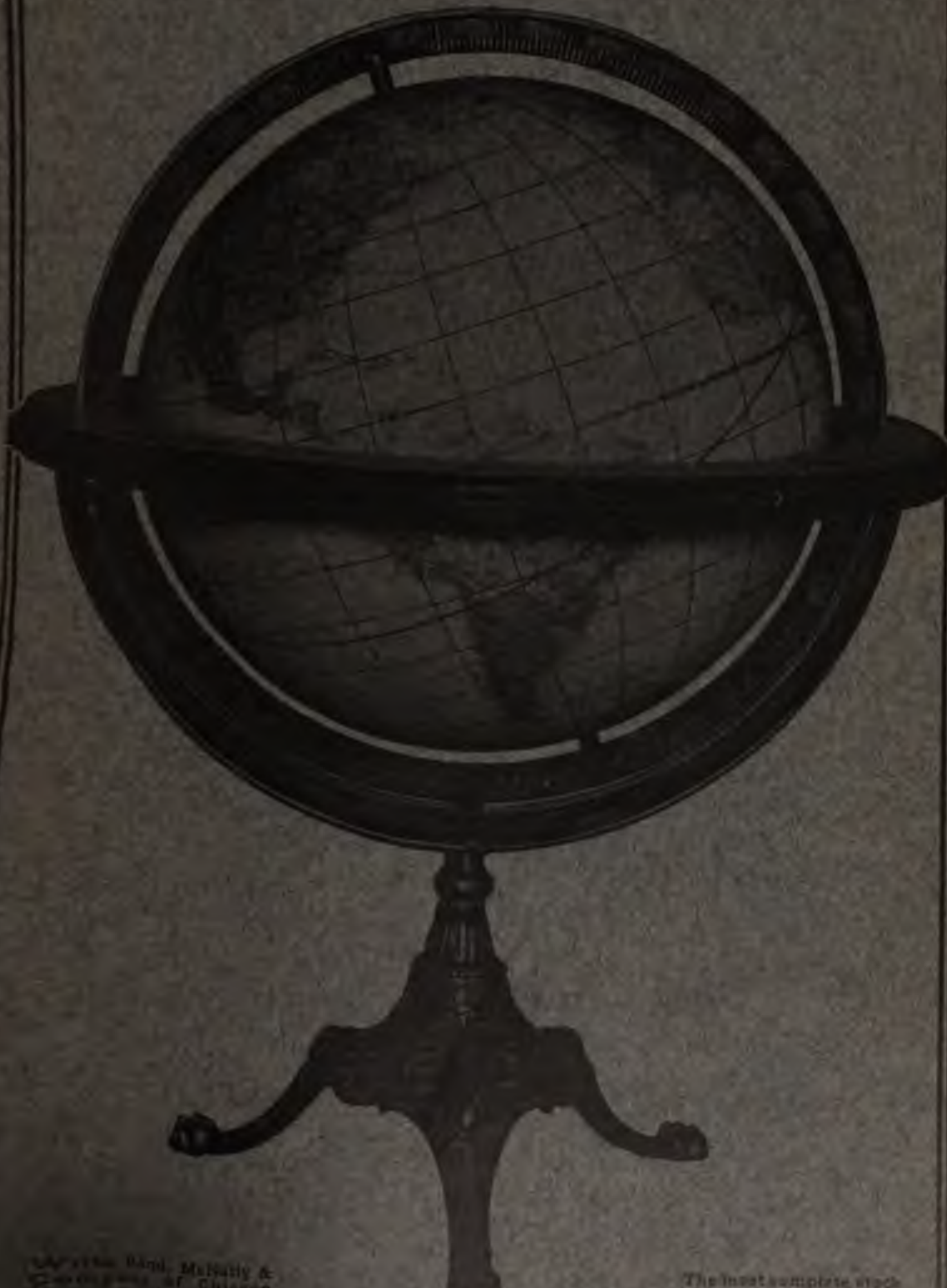

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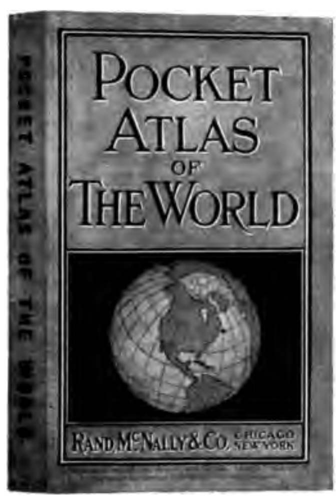

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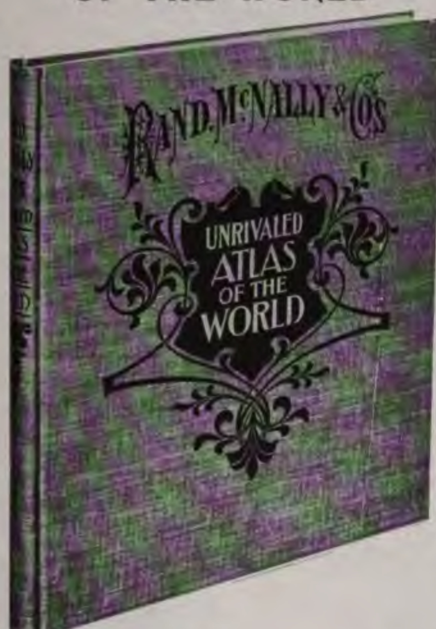

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FIG. 9. *A cross-roads or "four corners." The beginning of a village.*

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FIG. 26. *A view of mountains and highland valleys with a mountain range and peak in the distance.*

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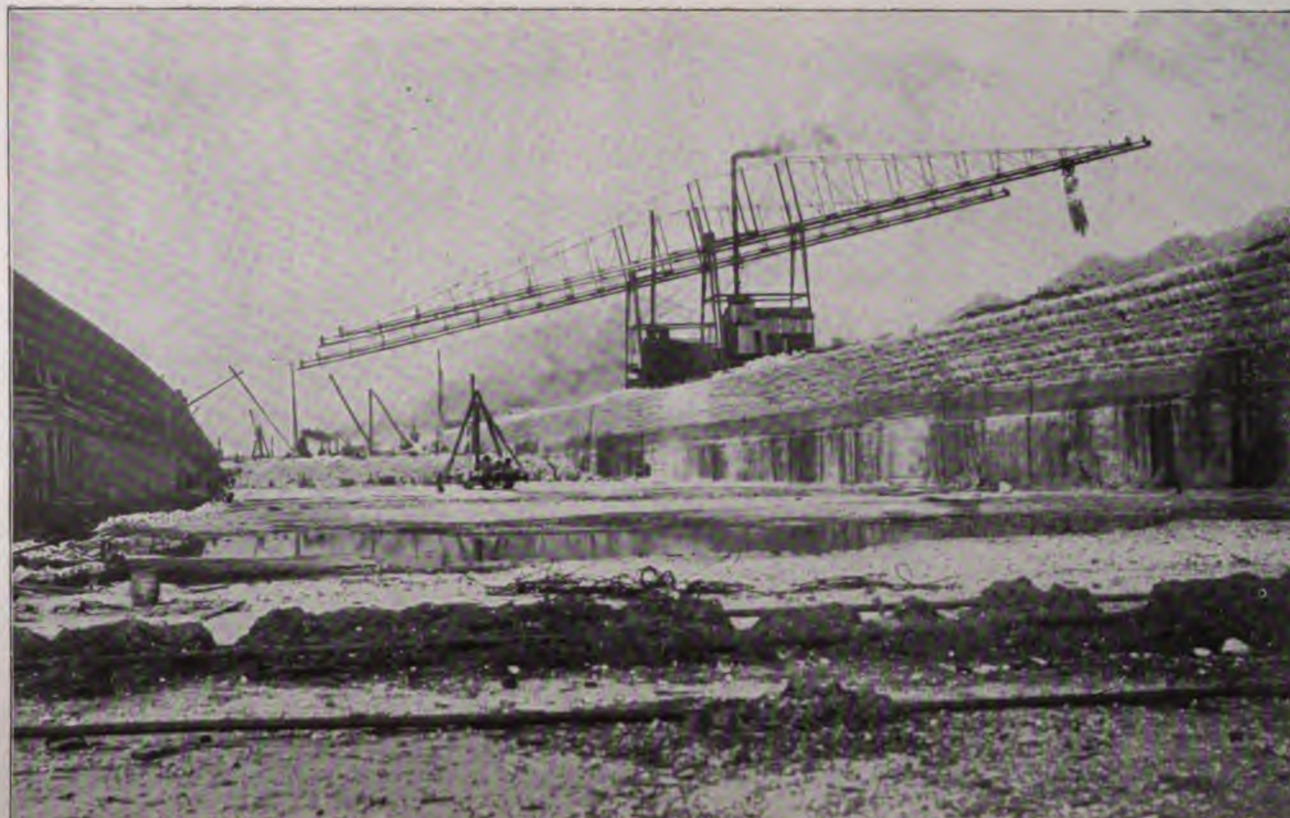

FIG. 13. *A view of work on a big cut in the Chicago Sanitary and Ship Canal.*

The Chicago drainage canal was one of the most stupendous undertakings ever carried out by the city of Chicago. It provides for the disposition of Chicago sewage through an artificial canal from Lake Michigan through Chicago to the nearest point on the Illinois River at Lockport. *See page* 157

The JOURNAL of GEOGRAPHY

VOL. III. APRIL, 1904 No. 4

THE MOTIONS OF THE EARTH

PART I

BY FOREST R. MOULTON
Of the University of Chicago, Chicago, Illinois

INTRODUCTION

THE relative positions of the earth and the various heavenly bodies continually change, and these changes imply that some of them, at least, are in motion. The difficult part of the question is to determine the part of the change which is due to the motion of each. This is illustrated and emphasized by the fact that in antiquity it was believed by some philosophers that the earth was absolutely at rest, and that all apparent motions were due to actual motions of the moon, sun, planets, and stars; by others, that the earth rotated on its axis, but that the moon, sun, and planets all revolved around it; by others, that the planets revolved around the sun, and that the sun with its retinue of planets revolved around the earth; and by others, chief of whom was Aristarchus of Samos (310–250 B. C.), that the earth rotated, and that the earth and planets revolved around the sun. It is an interesting fact that each one of these theories agreed with all the data which their authors possessed as well as any other, for it was only the *relative* motions they were explaining. If they had had any fixed point of reference to start from, it could easily have been determined which theory was correct. The difficulty is illustrated by the experience which everyone has had of sitting in a railway coach with another coach very near at the side. When one of the coaches starts the observer at once knows that one is moving, but he can not tell which it is until he sees some object known to be fixed on the earth. If we ever get airships passing each other at high altitudes, some amusing experiences along this line may be expected.

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At present it is universally believed by civilized peoples that the earth rotates on its axis and that it revolves around the sun. It is also known that this has been proved, but it must not be supposed that it has been proved except on the basis of certain assumptions, or axioms, as doubtless everything is proved. This may appear to weaken the case a little, but most of the axioms involved have an immeasurably wide verification in human experience. It is something like the results obtained in ordinary Geometry, which are always supposed to be of the most certain character although they are directly based on axioms which are admittedly incapable of proof. The recognition of these conditions simply shows us that there is a possibility of other perfectly logical explanations, just as there are Geometries other than the ordinary which are just as logical and at the same time agree just as well with every experience, but which seem to our minds much less simple. How often do we unconsciously accept as an axiom that, of a number of possibilities, the one which seems simplest is necessarily correct!

The objects of this paper are to describe what are believed to be the actual motions of the earth and the reasons for these beliefs, to state on what axioms they are founded, and to discuss some of the indirect conclusions which follow.

THE ROTATION OF THE EARTH

The first philosopher of antiquity after Pythagoras (569–470 B. C.) who seems to have advocated the rotation of the earth was Heraclitus of Pontus (about 380–320 B. C.). He was a friend and disciple of Plato (428–347 B. C.), a contemporary of Aristotle (384–322 B. C.), and an immediate predecessor of Aristarchus of Samos (310–250 B. C.) who strongly supported his views, and argued for the heliocentric theory of the solar system. Unfortunately Aristotle, whose towering genius was a guide not only for most of his contemporaries but also for the civilized world for more than a thousand years, maintained that the earth was the fixed center of the universe, although admitting and attempting to prove its sphericity. It follows from the statements in the Introduction that this error should not lessen our respect for his remarkable talents, for physical theories bear necessarily the imprint of the epoch in which they were born. To judge them justly, it is necessary to exclude from our consideration all their faults which appear only in the light of subsequent discoveries.

Since the time of Copernicus (1473–1543) the present theory of the rotation of the earth has been almost

Copernicus gave no proof that the e

more simple than that the whole heavens should turn around it. After Galileo (1564–1642) had applied the telescope to celestial objects the idea of rotation was supported by analogy with the other planets and sun, whose apparent rotations could not be explained except on the hypothesis that they actually turn on their axes. So far we have the uncertain proofs (?) of simplicity and analogy.

After Newton (1642-1727) published his celebrated laws of motion in 1686 a new series of demonstrations based on these axioms became possible. The first was due to Newton himself who showed that, assuming that the earth rotates, it will be bulged at the equator, and conversely. The demonstration was completed in 1745 by the verification of the oblateness from the measures of Picard in France, of Bouguer La Condamine, and Godin in Peru, and of Maupertuis in Lapland.*

Newton also pointed out the fact that if a body is dropped from a great elevation, it will strike the earth a little east of the foot of the plumb line let fall from the starting point. The reason for this is quite simple. The body is subject to an eastward motion due to the rotation of the earth which is greater than that at the surface of the earth where it strikes. Now, the fact that it falls does not interfere with its eastward motion; consequently, during the time of its fall it goes farther eastward than the foot of the plumb line goes, and the deviation is the result. The variation is small, amounting to about two inches in a fall of 500 feet in our latitude, and air currents make its successful execution very difficult. Nevertheless, it was successfully performed by Benzenberg at Hamburg, in 1802, by Reichert at Freiberg, in 1831, and more frequently in recent times, mostly in deep mine shafts. This argument is based directly on the laws of motion.

It follows from the laws of motion that a pendulum tends constantly to swing in the same plane. It is easy to see that if a pendulum were suspended at the pole of the earth, the earth would rotate under it; that is, the plane of the swing of the pendulum would apparently rotate in the opposite direction with the period of a day. At the earth's equator there would be no rotation at all. At intermediate latitudes there would be a rotation, though slower than at the poles, the rate depending upon the latitude in a way which can not be derived by simple methods. This experiment was devised and carried out with great success by Foucault at Paris, in 1851, and has been many times repeated by others.

The gyroscope experiment, also due to Foucault, is essentially of the same character, the pendulum being replaced by a heavy rotating wheel.

* See THE JOURNAL OF GEOGRAPHY, November, 1903, p. 485.

There are other proofs of the same general character, though less conclusive, such as the direction of trade winds, ocean currents, direction of rotation in cyclones, etc.

A method of independent character consists in measuring motion in the line of sight by means of the spectroscope. When a celestial object, as the sun, is rising in the east the observer is approaching it owing to the earth's rotation, and when it is setting he is receding at the same rate. It follows from the wave theory of light that this motion causes a slight change in the apparent color of the source of light, just as the motion of a locomotive has an effect upon the pitch of its whistle. The spectroscope is an instrument which can be used to measure extremely slight changes in color, and consequently motion in the line of sight. By observations of stars near their times of rising and setting the rotation can be proved, though the amount of motion is near the limits of observation.

The question of whether the rotation is uniform or not was discussed in the paper on Time.* The conclusion was that while the rate of rotation is almost certainly not exactly uniform, the variations are extremely slight and very much below the limits of observation.

THE VARIATION OF LATITUDE

The latitude of a place on the earth depends upon its distance from the earth's pole, which is determined by the earth's rotation. Now if the earth's axis of rotation is not always the same, the pole will not always be at the same point, and the latitude of every place will vary. There is no dynamical reason why it may not change if the earth is given the proper disturbance but the period of variation will be a perfectly definite interval of time depending upon the size, mass, distribution of density, rate of rotation, and rigidity of the earth. It is something like the wabbling which may be set up in a "sleeping" top by a little external disturbance, though the analogy is not perfect. Assuming that the earth is *perfectly rigid* Euler and Laplace showed that such a wabbling in its rotation must take place, if at all, in 305 days. It was not supposed that the lack of perfect rigidity would make very much difference in the period. Since no wabbling with this period, or indeed any other, had been found, it had come to be firmly believed that the earth's axis is sensibly fixed; but between 1880 and 1890 new observations of extraordinary precision, chiefly by Küstner at Berlin, showed beyond a doubt that there is a variation of at least two- or three-tenths of a second of arc corresponding to a

* THE JOURNAL OF GEOGRAPHY, September, 1903, p. 354.

shifting of the pole by twenty or thirty feet. This work has since been amply verified by observers in many places, and the question is of such importance that by international coöperation observatories have been established in Maryland, California, Japan, and Italy to make further investigations along this line. The whole amount of the variation does not exceed six-tenths of a second of arc, or about sixty feet, and is exceedingly irregular. The accompanying figure which represents sixty feet square shows the variation of the position of the pole from 1890 to 1898 according to the computations of Albrecht. Dr.

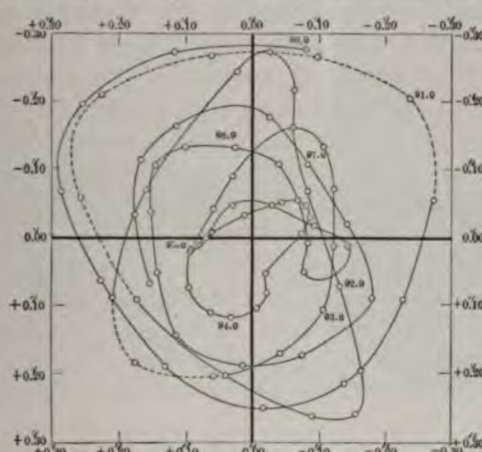

FIG. 1. *Albrecht's computations showing the variation of the positions of the pole, 1890–1898. From Young's Manual of Astronomy.*

Chandler has shown that this motion is the resultant of at least two simpler ones, the smaller one having a period of one year and the larger one a period of 428 days. Although the combined effect is always small it is conceivable that it may some time give rise to international complications where boundaries are defined by latitude alone.

There are two questions which at once arise in one's mind. One is, what is the source of the disturbance, and the other, how it happens that the larger period differs so much from that given by theory.

Any change of material on the surface or in the interior of the earth will cause a change in the axis of rotation.

Large masses are shifted by atmospheric currents, the flow of rivers, the deposit of snow, etc., but these causes very nearly balance each other, and even if they did not, the masses involved in them are so small compared to that of the whole earth that the results would be quite inappreciable. At present the cause of the variation of latitude is not certainly known. Much less is there any assignable cause for such large variations in latitude as some have imagined in attempting to explain the marked changes in climate which different parts of the earth have undergone. The researches of Darwin and Schiaparelli have shown conclusively the incompetency of such a theory.

The second question has been given a reasonable answer by Professor Newcomb and others. As has been stated, the 305-day period is found under the hypothesis that the earth is perfectly rigid. The thought that a nearly rigid body would behave sensibly as a perfectly rigid one is suggested by our experience with very small bodies. The leverage for strain increases so much faster than the resisting power, as the size increases, that matters are quite altered in large bodies like the earth. A glass marble will lie on a rigid support and preserve its shape almost perfectly; but if it were a few miles in diameter, it would flow out at the bottom like a viscous mass. Newcomb made a test of the effect of a lack of rigidity on the period of wabbling by assuming that the earth has the rigidity of steel. His computation showed that if this hypothesis were true, the period would be 443 days, somewhat greater than that observed. Consequently the actual effective rigidity must lie between perfect rigidity and that of steel, or *the period of variation of latitude shows that the earth is on the average a little more rigid than steel.* It should be added that a number of other tests, such as certain tidal phenomena and the transmission of earthquake waves, lead to the same conclusions. Here Dynamics and Astronomy unite in giving the geologist precious results respecting the condition of the interior of the earth which his own methods seem powerless ever to reach.

(*To be concluded in the May issue.*)

TRANSPORTATION*

PART II

BY JOHN THOM HOLDSWORTH

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CONTEST BETWEEN CANAL AND RAILWAY

"IN no country has there been a longer or more severe struggle between canals and railroads than in the United States. . . . In no country have railroads and canals been afforded equally free scope for development, and in no country have transportation rates been cut so fine and reduced so low." † At the outset, however, this struggle

* Continued from THE JOURNAL OF GEOGRAPHY, Vol. III, No. 3, March, 1904, page 120.

† Jeans, p. 192.

was waged under very unequal conditions. Up to 1851, the railroads were greatly handicapped by having to pay canal tolls on their tonnage, and, in some instances, being prohibited from carrying freight. "The State authorities looked upon the canals as a trust confided to their keeping, and protected them against the railroads."* With the repeal of these discriminating laws in 1851, railroads developed rapidly. In 1857, the total traffic of the canals declined 772,000 tons, while at the same time railroad traffic had a large increase. The railroads not only offered much more rapid transportation, but also very low rates, and entered into arrangements with steamers on the lakes and rivers to divert freight from the canals over their roads. Hadley says of this

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FIG. 5. *Traveling along the Erie Canal.*
The passage is only wide enough for the passage of canal boats, and the canal is not deep enough for large boats.

contest: "From 1853 to 1859 there was a fight for supremacy between canal and railroad. For twelve years more there was a contest for profits. Then it became a question whether the canal could pay expenses of maintenance; a question which was finally decided in the negative." †

At present only three States—New York, Ohio, and Illinois—own or give aid to canals. (See Figs. 5 and 13.) All the others have leased, sold, or abandoned these waterways which have been unable to meet the competition of the railroads. (See Map IV, page 153.)

A statement is appended showing the cost and date of construction, length, number of locks, and navigable depth of the principal canals of this country used for commercial purposes.‡ (See Map IV, page 153.)

* Jeans, p. 197.
† Hadley, p. 30.
‡ World Almanac, 1903.

CANALS.	Cost of Construction.	When Completed.	Length Miles.	No. of Locks.	Depth. Feet.	LOCATION.
Albemarle & Chesapeake	$1,641,363	1860	44	1	7½	Norfolk, Va., to Currituck Sound, N. C.
Augusta	1,500,000	1847	9	...	11	Savannah R., Ga., to Augusta, Ga.
Black River	3,581,194	1849	35	109	4	Rome, N. Y., to Lyons Falls, N. Y.
Cayuga & Seneca	2,232,632	1839	25	11	7	Montezuma, N. Y., to Cayuga & Seneca L.
Champlain	4,044,000	1822	81	32	6	Whitehall, N. Y., to West Troy, N. Y.
Chesapeake & Delaware	3,730,230	1829	14	3	9	Chesapeake City, Md., to Del. City, Del.
Chesapeake & Ohio	11,290,327	1850	184	73	6	Cumberland, Md., to Washington, D. C.
Companys	90,000	1847	22	1	6	Miss. River to Bayou Black, La.
Delaware & Raritan	4,888,749	1838	66	14	7	New Brunswick, N. J., to Trenton, N. J.
Delaware Division	2,433,350	1830	60	33	6	Easton, Pa., to Bristol, Pa.
Des Moines Rapids	4,582,009	1877	7½	3	5	At Des Moines Rapids, Mississippi Riv.
Dismal Swamp	2,800,000	1822	22	7	6	Connects Chesapeake Bay with Albemarle S.
Erie	52,540,800	1826	387	72	7	Albany, N. Y., to Buffalo, N. Y.
Fairfield			4½	None		Alligator R. to Lake Mattimuskeet, N. C.
Galveston & Brazos	340,000	1851	38		3½	Galveston, Tex., to Brazos River, Tex.
Hocking	975,481	1843	42	26	4	Carroll, O., to Nelsonville, O.
Illinois & Michigan	7,357,787	1848	102	15	6	Chicago, Ill., to La Salle, Ill.
Illinois & Mississippi	568,643	1895	4½	3	7	Around lower rapids of Rock R. con. with Miss.
Lehigh Coal & Navigation Co.	4,455,000	1821	108	57	6	Coalport, Pa., to Easton, Pa.
Louisville & Portland	5,578,631	1873	2½	2		At Falls of Ohio R., Louisville, Ky.
Miami & Erie	8,062,680	1835	274	93	5½	Cincinnati, O., to Toledo, O.
Morris	6,000,000	1836	103	33	5	Easton, Pa., to Jersey City, N. J.
Muscle Shoals & Elk R. Shoals	3,156,919	1889	16	11	6	Big Muscle Shoals to Elk R. Shoals, Tenn.
Newberne & Beaufort			3	None		Clubfoot Creek to Harlow Creek, N. C.
Ogeechee	407,810	1840	16	5	3	Savannah R., Ga., to Ogeechee River, Ga.
Ohio	4,695,204	1835	317	150	4	Cleveland, O., to Portsmouth, O.
Oswego	5,239,526	1828	38	18	7	Oswego, N. Y., to Syracuse, N. Y.

MAP IV. A MAP SHOWING THE CANALS IN USE AND ABANDONED IN THE NORTHERN UNITED STATES.

Based by permission, on a map from Tilden & Clark's Geography of Commerce, published by B. H. Sanborn & Co., Boston.

CANALS	Cost of Construction.	When Completed.	Length Miles.	No. of Locks.	Depth, Feet.	LOCATION.
Pennsylvania	$7,731,750	1839	193	71	6	Columbia, Northumberland, W-B. Huntingdon.
Portage Lake & L. Superior	528,892	1873	25	None	15	From Keweenaw Bay to Lake Superior.
Port Arthur		1899	7		26	Port Arthur, Tex., to Gulf of Mexico.
Santa Fe	70,000	1880	10		5	Waldo, Fla., to Melrose, Fla.
Sault Ste. Marie	4,000,000	1895	3	1	18	Connects Lakes Superior and Huron at St. M. River.
Schuylkill Navigation Co.	12,461,600	1826	108	71	6½	Mill Creek, Pa., to Philadelphia, Pa.
Sturgeon's Bay & L. Michigan	99,661	1881	1¼	None	15	Between Green Bay and Lake Michigan.
St. Mary's Falls	7,909,667	1896	1¾	1	21	Connects Lakes Superior & Huron at Sault Ste. Marie.
Susquehanna & Tidewater	4,931,345	1840	45	32	5½	Columbia, Pa., to Havre de Grace, Md.
Walhonding	607,269	1843	25	11	4	Rochester, O., to Roscoe, O.
Welland	23,796,353		26	55	14	Connects Lake Ontario and Lake Erie.

Despite the abandonment of many lines of State and private canals, the interest and faith in canal transportation, properly adapted to modern conditions, has not died out by any means. "Canals as they were a century ago have no longer any function to fulfill that is worthy of serious consideration. Their mission is ended, their use is an anachronism. The canal of the future must be adapted to the new conditions of commerce." Chief interest continues to center about the Erie Canal, connecting New York with the steadily increasing trade of the Great Lakes, in grain, ore, timber, animal products, coal, etc. (See Figs. 5 and 6.) These bulkier raw products, which originate largely in the States drained by the Great Lakes system, are shipped to the foot of navigation at Buffalo. Thence they are transported by barges through the 387 miles of the Erie Canal to Albany, and down the broad Hudson to the docks of New York. The competition of the railways, however, has gradually overshadowed the canal, and now it retains only a very small part of the traffic between the lakes and the seaboard.

The canal has brought such inestimable benefits to the State of New York, and especially to the cities of New York and Buffalo, that many plans have been projected to improve it so as to meet the demands of modern traffic. As completed in 1825 it was 40 feet wide on the surface, 20 feet at the bottom, and 4 feet deep. Enlargements were made from 1836 to 1862 so that the dimensions were: Surface width, 70 feet; bottom width, 56 feet; depth, 7 feet. This canal, improved but little since, accommodated boats 98 feet long, 17½ feet beam, drawing 6 feet of water, and having a cargo capacity of about 250 tons. In 1895, the legislature voted $9,000,000 for deepening the Erie, Champlain, and Oswego canals, but this sum proved quite inadequate.

For many years there has been an earnest agitation for a deep-sea waterway, large enough to carry ocean-going vessels, from the lakes to the Hudson. Two surveys have actually been made: the St. Lawrence-Champlain route, suggested by the Cleveland Commission of 1896, and the Oswego route, approved by the Raymond-Noble-Wisner Commission appointed by President McKinley. The first route would require a canal from Tonawanda, near Buffalo, to Olcott on Lake Ontario, thence down the St. Lawrence to a point opposite Montreal. From here a canal would cross to the Richelieu River, thus giving connection with Lake Champlain, which in turn is connected by the Champlain Canal with the Hudson. The Oswego route would follow a canal from near Buffalo to Olcott, then by Lake Ontario to Oswego, where it would turn inland along Oneida Lake and the Mohawk River to Cohoes

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FIG. 6. *Canal boats from the Erie Canal being towed to steamers in New York Harbor for the transshipment of their cargoes.*

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FIG. 7. *Canal boats about to enter the locks. A canal very frequently runs alongside a river. Here a dam has been built across the river in order to supply the canal with water.*

on the Hudson. This latter route, besides being 244 miles shorter than the Champlain route, has the advantage of being entirely within the American line.

The latest project to find favor, however, is the barge canal recommended by the expert Committee on Canals appointed by Governor Roosevelt. A bill embodying the recommendations of this Commission recently passed the New York Legislature, and in November last the voters of the State agreed to make the proposed improvements at a cost of $101,000,000. The bill provides for the enlarging and rebuilding of the Erie and Oswego canals to carry boats 150 feet long, 25 feet wide, and 10 feet draft, with a cargo capacity of 1,000 tons each. The Champlain Canal is to accommodate boats of 250 tons. The proposed new canal over the old Erie route is to follow the present canal for about two-thirds of the distance. It will be fit for use by steamers of 900 tons capacity towing two barges of 1,000 tons each. It is estimated that these barges, capable of carrying 33,333 bushels of wheat each, could do a profitable business at eight-tenths of a cent per bushel from Buffalo to New York.

With the enormous development of traffic in the new raw products of the Mississippi Valley, the demand for an inland waterway connecting the Great Lakes with the Mississippi has become more urgent. The marvelous growth of the port of New Orleans in recent years shows how the trade of the great valley has increased, and the construction by the United States of the Isthmian Canal will undoubtedly greatly augment the volume of river tonnage. President Madison urged the great need of a ship canal connecting Lake Michigan and the Mississippi so that light-draft war vessels could reach the great inland seas in case of war with Canada. When repeated attempts to secure the aid of the Federal Government had failed, the city of Chicago, unaided, undertook to build a connecting waterway, which, however, was to answer sanitary rather than military or commercial needs. Work on the Sanitary and Ship Canal was begun September 3, 1892, and completed January 2, 1900. It connects Lake Michigan at Chicago with the Illinois River at Lockport, a distance of thirty-four miles. "The canal was cut for the purpose of giving to the city of Chicago proper drainage facilities by reversing the movement of water which formerly flowed into Lake Michigan through the Chicago River, and turning a current from Lake Michigan through the Chicago River to the Illinois River at Lockport, and thence down the Illinois River to the Mississippi. The minimum depth of the canal is 22 feet; its width at bottom, 160 feet; and the width at the top from 162 to 290 feet." (See frontispiece, facing page 145.) The channel discharges 360,000 cubic feet per minute, which capacity can be largely increased. The total cost of this greatest feat of sanitary engineering in the world was $34,000,000. It is expected that Congress will make it a commercial highway by deepening the Illinois and Mississippi rivers to fourteen feet and constructing locks for fleets of barges from Lockport, the terminus of the drainage canal, to St. Louis.

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FIG. 8. *Shipping wharf on the Mississippi River Levee at New Orleans.*
If a ship canal were built connecting the Great Lakes with the Mississippi River, the value of New Orleans as a shipping port for the Mississippi Valley States would be vastly increased.

PROPOSED CANALS

In the last few years Congress has been deluged with memorials pleading for ship-canal connections. Philadelphia has long urged the necessity of a canal across New Jersey to New York harbor; Baltimore demands a passage across Delaware; Pittsburg seeks a ship canal from the Allegheny River to Lake Erie, and Cincinnati demands a similar channel to Toledo; Chicago urges the completion of a 22-foot waterway to St. Louis, and, also, a canal west to the Mississippi; and Minneapolis expects to get a ship canal to Duluth.

CANADA'S WATERWAYS

Relatively to her trade and population, Canada has one of the most extensive and perfect systems of canal communication in the world. Inasmuch as the principal articles of her trade are raw products, she has carefully developed cheap water transportation, using as a basis the great drainage system of the Great Lakes-St. Lawrence. Canada has spent on her canals $12 per head as against our 15 cents, and has under consideration yet larger canal projections. Canadian vessels (and by the Washington treaty of 1870, American vessels also) now have a 14-foot waterway from the head of Lake Superior to tide water, a distance of over 2,000 miles. Some boats loaded at Chicago have actually made the passage through the Canadian canal system to England without breaking bulk.

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Fig. 9. *Congested transportation.*
This fleet of lake carriers is tied up at Sault Ste. Marie because of a blockade caused by heavy traffic in the canal.

FIG. 10. *Modern Lake and Canal Transportation.*
A whaleback freighter passing through the "Soo" locks in the Sault Ste. Marie canal between Lake Superior and Lake Huron.

The important canals of the Dominion are as follows:*

I. The through route between Montreal and the head of Lake Superior.
   1. Lachine, 8½ miles, extending from Montreal to Lachine, overcoming the St. Louis rapids.
   2. Soulanges, 14 miles, extending from Cascade Point to Coteau Landing, overcoming several rapids.
   3. Cornwall, 11 miles, from Cornwall to Dickenson's Landing, past the Long Sault Rapids.
   4. Williamsburg Canals (the Farrans Point, Rapide Plat, and Galops canals) 112 miles.
   5. Murray, 5 miles, extending through the Isthmus of Murray between the Bay of Quinte and Lake Ontario, thus enabling vessels to avoid the open-lake navigation.
   6. Welland, 26¾ miles, connecting Lakes Ontario and Erie, and avoiding Niagara Falls. This canal was constructed in 1833, enlarged in 1871, and again in 1900. It has 25 locks, with a total rise of 327 feet, and cost $25,000,000.
   7. Sault Ste. Marie, 1⅛ miles, through St. Mary's Island on the north side of the rapids in the St. Mary River, and connecting Lakes Huron and Superior.

II. Ottawa River canals, avoiding rapids between Ottawa and Montreal.

* Report Canadian Department of Railways and Canals, 1900.

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FIG. 11. *Port Said.*

The northern entrance to the Suez Canal. At this port all vessels passing through the canal pay toll.

III. Rideau, 126 miles, connecting Ottawa on the River Ottawa with Kingston at the eastern end of Lake Ontario.

IV. The Trent extends from Trenton on the Bay of Quinte, Lake Ontario, through a chain of lakes and rivers to Lake Huron. As yet there is not a connected system of navigation.

V. The Richelieu & Lake Champlain commences at Sorel, at the confluence of the St. Lawrence and the Richelieu, 46 miles below Montreal, extends along the river Richelieu, through the Chambly Canal to St. Johns, thence down the Richelieu to Lake Champlain. It is eighty-one miles from Sorel to the boundary line.

VI. St. Peters connects St. Peters Bay on the southern side of Cape Breton with Bras d'Or Lake.

Canada's total expenditure on her canals up to June 30, 1900, amounted to $95,317,000. Still other canal projects are contemplated, notably the Montreal, Ottawa, and Georgian Bay Canal, intended to divert the trade of the Lakes to Montreal. When completed it will bring Duluth and Chicago 500 miles nearer to Montreal, and will afford a direct, air-line route to Liverpool, saving 1,000 miles over the route via New York. Much interest has been shown, too, in the project to connect Winnipeg, in the center of the great Manitoba wheat fields, with the Great Lakes by a ship canal. That Canada realizes the great importance of her chief water route is shown by the agitation to deepen the Lakes-St. Lawrence channel to eighteen feet throughout.

GREAT SHIP CANALS OF THE WORLD

The artificial waterways of the world, properly termed ship canals, are: *

1. Suez Canal, begun 1859, completed 1869. In its present form the canal cost about $100,000,000. It is without locks, being at the sea level throughout the 90 miles of its length. Passage through the canal averages about 18 hours. The tolls are 9 francs per ton net register (Danube measurement), which is a little more than $2 per ton U. S. measurement. In 1900, 3,441 vessels with a gross tonnage of 13,699,237 tons passed through the canal.
2. Kronstadt & St. Petersburg Canal, begun 1877, completed 1890. This canal extends from Kronstadt on the Gulf of Finland to St. Petersburg, a distance of 16 miles, though the canal proper is only 6 miles long. It has a navigable depth of 20½ feet, and represents a total cost of $10,000,000.
3. Corinth Canal was begun 1859 and completed 1893. It connects the Gulf of Corinth with the Gulf of Ægina, and is about 4 miles long. It has a depth of 26¼ feet, and cost about $5,000,000. The average tolls are 18 cents per ton and 20 cents per passenger. Like the Suez and Kronstadt canals, it has no locks.
4. Manchester Ship Canal connecting Manchester with the Mersey River, Liverpool, and the Atlantic Ocean, was opened January 1, 1894. The canal is 35½ miles long, and cost $75,000,000.

* Great Canals of the World, Bureau of Statistics, Monthly Summary, May, 1902.

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FIG. 12. *The Suez Canal at the entrance to Lake Timsah. The canal is 150 feet wide the whole distance.*

5. Kaiser Wilhelm or Kiel Canal, begun in 1887, completed 1895. This canal, 61 miles long, and 29½ feet deep, connects the North Sea with the Baltic at Kiel. The total cost was about $40,000,000.
6. Elbe & Trave Canal, opened in 1900, connects the North Sea and the Elbe River with Lubeck on the Baltic. It is 41 miles long, has a depth of 10 feet, and cost $5,831,000, of which Lubeck contributed over $4,000,000.

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FIG. 13. *A street canal in Amsterdam.*
Much of the commerce of the city is carried on by the use of these numerous canals.

OTHER IMPORTANT CANALS

In addition to the above great ship canals, there are a number of important waterways worthy of notice:

1. North Holland Canal, cut in 1845 from Amsterdam to Helder. It is 51 miles long, 20 feet deep, 125 feet wide at the surface, and carries vessels of 1,300 tons. The great prosperity of Amsterdam in recent years is largely due to this canal.
2. The Caledonian Canal runs through the north of Scotland, and connects the Atlantic Ocean and the North Sea. The canal proper is 250 miles long, 117 feet deep, 126 feet wide at the surface, and cost about $7,000,000.
3. The Canal du Midi, cut through France from Toulouse on the Garonne River to Cette on the Mediterranean, is 150 miles long, 6½ feet deep, 60 feet wide, has 114 locks, and at its highest point is 600 feet above sea level. It cost $3,500,000, and will carry boats of 100 tons.

(*To be continued.*)

THE COURSE IN GEOGRAPHY IN THE STATE NORMAL SCHOOL AT SALEM, MASS.

BY WILLIAM CHARLES MOORE

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THE State Normal School at Salem, Massachusetts, is most favorably situated in a locality rich in geographical illustrations. Looking northward from the windows of the school building the principal industrial features of a moderate sized city, including a cotton mill, shoe factories, and a tannery, are easily identified. Towards the northeast is the harbor from which in times past the vessels of Salem sailed to all parts of the globe. (See Fig. 1.) Towards the west can be seen the line of railroad by which the city is connected with the chief center of trade in New England, and in this direction also is a large freight yard in which cars of all the principal railways of the Eastern United States are to be found. Looking in a southerly direction the eye is pleased and rested by fresh green meadows through which the tidal creeks reach out their glittering arms. Here also are fertile vegetable gardens, fields of waving corn, smoothly graded knolls, and, in the distance, numerous ranges of irregular rock hills spiked with dark green cedar trees. (See Fig. 2.) In one direction, therefore, are the agricultural and pastoral conditions typical of a rural community, and in the other the important industrial and commercial features of city life.

The organization of the normal school provides a two years' course for the professional training of teachers, and a system of elementary schools which serve as the basis for the observation and practice-work of the normal school students. The work of the elementary department plans to prepare the children for admission to the high school in eight years.

The course of geography in the normal school proper consists largely in the observation and discussion of the methods of teaching pursued with elementary pupils. The outline of work actually performed by the classes of children is made the basis of these recitations and discussions. The instructor in charge of this department finds a very profitable part of his duty in supervising and teaching the lessons in geography in the elementary school. One marked result of this intimate and actual contact with the children is the unity which exists between the theoretical work of the normal school class room and what is actually accomplished with the elementary pupils.

Perhaps another result is that some of the things which find an honored place in many of the geography outlines have been discarded in favor of a simpler, more rational, and less formal treatment. The study of geography in the elementary school is suffering from the severely logical method of teaching into which the work has been thrown by educators who have had little or no actual experience with children.

The regular work in geography with the children begins in our school with the third grade, that is, with the pupils who have attended school for three years, and continues through the eighth or last grade. During the first and second years of school life the nature study and language lessons have been creating a certain fund of experience which contributes more or less directly to the work in geography. During the third year this information is gathered together and additional experience created in the study of the surface features, occupations, people, map reading, simple weather phenomena, and productions.

This introductory treatment is of course very simple. It is intended as a preparation for the more careful study of these topics which comes in the next year. In that year, the fourth, the work with local surface features is followed closely by a study of distant areas which are similar in type to the local forms or which contribute more or less directly toward supplying the materials needed by the children for food, clothing, and shelter.

The study of the local surface features begun in the third year and continued throughout the fourth year is based upon the usefulness of the hills, valleys, and plains to the people of this community in affording suitable building sites, in determining the location of streets, roads, and railways, in furnishing a food supply, and in giving beauty and variety to the landscape.

The physiographical aspect of the hills, valleys, and plains, although not ignored, is not made the starting point. For example, within easy reach of the school building are various illustrations of rock hills and gravel hills. But the study of hills as individual things, separate from any obvious relation to the life of the community, is not of geographical importance. Instead, therefore, of selecting types from the unsettled district to the south and west where, although numerous hills of both kinds are to be found, few of them are conspicuous for their usefulness, we turn towards the settled area, for it is here that the surface features are in a more intimate relation to the daily life of the people.

The gravel hills within the settled portion of the town have streets laid out upon their surfaces, the approaches to their summits are in

most cases easy, and the sides and tops of the hills are well built upon. The nearby rock hills, on the contrary, are not laid out in building lots, there are few houses upon them, and the area is used for little more than pasture land. Some of the hills, therefore, afford desirable building sites, and some do not. These facts are easily within the everyday experience of the pupils and may be considered also as coming within the range of their natural interests.

The explanation of these facts leads in a very simple way to a recognition of the difference in structure between rock hills and gravel hills. The pupil soon discovers that in every case the hills that are not occupied by buildings are of solid rock. The reason is that the blasting and excavating necessary for the construction of cellars adds considerably to the cost of building. Further, the laying out of streets upon the rock hills is almost prohibited by the steepness and irregularity of their slopes. The hills that are well built upon are found by the pupils to be composed of gravel and sand. This loose material offers little resistance to the pick and shovel. As a result streets are laid out without much difficulty and the erection of houses is encouraged.

The control which the surface features have exerted in determining ordinary lines of travel is well illustrated in the location of Lafayette Street, the main thoroughfare. Although in the beginning it was simply a rough country road from Salem to Marblehead, the fact nevertheless remains that throughout its entire length it avoids both the highest and lowest parts of the land. Thus the steep grades of the hills as well as the marshy lowlands, which at times must have been quite impassable, are both avoided. The influence of the topography upon the location of other streets is also easily seen.

To the south of the school building in the agricultural area before referred to there is good opportunity to study the usefulness of the surface features in providing a supply of food. Here upon the flat stretches and gentle slopes where the loam is fine and dark are the vegetable gardens; on the lowlands, where the soil is too wet for planting, the rich green grass gives promise of an abundant hay crop; and upon the southern slopes of the gravel hills are fields of waving corn. The rock hills with their steep sides and their gravelly soil offer little encouragement to cultivation and are therefore used only for grazing.

This brief description indicates the kind of work which receives emphasis in the study of local surface features. Whenever it is possible to do so without making the instruction stiff and formal the attention of the pupils is directed to the effect of the diversity of the surface

the meadows.

features in giving beauty and variety to the landscape. It is impossible to indicate, within the limits of this article, the numberless details in the study of the home geography which the very favorable situation of the school building makes not only possible but easy. Let me emphasize the fact that the study of the locality does not stop with simply observing and describing the characteristics of the hills, valleys, and plains, although this in itself would be a very commendable aim; it includes a recognition and emphasis of those relations of the local geographical features to the life of the people of this community which help to explain the control which distant geographical features exert upon the distribution of the world's population.

The knowledge of the position and characteristics of the natural and artificial surface features of the neighborhood gained in this study of the local geography is a very important basis for the first work in map reading. In developing this line of thought the children have the advantage of a very carefully constructed model of the locality surrounding the school building. This model is fashioned in putty. Its horizontal scale is thirty-four inches to the mile, and its vertical scale is one inch to forty-five feet. Upon it the hills, valleys, plains, coast line, harbor and mill pond, streets and railways are shown. It is not used, however until after some familiarity with the various natural and artificial surface features has been gained. Then the pupil is led to make a close association between the actual features of the locality and their representations upon the model, and the study of surface features goes hand in hand with the study of the local maps. The details of this work can not be included in this description.

We have found, by the way, that the almost universal device recommended to teachers of having the pupils develop logically the map of the neighborhood step by step from the plan of the pupils' desks is *not* a good way to teach young children what drawing to a scale means. In the first place the careful work required for good results is not interesting to children of that age; in the next place, the results, even after considerable effort on the part of the teacher to give the work an acquired interest to the pupils, are slovenly and unsatisfactory. Finally, it can be said, the work is wholly unnecessary, for the pupils from the kindergarten upward, in their clay modeling and outline drawing, have been making use of the principles involved in representation to scale. All that is really necessary at this time is to show the children, by means of photographs of themselves, of the teacher, and of scenery with which they are familiar, the necessity for making the features that are smaller than the others in nature the smaller parts in the representation, and that each part in the picture or model is made the proper size to look right.

Following the work with the model of the neighborhood and closely associated with it and with the features out of doors comes a slope-line map of the same scale. The slope lines are lines which indicate the paths which running water would take in flowing down the hills. The work with this map, therefore, is very closely associated with the study of local drainage.

A contour map of the home locality with a vertical interval of seven feet comes next in the study of map reading, and prepares the way for a very intelligent appreciation of the Salem sheet published by the United States Geological Survey. It also leads directly to an interpretation of wall maps like the Sydow-Habenicht.

The work with the series of local maps is found to be an exceedingly important and valuable part of the course in geography. There are many interesting details connected with the development of this topic with the children which must be omitted from this article for want of space. "Without maps true geography teaching is impossible," but *with* maps like those used in this school the work takes on a concrete character which gives an interest and reality to the lessons that is most gratifying.

The study of distant surface features implies considerable progress in the reading of maps. The successful interpretation of the map symbols, however, will depend upon the thoroughness with which the study of the home locality has been pursued in connection with the local map. The use of pictures and the ability to form good mental images from verbal descriptions are also indispensable.

The plan by which the pupils in this school are led to an understanding of maps of distant places through a study of local maps has already been outlined in part. The steps have been so natural and easy that when the map of North America is reached the pupil recognizes at once the meaning of most of the conventional symbols. Just as soon as these have been named, suitable pictures of important features are shown. These pictures help the process of visualization by giving life and reality to the places represented upon the map. A picture of the Arctic coast line, one of the tropical shores of Central America, others of the coast lines of New England, New Jersey, Florida, California, and Alaska; views of the Rocky Mountains, the great plains, the prairies, the tundras, and of the Mississippi and other rivers—

all of these are recognized, described, and associated with the particular area upon the map or with the appropriate symbol.

The study of the map (Sydow-Habenicht) illustrated by pictures and supplemented by verbal descriptions is made from this time on the basis of every geography lesson. Those distant surface features which are intimately connected with the lives of the people in this locality are studied first. The pupils recall the various needs in their own climate, and some of the more important commodities of life are traced back to their region of production. Then pictures which illustrate the conditions under which these things are grown or raised are used. The significant things in the picture—the character of surface, kind of soil, climatic conditions, productions, and people—are looked for and emphasized.

The wheat fields, grazing sections, garden farms, fruit districts, lumber regions, cotton and sugar plantations, and the mining and manufacturing centers of North America in particular and the world in general are recognized and studied as the work progresses. The control which relief, climate, and soils exert over natural productions is continually kept before the pupils, and frequent reference is made to the local conditions which illustrate these relations.

The study of these industrial regions leads almost immediately to the recognition of the physiographic types—prairies, coastal plains, flood plains, delta plains, tundras, mountainous regions and coastal forms, and the relation of the rivers to these surfaces features.

The topics, weather, climate, and natural productions receive due attention in the work of the third and fourth years. The aim in the study of the weather is to secure definiteness in the observation of characteristic phenomena, and to acquire the experience necessary for a rational understanding of climatic conditions. Instead of a formal record kept day after day the teacher is expected to take advantage of the opportunities as they occur for studying typical conditions.

The study of natural productions—plants, animals, and minerals—is closely related to the so-called nature work. The geographical aspect of the study of the organic side of nature consists largely in picturing and describing the plants and animals in their relation to the climatic conditions and physical features. This work, like the study of *People*, can be done most intelligently, not as a separate topic, but in connection with the work on relief, drainage, and coastal forms.

A summary of the work which is attempted in the fourth year, of which the above is only a partial and very brief description, is as follows:

Relief, Drainage, and Coastal Forms.
- Local surface features studied in detail.
  - School buildings, dwellings, factories, streets, in relation to general surface features.
  - Hills, valleys, plains, and coastal forms of the neighborhood.
  - Surface drainage in relation to hills, valleys, and plains.
  - Distant portions of landscape seen from schoolroom windows.
  - Usefulness and beauty of forms of land and water.
- Distant surface features studied in their relation to life.
  - Plains: prairies, coastal plains, western plains, tundras, pampas, llanos, selvas, steppes, etc.
  - Mountains: Appalachian and Rocky Mountain highlands; Andes, Alps, Himalayas.
  - Rivers and valleys: Mississippi, St. Lawrence, Columbia, Mackenzie, Yukon, Colorado, Hudson, Ganges, Indus, Yang-tse, Nile, etc.
  - Coastal forms: irregular coast lines, harbors; regular shore lines. Rocky, sandy, and marshy coasts.

Map Reading.
- Position: distance, cardinal directions.
- Local maps: model, slope line and contour maps; Salem sheet.
- Maps of distant places: wall maps, globes.

Natural Phenomena.
- Forms of water: Atmosphere. Observations of sun, moon, stars.

Climate.
- Weather observations at characteristic times; distant climatic conditions.

Productions.
- Minerals.
- Plants and animals.

People.
- Races: life and surroundings of people recognized in study of distant surface features.
- Occupations: industrial conditions of home locality and distant places.
- Commerce: inland and maritime trade of Salem.

The pupil at the end of the fourth year of school life has gained a fairly good knowledge of his own locality and considerable information concerning distant physical features, climate, and people.

During the next year, in the study of the earth as a whole, the aim is to give the world-wide views of these same geographical phenomena.

The larger features of relief, drainage, and coast line, already described to some extent as individual things are now recognized as a part of and in relation to the whole earth.

The various things considered are form and size of the earth, earth in space, rotation, land and water divisions, latitude and longitude. The relief, drainage, coast lines, climate, and productions of the world and the topic People.

The spherical form of the earth is not a new idea to the pupils, and the purpose at this time is to furnish some reasons for the belief. The usual proofs are presented and illustrated by means of objects, pictures, and diagrams, but the teaching does not stop with the apparatus. By means of the imagination, with the device out of sight, the facts are applied to the earth itself.

To picture the earth in space is a difficult thing, even for adults, and it ought not to be attempted by children without previous observation of the moon. Some basis for imagining the earth in space may also be obtained by looking at pictures representing the earth seen along distance away, and if the mental image which the pupils acquire is nothing more than the memory of a good picture interpreted in terms of their observation upon the moon, the teaching need not be counted a failure.

The rotation of the earth is also something which requires a well-trained imagination to perceive. Usually the teaching of this topic amounts to nothing more than a mere juggling with objects. The geographical phases of rotation, however, include not much more than a study of day and night, and since the alternation of light and darkness is something within the experience of every child this is therefore made the starting point in teaching rotation.

The pupils describe the apparent movement of the sun from morning until evening. They think also of the possible path during our night. They are then told what people at one time believed and what the facts really are. Then comes the work with objects, not with a candle or lamp, but with a sphere held in the sunlight. This objective demonstration is followed by the application of these facts and relations to the earth itself. The details of these lessons have been carefully worked out, but space forbids more than this brief mention.

Small hand globes are supplied each pupil, and are constantly used in the naming and description of the divisions of the earth's surface into land and water, continents and oceans, and hemispheres. Pictures of mountains, plains, deserts, coast line, Arctic scenery, and tropical vegetation are associated with particular areas and appropriate symbols upon the globe.

The primary highlands of the world, the lowlands and basins, the relation of drainage to highlands, lowlands, and basins are studied in the order named. New facts are not so much in evidence at this time, although of course no opportunity is lost to broaden and clarify the pupils' knowledge. The work has the character of a summary in which the aim is to see the world features in their relation to each other and to the whole.

The study of the climate of the world—heat belts, winds, and rainfall—is one of the most important and perhaps most difficult parts of the work of the fifth grade. The successful presentation of this topic requires very careful teaching. The writer was, moreover, inclined to believe at first that even under very favorable conditions the work might prove too difficult for the children, but actual experience has proved this not to be the case. Indeed, in the succeeding grades we find that the facts and their simple explanations which have been taught at this time constitute a very reliable part of the children's geographical information.

It is impossible to describe within the limits of this article the numerous concrete illustrations which are brought in to teach the fundamental facts about climate, nor to dwell upon the use which is made of pictures and stories in giving life and meaning to verbal statements. It must be remembered that the work here outlined depends very much for its success upon the previous preparation of the pupils, and upon the closeness and unity with which the work has been organized.

The line of thought is in general as follows: The location upon the globe of the warmest parts of the earth, the coldest parts, and the places of intermediate temperature. This is review. Then comes the explanation of these conditions by recalling the observations which the pupils have made upon the relation between the inclination of the sun's rays and the morning, evening, and noontime temperatures, and also the relation between the sun's meridian altitude and the seasonal variations in temperature. The importance of these observations in explaining fundamental differences in temperature upon the earth's surface is shown by means of a slated globe and a cardboard ring with parallel lines drawn upon it to represent the sun's rays.

The distribution of temperature upon the earth's surface as determined by latitude and as modified by the relation of land and water, is presented to the eye by means of a *heat belt* globe. Upon this globe the cold polar caps are shown in dark blue, the cool belts in light blue, the warm belts in green, and the hot belt in orange. This heat belt globe is referred to constantly in the subsequent study of continents and countries.

The study of winds and rainfall of the world is closely connected with the work on heat belts and is based upon previous observation and experimental work. Ocean currents are taught as an application of the effect of the planetary circulation of the atmosphere upon the ocean waters.

The topic, World Productions, offers an excellent opportunity for summarizing and relating a large part of the geographical information already acquired and for emphasizing the control which the surface features, temperature and moisture, exert upon the distribution of plants and animals. Further, a discussion of the importance of the products of the world in supplying man's needs, of the land and water routes by which the surplus productions are sent to different parts of the world, and of the location of the principal trade and transportation centers, is valuable in showing the relation of the earth to man.

The study of People is pursued in connection with every topic in geography. As a result the pupils acquire in the most natural and informal way considerable information concerning the habits, customs, and the degree of civilization of the different races. The aim at this time, towards the close of the fifth year of school life, is to recognize in a somewhat more logical way than before the distinctive characteristics of each race, and to note their original and present distribution upon the earth's surface. This work gives a good opportunity for recognizing the different states of society and for discussing, in a simple way, the progress of the human race from savagery through a condition of barbarism to civilization.

The work of the sixth and seventh grades is concerned with a study of each continent as a unit. The particular aims are to recognize the most important physiographic regions in each grand division, to describe the climate, and to trace the influence of relief, drainage, climate, and soils in determining the development of industrial and commercial conditions. The division of each continent among the nations of the earth, and the characteristic features of their different political institutions and habits of life, is now an important part of the work. The relation of distant people to ourselves in particular and to the rest of the world in general is, of course, kept constantly in mind.

The outline of the work of the sixth and seventh grades is given below:

The Continents.

- North America.
  - Position.
    - Hemispheres, relation to oceans and other continents, latitude and longitude.
  - General Description.
    - Outline.
    - Relief: highlands, lowlands.
    - Drainage: Atlantic, Pacific, Arctic, interior.
    - Coast line: regularities, irregularities, harbors.
    - Climate: heat belts, winds, rainfall.
    - Productions.
    - People.
  - Physiographic Regions.
    - Atlantic Coastal Plain.
      - Position in North America; direction and distance from home; relation to us in supplying needs.
      - Surface features; slope, soil, drainage; fall line; geographic history.
      - Climatic conditions; effect of proximity of ocean.
      - Productions in relation to surface features and climate.
      - Location of cities as centers of accumulation and distribution.
      - Routes of transportation—by rail, by water.
    - Gulf Coastal Plain.
      - Location.
      - Description; surface features, history, climate, agricultural products.
      - Leading cities and trade routes.
    - Northern Plain.
      - Location in North America; direction and distance from home; means of getting there.
      - Description; surface features, history, climate; comparison with Gulf plain.
      - Productions and occupations.
    - Prairies.
      - Location, extent, direction, and distance from home; relation to us in supplying needs.
      - Description: surface features, history, climate, agricultural products.

Commercial routes: Great Lakes, rivers, railroads.
Leading cities.
Great Plains.
Location, extent, relation to prairies.
Description; surface features, climate, industries.
Cities.
Rocky Mountain Highland.
Extent, general direction, principal ranges, and subdivisions.
Description and comparison of physical features, climate, drainage, and industries of Rocky Mountains, the Pacific ranges, Great Basin, Colorado and Columbia plateaus, Yukon region, and the highland of Mexico and Central America.
Appalachian Highland.
Extent, general direction, principal divisions.
Comparison with Rocky Mountain highland.
Description of physical features, climate, and drainage of the mountainous region and the Piedmont belt.
St. Lawrence Basin.
Countries.
Location, extent, comparison of relief, climate, soils.
United States.
Groups of States.
Description of each section.
Cities.
Canada and Newfoundland.
Political organization.
Industrial conditions.
Mexico, Central America, and West Indies.
South America.
Position (same as for North America).
General Description (same as for North America).
Physiographic regions.
Description of surface features and climate of Andes, Brazilian and Guiana highlands, the selvas, pampas, and llanos, the desert of Atacama, and the plain of Chile.
Plants, animals, and people in relation to surface features and climate.
Countries.
Location, extent, political organization.
Brazil.
Relation to physiographic features and climate.

Industrial conditions.
Cities and trade routes.
Similar plan for the other countries.

Observation Work (Carried on parallel with the study of *The Continents*)
Meteorological.
Prevailing winds of summer and winter.
Changes in weather caused by passage of storms.
Weather map.
Astronomical.
Sun; time and place of rising and setting, meridian altitude.
Moon; position and shape of young moon and changes throughout the month.
Planets; evening and morning stars, names of planets.
Stars; circumpolar constellations, other groups.
Local Geographical Features.
Weathering, formation of soils. Gutter streams.
Industrial conditions.

Continents (Continued).
Eurasia.
Position, Relative Size, Outline.
General Description (see North America).
Physiographic Regions.
Eurasian highland; principal mountain ranges, plateaus of Mongolia, Tibet, Iran, Asia Minor.
Northern lowland; tundras, forest plains, steppes.
Plains of Manchuria; China, Indo-China, India, and Mesopotamia.
Plateaus of Arabia and the Dekkan.
Plateaus and plains of Europe.
Countries of Eurasia.
Location, extent, political organization.
Industrial conditions.
Cities and trade routes.
Africa.
Position, size, shape, coast line.
Relief, climate, drainage.
Productions, people, countries.
Australia and the Island Groups.
Position, size, coast line.
Relief, climate, drainage.
Productions, people, government.

The work of the eighth year consists principally in a study of the life of the world in its geographical relations. The discussions depend to a great degree upon current events and cover matters of local interest and happenings of national and foreign importance. The work includes the recognition of the geographical significance of the particular event, a discussion of the conditions leading up to it or surrounding it, and a study of the people—their characteristics, government, territory, and international relations.

In addition to the study of the life of the world the work of the eighth year includes something of astronomical geography and physical geography.

The study of the earth in its astronomical relations consists in a review of the form, size, and rotation of the earth, latitude and longitude, and the presentation of the topic, Light Zones, with a discussion of the causes of change of seasons and variation in the length of day and night.

The topics in physical geography include a study of glacial phenomena, wave and river action, and soils. The character of the teaching throughout the previous grades has been such that the pupils have already gained considerable information about these phenomena and the aim at this time is to summarize and group the facts.

The outline of the eighth year's work is as follows:

- Life of the World in its Geographical Relations.
  - Current geographical events.
    - Local, New England, national, foreign.
    - Geographical conditions affecting the event.
    - People concerned; characteristics, government, territory, international relations; nations.
    - Man; races, distribution, advancement, government, religion.
    - Industries of the world; importance, development; commercial relations, trade routes.
    - Leading nations; relative importance, territorial possessions, characteristics of people, political institutions, industrial conditions, commercial relations.
- Astronomical Geography.
  - Form, size, rotation of the earth; latitude and longitude.
  - Revolution of the earth, light zones, change of seasons, length of day and night.
- Physical Geography.
  - Glacial phenomena; river and wave action; soils.

GEOGRAPHICAL NOTES

Plans for Home Geography Study.—The imagination must ever play an important part in all successful work in geography and the concrete material furnished by our home surroundings is largely that upon which we must rely for our correct images. The real things, the actual work and business that may be seen, the physical conditions about us, are first to be carefully and intelligently seen and then the imagination may build up a larger world of real things, activities, and physical conditions, all somewhat like and yet unlike those with which we are already familiar; but it must not be supposed that either children or adults have really observed many of those things that years have made familiar. Inaccurate, vague observation is neither knowledge nor a safe foundation for knowledge. The larger understanding of the world must begin by giving the children's observation very definite and conscious aim. Problems must be clearly conceived by the teacher and then definitely and plainly proposed before either interest or advantage can come from an attempt at their solution by the children. Irrelevant matter, however valuable in itself, should be mercilessly excluded from consideration; first, because it will confuse the children's thought; second, the one who is tolerated in this way is deceived into thinking he is contributing something valuable, and finally it tends to fix a vicious habit of illogical thinking, so ruinous to all effective work.

The knowledge which children may be fairly expected to gather through well-directed observations will, very naturally, group itself about the common foods and drinks, the fibers used for clothing, the building materials, and the fuels, with something about transportation. The children can easily bring to the schoolroom samples of most of the cereals, of coffee, of tea, of sugar, and, after they have been sufficiently studied, these samples can be placed in boxes or bottles of appropriate size and form, and in a very short time a most complete and useful cabinet will be formed. In a similar way can the children observe fruits, nuts, spices, and some of the more common special food preparations. The home, or the nearest grocery, will readily furnish specimens for study, and much more satisfactory work can be done studying specimens in the schoolroom than in the home or the grocery. A discussion of the common meats will lead to a knowledge of the kind of animal that furnishes each variety and some of the more marked characteristics in the life of these animals. Nothing should be sought because it is remarkable or strange; choose rather the familiar things in order the better to see their great values, and let the novelty of the discussion and observation come from the more accurate and broader knowledge that may be gained by properly considering those things which the children may have thought they knew quite thoroughly before. No more valuable lesson can be learned by the children than that of the necessity for accurate knowledge. The child that recognizes his weakness has taken the first step toward strength.

Let it never be forgotten that in carrying on this work a mass of loose, chaotic, half-knowledge which the children's experience has already furnished should now be corrected and made definite, and thus become a most valuable fund on which to draw in all future work.

A consideration of the important food products will very naturally lead to the further consideration of some of the most important matters required for their production; as soils, warmth, rainfall, methods of planting, cultivation, and harvesting. The further fact will come to the knowledge of the children that some of the foods are produced in our own country and some come from abroad, and we must consider how to present as clearly as possible the matter of location.

Probably no better way of teaching children the meaning of a map, including the idea of relief, has been devised than that of having them take a bird's-eye view of some section and then show them how to make a sketch map representing its main surface features. With this will necessarily be associated some definite measurement that shall constitute a scale. No such excursion should be undertaken until the teacher has previously taken it and knows just what can and should be seen, and has also instructed the children what is most important to look for. Mere going will not be seeing, nor will it necessarily furnish anything educative.

Some observation of small hills and valleys, of watersheds and surface drainage and erosion, in convenient nearness to the schoolhouse, should be made and will be understood. The value of surface cultivation in retaining moisture may be demonstrated by taking two boxes of the same size and filling them with the same kind of soil, then weighing them, and letting the surface of one be left untouched and that of the other be frequently stirred and kept well pulverized and both boxes be tested by weighing from time to time. Thus children can determine for themselves one of the main objects in the surface cultivation of various crops.

The textile fabrics lend themselves to schoolroom observation with great readiness. If requested, the children will bring samples of different kinds of cotton, of woolen, of linen, and of silk fabrics. These may be observed and compared and finally cut to a uniform size and pasted on cardboard of convenient size and laid away for future use. Almost always an inquiry will bring to the schoolroom the stalks of flax with the seed still on, stalks of cotton showing the fiber in the boll, always samples of wool, and sometimes of the silk cocoon. Flax and cotton seed may be planted and the plants observed during growth. Nearly every neighborhood can furnish a spinning-wheel, and a simple loom may be made or bought, and thus may be gained a very intelligent knowledge of the essentials in the great textile industries.

The building materials are always at hand and samples may be brought into the schoolroom. If there is a stone quarry near, visit it, after determining what it is desirable to see; the sight of a brickyard, a tile factory, or a limekiln will be very helpful, but the products of all these may always be had. One or more visits to a house in process of erection will be well. There is no excuse for not knowing at least a few of the trees that are specially valued for their lumber. Almost every neighborhood, prairie or woodland, has white pine, Norway pine, white oak, red oak, white elm, black walnut, and hickory trees, and these furnish a very large part of the world's lumber.

In studying a few of the more important processes in manufacturing, try to see but one simple thing at a time. How is coal made to produce steam? How is steam taken from a boiler to a steam cylinder and made to move a piston? How can a belt from the drive wheel on an engine be made to turn a line shaft in a factory? How can water turn a wheel? Each of these questions is fundamental in the manufacturing world, and each by itself is very simple, and a little observation by the children either singly or in groups, after the matter has been carefully talked over, will lead to a correct answer. Visiting a large manufacturing plant will not do it. In fact, such visits are of very small value to fourth or even fifth grade children.

Children can easily be led to see that each farmer spends quite an appreciable amount of time hauling his surplus products, milk, grain, live stock, to the most convenient shipping point. The amount of time and energy that this will require depends largely upon the condition of the roads, and children can understand that a well-rounded roadbed that has good surface drainage and a top finish of gravel or crushed stone is an economical investment of money. It is easily understood that to haul a ton of produce a mile, on even a good road, costs as much as it would to send the same material on a well-equipped railroad twenty miles, or by ocean steamer two hundred miles, and that on a poor road the expense is more than doubled, so that it not unfrequently happens that it costs a farmer more to haul his surplus product five miles from his home to the nearest railway station than it does to ship it from there to a market five hundred miles away, he, in the meantime, placidly continuing to drive through mud and "chuck" holes day after day, putting in his spare time complaining of "hard times" and the exorbitant freight rates charged him by railroads for taking his products to market. It is with the highways that we should begin to study the great problem of transportation.

It is frequently surprising that children have so large a fund of loose observation on the transportation problem. It simply needs to be made more definite and put into organized form. They will have observed wagons very differently arranged so as to be adapted to hauling different products, as gravel, coal, hay, corn in the ear, flour, unsacked wheat. They will have noticed railroad trains having cars adapted to carrying coal, loose grain, furniture, cattle, hogs, sheep, poultry, fruit, butter, mail, passengers asleep and passengers awake, passengers that are dining and passengers that are smoking. They may have noticed the springs under the passenger coaches, and may know something of the use of airbrakes and automatic couplings. Help the children to put this into the form of conscious knowledge by learning not only the use of each of the observed forms, but also to understand how each is adapted to its use.

If the work here outlined is successfully done, the children will have a very fair foundation for that larger knowledge which we hope to aid them in gaining. All places referred to should be located in direction and comparative distance from home, and the globes and maps used at every step to help in this matter. Have all wall maps hung on the north wall, and, so far as possible, maps in books placed with their tops actually to the north.—*The Catholic School Journal.*

The Effective Teaching of Geography. — There is, perhaps, no subject the teaching of which is more generally distasteful than geography, and few subjects which are so ineffectively taught. I say "ineffectively" advisedly, though I am, of course, quite aware that it is possible in geography to obtain nearly always fair results as far as examinations are concerned. But this fact is anything but comforting when one reflects that it is simply due to the getting up of the text-book on the part of the pupils. And I am sure I shall not be alone in maintaining that mere lists of names and isolated facts do not constitute geographical knowledge. True, they are indispensable adjuncts of it, but that is all. Pupils need vivid and accurate knowledge of each country they study, such a knowledge as will enable them in the future to talk intelligently of other lands. The error in the teaching of geography lies mainly, I think, in a wrong use of the text-book. The text-book, which should be simply a correct outline of facts and a compendium of data for reference, is a book for the pupil, not the teacher. The teacher's lesson must be given on independent lines, and should be the result of careful reading. Naturally, a power of graphic description on the part of the teacher is of the greatest value. But a description which is merely a monotonous reproduction of some book of travel will fail to a certainty. Description, to succeed at all, and to make a real impression on the pupils, must be vivid and lifelike as if the teacher had personally visited the scenes described. Probably some will object that this is a counsel of perfection and impossible to attain generally. Perhaps so, but I am certain that the power *can* be cultivated even by the most unimaginative teacher. And, when geography is taught in the graphic manner I advocate, the educative value to the pupil is great indeed. The pupil whose interest has been once awakened will read up descriptions and details out of school. To take a few examples at random : there are few pupils who, having once formed a picture of the Bad Lands in the Lower Valley of the Yellowstone River, or of the great canyon river, the Colorado, or of the wonderful asphalt lake in Trinidad, will ever wholly lose the impression.

Pictures, to be pinned on the notice-board, of the places mentioned are of the greatest help to the teacher. Generally speaking, the pupils are very glad to bring such pictures if they happen to possess any. I quite foresee, however, that, in the desire to be graphic and interesting, accurate detail may be overlooked. Pupils must know how to use their maps, be trained to observe always its scale, and to give when required the distance from one place to another or an area, approximately only, as I need scarcely add. Positions of towns, rivers, etc., must be known as exactly as possible, and pupils should be made to feel that a slight misplacement, which means in reality some hundreds of miles, is a serious error.

As to actual map drawing, this has to do with facility in drawing rather than anything else. There is one thing, however, which is most helpful in the teaching of geography: The pupil should be able to reproduce from memory a country or a part of a country with a fair degree of accuracy, and, above all, be able to mark towns and rivers correctly. Perfect accuracy of outline is unattainable except for the few, and should most certainly not be insisted on. And, indeed, it is not really of great importance. Use may be made occasionally of lantern-slides, but this should not become too frequent, or the geography lesson may come to be regarded as amusement and nothing more.

I have not space in this letter to touch on the teaching of physical geography at all, for that branch is important enough to claim a separate consideration. And, indeed, there is so much to say on the subject of the teaching of geography, that I have not attempted to write comprehensively. I have merely tried to indicate briefly the practical lines on which my own teaching of the subject is based.—*The School World*, December, 1903.

The Eastern Shore of Virginia.—Perhaps few of the tourists on the "Cape Charles route" have an idea what an important strip of our country they are rushing through, down the "Eastern Shore" sliced off by Chesapeake Bay from the states of Maryland and Virginia.

The monotonous succession of flat, sandy fields, marshy inlets, and unpretending railway stations hardly tempts the eye from novel and newspaper, or arouses more exciting emotions than the through passenger's nervousness as to connections after the train's unaccountable delay at some little nowhere-in-particular, or his mild amusement at such apparent misnomers in his time-table as "Fruitland," "Eden," and "Bloomtown"; or "Only," whose sole visible claim to uniqueness is its "Hotel de Fox," suggesting that a rival Hotel de Rabbit may be just out of sight in the brier-patch.

The through passenger is perhaps unaware that to this sand strip and its invading tides his city table, whether set for him in Philadelphia or New York, Boston, San Francisco, or say London, has long been indebted for many of its costly luxuries; for soft-shelled crab and caviare, quail and ptarmigan and reed-bird, canvas-back duck and diamond-back terrapin, for early dainties of sea and shore, orchard and garden, too numerous to catalogue.

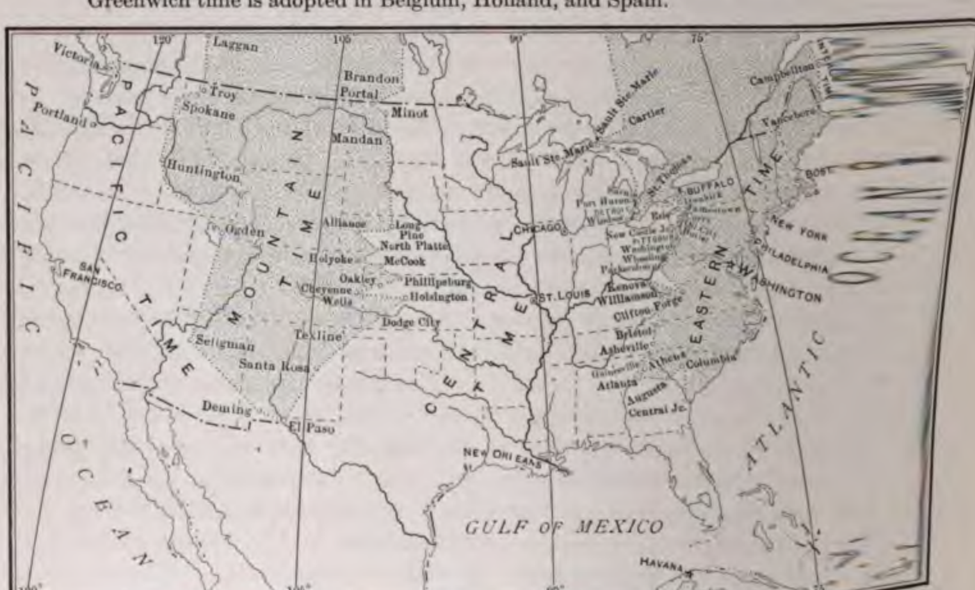
If our tourist have economic as well as gastronomic tastes, it may interest him to know that this backbone railroad and its branches netting with nerve force the peninsula, have carried northward in one year over ten thousand carloads of peaches and small fruits, as many more being shipped by boat or preserved in the canneries and evaporating plants; that ten million bushels of oysters are taken yearly, giving employment to over thirty thousand hands; and that while the northern half of the two-hundred-mile strip is a fine wheat and grass growing region, figs and pomegranates come to perfection at its southern extremity. To enjoy these kindly fruits of the earth and sea, six million consumers wait within twenty hours' distance from the lowest point of the peninsula, and wheel and keel bring its farmers, fruit raisers, and fishermen into quick contact with the markets of the world. Well may this narrow sand strip be called the Land of the Epicure.—*The Southern Workman*, January, 1904.

An Interesting Atmospheric Phenomenon.—Recent newspaper announcements of an active volcano in Kentucky "becoming quite alarming," etc., recall a familiar phenomenon which is sometimes most impressive and deceptive in its appearance. On January 3d, a party of geologists visited the once famous Pilot Knob in Missouri. On nearing the summit, which is covered with great angular rock fragments, many of the cracks seemed to be emitting steam in considerable quantities. The amount of vapor was comparable to that which might have risen from a half-dozen pans of water boiling vigorously in as many different cracks. The whole appearance was so vividly volcanic as to suggest at once the origins of most of the sensational stories about volcanic eruptions in the non-volcanic States. Careful observation disclosed the following circumstances: The atmosphere was cold and dry; the temperature of the previous night was close to zero F. The observation was made at 1 o'clock P. M., while the temperature was still below the freezing point, but the sun was shining brightly, as it had been doing for some hours. To some of the vertical faces of the rocks, snow from a recent storm was still adhering. On these faces, exposed to the bright sun, both melting and evaporation were active. Convectional currents were induced by the same conditions, but the vapor upon rising was soon partially condensed in the cold surrounding air. Currents other than vertical, among the angular blocks, caused the vapor to be drawn into and to issue from crevices not illuminated by the sun, and which contained no apparent source of the vapor, thus adding to the deception. Essentially similar conditions and phenomena are common at ordinary levels where they excite no comment. They are doubtless more common, however, on high, rocky peaks, where the bright sunshine is quite as intense as on the plains below, and the air in calm weather may be much colder. Here are the best conditions for great evaporation into an atmosphere whose dew point is far too low to allow it to retain all the moisture thus supplied. Furthermore the conditions of convection on the hillside cause an updraught during the warmer parts of the day, thus concentrating the vapors around the central peak. The conditions and phenomena are well calculated to deceive the casual observer, who may be as ready to ascribe volcanic action to one hill as to another.—*N. M. F.*

Standard Times.—The following is a list of Standard Times that have been adopted in various places for railway and other purposes, referred to the Meridian of Greenwich:

Mid Europe (Denmark, Germany, Italy, Switzerland, Norway, and Sweden)	1h. East
Cape Colony	1½h. East
Natal	2h. East
Egypt	2h. East
Japan	9h. East
Australasia—	
West Australia	8h. East
South Australia	9½h. East
Victoria	10h. East
Queensland	10h. East
Tasmania	10h. East
New Zealand	11½h. East
America—	
Intercolonial	4h. West
Eastern	5h. West
Central	6h. West
Mountain	7h. West
Pacific	8h. West

Greenwich time is adopted in Belgium, Holland, and Spain.



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STANDARD TIME BELTS IN THE UNITED STATES

The English Mile Compared with Other European Measures.—

	English Mile.	English Geog. M.	French Kilom.	German Geog. M.	Russian Verst.	Austrian Mile.	Dutch Ure.	Norweg. Mile.	Swedish Mile.	Danish Mile.	Swiss Stunde.
English Stat. Mile	1.000	0.867	1.609	0.217	1.503	0.212	0.289	0.142	0.151	0.213	0.335
English Geog. Mile	1.150	1.000	1.855	0.250	1.738	0.245	0.333	0.164	0.169	0.246	0.386
Kilometer.......	0.621	0.540	1.000	0.135	0.937	0.132	0.180	0.088	0.094	0.133	0.208
German Geog. Ml.	4.610	4.000	7.420	1.000	6.953	0.978	1.333	0.657	0.694	0.985	1.543
Russian Verst ...	0.663	0.575	1.067	0.144	1.000	0.141	0.192	0.094	0.100	0.142	0.222
Austrian Mile....	4.714	4.089	7.586	1.022	7.112	1.000	1.363	0.672	0.710	1.006	1.578
Dutch Ure	3.458	3.000	5.565	0.750	5.215	0.734	1.000	0.493	0.520	0.738	1.157
Norwegian Mile..	7.021	6.091	11.299	1.523	10.589	1.489	2.035	1.000	1.057	1.499	2.350
Swedish Mile	6.644	5.764	10.692	1.441	10.019	1.409	1.921	0.948	1.000	1.419	2.224
Danish Mile.....	4.682	4.062	7.536	1.016	7.078	0.994	1.354	0.667	0.705	1.000	1.567
Swiss Stunde....	2.987	2.592	4.808	0.648	4.505	0.634	0.864	0.425	0.449	0.638	1.000

Decisions of the U. S. Board on Geographic Names; Approved January 6, 1904.—

Allegrippis; ridge in Huntingdon County, Pa. (Not Allegrippes nor Allegripus.)

Beckley; pond in town of Norfolk, Litchfield County, Conn. (Not Blakley nor Blakeley.)

Brannock; bay, Dorchester County, Md. (Not Bronnack, Brannack, nor Brannocks.)

Bumkin; island, Hingham Bay, town of Hull, Plymouth County, Mass. (Not Bumpkin.)

Celoron; P. O. and R. R. station, Chautauqua County, N. Y. (Not Celeron.)

Cienega del Gabilan; land grant, San Benito County, Cal. (Not Sienega del Gabilan.)

Dorseys; creek on north side of Annapolis, Anne Arundel County, Md. (Not Graveyard, Dorsey, nor College.)

Highland; lake in town of Winchester, Litchfield County, Conn. (Not Long.)

Inchwagh; lake in Livingston County, Mich. (Not Nitchwage nor Michuaga.)

Lemon Fair; river, Addison County, Vt. (Not Lemonfair nor Lemonfare.)

Morgan River; stream in Barkhampsted, Litchfield County, Conn. (Not Mohawk Brook.)

Rocky Mount; P. O., town, and township in Edgecombe County, and town and township in Nash County, N. C. (Not Rockymount.)

Rosbys Rock; P. O. and R. R. station, Marshall County, W. Va. (Not Rosbysrock nor Rosbbys Rock.)

Sollers; R. R. station, and point in Patapsco River, Baltimore County, Md. (Not Sollars nor Soller.)

Spa; creek on south side of Annapolis, Anne Arundel County, Md. (Not Spaw nor Spat.)

Starvout; P. O., settlement, and creek, Douglas County, Oregon. (Not Starveout nor Starve Out.)

From Paris to Peking by Rail.—According to the *Boersen Courier*, a meeting was recently held in Vienna to arrange for direct service between Western Europe and Peking, China. The meeting was attended by representatives of Russian, English, French, Bulgarian, Dutch, and German railroads. It was decided to run a train *de luxe* from London and Paris via Berlin and Warsaw to the Chinese capital, beginning May, 1904. The Russian Government will arrange to simplify passport and customs regulations for through passengers to minimize delays and formalities. It is the purpose of those participating in this movement to make it possible for passengers to book in London or Paris to China without change. Another interesting item connected with the arrangements is the issuing of a round-trip ticket, first class, for $204, which permits the traveler to make the trip both ways by rail or one way by rail and the other by water. The trip by rail is to be made in seventeen days. The tickets are to be good on the ships of all companies voyaging around Asia, and permission is to be granted to stop off at any port at which the ship calls, with the privilege of taking another ship. *Consular Reports*, January, 1904.

Snow Crystals. Snow crystals are divided into two great classes: those columnar in form and those of a tabular form. The forms vary according to the wind, the height of the clouds, the degree of cold, the amount of water in the air, etc. Crystals formed in cold weather or in high clouds are usually columnar or solid tabular. Those formed in moderate weather and light winds or in low clouds are apt to have frail branches and to be of a feathery type. Mixed forms grow partly

[illegible]

in low and partly in high clouds. High winds are given broken and irregular forms, and much moisture the very granular crystals.

The most common forms outlined within the nuclear or central positions of the crystals are a simple star of six rays, a solid hexagon, and a circle.

EDITORIAL

IS GEOGRAPHY RECEIVING SUFFICIENT ATTENTION IN ELEMENTARY SCHOOLS?

THE progress of the last decade in elementary school geography work, evidenced as it is by better methods of presentation, improved texts, more logical courses of study, more inquiring teachers, and an enlivened public opinion, is encouraging and most pleasing. Is it not possible, however, that in our satisfaction at progress, we have neglected one important element, namely, the time schedule in the curriculum?

How can thought work be developed and discipline given, even under the most favorable conditions of equipment, unless there is adequate time for such work? Memoriter work may be secured through cramming, but the emphasis of the "causal notion" rightfully decreases, though it does not and should not eliminate, memoriter work. Here is the theoretical difference between the old and the new.

In fact, however, the new in many cases is, and under the circumstances must be, memoriter work, because the time allowance for "covering" a certain ground permits of no other result. What training, for instance, can come from 120 minutes devoted to the following series of topics proposed for sixth grade work?

Northern Africa. Under control of various nations. Political divisions. Sahara—French; small section Spanish; area; surface; means of travel.

Egypt (and neighboring British territory). The Nile; its importance; agriculture. People; progress due to British direction. Suez Canal; agreement among nations concerning it. Cities.

The Barbary States. Location—climate; products; capitals. Tripoli (Turkish), Tunis and Algeria (French), Morocco (independent). Conditions in Morocco with regard to progress.

Southern Africa. Comparison with Northern Africa. Dutch settlement at Cape Colony. Emigration to Transvaal and Orange Free State;

discovery of gold; Boer war; result. Industries, products, climate. Mineral wealth (diamonds). Commerce and cities. Portuguese and German possessions. Compare Southern Africa with Southern South America in products and importance.

Not only is there a tendency to crowd individual grades, but the total amount of time devoted to geography in the elementary schools as a whole is often grossly, one might say grotesquely, inadequate.

In the course of study adopted for Greater New York last year, English, History, Mathematics, and Geography together are given less than one-half of the total school time in the eight grades. Geography receives less than 4 per cent of the total weekly time scale and has five minutes more time a week than has history. The work of geography is concentrated in the fourth, fifth, sixth, and seventh grades, though it should be noted that there is a very small amount of geographical nature study in the second and third grades.

Such a condition of affairs in reference to a subject which has long been and still is one of the four fundamental subjects in the curriculum is undoubtedly an extreme case. It is not, however, so extreme as to be particularly individual, and herein lies the danger. We are so accustomed to seeing the newer subjects almost replacing the old that we are not surprised at any allotment of time. We quietly acquiesce and accept what we do not approve, perhaps unconsciously taking comfort in the thought that the pendulum must turn back in its course before long, and that there are better times coming.

Surely physical training, nature study, including elementary science, hand-work, and music, have a right to a place in the curriculum, and have proved their extreme value as factors in elementary education. It is obvious that to introduce the new must mean a reduction of the time to be given to the old. Have we gone too far in this reduction? Has any one of these subjects as yet proved its right to have more time than either history or geography? Are our curricula symmetrical or lopsided? Are we sacrificing the essential for the relatively less valuable? Does geography deserve more or less time than it now receives? We think it deserves more, and believe that if the geography specialists are as insistent in their demands as are the specialists in the newer subjects, geography will hold its own from now on and perhaps regain some of its lost prestige. Let us work toward this end, not in the interests of the subject, but primarily because we believe that geography has proved its value and that the best interests of the children in our schools require more and better geography.

REVIEWS

Commercial Geography. By Jacques W. Redway. Size, 6 x 3¾ inches. Pp. viii and 406. Chas. Scribner's Sons, New York, 1903.

Redway's Commercial Geography is the latest addition to the rapidly growing list of commercial geographies written by well-known American authors.

The volume before us contains thirty-four chapters. It is, like most of the recently published texts on commercial geography, capable of division into four parts. There is, first, a general discussion of commerce of 87 pages, next a description of the commodities of trade covering 122 pages, then an account of the industries of the United States of 51 pages, and finally a review of the productive industries of the remainder of the world covering 137 pages.

The first seven chapters embrace introductory elements on commerce, a brief history of commerce, a discussion of the topographic and climatic control of commerce, a description of the means of transportation, and an enumeration of the factors governing the location of cities. All of these chapters are well done except the first, entitled "General Principles," which, to the reviewer's mind, is too simple and too indefinite. The classification of industries adopted here does not include all the common industries later mentioned and distinctions are not always clearly drawn. The climatic and topographic control of commerce is well discussed, as are also ocean and inland navigation and transportation by rail. The chapter on factors in the location of cities and towns is interesting, but not sufficiently inclusive. All our American commercial geographies have thus far failed to give the proper emphasis to the principles of economics necessary to an understanding of commercial geography. For instance, some idea of the function of a market and of the economy of urban conditions through the application of the principle of production on a large scale might have prefaced the discussion of the general relation of cities to industrial society to elucidate the subject; and, in the further development of it, the complex way in which commercial forces enforce physical conditions and regulate the frequence and distribution of cities might have been attempted, applying, for example, the principles of railway transportation so compactly stated on pages 69, 70, and 71.

The description of the commodities of trade occupies nine chapters, and is, as a rule, well done. This is a kind of material which it is hard to present except in a catalogue form, and which yet must be so arranged and treated that the vital relations in trade may be constantly brought out. To give too much is to make the text monotonous; to give too little is to make it invaluable. Between these extremes is the happy mean as to quantity which the author has very closely approached.

The remainder of the book is devoted to the regional commercial geography ot the world. The reviewer does not believe that progress in an understanding of the principles of commercial geography, nor effective coördination in the science can be brought about by such a representation of the facts of the subject. As yet, however, few authors in this field have succeeded in departing far from this regional treatment, inherited from the elementary school texts of to-day, and passed down to them from the "grammars" of nearly two centuries ago.

The author has presented his facts with a good distribution of space, so that the relative importance of foreign countries is indicated by the attention they receive.

The book is typographically pleasing, and is well printed. It has many features which make it seem less forbidding than some books on the same subject. It is a rival and not a superior to its colleagues in the field of commercial geography, and hence does not represent the progress that every new book in any field should mark.

E. D. J.

NEWS NOTES

All interested are reminded again that suggestions for the Educational Program of the Eighth International Geographic Congress should be sent to the senior editor of the JOURNAL at the earliest possible date.

Prof. D. C. Ridgley, formerly principal of a grammar school in Chicago, has been made head of the Department of Geography at the Illinois State Normal University, Normal, Ill. Professor Ridgley goes to his new position qualified both by training and experience to place the work of geography on a high plane.

Educational Papers of the International Congress of Geography.—The October and November numbers of the JOURNAL OF GEOGRAPHY will contain the most important papers on Educational Geography to be read before the International Congress of Geography to be held in Washington, D. C., 1904.

Mr. Robert M. Brown, formerly instructor in physiography at the High School, New Bedford, Mass., has been appointed as instructor in geography at the Normal School, Worcester, Mass. Mr. Brown will be known to the readers of the JOURNAL as an author of several valuable papers. Other papers of a similar nature may be expected from him in the near future.

The Sea of Azov.—The daily papers reported in the middle of December that the Sea of Azov had suddenly receded, exposing the bed for several miles off shore. Vessels were left high and dry and the sand was thrown ashore, causing great damage. The shore of the sea has very gentle slopes, and thus a slight depression of the sea floor or a strong wind which could hold the water back would cause a large area to be exposed. The greatest recession was reported from Taganrog, one of the important ports of the Russian Empire, because of its proximity to the wheat fields.

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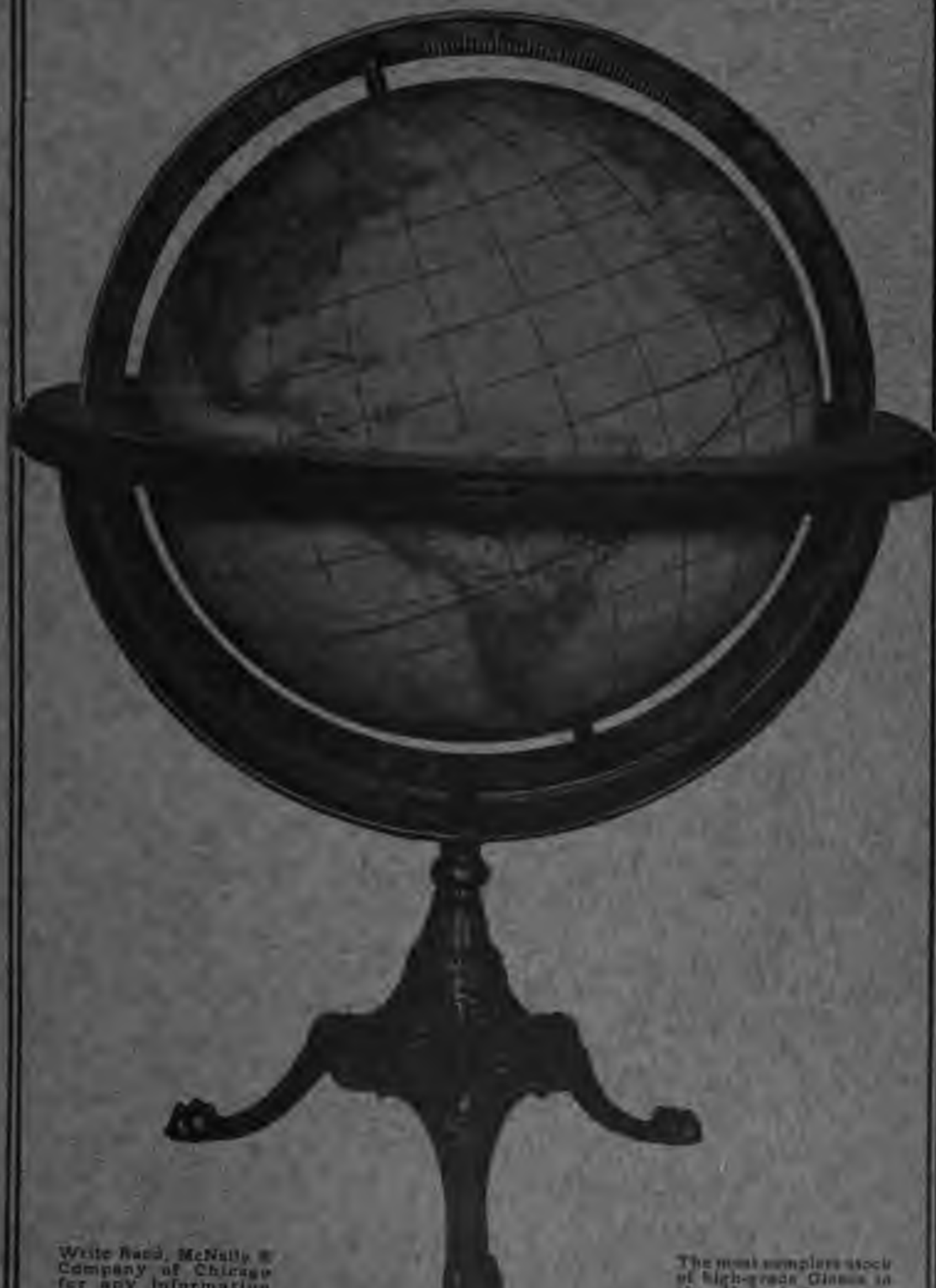

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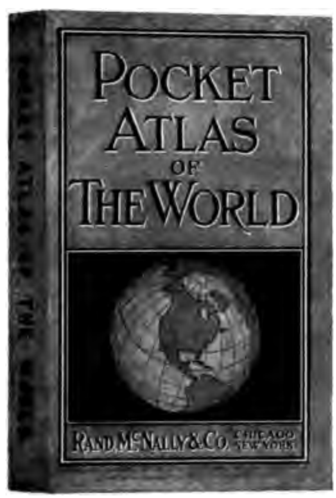

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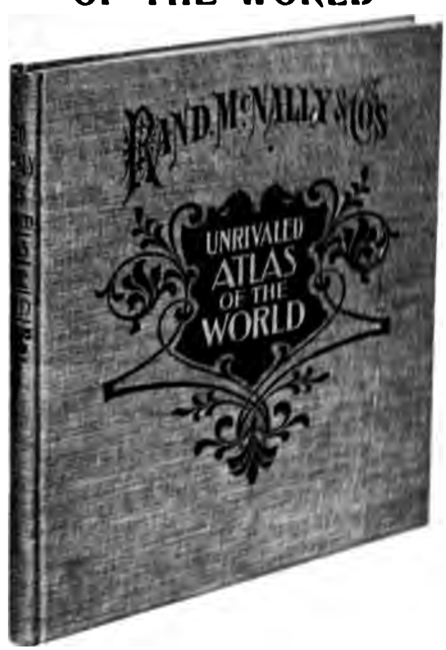

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FIG. 9. *A cross-roads or "four corners." The beginning of a village.*

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FIG. 26. *A view of mountains and highland valleys with a mountain range and peak in the distance.*

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FIG. 113. *A cape, peninsula, and isthmus. This is a characteristic bit of New England shore.*

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Vol. III. MAY, 1904 No. 5

SUMMER COURSES IN GEOGRAPHY

THE announcements of summer courses for 1904 sent out by our leading universities and normal schools contain the welcome evidence that geography will again receive, as it did last year, a very generous allowance of time and attention. This is especially true at the University of Chicago and at Columbia University, where unusually attractive opportunities for geographical studies and investigations will be offered, and at Cornell University, where last year's successful summer school of geography will be repeated under still more favorable conditions by the same strong corps of well-known instructors and geographers. So many and such valuable courses are announced by these and other educational institutions that every student and teacher of geography will be able to find interesting and profitable work in his chosen field. It is believed that many readers of the JOURNAL are planning to do such work this summer, and it is for their convenience that the Editors have prepared the following brief summary of the principal courses in geography and allied subjects.

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The earth's features, treated with special reference to their origin and significance. Genetic geography. The course will have special reference to North America. *June* 18–*July* 27.

Research Course in Physical Geography. Professor R. D. SALISBURY.

Topics will be arranged with students individually, on conference with the instructor.

INDIANA STATE NORMAL SCHOOL, Terre Haute, Ind. *The Development of Land Forms,* with daily field and laboratory work. Professor CHARLES R. DRYER. *June* 27–*August* 5.

DRAKE UNIVERSITY, Des Moines, Iowa. *Physical Geography.* Professor E. M. LEHNERTS.

Land forms, and the agents and processes which have produced them; the atmosphere and the ocean; scientific weather forecasting; principles underlying the distribution of plant and animal life; the influence of the physical environment of man. Library readings, recitations, and laboratory work are supplemented by a study of the geology and physiography of Des Moines and its vicinity. Five hours a week. *June* 20–*July* 29.

GEOGRAPHY OF THE ATMOSPHERE

INDIANA STATE NORMAL SCHOOL, Terre Haute, Ind. *Meteorology.* Professor CHARLES R. DRYER.

A study of the atmosphere, weather, and climate, with daily laboratory work and instrumental observations. *June* 27–*August* 5.

NORTHERN ILLINOIS STATE NORMAL SCHOOL, DeKalb, Ill. *Meteorology.* Professor F. L. CHARLES.

A course in elementary science, with special reference to weather phenomena. Recording of local data; forecasting; laboratory work and recitations. *June* 20–*July* 29.

THE UNIVERSITY OF CHICAGO, Chicago, Ill. *Elementary Meteorology and Oceanography.* Mr. H. H. BARROWS.

An outline course for teachers of physical geography and physiography. *July* 28–*September* 2.

CORNELL UNIVERSITY, Ithaca, N. Y. *Elementary Meteorology.* Mr. FRANK CARNEY.

The object of this course is to offer enough information to render the subject of meteorology and climatology more practical to teachers. Lectures (with slides), recitations, and assigned readings. *July* 7–*August* 19.

For a laboratory course in meteorology consult the courses mentioned in this paper under the heading *Field and Laboratory Courses.*

GEOGRAPHY OF PLANTS AND ANIMALS

THE UNIVERSITY OF CHICAGO, Chicago, Ill. Four courses:

Elementary Ecology. Dr. COWLES and Mr. HOWE.

Plants in relation to their environment. Field work, laboratory work, assigned readings, and lectures. *First term, June* 18–*July* 27

Physiographic Ecology. Dr. HENRY C. COWLES.

Origin, development, and death of the various plant associations, especially such as are found in the United States and Canada. *Second term, July* 28–*September* 2.

Research in Ecology. Dr. COWLES.

This course requires special training in ecology, and in related lines of study, especially geology and plant physiology.

Field Zoölogy. Dr. C. M. CHILD.

A study of the fauna of the region about Chicago, with special reference to the relations between animals and their environment.

COMMERCIAL GEOGRAPHY

CORNELL UNIVERSITY, Ithaca, N. Y. Three courses:

Commercial Geography. Mr. PHILIP EMERSON.

A study of important topics in commercial geography, with special relation to the position held by the United States in the commercial struggle of the present time. The history of commerce and industry; the physical controls of commerce; the great commercial staples and the development of allied interests; the commerce and industries of the United States and the leading commercial nations and regions. *July* 7–*August* 19.

Geographic Influences and Relations. Mr. R. H. WHITBECK.

Lectures and discussions designed to show the influence of physiographic and climatic conditions upon human activities: The influence of soil, coast line, mountains and valleys, plains and plateaus, gaps and passes, winds, rainfall, ocean currents, altitude and latitude, navigable inland waters; geographical causes leading to the location and growth of cities, the location and migration of industries, the establishment of transportation routes, and the prosperity of states and regions; man's reaction upon his environment, and his conquest of natural obstacles. *July* 7–*August* 19.

UNIVERSITY OF ILLINOIS, Urbana, Ill. *Economic and Commercial Geography.* Assistant Professor N. A. WESTON.

A study of the effects of geographical conditions on economic and commercial life. The physical features, resources, domestic and foreign trade, trade routes, transportation facilities, and industrial characteristics of the population of the United States and the leading foreign countries. *June* 13–*August* 12.

HARVARD UNIVERSITY, Cambridge, Mass. *Commercial Geography.* Dr. C. A. HERRICK.

A course of lectures, supplemented by class recitations, practical demonstration of methods, and excursions. A general outline of the subject with enough discussion and demonstration of methods to prepare teachers for work in secondary schools. *July* 5–*August* 12.

THE UNIVERSITY OF CHICAGO, Chicago, Ill. *Commercial Geography for Teachers.* Assistant Professor H. R. HATFIELD.

The scope and method of commercial geography, its bibliography, text-books, and original sources. Special topics will be investigated. *June 18–September 2.*

For laboratory work in commercial geography consult courses outlined below.

FIELD AND LABORATORY COURSES

CORNELL UNIVERSITY, Ithaca, N. Y. Nine courses:

Laboratory Course in Physical Geography. Mr. CARNEY and Mr. HUBBARD.

A practical course to illustrate the methods and materials available for laboratory and field work in high schools. Attention is given to the possibilities open to the teacher in schools having limited laboratory equipment. Where desired by a teacher, personal suggestions will be made regarding the local field work he may carry on with his classes. *July 7–August 19.*

Field Course in Physical Geography. Professor TARR, Assistant Principal CARNEY, Mr. WHITBECK, and Mr. HUBBARD.

One afternoon each week is devoted to the study of physiographic phenomena in the field, and two days at the end of the week are given to all-day excursions. An excursion to Niagara is also offered in connection with this course, but attendance upon it is voluntary. An excursion to the anthracite coal fields is also open to students in this class. *July 7–August 19.*

Laboratory Course in Meteorology. Assistant Principal CARNEY.

A course planned for both grammar and high-school teachers. Some of the topics considered, discussed, and illustrated are: Non-instrumental observations—when to begin and over how long a period to continue the most simple observations; record-tables and methods of using them; instrumental observations—tabulation of records, averages; use of weather maps; filing of these maps and of newspaper clippings of notable meteorological phenomena; the equipment of a meteorological laboratory. *July 7–August 19.*

Laboratory Course in Geology. Mr. F. V. EMERSON.

A course intended to furnish an opportunity for the study of such geological phenomena as are capable of illustration by specimens, maps, and models. *July 7–August 19.*

Field Course in Geology. Professor A. P. BRIGHAM, Mr. F. CARNEY, Mr. F. V. EMERSON, and Mr. G. D. HUBBARD.

One afternoon each week and two Saturdays are devoted to excursions in the neighborhood of Ithaca. A voluntary excursion to the anthracite coal fields of Pennsylvania is offered. Students of this course are also permitted to go on the Niagara excursion. *July 7–August* 19.

Laboratory and Field Work in Commercial Geography. Mr. PHILIP EMERSON.

Methods of teaching commercial geography and of studying commerce and industry: (*a*) In the factories and mills of Ithaca and vicinity; (*b*) in the laboratory by means of selected specimens, photographs, statistics, Government reports, and other material in print, and by the making of illustrative maps, charts, and diagrams; (*c*) in the conservatory and garden and on the farm. *July 7–August* 19.

Advanced Course in Dynamic Geology and Physical Geography. Professors TARR and BRIGHAM, with assistants.

Advanced field and laboratory work under the supervision of the instructors. The work will vary with the needs of the individual students. *July 7–August* 19.

Five-day Field Excursion. Professor R. S. TARR.

An excursion by rail, steamboat, and wagon, with frequent stops at points of interest. Its object is to study a large area, interpreting the phenomena observed, and noting the influence of physiography on the industries. The estimated expense is $40.00. All who desire to go are expected to notify Professor Tarr before June 1st.

THE UNIVERSITY OF CHICAGO, Chicago, Ill. Four courses:

Field Geology. Dr. W. W. ATWOOD (first term) and Mr. R. T. CHAMBERLIN (second term).

Training in stratigraphic, glacial, and other field determinations, together with mapping, sketching, and technical description. The field is the vicinity of the Dells of the St. Croix, Minnesota-Wisconsin.

Field Geology. Professor SALISBURY and Dr. ATWOOD.

Advanced field work, involving the systematic investigation of a formation or an area. The fields for 1904 will be in the West, or in Wisconsin. Dr. Atwood's party will spend the month of September in the vicinity of the Grand Canyon of the Colorado. Other parties, doing more special work, will study the former glaciation of selected mountain regions in the West, or in Eastern Wisconsin. *Second term, July 28–September* 2.

Field Geology. Professors T. C. CHAMBERLIN, SALISBURY, IDDINGS, and Assistant Professor WELLER.

Thorough and systematic work in close conformity to official standards, and, as nearly as possible, individual and independent. The course may form the basis for a doctor's thesis.

Field and Laboratory Course in Geology. Mr. L. H. WOOD.

The geography and geology of Chicago and its vicinity, studied in the field and from relief, topographic, and geologic maps. The course will include two field trips and three laboratory exercises weekly. For teachers and for those who wish to learn methods of field work. *First term, June* 18–*July* 27.

Map Study. Mr. H. H. BARROWS.

An advanced course in the interpretation of topographic and geologic maps. Especially for teachers who wish to introduce laboratory methods into physiographic and geologic work. *July* 28–*September* 2.

Physiographic Drawing, Chalk Modeling. Mr. GEORG THORNE-THOMSEN.

The primary purpose of this course is to give students of physiography ability to sketch topographic forms on the blackboard. *June* 18–*July* 27.

THE SCHOOL OF EDUCATION, THE UNIVERSITY OF CHICAGO, Chicago, Ill. *Field Geography.* Associate Professor ZONIA BABER.

The class will visit Northern Illinois and Southern Wisconsin; thence by the way of St. Paul and the Mississippi River to St. Louis, where a week will be devoted to a study of the geographic exhibits of the World's Fair. Stops will be made at points of special topographic, geologic, or industrial interest. *July* 28–*September* 2.

UNIVERSITY OF MISSOURI, Columbia, Mo. *Physiography.* Professor C. F. MARBUT.

A course of study in the principles of physiography, taken up from the point of view of the needs of the high-school teacher. Laboratory work, field work, and occasional lectures and conferences.

UNIVERSITY OF WISCONSIN, Madison, Wis. *Field Geology.* Mr. S. H. BALL.

Students work in parties of two, and an area near Madison is assigned to each party. Each student makes his own topographic map and, with this as a base, prepares a geological map and a written report of his area. *June* 27–*August* 5.

GEOGRAPHY OF CONTINENTS AND COUNTRIES

COLUMBIA UNIVERSITY, New York City. *Geography of North America.* Professor R. E. DODGE.

This course will be devoted to a topical outline of the geography of North America, which will be treated in such a way as to bring out the causal relation existing between the physical and life conditions.

The needs of teachers in the intermediate and upper grammar grades will be constantly kept in mind, and the endeavor will be to show through the study of North America how each of the continents may be treated in school work. The lectures will be illustrated by maps, models, and photographs. Training will also be given in the use of reference books, and in the organization of subject-matter by means of special papers on selected topics to be prepared outside of the classroom and submitted for criticism. *July* 6–*August* 17.

THE UNIVERSITY OF CHICAGO, Chicago, Ill. *Economic Geography of North America.* Assistant Professor GOODE or Mr. WOOD.

A study of the natural resources of the continent as factors in its economic development. The geologic structure, the physiography, and the climate, treated as factors determining or affecting the location and utilization of mineral resources, arable and grazing lands, forests, etc. The influence of these various resources on the settlement and development of the continent. *July* 28–*September* 2.

THE SCHOOL OF EDUCATION, THE UNIVERSITY OF CHICAGO, Chicago, Ill. *Continental Study: North America as a Type Continent.* Associate Professor BABER.

Effect of the geography of North America upon the development of its civilization. Means of study. Methods of teaching. Map drawing and sand modeling. *June* 18–*July* 27.

CORNELL UNIVERSITY, Ithaca, N. Y. Three courses:

The Geography of the United States. Professor A. P. BRIGHAM.

A summary study is given of the evolution of the North American continent. The lectures are then mainly devoted to the several physiographic regions of the United States. The origin of the land forms is explained, and especial attention is given to the control exercised by geographic conditions upon the colonization, social life, commerce, and military history of the United States. Under the last head, military movements in the Revolution and selected campaigns of the Civil War will be studied. Forestry and forest reserves, the arid lands and irrigation, and the development of lines of travel and communication are among the topics treated. *July* 7–*August* 19.

The Geography of Europe. Professor R. S. TARR.

A consideration of the physiographic features of Europe and their influence upon the history and industrial development of the several nations. The principal sub-topics are: (1) Physiography of the continent and its development; (2) climatic conditions; (3) natural resources; (4) influence of these various physiographic features upon race characteristics, early movements of people, development of navigation, modern national development, and location of leading cities, both in the past and present. Fully illustrated with lantern slides and maps. *July 7–August* 19.

The Geography of Tropical Countries. Mr. G. D. HUBBARD.

This course is designed to meet the demand for a better knowledge of tropical lands, a demand made by their growing importance, as markets and sources of raw materials, in the industrial development of temperate lands. *July 7–August* 19.

INDIANA STATE NORMAL SCHOOL, Terre Haute, Ind. *Geography of the United States, Physical and Political,* with map drawing on mathematical projections. Professor CHARLES R. DRYER. *June 27–August* 5.

SPECIAL METHODS IN GEOGRAPHY

COLUMBIA UNIVERSITY, New York City. *The Teaching of Geography.* Professor DODGE and Miss KIRCHWEY.

This course will be devoted to a consideration of the course of study in geography for elementary schools, and to the general principles underlying good geography teaching. The lectures will consider the following topics: The scope of geography in elementary schools; the present status of geography in elementary schools; the point of view to be held by the teacher of geography; the division of the course of study; the knowledge of location and how it should be secured; the relation existing between geography and other subjects, especially nature study, hand work, and history; excursions and reference work in geography; the use of maps and illustrative material; commercial geography in the upper grades; the use of a text-book; references for teachers and pupils; thought questions in geography; the teaching of industries, etc. A course of study will be outlined and suggestions given as to the material available for presentation in each of the grades, as to the general manner of treatment adaptable to pupils of different ages; certain topics like home geography and the topical treatment of continents will be treated fully. Certain difficult problems like the teaching of latitude and longitude, the understanding of a map, etc., will be treated in such detail as time will permit. Each pupil will be called upon to outline some special topics in order to give training in the use of references and in the organization of subject-matter. These topics will also be later outlined as lesson plans to be given in certain grades, and a certain number of class hours will be devoted to the criticism of good and bad outlines and plans. Especial attention will be given to ways of teaching the present course of study in the New York City schools. *July* 6–*August* 17.

UNIVERSITY OF MISSOURI, Columbia, Mo. *The Teaching of Geography.* Professor C. F. MARBUT.

A course of lectures and occasional field and library work on the teaching of geography in the grades, with special emphasis of the public-school geography, the methods of teaching, the aim of the subject, and the sources of material for properly illustrating it. The geography of the whole public-school course will be considered, though most emphasis will be laid on the work in the sixth, seventh, and eighth grades.

DRAKE UNIVERSITY, Des Moines, Iowa. *Methods in Geography.* Professor E. M. LEHNERTS.

The work in this course includes both a review of the subject-matter of school geography and the special consideration of methods of teaching it. A course for the grades is outlined, and the matter and the methods of presentation at the several stages are discussed. Lectures, recitations, and laboratory work. *June* 20–*July* 29.

CORNELL UNIVERSITY, Ithaca, N. Y. Three courses:

Type Studies in Geography for Grammar Grades. Professor CHARLES A. McMURRY.

The selection of important topics as types in geography; illustrations of type studies in North America, Europe, and other lands; the principles of method illustrated by such type studies; relation of such studies to text-books in geography; the course of study in geography, and the value of earlier lessons in the interpretation of later lessons in the course; the method of oral treatment of some topics; reviews and comparisons. *July* 7–*August* 19.

Home Geography. Professor CHARLES A. McMURRY.

An analysis of those geographical facts and materials which lie within the range of the children's senses. The necessity for this study as a basis for later book and map studies of the large world beyond is illustrated. The topics of home geography; study of excursions with classes of children; the oral treatment of topics in classroom work; the relation of home geography to the later geography studies and to text-books; a course of study showing the leading topics in this transition from the home neighborhood to the state and the United States; leading topics of the home state and their treatment; the study of the earth-whole in the early years, and its relation to the child; means of illustrating the earth-whole and its parts. *July* 7–*August* 19.

Aims and Problems in Geography. Supervisor R. H. WHITBECK.

Designed more particularly for grammar school teachers. The course consists of lectures, discussions, and laboratory exercises, dealing with the actual problems of the classroom. Some of the topics treated are: The chief aims in teaching geography; the relative value of different kinds of geographical knowledge; methods of conducting the recitation; the proper use of the text-book by pupils and by teachers; the use and misuse of supplementary books; the value of studying things instead of about things; map modeling, map drawing, and the use of outline maps; written and oral exercises, reviews, tests, and examinations; the proper scope and limitations of geography. *July 7–August* 19.

MICHIGAN STATE NORMAL COLLEGE, Ypsilanti, Mich. *Teachers' Geography.* Mr. I. BOWMAN.

The course is planned for teachers and advanced students, and deals with topics in mathematical geography, map projections, and the geography of the atmosphere. Lectures, recitations, and laboratory work. *June* 27–*August* 5.

THE DELTA OF THE MISSISSIPPI*

BY FRANCIS E. LLOYD

Professor of Botany, Teachers College, Columbia University

DURING the summer of 1900 I undertook a trip to the Delta of the Mississippi River and the islands which lie to the eastward, for the purpose, primarily, of studying the vegetation of that bit of country. Though but a very amateur in matters of geography, I have to confess that my interest in the Delta well-nigh eclipsed my more immediate interest in its plants, until, at least, my mind regained its equilibrium. I shall in the present paper attempt to give an account of my observations of this interesting region, having reference chiefly to that portion commonly known as the Delta, and not to that larger area bordering the lower Mississippi, which in recent geological times has been built up by the same processes which may now be seen in operation in the Delta itself. (See Map 1.)

The only practical way of exploring such a region is by means of a boat of light draft. The waterways, though tortuous, are continuous and the water, for a very considerable distance from the land, shallow.

*For folding map of the Delta of the Mississippi see inside front cover.

For this reason the party of which I was a member hired a "scow schooner," ordinarily used for oystering. This is the finest kind of craft for knocking about such waters. Roomy, unpainted, stiff, drawing little water, one can creep into the veriest bits of mudholes, and *get out again;* being roughly built and no better finished, a naturalist has to take no precautions for the preservation of appearances; and being roomy there is plenty of space to sleep on the deck, under mosquito netting, and thus be cool at night. A few weeks' cruise on such a boat is an ideal experience.

On approaching the Delta from the east, with still a wide expanse of water ahead, and in the distance the low stretch of green marsh and a curious, jagged sky-line of willows, reaching far to the north, one will, perhaps, receive a suddenly applied demonstration that the land is not so far off as it seems. In a word, the boat is aground. Instinctively, she is headed up to the wind, if possible, and all hands jump overboard, a most comical procedure that never fails to evoke laughter and remarks from one's companions. In this concrete way we learn that beneath the mud-laden water the bottom extends out to sea for many miles at a depth of two or three feet, and less in places. Such an experience demonstrates to us what the great river is doing. Its water, opaque with sediment, carries most of this over the shallow, submerged extension of the Delta. Some of it, however, gradually settles to the bottom, and thus slowly raises the level of the sea floor, while the rest of the detritus is precipitated farther seaward. Deeper channels in this platform are eroded by the currents, which extend out from the various mouths of the river. Low, submerged mounds are formed by eddies, and the whole vertical contour is modified from time to time by storms. The constant change makes navigation especially dangerous. You are compelled literally to feel your way along, even in a small "scow," by means of an oar, a man on each bow calling off the depth in feet and inches. It is only by the submerged channel formed by the South Pass current that approach may be had by ocean-going vessels, and this calls for skilled pilotage.

From a considerable distance the Delta appears as a very low extent of land, with even, horizontal contour. The color is a uniform dark green, the whole landscape being somber and monotonous, especially in the failing light of evening. The impression of the contour, however, is deceptive, for a closer approach shows that the land is broken up into a maze of bays, "cut-offs," and lagoons, forming necks of land and islands of all sizes and shapes. An adequate notion of

FIG. 2. *A view looking east of south from the top of the South Pass Lighthouse. The white oblique line is a board footpath to a boat mooring. The dark line parallel to the horizon is a sand spit extending westerly from the mouth of the river.*

the complexity of the land forms may best be had by getting a view from a point of vantage at the top of the South Pass Lighthouse. Such a view is seen in the second figure and no further word of description is necessary. How this horizontal contour is brought about is to be explained, at least in part, by the secondary action of the waters outside of the Delta. Were it not for the tidal action and the effects of wind and currents, the Delta would be built up regularly, as is suggested by the more even contour line of its submerged portion. But, given these factors and a soft, homogeneous, flat, low-lying alluvial deposit to work upon, together with occasional unevenness, due to buried or partly buried detritus of small and large pieces of tree trunks, branches, and the like, which float down the river and are deposited, we can easily understand how the irregularities of contour arise. These help to direct the erosive forces, and thus are a factor in producing the result above described.

Our entrance to the Delta was made through Cubit's Gap on its eastern side. This is the main channel of a secondary delta, caused, at some period of extraordinary flood, by the main current breaking through its low-lying bank at a weak point. The lateral stream thus originated will in time build up a form similar to, but smaller than, the chief delta. At occasional points along the shore are encountered fishermen's houses, built on the low-lying marshes. Their situation is precarious, because the muddy surface is frequently submerged, and the run of rough water during storms is sometimes disastrous. The danger is reduced by building upon long spiles, which lift the house above the surface. The experience of entering such a dwelling is certainly novel. The fisherfolk are chiefly Italians, who are very hospitable. Their boats are single-masted luggers of light draft, well built and graceful.

Upon entering the main stream of the Mississippi, we follow the stream in its southeasterly course. At once the appearance of our surroundings changes. A few minutes previously a whole sea was behind us, and the feeling we experienced was that of approaching the land. Now it seems as if we are floating on a river inland, its banks clothed with a tall grass (*Phragmites*), or "canes," as they are locally called, which shut out the distant view. (Fig. 3.) Trees of black willow, which form a continuous growth farther up stream, are to be seen occasionally along the bank, and the "canes" are often overgrown by a species of ampelopsis (*Ampelopsis arborea*), but more frequently and densely by a leguminous vine (*Vigna glabra*), bearing numerous yellow, pea-like flowers. Of these plants, the "cane" is the most interesting, for its growth contributes very materially to the stability of the muddy bank. It spreads by runners, some of which project out into the stream, extending downward with the current as much as thirty meters or more. Those which take root contribute to the formation of hummocks, which, by their close juxtaposition, make a firm framework to support the soft materials of the bank.

F[I]G. 3. A view of the river bank of the South Pass showing the dense growth of canes (Phragmites.)

From the western bank of this part of the Delta stretch considerable reaches of low, swampy meadow land, clothed with grasses and weedy plants, among which a sensitive plant (*Mimosa strigillosa*) is very common, and responds rapidly to the touch by closing tightly its leaflets and bending down its leaves.

Continuing the course down stream, we come suddenly to a parting of the way in three directions—quite the reverse of the ordinary experience in floating down stream. Instead of the tributaries feeding the stream, the stream divides its water among its distributaries (here the three main Passes) of which the middle, in line with the chief stream, is the South Pass, and the way we chose. Once well into this arm of the river, the most illuminating evidence of the work of the great river is before us.

If we climb the bank in this region, we can look beyond a few hundred feet out upon an expanse of salt water. (Fig. 4.) The highest part of this land is beneath us, only a few feet above the level of the swiftly-running stream, and an equal distance from it. This low ridge is a lateral barrier, built up from the sediment of the river laid down at times of flooding, and allowed to maintain a level above that of the sea level. In this manner a natural aqueduct of the stream's own making guides it to its mouth. From the ridge, the bank slopes more

FIG. 4. A view looking north along the western bank of the South Pass. On the right one sees the [illegible] water and the low, flat marshes contiguous to them. The highest ground, near the river, is indicated by the willows. Note the slope of the ground on the left of the ridge, and the sudden fall on the right. In the foreground part of a fisherman's house and of the "sea schooner" mentioned in the text. The fishermen's houses are always built on stilts to protect them from floods.

FIG. 5. *South Pass, from the lighthouse, looking north. Note the river flowing between the narrow irregular strips of land. The picture shows an outgoing steamship.*

gradually away toward the salt water. The canes of the higher level give way to a lower, stiff-leaved grass (*Spartina*). As one walks through this bristling foliage, thousands of small amphibious crabs scurry in all directions. It is in such low-lying, densely grassy places that the alligator builds its nest, consisting of a mass of dead grass packed about the eggs, which are laid in considerable numbers.

At the mouth of the South Pass is the small village and Government station of Port Eads, the seat of the jetty operations. The effort of the engineers who are managing these operations are so to control and direct the stream as to keep a ship channel open up to and above the mouth. This involves a vigilance as eternal as the stream itself. From the top of the South Pass Lighthouse may be had a most instructive panoramic view. In Figure 2, which is a view looking seaward, besides the details referred to above, we see in the distance a long, slender spit, which is formed by the deposit brought about by the influence of the still "back-bay" waters upon the moving waters on the outside. This narrow stretch of land outlines most perfectly the ideal form of the Delta. In the map (Map 1, Fig. 1) this is seen on the western side of the mouth.

Looking north we see the South Pass with a vessel on its surface, and the irregular and, at times, very narrow strip of land which walls in the current.

Once outside, and we bear northeasterly to pass around the N. E. Pass on our return to our "port of departure." After passing out of the ship channel, we are again in shallow water until we cross the channels extending from the other mouths, in the vicinity of which there are large numbers of very curious islands, all nameless, well termed collectively the "mud lumps." They consist of a very compact black or yellowish clay, overlaid with a thin top soil. In size they vary from a few square rods to perhaps fifty acres, and their surface is three to nine feet above sea level. They appear to have an origin quite different from the other islands—for their topography suggests very strongly that they have been erupted from below the surface of the water. I can not say, however, that this is true. The vegetation of these dreary spots is sparse, and weedy in character. The lack of natural charm is emphasized by the frequent abundance of flies, which buzz about one in a most threatening manner and bite viciously. One very interesting little plant we found, which evidently had been brought down the stream—a little floating fern, *Azolla Caroliniana.* This was growing in a little cove of a mud lump near Pass á Loutre. On islands near by we found immense flocks of pelicans.

After leaving the North Pass we sail northwesterly for Bird Island, a long, slender strip of alluvium overlaid on the seaward side by sand in sufficient quantities to be heaped up by the wind into small beach dunes. Here we find the beautiful sea oats, *Uniola paniculata,* which add a strikingly graceful element to the otherwise monotonous grassy, beach dune vegetation.

The most important grass is *Panicum amarum,* since it is a sand binder, and is largely responsible for the topography of the beach dunes, which are found at the limit of ordinary wave action. (Fig. 6.) Growing chiefly at this point we find the common tropical beach convolvulus, *Ipomoca pes-caprae,* so called on account of the resemblance of the leaf to the hoof of a goat. The runners of this plant attain a length of 120 meters on the Florida strand, although the longest I found in the Delta region were only a fourth as long. The plant has fine reddish-purple flowers, seen in their beauty only in early morning. There is another similar plant, found in Breton Island, with lobed leaves and white flowers.

Bird Island serves as a type of many other islands, such as Breton Island and Cat Island, in that the foundation is alluvium. Overlying this, on the seaward side, which is also the windward side with respect to the prevailing wind, is a layer of sand, more or less deep, according to the size of the island. On the largest, enough is present for the making of large dunes, in the lee of which stretches of sandy plains are found. On these islands the vegetation is composed of pine trees and palmettos, and is very similar to the vegetation of the coastal plain of the mainland.

One other type of island remains to be mentioned, of which there are many examples on our course from Bird Island to Cat Island, west of Chandeleur Sound. They are similar in origin to the sandy islands, but are peculiar in the circumstance that the sand is absent and small shell

FIG. 6 *The Beach Dunes formed by a coarse, gray-green grass (Panicum Amarum). Two species of beach morning-glory are to be seen creeping over the sand.*

FIG 7 *A "shell-dune," with its very sparse, weedy vegetation. On the right is the uniform clothing of a succulent (Batis Maritima).*

fragments take its place. (Fig. 7.) They are therefore a
called "shell islands." The shells are always found forming
narrow dune on the seaward edge of the island, quite para
cent to the very narrow, muddy beach. (Fig. 8.) The
muddy, and marshy surface supports a growth of low su
(*Salicornia* and *Batis*), and, less frequently, of the
(*Avicennia nitida*), which is here at its northern limit
very interesting on account of its air roots, which pro
of the mud, and enable the plant to respire. For a
the other succulent plants have corky outgrowths on

The shell dunes, on the other hand, produce a
and very scant weedy vegetation of amaranths,
trailing vines, euphorbias, and the like. (Fig. 7.)

The shallow waters of all the islands are very pr
shrimp, and small fish. The latter are caught by

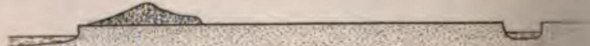

FIG. 8. *An ideal section of a small island with a shell-dune*
The form of the dune as seen in transverse sectio
direction in which it is moved by the

net," a circular net, which, when thrown with skill, brings death to dozens of mullet or thousands of shrimp. This form of net is especially adapted to shallow waters, although it is used also throughout the West Indies. I am told that it is found in the Nile delta also, and I have seen it on the Rhine.

One of the most unique experiences I ever had was on a dark night at Breton Island. Taking the skiff, with the purpose of throwing the

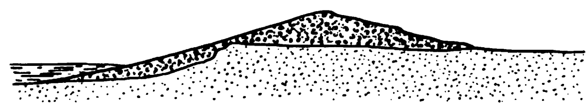

FIG. 9. *Another form of a shell-dune.*

cast net, we saw, as we rowed, thousands of phosphorescent streaks of light shooting hither and thither through the water, like comets in a black sky. It was almost beyond belief, but all caused by the sudden scurry of mullet as the boat frightened them by its approach.

The limit of space has prevented a more detailed account of what we saw upon this delightful and instructive trip. I have tried, however, to bring out the salient features of our experiences of three weeks, which will never be forgotten. We were fortunate in landing at Biloxi, Miss., just in time to escape the terrors of the storm which laid waste the city of Galveston.

THE MOTIONS OF THE EARTH *

PART II

BY FOREST R. MOULTON
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THE REVOLUTION OF THE EARTH

THE question of the revolution of the earth around the sun is quite distinct from that of its rotation on its axis, some of the ancient philosophers having held to one theory and not to the other. Aristarchus (310–250 B. C.) was the first to systematically develop the heliocentric theory, that is, to explain celestial phenomena by supposing that the earth and planets revolve around the sun. He could give no proofs of its correctness and it was quite generally abandoned. The most celebrated astronomical work of the ancients was the Almagest of Ptolemy (100–170 A. D.) which dominated this field of science for fourteen centuries. Ptolemy showed in it that all the

* Continued from THE JOURNAL OF GEOGRAPHY, April, Volume III, No. 4, p. 150.

celestial phenomena known at his time could be explained on the theory that the earth is the fixed center of the universe, the stars and sun revolving around it in circles, and the planets revolving in little circles whose centers move uniformly around the earth in large circles.

Copernicus (1473–1543) developed again the heliocentric theory, with references to Aristarchus, but to explain certain irregularities of motion he supposed the sun not to be in the exact centers of the various circles. His successor, Tycho Brahe (1546–1601), returned to the geocentric theory because *he could observe no changes in the directions of the stars* at different times of the year, which should vary somewhat during the year if the earth revolved around the sun. His successor, Kepler (1571–1630), returned to the heliocentric theory and discovered the three celebrated laws of planetary motion which bear his name. From his time on the heliocentric theory has been universally accepted.

These different theories did not arise from any errors in the thinking of the authors of the contradictory systems. The fact is that they had no data by means of which they could prove one was right and another wrong. Their observations, the same as nearly all of ours at the present day, were concerned only with relative motions, and one system explained them as well as another. The only proof that the great Newton (1642–1727) could give was that, by admitting the heliocentric theory, a *very simple* explanation could be given to all phenomena by means of Kepler's laws and the law of gravitation.

The first fairly direct demonstration of the motion of the earth was through the discovery of the aberration of light by the great English astronomer, James Bradley, in 1726. If rain were falling directly downward and one were standing still in it, he would be struck squarely on the top of his head by it. However, if he should walk rapidly through it, he would be struck on the forward side, or it would seem to descend slantingly, the deviation from the vertical depending both upon its velocity of descent and his rate of walking. So, also, light coming perpendicularly from a star to the plane of the earth's orbit seems to come in slantingly because of the earth's motion. The result is that the star is always apparently displaced a little in the direction of the earth's motion, the amount depending both upon the velocity of light and the velocity of the earth in its orbit. The actual amount of displacement is found by measuring the little circle which the star apparently describes in the sky in the course of a year. When the direction of the star is not perpendicular to the plane of the orbit of the earth the results are, of course, somewhat different, but the differences are easily accounted for.

The velocity of light had been previously found by the Danish astronomer Roemer, in 1675, from observations of the eclipses of Jupiter's satellites, to be finite and about 186,000 miles per second. The one unknown quantity remaining in the problem was the velocity of the earth, which came out as it should under the heliocentric theory. Modern astronomical observations have given the aberrational constant (20".47), and physical experiments the velocity of light (186,330 miles per second) with a high degree of precision. The resulting velocity found for the earth not only verifies its motion but also gives the size of its orbit, and therefore the distance to the sun. This is, in fact, one of the accurate methods of finding the distance from the earth to the sun.

If one were to deny the revolution of the earth around the sun, he would have to admit that all the stars in the sky describe actual small orbits, with the same apparent diameter whatever their distances, in exactly a year, and in such a manner that they are constantly ninety degrees behind the sun in its motion around the earth.

It has been remarked that Tycho Brahe abandoned the heliocentric theory because he could not detect any apparent change in the direction (technically, no parallax) of the fixed stars during the year. His reasoning was conclusive qualitatively, and failed only because the fixed stars are immeasurably more remote than the wildest imagination could have suspected, and they have such small parallaxes that he was far from being able to detect them. Every attempt at finding a star apparently displaced by the motion of the earth failed until 1838 when the German astronomer Bessel found that the little star 61 Cygni, barely visible to the naked eye, was projected on slightly different parts of the sky at different seasons.

The parallax of a star is the angle subtended by the semidiameter of the earth's orbit at the distance of the star, and equals the apparent displacement of the star due to the motion of the earth through a distance equal to the radius of its orbit. The parallax of 61 Cygni is 0".40, an angle which would be subtended by an object an inch in diameter at a distance of about eight miles, and one exceedingly difficult to measure, involved as it is in the question of parallax with many other greater inequalities, such as the aberration, and subject to a vast number of possible errors. The distance of 61 Cygni from the earth is more than 500,000 times the distance from the earth to the sun, which is 93,000,000 miles. The nearest star in the whole sky so far as is known, is Alpha Centauri, a bright star in the southern heavens which is 275,000 times as far from us as we are from the sun. When a star is more than 2,000,000 times as far from us as we are from the sun its parallax can not be certainly measured by present processes. In spite of the arduous labors of astronomers of many countries less than forty stars among the thousands which stud the sky have so far been found to have measurable parallaxes. The stars are so inconceivably remote that it is meaningless to us to express their distances in miles, and astronomers have come to use, instead, the time it takes light to come from them to us. The velocity of light is so great that it travels nearly eight times the distance around the earth in a second, yet it takes nearly four and one-half years for it to come from Alpha Centauri. When you look out in the south in the early evening at Sirius, the brightest star in all the sky, you see light which left it more than eight years ago, and you see light from the north star more than forty years after it started on its long journey.

If one were to deny that the apparent displacement of the stars is due to the parallactic effects of the motion of the earth, he would have to admit that nearly forty stars describe small orbits of different sizes in exactly a year. and that they are constantly on the same side of their orbits that the sun is of its orbit around the earth.

In discussing the rotation of the earth it was stated that relative motion in the line of sight may be measured by the spectroscope. Evidently this affords an independent means of testing the revolution of the earth. Suppose a star in the plane of the earth's orbit is considered, and for simplicity that it is at a constant distance from the sun. At one time of the year the earth will be approaching it with the rate of its orbital velocity, about eighteen and one-half miles per second; six months later it will be receding at the same rate. These are velocities which can be measured very easily with the powerful modern instruments, and in this way the motion of the earth around the sun has been often verified. If the star is in motion with respect to the sun the problem is equally simple. For, suppose it is receding at any rate, say, ten miles per second. At one time of the year the spectroscope will show a relative velocity of 18.5—10 =8.5 miles per second, and six months later a relative velocity of 18.5 +10 =28.5 miles per second. If the observed star is not in the plane of the ecliptic, the matter is a little different but presents no difficulties.

The spectroscope has been in effective use in astronomy less than fifty years, and the observations of the kind under discussion have nearly all been made in the last fifteen years. They show the exact motion demanded by the heliocentric theory. If one were to deny that the changes in the relative motion in the line of sight of the various stars is due to the motion of the earth around the sun, he would have to admit that all the stars move toward and from the earth with a period of one year and with velocities precisely equal to the components of motion in their direction which the earth would have if it did move around the sun.

Each of these three independent methods of testing whether the earth moves (by the aberration, by the parallax, and by the motion in the line of sight) leads directly to the heliocentric theory. or to alternatives which one can not bring himself to believe possible. The question of the earth's revolution seems to be definitely settled and it is altogether improbable that anything will ever be discovered which will throw it in the slightest doubt. It is worthy of note, though, that the actual proofs of it are quite recent, in 1726, in 1838, and in the last few years respectively.

THE SHAPE OF THE EARTH'S ORBIT

The ancients seem to have regarded it as axiomatic that all the celestial motions are uniform and in circles. The first dissenting voice was that of Kepler, who from a most laborious discussion of Tycho Brahe's observations of Mars, announced, in 1609, that this planet moves in an ellipse with the sun in one of its foci. The same thing was in a few years verified for several other planets, and it was also shown that the radius from the sun to the planet always sweeps over equal areas in equal times. These conclusions, drawn without hypothesis from observations, formed the direct foundation for Newton's demonstration of the law of gravitation which was published in the *Principia* in 1686.

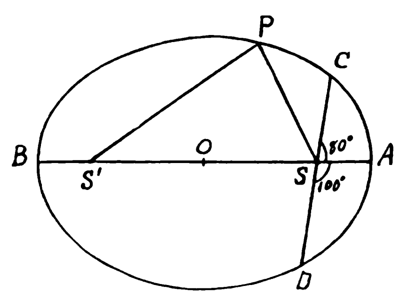
An ellipse is a closed oval which has the property that the sum of the distances from any point on it to two fixed points within is constant and equal to its length. Or, it is the apparent shape of a circle when its plane is not perpendicular to the line of sight. In Figure 2, S and S' are the foci, and $\overline{PS'}+\overline{PS}=AB$ wherever the point P may be. The eccentricity is $\overline{OS}\div\overline{OA}$. As the ellipse becomes more and more nearly circular the foci S and S' approach the center O. The orbit of the earth is so nearly circular that its eccentricity, which is .0168, can not be shown in a diagram.

To draw an ellipse easily set two pins in the paper, place a loop of thread over them of such length that there shall be a little slack, take a pencil with a small groove cut in the graphite near the point for the thread to run in, and trace out the curve by moving the pencil so as to keep the thread always taut. In the diagram the pencil would be at P, the pins at S and S', the thread reaching from P to S', from S' to S, and from S back to P. It follows that if the curve is drawn in this way $\overline{PS'} + PS$ is a constant and when P is at A or B it is seen that the sum equals AB.

It is sometimes supposed that the orbits of the planets are ellipses because of their mutual attractions, without which they would be strictly circular. Nothing is more erroneous, although the proofs of this statement and some of those which will follow can not be given without conisderable mathematics, and will therefore be omitted here.

Suppose the sun is at the focus S and that the planet is started from A at right angles to the line $\overline{SA}$. There is one certain velocity depending upon the sum of the masses of the sun and planet and their

FIG. 2.



distance apart which will give a circular orbit if there are no other forces involved. A greater velocity will give an ellipse such as is drawn in the figure, the elongation being greater the greater the initial velocity. A lesser velocity will also give an ellipse, but in this case the point A will be the one farthest from the sun. Since there is only one velocity which will give a circle while an infinity give ellipses it is not in the least strange that all the orbits are ellipses instead of circles, and according to modern views the lack of circular motion indicates no imperfection in the system.

Another view which is somewhat prevalent and entirely erroneous is that the planets are so distributed that a perfect balance of forces is kept up, and that any disturbance to the system would result in its speedy collapse. The fact is that the planets interact upon each other to some slight extent, but, i' every planet except the earth were removed, only a somewhat attentive observer of the sky would ever notice any difference.

As has just been stated the mutual attractions of the planets modify their motions to some slight extent and the result is that no planet moves in an exact ellipse. These deviations from elliptic motion are called perturbations. Although the planets do not move in fixed ellipses it has been found convenient, both in analysis and popular description, to consider that they always move in ellipses, but in ones which continually change in eccentricity, position, etc. The idea has been aptly illustrated by comparing the motions of the planets with that of a bead running on a wire hoop bent into the form of an ellipse and whose eccentricity, position, etc., continually change. The bead is always running on an ellipse, but the ellipse is constantly varying.

A question of the very highest interest and importance relates to the effects of the mutual attractions of the planets upon their orbits, particularly whether the present general configuration of the solar system ever will be greatly altered or not. This is a question of great mathematical difficulty, and has not been answered with certainty for an indefinite time, but the conclusions are undoubtedly very nearly correct for perhaps several hundred thousand years. The appropriate mathematical discussion, due to Lagrange and Laplace at the end of the eighteenth century, shows that the mean distances from the sun and the periods do not change in the long run, although they are subject to short period variations; that the eccentricities and inclinations to the plane of the earth's orbit increase or decrease for many thousands of years and then change in the opposite direction, and have also short period variations; and that their lines of nodes (*i. e.*, the lines of intersection of their planes with the plane of the earth's orbit) and the lines of their major axes continually revolve in one direction, besides having short period oscillations. The amounts of change and these long periods of oscillation are different for the different planets. Thus, in the case of the earth the eccentricity which is now .0168 is slowly diminishing and will continue to decrease for about 24,000 years when it will be about .003, after which it will increase for about 40,000 years when, according to Leverrier, it will be about .078; the plane of the earth's orbit changes through an angle of 2° 40′ in the course of many thousands of years; and the line of the earth's major axis completes a rotation in the direction in which the earth moves in about 108,000 years.

CROLL'S THEORY OF THE ICE AGES

One might suppose that the questions which have just been discussed are of importance to the mathematical astronomer rather than to one whose interests are primarily in geography or geology, but the conclusions arrived at are very far-reaching in their points of contact, as will be illustrated by an example in this section.

The point *A* (see Fig. 2) is the perihelion point and while in that part of its orbit the earth receives more light and heat from the sun than at any other time, the amount being about 1-15 more than when at *B*. If the earth's orbit had its maximum eccentricity of .078, the difference would be nearly 1-5, and if it had its minimum value of .003 the difference would be about 1-85. The earth is at *A* on December 31st and at *B* on July 2d (a variation of a day or two in these dates is possible owing to the leap year and perturbations). If the angle *DSA* equals 100 degrees, and the angle *ASC* 80 degrees, then the sun is at the autumnal equinox when the earth is at *D*, and at the vernal equinox when the earth is at *C*. If the whole year is to be divided into two seasons, winter and summer, the northern hemisphere will have winter while the earth is moving through the arc *DAC*, and summer while it is moving through the arc *CBD*. Since the area *DAC* is less than the area *CBD*, and since the radius from the sun passes over equal areas in equal times, it follows that our winters are shorter than our summers. The actual count from September 22d to March 21st, and from March 21st to September 22d shows them to be 180 and 185 days respectively. In the southern hemisphere things are precisely reversed. That is, our winters are shorter than those in the southern hemisphere, but, latitudes and other things being equal, we receive more heat daily than is received there because the earth is nearest the sun in our winter. Our summers are longer than those south of the equator, but, other things being equal, we receive less heat daily. The appropriate mathematical discussion shows, however, that corresponding latitudes in the two hemispheres receive precisely equal amounts of heat in any two corresponding seasons or proportional parts of seasons, but, owing to their different lengths in the two hemispheres, the heat is distributed throughout the year quite differently in the two cases.

About twenty years ago James Croll attempted to show that the six or seven ice ages which have followed one another in the continents of the northern hemisphere were due to the very unequal distribution of heat throughout the year, which would occur at the epochs when the eccentricity of the earth's orbit is great, and the earth at perihelion in our summer. According to this theory the glacial epochs have been separated from each other by immense periods of time, in fact, much longer than any other considerations seem to indicate. For this and other reasons which can not be entered into here, the theory is now generally regarded as incompetent, although it can not be doubted that the causes which Croll pointed out have had considerable effects on the climate of the earth in the ages that are past, and that they will exert sensible influences in time to come.

MOTION OF THE SOLAR SYSTEM WITH RESPECT TO THE FIXED STARS

As everything on the earth, even the "eternal hills," is subject to change, so also in the heavens everything changes. The fixed stars are only relatively fixed, the configurations of the constellations being greatly altered in the course of thousands of years. With modern instruments the relative drifting of most of the bright stars and many faint ones can be detected in a year or two. These observations imply relative motions among the stars, and as the sun is a star it is only reasonable to expect that it moves with respect to the other stars.

Over one hundred years ago Sir William Herschel found that the stars in one part of the sky were apparently getting a little farther from each other, while in the opposite part they were apparently closing together. Although these motions were very slight and found only by taking averages, he boldly interpreted it as meaning that the whole solar system is moving toward that part of the sky where the spreading out occurs, and he fixed the point toward which we move as in the constellation Hercules. This constellation is almost at the zenith in our latitude the 1st of April at five o'clock in the morning, being in the eastern sky immediately before daylight. The work of one hundred years along the line of Herschel's investigation has verified his conclusions even to almost the precise point in the sky designated by him.

In the last few years the spectroscope has been applied to test the motion of the system. It would be a simple matter if the stars were not moving with respect to each other. As it is, the spectroscope gives the combined components of motion of the star and earth in the line joining them. From a large number of observations it is found that, *on the average*, the sun and the stars in the direction of Hercules are approaching each other, while the sun and the stars in the opposite direction are receding from each other. Therefore this method leads to the conclusion that the sun is moving toward the constellation Hercules with respect to the fixed stars. The spectroscope also gives, by averages, the velocity of the sun's motion, which turns out to be about eleven or twelve miles per second. The earth is thus describing a spiral around the line of the sun's way as an axis.

Some of the stars and the sun are approaching each other or receding from each other at astonishing velocities. Thus, Sirius and the sun are receding from each other at the rate of more than twenty miles per second, or more than 300,000,000 miles annually. Although this has been going on indefinitely no observable change in the appearance of the star has taken place since scientific observations of it have been made. The reason is that this distance, great as it may be, is but an extremely small part of the vast distance between the star and us. Although Sirius is comparatively near us, as the distances to the stars go, it will be more than 800 years before a velocity of twenty miles per second will increase its distance by one per cent. Vega, the brightest star in Lyra and quite near the apex of the sun's way, and the sun are approaching each other at the rate of about fifty miles per second.

Probably the sun is moving in a sensibly straight line, for the stars are so extremely remote that their attractive influences are quite inappreciable. It is not necessary to assume, as is sometimes done, that its motion is due to the attraction of other bodies, for this implies that it was originally at rest, an assumption which is by no means necessary, and not even probable.

One possible consequence of the sun's motion remains to be mentioned, and that is that it may some time encounter meteoric matter or even collide with a star. In fact, this outcome seems to be almost inevitable, ultimately. If a collision should occur, it would result in the destruction of the present system by the enormous amount of heat generated in the impact. The combined mass would become nebulous, after which it would undergo an evolution of cooling and shrinking. Indeed, it may be that our present system has evolved from a nebulous mass generated by collisions of earlier and smaller bodies than the sun. It is fairly probable that temporary stars owe their sudden intense luminosity to the heat generated by the impact of collisions of some sort.

THE FUNCTIONS OF GEOGRAPHY IN THE ELEMENTARY SCHOOL: A STUDY IN EDUCATIONAL VALUES

BY WILLIAM CHANDLER BAGLEY
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REDUCED to its lowest terms, education consists in giving to the individual experiences which shall modify his future adjustments with reference to certain social or moral ends. Such experiences may be imparted either directly (through the individual's personal contact with the environment) or indirectly (through language or some other symbolic medium for the transmission of experience). Such experiences may function either automatically (as habit) or consciously (as judgment or reason). The problem of the science of educational values is to determine the part which the various items of the curriculum play in this process. Given any subject of instruction, for example, the question must be answered: In what different ways will this knowledge be likely to function in future adjustments? This question answered, the detailed problems of method can then be attacked: How shall we teach this subject in order that it may efficiently fulfill its function? How much time and energy shall be allotted to this subject in comparison with other departments of instruction?

The increasing importance of geography in all stages of education renders the question of values especially important. Why has this subject so suddenly assumed a position of great importance, not only in the elementary schools, but also in the high schools, the colleges, and the universities? What has caused so marvelous a change in the status of a discipline which, only a few years since, was derisively termed "the sick man of the curriculum"? An answer to these questions immediately suggests itself: A knowledge of geography has been found to be of service to its possessor. What this service is, and how the "new" geography has come to render it efficiently, when the "old" geography was inadequate for this purpose, are questions that certainly merit careful consideration.

It is obvious that one's estimation of the value of geographical facts depends entirely upon one's connotation of the term "geographical." If we include under this term only those facts that were commonly made the subjects of geographical instruction twenty years ago, we must say in all candor that such facts have but a minimum of utility for their possessor—unless, indeed, he chance to be a sailor. If, however, we mean by geographical facts all the knowledge which man has accumulated concerning his environment and its relation to his life, then the question obviously assumes a different aspect. Thus defined, geography becomes the nucleus of all the sciences that deal with natural phenomena. But geography is something more and something less than a mere blending of these various departments of knowledge. It is both more and less than astronomy plus geology plus botany plus zoölogy plus anthropology. Twenty years ago this statement would not have been true, at least in so far as the geography of the schools was concerned. Geography at that time was but a mosaic of materials borrowed from the various sciences of nature. This mosaic was not in itself a science, because it lacked a unifying principle.

The very looseness of the old definition betrays this weakness: "Geography is a description of the surface of the earth and of its countries and their inhabitants."

The unifying principle which has made geography a science is Man. Not all the facts of botany are important in geography, but only those that are directly connected with man's welfare. This does not imply that a complete treatment of geography would not perhaps involve all the facts of botany, but these would be arranged and classified with reference to this unifying principle. The pure science of botany, on the other hand, takes no account whatsoever of this principle. To all intents and purposes, a pure science is a closed system.

This distinctively human view of geography was first clearly enunciated by the great German geographer, Karl Ritter, who died in 1859. It has only been within recent years, however, that the principle has come to be generally adopted, and even to-day there are some authorities who refuse to recognize the limitations which it imposes; but even the latter would probably agree that, for educational purposes, this view of geography is the most satisfactory. Mr. Redway has summed up the matter in the following words: "The question of the nature of geography is gradually settling itself into one that inquires into the proper basis and scope of the subject. During the past twenty years we have seen public opinion throw aside the notion . . . of geography as a 'description of the earth's surface,' and substitute therefore a very broad idea, 'the study of the earth as the home of man.' . . . If I felt called upon still further to add to the literature of definition, I should put it as 'the study of man and his environment,' or, perhaps, 'life and its environment.'" *

If, then, we look upon geography as a study of the environment in its relation to the life of man, the *utilitarian* value that attaches to this subject is obvious from the outset. Broadly speaking, all life is adjustment to an environment. Anything that tends to render this adjustment more efficient is of value from the standpoint of utility. Whatever reduces waste, whatever saves time, energy, labor, whatever increases wealth and material prosperity may be looked upon as utilitarian in its value. That the facts of geography, as we now understand that term, possess such utilitarian value in a degree sufficient to warrant their wide dissemination is easily demonstrated. A few concrete instances will suffice to illustrate this point.

The process of distribution that is continually going on, tending to relieve … of the earth's surface and to populate the

p. 155.

undeveloped areas, can take place either blindly or intelligently. In the former case, lack of accurate information concerning the conditions of different regions—their relative productivity, healthfulness, etc.—leads to a chance or fortuitous selection of favorable environments; that is, under conditions of geographical ignorance, migratory movements frequently entail a tremendous material waste, to say nothing of human suffering. Inadequate knowledge of climatic conditions, for example, led to the misfortunes that followed the wild rush into the semi-arid regions of Kansas and Nebraska in the early 80's. To-day the work of the various scientific bureaus of the national Government is devoted to the gathering of accurate information regarding the temperature, rainfall, fertility, and salubrity of various parts of the country. Annually a vast mass of information is collected, digested, and published—information which is, in its very essence, geographical knowledge. The pupil in the upper grades of the elementary school could and certainly should be made acquainted with the sources of this information and trained in its interpretation. The expense which is involved in the collecting of this data would be repaid in a generation, if the schools would see to it that their pupils know where to get at it and how to use it. In fact, a more intimate connection between the Department of Agriculture and the public schools is earnestly to be desired. In some instances a start in this direction has been made through the medium of the State agricultural colleges; but, as yet, it is only a start. The only possible objection that could be urged against such a correlation would come from wild-cat land companies that attempt to colonize unproductive regions. An examination of the advertising pages of recent magazines will demonstrate that such companies exist even to-day.

The merchant engaged in the export trade has no longer to send his vessels to distant shores on the chance that a market may there be found for his goods. The Consular Reports published by the Government give accurate information concerning the commercial geography of foreign countries—what goods are in demand, at what profit they can be sold, what duty must be paid for their importation, what commodities will not find a sale, and a host of other valuable facts which operate to reduce losses and increase profits. All this geographical knowledge is important, from a utilitarian point of view, to many different classes of people. It is knowledge which the merchant, the farmer, the manufacturer, and the legislator may frequently use to their advantage. And the laborer seeking a market for his labor may be just as materially benefited by such knowledge as the manufacturer seeking a market for his products. Here, again, is a suggestion toward the making of geography practical in the elementary school. The writer once proposed this question to an eighth grade class that had been exceptionally well prepared in commercial geography: The Great Northern Railroad recently sent a representative to Asiatic Russia to study the Trans-Siberian Railroad; what motives led the management to take this step? A variety of answers were obtained, nearly all showing commendable acumen of thought. These were criticised by the class with the aid of suggestive questions, and finally the conclusion was reached that the Great Northern directors were anxious to know whether they could compete with Russia in supplying wheat for the oriental market. It is obvious that such a question of commercial geography is of vital interest not only to the stockholders of the Great Northern Railroad but also to the entire population of the northwestern States.

We have spoken so far only of the utilitarian value of detailed facts of geography. But the new geography, like all true sciences, renders deductive processes possible. From the facts are induced great principles which can, in turn, be applied to particular instances with reasonable certainty that the conclusions will be justified by actual facts. "All knowledge," says Professor Ostwald, "is prescience"; that is, the ultimate value of knowledge, as such, lies in the fact that with it one can forecast the future on the basis of the past. The value of the principles of geography, from a utilitarian standpoint, is as unmistakable as the value of detailed geographical facts. To-day we not only know, as a matter of direct observation, that certain regions are unsuitable for agricultural pursuits, but, given the contour of a certain region, given other facts of its topography, given a few hints as to its geological history, given the prevailing winds, and its distance from the sea, we can determine *a priori* its suitability for agriculture. There is, of course, a possibility of error. Actual test may overthrow the results of our theoretical considerations; but the chances are greatly in favor of their validity. An interesting example of a gigantic enterprise, based upon *a priori* reasoning from geographical generalizations, is furnished by the recent exploitation of the water power of Sault Ste. Marie. All precedents seemed to justify the assumption that a great manufacturing and commercial center should grow up at this point. Its situation near the wheat fields of the Northwest, near the immense virgin forests of Ontario, near the unrivaled deposits of iron ore in the Lake Superior region; its facilities for water communication with the most populous centers of the continent; its proximity to the labor market—

—all these conditions supplemented the extensive water power developed by the rapids of St. Marys River in warranting the rosiest pictures of the future. A large corporation was organized for the purpose of developing these resources. A canal was dug on the Canadian side—cut through the solid rock—to bring the water to the turbines at a convenient point. Factories were constructed on a scale hitherto unheard of in the business world. Steamer lines were operated on the lakes, and a railroad was pushed north into the forest to bring down pulp wood and iron ore. For a time everything went as anticipated, but a few months ago the entire organization collapsed. Some important factor, no one seems to know just what, had been overlooked. Possibly the results were expected too quickly; time was not allowed for natural development. But that the fundamental conclusion was valid—that a great city will sometime grow up at this point—no one seems to doubt, even after this disastrous failure.

Does the utilitarian value of geography justify the importance which this subject has assumed in education? Is it of value to special classes rather than to the average citizen? Should the study of geography be left, in the main, to the higher institutions? Every one must know how to read and write, how to compute, how to express himself effectively; could not the time of the elementary school be spent more profitably upon such subjects as these? Upon the basis of the above considerations, and bearing in mind the fact that the majority of children never get beyond the elementary school, these questions must be answered in favor of geography. The utilitarian value of geography, however, would not justify its preëminence in the elementary school to the neglect of these other branches. Nor is the utilitarian value the only value that accrues to its study. It adds an increment, and a large increment, to the total value of the subject, but very few disciplines rest upon utility alone. It is only necessary here to point out that the utilitarian value of geography is extremely important, and that our methods of teaching must be modified in some degree by this fact. To what extent they should be modified can be determined only by a comparison of the utilitarian value with the other values which geography may possess.

We know that the prominence of certain items of the curriculum is justified, not by the utility of their facts and principles in actual application to the problems of life, but rather by the condition that ignorance of these facts and principles brands a person as uneducated, and hence serves to militate against his maximal efficiency in society. The study of grammar is, perhaps, the best instance of a subject of formal instruction, the main value of which is *conventional*. A sentence that is grammatically incorrect may express one's thought just as clearly as a sentence that is grammatically correct, yet habitual use of incorrect forms—disregard of conventional requirements—will distract the attention of one's auditors from the thought to the form, and hence will militate against the maximal efficiency of one's expression. The question now arises: In what degree will conventional requirements justify the teaching of geography in the elementary schools?

Geographical knowledge is certainly "assumed" as part of the intellectual equipment of every one who would claim for his thoughts and opinions the consideration of the average man. The man who does not know that the earth is round will surely be handicapped in his dealings with others; for, in social intercourse, men and women generalize upon slight bases, and the man who has proved himself to be ignorant upon so common a branch of knowledge as geography will receive scant attention upon other matters. The elementary school owes it to the individual to furnish him with those geographical facts and concepts that "every one must know." In this day, when "learning by heart" has been practically banished from orthodox pedagogy, it is especially necessary to emphasize this point. A number of facts must certainly be memorized for this reason if for no other.

In addition to the value of its facts in direct application to the needs of life, and in addition to its conventional value, geography has a peculiar value as a preparation for other subjects. A knowledge of geography is especially important in the successful study of (1) history and current events, (2) literature, and (3) natural science.

(1) "History is not intelligible without geography," says a recent writer.* "This is obviously true in the sense that the reader of history must learn where the frontiers of States are, where battles are fought out, whither colonies were dispatched. It is equally if less obviously true that geographical facts very largely influence the course of history. Even the constitutional and social developments within a settled region are scarcely independent of them, since geographical position affects the nature and extent of intercourse with other nations, and therefore of the influence exerted by foreign ideas. All external relations, hostile and peaceful, are based largely on geography, while industrial progress depends primarily, though not exclusively, on matters described in every geography book—the natural products of a country and the facilities which its structure affords for trade, both domestic and foreign."

* H. B. George: *The Relations of Geography and History*, Oxford, 1901, p. 1.

It should not be overlooked, however, that the relation of geography to history is, in some measure, reciprocal—that, while geography is essential to the understanding of history, history is sometimes no less important in the rational study of geography. It is perfectly obvious that the significance of many geographical facts depends in no small measure upon historical conditions. Boundaries between countries, for example, are important geographically, yet they frequently have no adequate geographical explanation and must be interpreted entirely from historical bases. This point is also illustrated by the location of certain cities, although here a geographical influence may often be traced through historical media. For example, the capitals of the South American republics in the Andes region (including also Venezuela) are all situated away from the seacoast in all but inaccessible mountain regions. The cause of this phenomenon must be sought, not directly in geographical, but rather in historical conditions. For generations the neighboring seas were infested with pirates, and cities on the coast were constantly subject to pillage and sack at the hands of these outlaws. Nevertheless, that this historical condition should have arisen is undoubtedly due to the operation of geographical causes.

Admitting the reciprocal nature of geography and history, however, it is plainly apparent that geography is the more fundamental, hence its greater preparatory value in connection with history.

The study of geography is also essential to the rational understanding of "current events." Not to evaluate current tendencies with some degree of intelligence is certainly not to prove oneself efficient in society. In this day when an occurrence on the other side of the globe may immediately and directly influence the humblest citizen on this side, the ability to read newspapers intelligently needs no elaborate argument for its defense. And the ability to read newspapers intelligently certainly involves not a superficial but a thorough knowledge of geography, as the contemporary happenings in the Orient abundantly testify.

(2) Geography stands in an intimate relation to the study of literature. The classics commonly read in the elementary schools—*Robinson Crusoe* and *Evangeline*, to name only two—could not be adequately appreciated without a prior knowledge of geographical facts. Just what weight should be attached to geographical study upon this ground is necessarily indeterminate, but this factor certainly adds an increment, and a large increment, to its total value.

(3) Rather more tangible is the relation of geography to the natural sciences. As pointed out above, geography borrows many of its facts

from different fields of natural science—from geology, meteorology, astronomy, botany, zoölogy, etc. In the high school and college each of these sciences is treated in and for itself as a pure science—that is, without explicit reference to its economic or human relations. It is obvious, however, that the initial study of a science should be from the human side. The child should be introduced to facts and principles in their relation to his life. This is what geography attempts to do. In a sense it might be looked upon as an introduction to all the sciences of nature. It is here that the child must get that first large view which should precede all detailed and abstract study—abstract in the sense of being considered apart from its human relations. Educators are now coming to believe that the curriculum should include geography not only as a preparation for the sciences, but also as a culmination of all scientific study; that is, an advanced course in geography should form the capstone of the science work in high school or college. The student should bring together the facts and principles that he has acquired in the detailed study of the various sciences, and discover their relations to human life. This is only a consistent application of the general principle that mind begins with large wholes, passes from these to detailed parts and then back again to the wholes—analysis followed by synthesis, differentiation followed by integration. In any case, however, we can not doubt that geography has great value as preparatory to the study of science, and that, if the student is to get the most from the study of science in high school or college, he must be thoroughly grounded in geography in the elementary school. Here, however, we are speaking for the few rather than for the many. To the majority of our pupils the initial study of geography forms the sum total of their scientific instruction. Therefore the preparatory value of geography can not be unduly pressed as a justification for its preëminence in the elementary school.*

The dividing line between *practical* and *cultural* values is indeterminate. What we have discussed under the head of utility is beyond doubt "practical" in the narrowest sense of the word. But conventional values become practical when we look at them from a certain standpoint: when we remember that conventionally valuable facts aid one in one's social adjustments. The preparatory values are practical ultimately, provided that the subjects which they look forward to are in themselves practical. The values which we have now to discuss

* This would seem to indicate the fallacy of President Hall's proposals for replacing geography in the grades with elementary science. Cf. *The Ideal School*. Proceedings N. E. A., 1901.

will doubtless appeal to one as ultimately practical, although with more intermediate steps than is the case with those considered above. Because of this distinction we may class the following as cultural values, remembering, however, that the distinction between practical and cultural is one of degree rather than of kind.

Acquisitiveness in man is an instinct. Like all instincts it owes its existence to the forces of natural selection working upon fortuitous variations in nerve structure. It has been good for man to be curious about his environment, to study his environment, and to determine the laws that govern it. Primitive man did not realize, probably, that his inordinate curiosity was good for him. In his own rude way he investigated things for the mere "fun of it"—for the pleasure which it afforded him. Later in his development he came to find out that many of the facts which he discovered and many of the laws which he worked out were "good" for him—that the knowledge which he had gained helped him in solving the problems of his life. But this appreciation of the value of acquisitiveness came only after a long lapse of time.

The desire to satisfy curiosity is thus seen to be at the basis of knowledge. The child evinces this desire. His curiosity is boundless, and upon this native instinct the educator may build. It is clear, however, that he ean not trust to it entirely, for the very fact that it is an instinct means that it runs its course in passive attention. It is not sustained, directed, organized. All these things mean active attention, mean *work*. Curiosity soon tires, but any measurable addition to knowledge involves persistent effort.

It is the problem of the educator, then, to replace this instinctive curiosity with a higher mental process. The desire to obtain knowledge for the sake of knowledge is not to be discouraged, but it is to be held to a definite line until results follow. Wherever possible, the child's curiosity should be directed along lines that will help him most in his future adjustments. There are times, however, when this curiosity may be directed toward ends the practical significance of which is not once apparent, and it is these cases that we must discuss under the head of cultural values.

In the first place, some children may be curious in certain special directions. They may evince a desire, perhaps, to learn all that they can about Arctic exploration. The facts that they obtain from various sources may not be applicable to the problems that they must solve in later life, yet no sensible teacher would attempt for a moment to curtail this interest. He has here the opportunity to replace instinctive curiosity with a higher sentiment, namely, intellectual interest. This is closely akin to other forms of sentiment, such as appreciation of art, music, and literature. None of these is, in itself, "practical," yet each subserves a very practical end. Without some form of pleasure, life would be impossible. If the higher forms of pleasure—the sentiments—are not developed, the individual will be thrown back upon the primitive pleasures. He will follow the instincts, the lines of least resistance. In our school work to-day we are trying to develop the aesthetic sentiments—to cultivate an appreciation for art, music, and literature. We should certainly not neglect the intellectual sentiment the pleasure that comes from knowing. It is for this reason that the wise teacher would never think for a moment of curtailing interest in such a subject as Arctic exploration. The opportunity is too valuable to be lost. With a little trouble he may lead the child to take delight in an intellectual pursuit, just as with a little trouble he may lead the child to see the beauty in a great picture, or a classical musical composition, or a world epic.

In the second place, items of knowledge which have little or no significance in the practical affairs of life may nevertheless be necessary to a *system* of knowledge. It is a well-known fact that systematic arrangement or organization is an extremely important factor in the "efficient recall" of items of experience at times when they are needed.* Very frequently in making a system of knowledge—in arranging the items of experience in an orderly fashion—it is necessary to insert many facts and principles which have in themselves little practical value. Thus the individual may never be called upon to apply his knowledge of the Arctic regions, but such knowledge is necessary in order to make his world view comprehensive. Without it there would be a distracting gap.

The briefest examination of the curricula of the secondary schools and colleges will serve to demonstrate the importance of the "cultural" values which we have discussed in the two preceding paragraphs. The larger part of these curricula is made up of subjects which subserve one or the other of these two functions: tending either to develop intellectual interests or to make more comprehensive and complete the body of knowledge. The science, the mathematics, the language and literature, which occupy so prominent a place in the higher education.

* The importance of "thought-connections" in recall has been demonstrated, time and again, by the methods of experimental psychology. *Cf.* The work of Ebbinghaus, Steffens, and Lobsien

can be justified only upon these grounds. In the elementary school, on the other hand, the cultural values are not so prominent. The bulk of the time is given over to the study of arithmetic and language, the latter including reading, writing, composition, and grammar. Literature and geography divide most of the remaining time between them. Arithmetic and language are justified principally because of their utilitarian values. Literature is prominent chiefly because of its conventional and cultural values. Geography might be said to occupy a midway position, being important from all sides.

If the foregoing analysis of the aims and functions of geography as an integral part of the elementary school curriculum is valid, it follows that our methods of teaching must be organized with these points in view. If possible, the various aims should be classified with reference to their relative importance in fulfilling the general end of education, namely, the production of the socially efficient individual. We should know with approximate accuracy just what facts and principles are to be impressed because of their utilitarian value, what are essential from the conventional standpoint, what from the preparatory, and so on. In many instances the groups will, of course, cut across one another, but it seems tolerably clear that methods of impressing facts and developing principles will vary according to the function which the facts and principles are to subserve.

These are problems which it must be left for educational research to solve. From the standpoint of the practitioner, at least, this suggests a field of investigation infinitely more promising than those which contemporary educational experts are attempting to exploit.

GEOGRAPHICAL NOTES

Wind-Blown Trees.—The communication on *Wind Effects*, by Prof. M. S. W. Jefferson, in your January number, interests me much, as it concerns a subject to which I have given some attention for several years. Observations of the kind to which your contributor refers are easily made, and add much to the interest of the study of meteorology, because they give it life. If any of your readers cares to pursue this subject further, he will find an instructive discussion of it in a recent paper by Prof. J. Früh, entitled *Die Abbildung der vorherrschenden Winde durch die Pflanzenwelt* (*Jahresber, Geogr. Ethnogr. Gesells.*, Zürich, 1901–02, 97 pp.). In this study Professor Früh classifies the effects of wind action on trees, names the most sensitive trees, and gives observations from different parts of the world. Savage tribes often make use of tree wind-vanes to guide them on their wanderings.

Apropos of wind-blown trees, I have somewhere heard a story of a gardener who, when shown a large number of trees which had been blown by the prevailing wind, and not appreciating the fact that what he saw was the result of wind action, said he could not take the place, because he could never keep all those trees trimmed at that particular angle.—R. DeC. Ward, *Harvard University, Cambridge, Mass.*

Our Proportion of the World.—"In area possessing one-fourteenth of the entire earth, in population one-twentieth, and increasing more rapidly than that of the rest of the world; in wealth one-fourth, in international commerce one-ninth, in banking power more than one-half, in savings deposits nearly one-third, in Government revenue one-tenth, in stock of gold nearly one-fourth, in stock of silver one-sixth, in amount of life insurance two-thirds, in railway mileage over one-third, in coal production one-third, in copper production one-half, in zinc production one-fourth, in iron and steel production more than one-third, in wheat crop one-fifth, in corn crop two-thirds, in cotton crop eight-tenths, in wool crop one-tenth, in output of newspapers and periodicals over one-third—this is the achievement of the United States after a century and a quarter of existence."—*Wall Street Journal.*

Primary Geography.—Years ago, as many teachers remember, such subjects as botany, zoölogy, and chemistry were taught from the written description in the text-book, but we have progressed in such a degree that any one attempting to teach now, other than objectively, would be considered on the verge of lunacy. Geography was taught in the same manner, but each succeeding year places it, too, more and more on an objective basis. We have advanced to a stage where objective teaching of every subject seems imperative. Verbal descriptions are inadequate, for, no matter how graphically you describe a place or thing, each listener is forming a different mental image, and no imagination, however clear, can create a mental picture at all correct, unless there is already in the mind suitable experience gained from actual observation of the thing described or from pictures of the object. So little do business men depend on verbal descriptions that, if they wish to construct a building, before entering into a contract for the same, they must see on paper a complete picture, that there may be no misunderstanding. They realize "that a greater amount of information and a more lasting impression is gained from a single picture than from pages of description." We as teachers are slowly adopting business methods. We are beginning to realize the importance of securing good mental images.

We know the best means of doing this is to visit the object itself; but since we can not charter an airship and travel with our little flocks from pole to pole, nor can we import mountain peaks, seas, or rivers at our convenience, the next best means is to model them on the sand table, and at the same time present the best pictures on the subject that can be secured. Dr. Redway says that in the teaching of geography climate is fundamental, and the first topic that should be considered, as its influence has everything to do with the food, shelter, and clothing of the inhabitants of the earth. To illustrate the power of this influence, I know of nothing better than the story written by Jane Andrews of the "Seven Little Sisters," which should be in the hands of every primary teacher. It is easily illustrated and dramatized and creates a desire for the further study of geography in children of every size.—*Nebraska Teacher*, February, 1904.

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E. D. J.

EDITORIAL

GEOGRAPHY FOR TEACHERS DURING THE COMING SUMMER

THE opportunities for enlarging and improving one's geographic knowledge during the coming summer will be exceptionally varied and alluring. In fact, no such combination of geographic possibilities has ever before been possible. The numerous summer schools in the larger universities and normal schools of the country offer facilities for geographic study valuable for teachers of all grades of work, detailed announcement of which will be found in our columns this month.

It should not be forgotten, however, that much geographic training of exceeding value can be secured without tuition and that the cheap rates to the St. Louis Exposition will make it possible for many teachers to secure a wealth of information of daily use in their class work, at an expense less than would be incurred in a six weeks' summer school. The exhibits of industries and mankind at St. Louis will be exceptionally fine and will form a school of geography of an unique character. The trip to St. Louis will also give opportunity for personal study of the topographic and climatic conditions of a region of great interest to any one living amid the varied surroundings of the Eastern States. To make such a trip of geographic profit the JOURNAL will be devoted next month to the geography of the Louisiana Purchase, and will be particularly valuable as a guide book, to be read before leaving home. People may pass through the most interesting region without seeing or appreciating the geography about them. Teachers anticipating a trip to St. Louis should therefore prepare their minds for what is to be seen by securing a preliminary knowledge of the geographic possibilities during such a trip.

The studying of geography first hand, either in the field or the classroom, is obviously the best means of increasing one's power in this field. It should be borne in mind, however, that there is no single means of securing inspiration and a due appreciation of the depth and significance of geography like coming in personal contact with the men and women who are leading in geographic thought and work. This unusual opportunity will be given this summer at the meetings of the International Geographic Congress, announcement of which has been already made in these columns. This is the first meeting of the

Congress in this country, and one of the first opportunities there has been for securing the presence of geographers from abroad. Neither have there been, in the past, many chances for an assembly of the geographers of this country. All enthusiasts should attend some of the meetings of the Congress without fail! All interested in the subject will gain inspiration and help from listening to the papers and meeting their fellow workers.

Thus, in at least three different ways, opportunities for growth in geography are possible this summer. It is to be hoped that every teacher will therefore take advantage of these conditions, which may not be duplicated again for many years. Summer schools increase in number and worth constantly; World's Fairs, cheap cross-country trips, and assemblies of geographers are rare. They therefore must be taken advantage of at the moment.

REVIEWS

New Physical Geography. By Ralph S. Tarr. Pp. xiii, 457. The Macmillan Co., New York, 1904.

Tarr's New Physical Geography is, as the author announces in his preface, a "new book" as compared with his earlier texts; and, as we should expect, is in most respects a distinct improvement upon them, although their excellence is attested by the number of editions through which each of them has passed.

This text seems best adapted to the last years of the high school, where the subject is more and more finding place; and the author has evidently adapted his treatment alike to the requirements of those who expect to go to college, and to the much larger class who get their only training in earth-science in the high school. So we find here much that, in the opinion of the strict constructionist, would not belong to physical geography.

By his "Topical Outlines," "Questions," "Suggestions," and lists of "Reference Books," giving publishers and prices, at the end of each chapter, the author has done an invaluable service for the vast army of teachers who are called upon to teach physical geography, but who have not been specially trained for the work. These will thank him also for his suggestions as to "Laboratory Equipment" and "Field Work," appendices J and K.

The topical summaries, excellent as they are, can not be considered an unmixed advantage, as they are an ever present temptation to neglect the longer consideration that precedes them. Many teachers, too, prefer to have their scholars make their own summaries.

The illustrations are both appropriate and attractive; but considering the size and weight of the book, possibly too numerous. In a few instances they are not as near their appropriate texts as could be desired, and the excessive number of bracket references to them seems confusing. A special word of praise is due the block drawings, and more of these could have been profitably used.

The treatment of the Land before the Atmosphere is not logical, nor does the author's reason for it seem sufficient. Such treatment must be either empirical, which the book before us is far from being, or to the scholar unintelligible. The study of physiographic features in their evolutionary development presupposes a knowledge of the air. It is unfortunate, too, that the author has seen fit to give even less space to his consideration of the air than he gave in his "First Book."

Most of the appended matter might better find place under its appropriate topic in the body of the text; and a fuller treatment, at the end of each chapter, of the response of organic forms to their physical environment would make unnecessary their separate treatment in chapters XVII and XVIII, which are too largely biological.

There is not the logical arrangement of topics in sequence that one would expect, and in some cases topics are considered out of what would seem their proper setting. Thus *superimposed* and *rejuvenated* rivers, and *river piracy* are considered under the subject of plateaus rather than under rivers.

A few unfortunate omissions occur, as on p. 45 where *gravity* is omitted from the agents of erosion, and p. 50 where *slope of the land* is not mentioned among the factors determining the amount of run-off.

The author's use of "divide" is at least unusual, and leaves no place for *undivided* regions.

The treatment of tides and ocean currents are alike unsatisfactory; and the mistake is made of considering *rising* and *flood* tide coincident in period, and likewise *falling* and *ebb* tide.

A very small number of typographical errors have crept in, as on p. 259 where "southeast trades" and "northeast trades" should be interchanged, and in Fig. 325 where -35 is evidently not intended.

Chapters XV, XVI, and XIX are distinct additions to the excellence of the book.

In spite of these minor roughnesses, many of which can be remedied in a later edition, the New Physical Geography will easily take its place among the very best texts on physical geography available. W. R. C.

A Laboratory Manual for Physical Geography. By Frank W. Darling. Size 9¾ x 8½. Exercises 32. Chicago: Atkinson & Mentzer, 1903.

The growing emphasis laid upon laboratory work in physical geography is evidenced by the steadily increasing number of laboratory manuals. The breadth of the field and the lack of unanimity in regard to what the essentials in laboratory work really are is clearly shown by the radical differences which these various manuals present to the laboratory teacher.

The manual under consideration contains thirty-two exercises; of these, six illustrate various problems in mathematical geography, seven treat of the atmosphere, while nineteen pertain to the lands. The apportionment is certainly unfortunate. The topic of the ocean has been entirely omitted, and that of the atmosphere, which lends itself so admirably to laboratory investigation, has received scant attention. While no one can question the importance of the land as a subject of study, the causal relation existing among the various elements of climate and weather may be so clearly demonstrated that this topic seems plainly entitled to an emphasis approximately equal to that which the lands receive. In this book, however, the author disposes of the subject of climate summarily—a single exercise on planetary winds being practically the extent of treatment. The topic of the weather is studied by means of daily weather observations, with the addition of one or two exercises on cyclonic storms.

The treatment of the lands is excellent—adequate in scope, detailed in character, and of a nature requiring careful observation and clear thinking.

The exercises dealing with mathematical geography are so suggestive that one can not help wishing for an amplification in this case also. The relation of the earth to the other heavenly bodies becomes more a matter of fact and less a matter of faith to the pupil, who makes direct though simple observations of the heavens, according to the plan outlined by the author, than to one whose knowledge of this field is gained through laboratory equipment and text-books.

While the omissions in the volume under consideration are of a serious nature and greatly impair its usefulness, its strong points and its valuable suggestions should recommend it to every teacher of physical geography either in a secondary or in a normal school. C. B. K.

The Yellowstone National Park. By Hiram M. Chittenden. Fourth edition, revised and enlarged. Pp. vii, 355. Cincinnati: The Robert H. Clark Company, 1903.

Chittenden's well-known volume on the Yellowstone National Park has lately appeared in a new and up-to-date edition, which forms one of the best guides to this "Wonderland." The book is almost equally divided into an historical and a descriptive section. The historical portion is extremely interesting, and gives the salient points in the history of this region in a small compass. For any one who is unfamiliar with the current beliefs in reference to the veracity of the early explorers in this region, Chittenden's volume will form a welcome introduction to some interesting history.

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The illustrations are excellent, and the statistical material well selected. Unfortunately, however, the author has referred but infrequently to the work of the many noted scientists who have unraveled the story of the history of the Park, and then in such a careless way that no one could readily find the original articles. This is a serious defect in a book descriptive of a National Park, and written by an officer of the United States army, especially when most that is known about the Park has been due to the indefatigable energies of Government officers, some of whom have practically given their lives to the task. R. E. D.

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The Philippine Islands, 1493–1898. Edited and annotated by Emma H. Blair and James A. Robertson. Vol. X, 1597-1599, pp. 318. Vol. XI, 1599–1602, pp. 318. Cleveland, Ohio: Arthur H. Clark Company, 1904.

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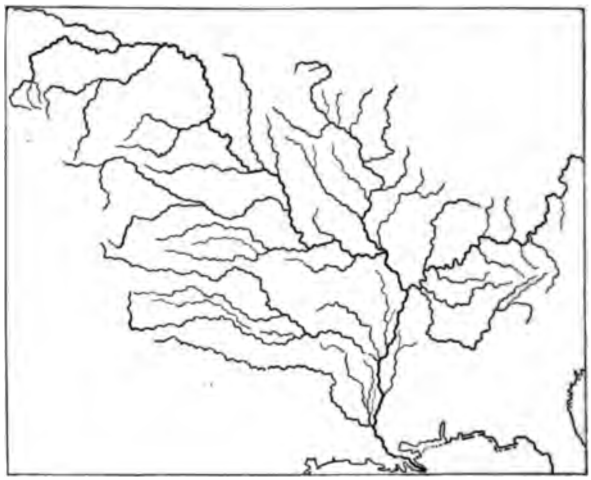

FIG. 1. *The Mississippi River system, showing the vast area and watered surface included in the Louisiana Purchase.*

Colorado. So ran the new possession, from the Gulf to the 49th parallel, from the Lake of the Woods to the Rocky Mountains, distances that are bewildering, areas that we travel over but never truly appreciate, an empire in which an average European state might be lost.

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FIG. 2a. *A scene on a Dakota cattle range. Thousands of similar herds scattered over the western prairies and grazing areas, make the Louisiana Purchase region a rich cattle country.*

products, the census expert affirms that one per cent of the farm products for that year would meet the price agreed upon by Livingston and Monroe and sanctioned by Congress.

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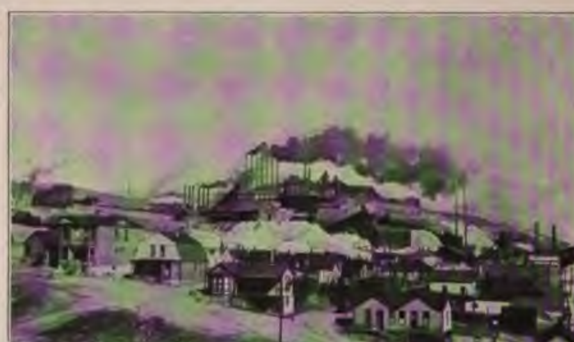

FIG. 3. *Copper mines, Butte, Montana.*

found in Arkansas, in Louisiana, and in Texas; or, leaping again past the Rocky Mountains, they cover the slopes of the Sierras, and mantle with the densest forests of North America parts of the Cascade and Olympic ranges. We should not have any of these but for Louisiana. We will not say that all hinged on the bargaining of a particular year, or of one administration, for the westward current of American life was too strong to be long checked. It had within a generation rolled over the Appalachians, and was in no danger of being permanently restrained from the long incline that leads up to the Rocky Mountains. The particular deeds of history that make most of what is put into the books are but culminating expressions of the larger life that does not depend on accidents or persons.

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fectly logical, if Louisiana and New Orleans were not to belong to the United States. Those early days made experiment of dividing the Mississippi along its course and failed. Later years down to the Civil War made trial of cutting the Mississippi into upper and lower halves. The simple and eloquent words of Lincoln in 1863—"The Father of Waters now flows unvexed to the sea"—might have cast their meaning back over all American history, for now first in our own time does the physical unity of the valley begin to find expression in social and historical solidarity. Galveston, Kansas City, and Omaha, or Chicago, Memphis, and New Orleans, more and more will point the way along the lines of social and commercial interchange.

We can hardly suppose that Jefferson, or his diplomats, or his explorers even dimly knew that they were transforming the nation into a world power. After Lewis and Clark had accomplished their mission, almost nothing was known of the riches of the Columbia basin and fifty years were to pass before railway surveys toward the Pacific were well in hand. The Plains were the Great American Desert of every schoolboy's geography, and not until 1849 did the greatness of California begin. And it has been left for the last ten years to tell us the meaning of our Pacific shore line. A friend whose wife is at this moment visiting in Los Angeles tells the writer that he was looking up her proposed journey thence to a point in Oregon. It had seemed like a run from Boston to New York. He found it was nearly a thousand miles. Doubtless half of the boys and girls in our high schools

FIG. 5. *Shipping wharf on the Mississippi River levee at New Orleans. This port has grown rich from the outflow of products through it from the Louisiana Purchase territory.*

would be surprised to find that if California were reversed and superimposed on the Atlantic coast, it would stretch from Boston to Charleston.

But the Pacific coast has its meaning not so much in its length, as in the Golden Gate, in the estuary of the Columbia River, and in Puget Sound. These are the gateways that lead out to Alaska, to Hawaii, to Manila, China, and Japan. Not less does Louisiana find its logical outcome in the Isthmian Canal, in preponderant influence in the Western Hemisphere, and in more complete use of the highways and resources of all Pacific lands. The Pacific outlet puts us in easy communication in the near future with at least 500,000,000 of people, and opens possibilities that outrun the most daring imagination.

Three of the seven greatest ports of the United States belong to the territory which was foreign until 1803; these are New Orleans, Galveston, and San Francisco, and it requires no seer to place the lower Columbia River and the cities of Puget Sound among the first centers of foreign commerce. Our great territory has given us room for all kinds of people and for many millions of them. We have had open doors toward Europe and acres enough to receive her children. The number and the cosmopolitan breadth of our population have been possible through the expansion which made its vastest stride in 1803. Adding to the weight of adequate numbers the variety and bulk of our natural resources, we became a nation largely sufficient to ourselves and able to reach out and hold what the unfolding of the years puts into our hand. For nations as for men, "To him that hath shall be given" is law inevitable.

That we should have more land, more men, more corn and wheat, silver and gold, that we should be many and rich, has flowed from the bargain of 1803. But beyond all this and higher, is the unfolding genius of our people, which was in no small way then determined. We were then assured of the long possession of a *frontier*, which means toil, danger, plasticity, and free evolution of institutions. We have had a hundred years of migrating frontier, marking an epoch from which we are now passing, but whose consequences we shall not soon outrun. We have had daring exploration, we have sketched in the outlines of a new civilization on fresh ground, and this new creation is now to be perfected in detail. We have had the discipline of long distances, the strain of diverse climates, the appropriation of untried resources, and we are now to watch the growth of new types of society, industry, and, it may be, of letters and the higher life.

Jefferson did not shrink from saying that they had done something outside of the Constitution, but the Constitution grew by interpretation rather than by formal amendment. Events and not theory developed the corporate life of the nation then as to-day. It was then that the first notes of secession were sounded, and they were heard—from Massachusetts! The great New England Commonwealth was more interested in fisheries than in a continent, but we must not judge her in the light of our knowledge. She said that the original balance of power was broken, that Virginia was all in all, that the South was outweighing the North in the counsels of the nation, and that the new slaveholding states that would arise across the Mississippi would leave her a cipher in the Union. We can hardly wonder at her fears, but looking backward we can see that the Louisiana Territory did indeed precipitate the struggle over slavery, but that it was also the great Northwest, the wide north end of old Louisiana, which turned the scale at last on many bloody fields for freedom and the Union.

We need not believe, without limit, that Jefferson was "the broad statesman who saw beyond the Mississippi, over the Rockies to the Pacific, and over the Pacific to the cradle of the world." We may hail him not only because he was wise, but also because he was wiser than he knew.

THE SURFACE AND CLIMATE OF THE LOUISIANA PURCHASE

BY N. H. DARTON
Of the United States Geological Survey, Washington, D. C.

STRETCHING from north to south entirely across the middle United States, the region of the Louisiana Purchase naturally presents great diversity of surface configuration and climate. There are lowlands and mountains, hills and plains, prairies and forests, with climatic conditions varying from cold to warm, and from moist to nearly arid. The mountains rise to altitudes of over 14,000 feet and the lowlands extend to tide water in the Gulf of Mexico. The plains and prairies occupy over a million square miles, and range in altitude from 200 feet and less in the lower Mississippi region to the high plains of Colorado, of which the more elevated portions reach 7,000 feet. The dominant features of topography are the products of deposition and erosion by the western tributaries of the Mississippi River.

FIG. 1. *Canyon of Jongue River, Big Horn Mountains, Wyoming. The limestone walls are over one thousand feet high, and the gorge is typical of these mountains.*

This river drains all of the region excepting its northeastern corner, out of which flows the Red River of the North, a stream emptying into Hudson Bay.

Mountains. From the Arkansas Valley in Colorado, northward through Colorado, Wyoming, and Montana, the western portion of the Purchase includes the Rocky Mountain Range which rises steeply 6,000 feet and more above the Great Plains extending far eastward from its foot. The high front range of these mountains trends nearly due north and south through central and northern Colorado and south-central Wyoming, passing a short distance west of Colorado Springs, Denver, and Cheyenne. Though several of its peaks rise to over 14,000 feet above the sea level, it is not the main continental divide between the waters of the Atlantic and Pacific oceans, for branches of the Platte and Arkansas head behind it. In Wyoming the front ridge is known as the Laramie Range and it is crossed by the Union Pacific Railroad at Sherman west of Cheyenne, where its altitude falls to 8,251 feet. The elevation increases again northward in Laramie Peak, north of which it soon sinks into high plains or off-sets west to the Wind River Range. The latter, merges into the Shoshone and Absaroka ranges, which extend north through northwestern Wyoming on the east side of Yellowstone Park. Thence through Montana the Rocky Mountains continue as a high range to and into Canada, forming the divide between the headwaters of the upper Missouri and Columbia rivers.

The Rocky Mountain Range thus forms the northwestern boundary of the Louisiana Purchase region, a huge rampart of high, rocky ridges interrupted by a high, wide valley in central-southwestern Wyoming, but elsewhere crossed only by elevated mountain passes from 8,200 to 12,000 feet in altitude and a few deep canyons through the Front Range in Colorado and southern Wyoming. These mountains have not had the effect of halting the tide of western progress, as in the case of the Appalachian ranges, for railroads and highways were extended across them in the earliest days of the great movement westward, and a large proportion of the settlers and miners pressed forward to the western slope without stopping at the foot of the mountains. The growth of the great city of Denver is due more to the presence of the mineral deposits in the mountains just west than to a halt in westerly progress.

The Bighorn Mountains are an outlying range of the Rocky Mountains in northern Wyoming, rising to an altitude of over 13,000 feet

World's Fair and National Educational Association Number

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and local areas of bad-lands. Wide districts of sand hills surmount the plains in some localities, notably in northwestern Nebraska, where high sand dunes occupy an area of several thousand square miles. The province is developed on a great thickness of soft rocks, sands, clays, and loams, generally spread in thin but extensive beds sloping gently eastward with the slope of the plains. These deposits lie on relatively smooth surfaces of the older rocks. The materials of the formations were derived mainly from the west and were deposited, layer by layer, either by streams on their flood plains or in lakes and, during earlier times, in the sea. Aside from a few very local flexures, the region has not been subjected to folding, but has been broadly uplifted and depressed successively. The general smoothness of the region to-day was surpassed by the almost complete planations of the surface during earlier epochs. Owing to the great breadth of the plains and their relatively gentle declivity, general erosion has progressed slowly, notwithstanding the softness of the formations, and, as at times of freshets many of the rivers bring out of the mountains a larger load of sediment than they can carry to the Mississippi, they are now building up their valleys rather than deepening them.

FIG. 4. *Sam's Ranch, in the Bad Lands. A typical view of the Great Plains and cattle ranch in central South Dakota.*

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FIG. 6. *Twin Sisters, a typical butte in Banner County, Nebraska, from the east.*

Louis. Its average volume of water a day at its mouth is ten billion cubic feet. The longest affluent of the Missouri River is the Platte River which rises in the Rocky Mountains in southern Wyoming and northern Colorado and empties into the Missouri River at Plattsmouth a few miles below Omaha. Its daily flow averages nearly a half billion cubic feet. The Yellowstone-Bighorn River system is the next longest affluent, flowing north out of northwestern Wyoming and northeastward across the southeastern corner of Montana. It has a larger volume than the Platte but the amount of flow has not been ascertained. The Kansas River, which flows across the northern portion of Kansas, is a large stream, and in the spring of 1903 this river was the principal cause of the great flood in the lower portion of Kansas City. The Missouri River receives but relatively little drainage from the east, the Big Sioux River being its principal affluent on that side. Its larger branches mostly rise in the mountains and bring vast volumes of water from the melting snow and great watersheds. The Missouri River and lower Mississippi River as one great stream have a length of 4,200 miles, the longest in the world.

The Arkansas River is the third in size of the affluents of the Mississippi River, rising in the middle of the Rocky Mountains in central Colorado and draining a large watershed area in Kansas, Oklahoma, Indian Territory, and Arkansas. Its length is 1,514 miles and it carries to the Mississippi River a volume of nearly six billion cubic feet of water a day. The Red River of the South rises in the southern end of the Rocky Mountains in northern New Mexico, flows across the panhandle of Texas, the southern portion of Oklahoma and Indian Territories, and through Louisiana, joining the great river near its mouth. Its length is 1,200 miles and its average daily discharge is five billion cubic feet. These volumes of discharge represent a vast amount of water going to waste, much of which in the western portion of the Purchase will eventually be husbanded for irrigation.

The rivers of the Great Plains present many interesting problems for students of physiography. They are not all of the same age and present many features of diversity. Some of those which rise in the high mountains to the west bear a heavy load of sediments, especially during freshets, which they can only carry in the regions of greater declivity, and as their velocity diminishes in the Plains eastward, they deposit a portion of their burden. In this way the Platte is filling up its present trough, especially in eastern Colorado and through Nebraska. The Arkansas and portions of the lower Mississippi present similar conditions of overloading and deposition. For several hundred miles in its lower portion the Mississippi flows on an embankment which it has built up ten to twenty feet above the adjoining lowlands.

FIG. 7. *The North Platte River at the Nebraska-Wyoming state line, looking down stream, showing shrunken condition of the river in mid-summer.*

In North Dakota and South Dakota the Missouri River has a relatively new course, the waters having originally flowed down the James River Valley. During the Glacial Period, the river was displaced from this valley by the advance of the continental ice sheet along the western margin of which the outlines of the present course were incised. The new valley was cut so deep during this period that, when the ice retreated, the old channel could not be regained and the river has remained in its new valley, cutting it down gradually to its present level. One of the most striking contrasts between an overloaded and an eroding stream is in southern Nebraska, where the Platte is filling up its valley and its neighbor on the south, the Republican, a branch of the Kansas, is deepening its valley. This is due to the fact that the Platte is overloaded with sediments from the mountains, while the Republican, fed by springs in eastern Colorado, receives relatively little sediment, besides having a slightly greater mean declivity, so that erosion preponderates over sedimentation.

Climate. The Louisiana Purchase region presents a general regularity in its variations in climate from north to south and east to west. This is most marked in the annual precipitation. At the southern extremity of the region, the mean annual rainfall is slightly over sixty inches and this amount diminishes gradually to the northwest to less than fifteen inches in the Great Plains of Eastern Colorado, Wyoming, and Montana. On the Rocky Mountains, Bighorn Mountains, and Black Hills there is locally increased precipitation to from twenty to thirty inches a year, due to the influence of these highlands in arresting moisture passing across the Continent.

In thermometric range there is a regular diminution of mean annual temperature to the north. In southern Louisiana the mean is slightly over 70°. In Arkansas it is 57° to 65° and then the diminution is regular to considerably below 40° in the northern portion of North Dakota and on the high mountain summits to the west.

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MAP I. The United States after the Louisiana Purchase.

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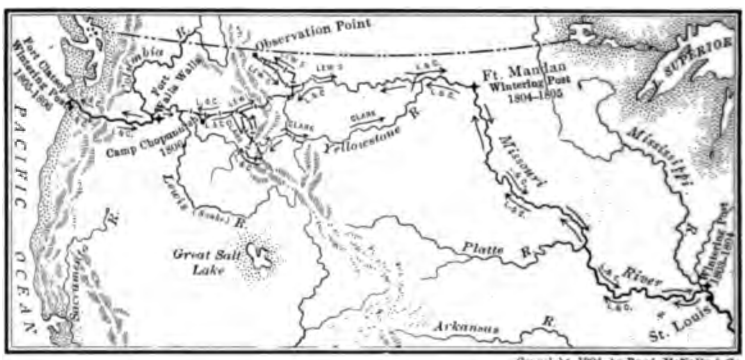
to American authority was made, Jefferson, now in a position to give effect to his earlier plans, organized an expedition to explore the country, and early in 1803 obtained from Congress the necessary authority and an appropriation of money. His objects were varied. Primarily the expedition was to seek for the best practicable route for commerce from the Mississippi Valley to the Oregon coast. At the same time the nature of the country was to be determined, its soil and productions, the plant and animal life, the course of the streams, the mineral productions, and the Indian inhabitants and their characteristics.

In selecting leaders for the exploring party, Jefferson exercised great judgment. He chose two young men, Virginians and originally



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MAP 2. *A map showing the Lewis and Clark Expedition.*
(From Mace's History of the United States.)

neighbors of his own, Capt. Meriwether Lewis, his private secretary, and Capt. William Clark, brother of Gen. George Rogers Clark, who had won the Illinois country from the British during the Revolution. They were accompanied by a party of thirty, including two French Canadian interpreters and an Indian squaw, wife of one of the latter. The winter of 1803–4 was spent in camp on the eastern bank of the Mississippi and in the following spring, May 14, 1804, the little expedition crossed the river and set out on their dangerous journey. Their plan was to proceed up the Missouri River to its source, there hide their boats, and then, passing over the mountains by the easiest trail, descend the Columbia to the ocean. This plan they carried out successfully. The journey up the Missouri was long and tedious. The current was swift and their canoes often were impeded by snags and sand bars. The banks frequently crumbled in or were covered by brush and bushes so that towing was almost impossible. They made frequent stops to hold councils with the Indians and distribute presents from the Great Father in Washington, now heard of for the first time by most of these savages. Finally after nearly six months of weary labor they reached at the end of October the villages of the Mandan Indians, situated 1,600 miles from the mouth of the river, near the present Bismarck, North Dakota. These Indians, whose peculiar characteristics differentiated them from all other natives of the northwest, proved on the whole very friendly, and here Lewis and Clark passed the following winter.

On the approach of spring the expedition once more set out. Working their way slowly and with difficulty up the Missouri, they reached the mouth of the Yellowstone, April 26th, and on June 3d the Marias River, which is so considerable a tributary that the travelers were in doubt which was the main stream of the Missouri and cast about for some time making careful measurements before deciding. It was a matter of much importance, for the wrong course would have taken them far away from their true objective, the nearest branches of the Columbia. Finally, against the judgment of the majority of the party, Lewis and Clark decided to take the more southerly stream, which proved the correct one. On the 13th of June they came to the falls of the Missouri. Here they had to make their first portage of eighteen miles, which consumed some time and required great labor on the part of the whole party. It was not till July 25th that they reached the second forks of the river where the same decision confronted them as before. There were three streams to choose from, but they rightly selected the northern one, naming the other two Madison and Gallatin after the Secretary of State and the Secretary of the Treasury.

The party were now well within the mountains and it became necessary to find and make friends with some of the Indians of the region who might guide them across the divide to the headwaters of the Columbia. The Indian woman of the party, squaw of one of the interpreters, was fortunately a native of this district, having been captured by one of the enemies of her tribe some years before and sold into the lower country. By her aid the explorers soon met a party of Shoshones and persuaded them to show the way through the pass. They came out on the Lemhi River, a tributary to the Salmon which flows into the Snake River and thence into the Columbia, so that the course of the explorers seemed clear before them. But as a matter of fact, they had arrived at the most difficult part of their journey. The Lemhi and Salmon rivers proved impracticable and they were forced to abandon them and strike off to the north over an almost impassable trail leading through the Bitter Root Mountains along the great continental divide. Game became scarce and they almost starved, being forced to kill and eat some of the horses they had procured from the Indians. From August 30th to Septemper 20th, they struggled through these mountains, but finally emerged in the valley of the Clearwater, where they encountered a band of Nez Percé Indians from whom they procured food and further information as to the way. They built and launched canoes on the Clearwater and paddling down this and the Snake River at last reached the Columbia on October 16th. Notwithstanding the dangerous rapids of this river, they passed safely through in their boats and on November 7, 1805, came out on the shores of the Pacific.

The winter was passed here in camp near the mouth of the Columbia, and the following spring the party set out on the return trip across the mountains. On their way back they discovered the Willamette River, which had escaped their notice on the descent, owing to the islands at its mouth, and then retraced their steps to their old camp among the Nez Percés, on the Clearwater. Obtaining guides here, they plunged into the intricacies of the Bitter Root Mountains, and on the 1st of July found themselves at a point near the mouth of Travelers Rest Creek, where the party was divided into three sections in order to find if possible an easier route through the mountains than the one they had followed coming out. Lewis was to proceed by the shortest trails to the falls of the Missouri and explore Marias River while waiting for his companions to come up. Another party was to follow the old route to the headwaters of the Missouri and, collecting the stores left there, join Lewis at the falls. Clark was to accompany these men to the three forks of the Missouri and then ascend the Gallatin River, pass over to the head of the Yellowstone, and follow this down to its junction with the main stream. All these plans was successfully carried out and after many adventures with Indians, grizzly bears, and buffalo, as well as dangers incident to the wild country through which they travelled, the entire party was once more united on the 12th of August, a short distance below the mouth of the Yellowstone. Two days later they came to the Mandan villages where they had spent their first winter and on the 23d of September, 1806, reached St. Louis after an absence of nearly two years and a half.

One of the members of the Lewis and Clark expedition, John Colter, had turned back before reaching St. Louis and joined a party of trappers. He spent several years in the mountains and in the winter of 1807 he crossed what is now the Yellowstone National Park, the first white man to behold the wonders of that region.

While the way to the Pacific was being blazed, another officer of Captain Lewis' regiment, Lieutenant Pike, was associating his name with the Louisiana Purchase. In 1805 he was sent to explore the headwaters of the Mississippi, where he made careful observations and supposed he had found the source of the river in Leech Lake. The following year he was sent with a party to discover the headwaters of the Arkansas River. Leaving St. Louis he traveled overland through

Drawn from an old print by H. W. Colby.

FIG. 1. *The city of St. Louis in the early fur-trading days*

Kansas, turned south to the Arkansas, and then pushed on into Colorado, where he discovered the famous mountain peak that bears his name. In endeavoring to reach the head of Red River he came upon the upper waters of the Rio Grande and trespassing on Spanish territory was arrested, and taken to Mexico, whence he was later sent back to the United States.

The Lewis and Clark expedition and the explorations of Pike led to the establishment of two trade routes through the western part of the continent known as the Oregon trail and the Santa Fé trail. The former owed its existence to John Jacob Astor, who established a fur company to operate on the Pacific Coast and sent out an expedition in 1811 under W. P. Hunt, to establish posts along the route followed in 1804–6. Instead of following the great bend of the Missouri so far to the north, however, Hunt turned west some 1,300 miles from its mouth and passed by way of the Black Hills and Green River through the mountains and thence to the Columbia. The War of 1812, however, broke up Astor's trading post on the Pacific and when the route was reopened, a somewhat different course was followed still farther to the south. Commercially the Santa Fé trail was more important than the Oregon. The year after Pike's expedition the first trading journey was made from the Mississippi to New Mexico, but the real history of the trail begins with the trading operations of William Becknell, shortly after 1812. From that time to the introduction of railroads the Santa Fé trail was the most important land route in America.

The road over the mountains followed by the Astorians was not satisfactory, and in 1819 the government sent out Major Long to search near the sources of the Platte River for a more southern pass through the mountains. In this he failed through following the South Branch of the Platte instead of the North. He made many important discoveries, however, within the state of Colorado, including Long's Peak, and explored the canyon of the Arkansas. His journey had pointed to the valley of the Platte as the shortest route to the mountains and it was but a few years before the Great South Pass in Wyoming was discovered, it is said by Alexander Henry, a Canadian fur trader, in 1823. Through this pass afterwards ran both the Oregon trail and the Overland trail to California.

In the third and fourth decades of the century the fur traders contributed most to the history of exploration within the Louisiana Purchase. Gen. W. H. Ashley of St. Louis organized the Rocky Mountain Fur Company in 1822, and established many trading posts. He led several expeditions into the interior, explored the Green River near South Pass, and visited Great Salt Lake, which had already been discovered by the famous guide and trapper, James Bridger. Another trader was Nathaniel J. Wyeth, who led two expeditions to the Columbia in 1832 and 1834, and did much to attract the attention of the East to the Oregon country and thus lead to its occupation by American emigrants. Captain Bonneville, U. S. A., was also interested in the fur trade and traveled much through the Rockies from 1832 to 1835. He crossed over into California by way of Great Salt Lake and is said to have discovered the Humboldt and San Joaquin rivers, although he was preceded in the overland journey to California by a St. Louis fur trader named Pattie, who is supposed to have been the first white man to cross the continent in this direction.

During this period a number of scientific men added to our knowledge of these parts. Among them may be mentioned Bradbury, the naturalist, Nuttall, the botanist, Townsend, an ornithologist, Nicollet, a French astronomer and geographer, and Maximilian, Prince of Neuweid, a German naturalist. Nor should Schoolcraft's excellent descriptions of the Indians of this region and Catlin's Indian portraits be forgotten.

In 1843 began the great emigration to the Columbia country. In that year about a thousand people followed the Oregon trail to the Pacific Coast, and thereafter for a number of years the exodus steadily increased. It was important that fuller information regarding the routes of travel across the mountains should be obtained and laid before the country and therefore the government determined to undertake an official exploration. At the head of the expedition was placed Lieut. J. C. Fremont, son-in-law of Senator Benton of Missouri. Fremont's work was of great importance in opening up the Rocky Mountain country for travel, and from the passes he discovered and the number of routes he demonstrated to be practicable he became known throughout the country as the "Pathfinder." His first expedition, undertaken in 1842, led him to South Pass and the Wind River Mountains in western Wyoming. The second, in 1843-4, took him first into Colorado where he found a new pass through the mountains, and then north through the basin of Great Salt Lake and on to the Columbia. All this region he carefully mapped out and then, after resting for a short time in Oregon, proceeded south through an entirely unknown country, into the Sacramento Valley of California. He returned by way of the Utah basin. In 1845 Fremont again started out, this time to find the best route for a railroad to San Francisco, then a Mexican town. Shortly after reaching the coast news came of the outbreak of war and he led a successful revolt of American settlers against the Mexican authorities. Two more exploring expeditions were organized by Fremont, one in 1848 in which he discovered a practicable route along the upper Rio Grande to the coast, and the other in 1853 when he opened new passes through the mountains between the 38th and 39th degrees.

In 1849 began the stampede for the California gold fields and thereafter all energies were turned for some years to a quest for the precious metals. The mountains were penetrated in every direction by the gold diggers, and the demand arose for railroad lines across the continent. Subsequent exploring expeditions were mainly confined to railroad surveys, among which may be mentioned the government surveys of I. I. Stevens, in 1853–4, from St. Paul to Puget Sound, now largely followed by the Northern Pacific; of Lieutenant Beckwith, in 1854, through the region of the South Pass, the route of the Union Pacific; and of Lieut. John Pope, in 1854, along the line subsequently followed by the Southern Pacific. Besides these there were many surveys undertaken both by the government and private corporations in the Rocky Mountain region between 1850 and 1860.

PRESENT INDUSTRIES WITHIN THE LOUISIANA PURCHASE*

BY SPENCER TROTTER

Professor of Biology, Swarthmore College, Pennsylvania. Author of the "Geography of Commerce"

INDUSTRIAL *Development of the Region.* The eastern border of the Louisiana Purchase was, during the first half of the nineteenth century. the western frontier of settlement. The vast expanse of rolling, grass-covered "plains" that stretched away westward from the frontier to the Rocky Mountains was the then little known "Indian Country" and the pasture land of the great bison herds. The first commerce of the region was in the hands of Rocky Mountain trappers and the traders of the Santa Fé trail and the Missouri. Pelts were the earliest commodity, and St. Louis, from its location on the Mississippi-Missouri waterway, was the focal point of this trade. St. Louis was the gateway to the "Far West" as Pittsburg was to the Ohio traffic and Buffalo to the Lake Region. Here expeditions fitted out for the long traverse of the "plains" and the wharves, piled high with goods, were lined with the flat-bottomed steamboats of the Missouri navigation and the larger craft of the Mississippi. Parkman gives a vivid picture of St. Louis trade in the summer of 1846.

The trapper and the trader were essentially a part of the Indian life of the Great Plains and gradually disappeared as the frontier moved farther westward. The fertile prairie lands of more abundant rainfall in the area now embraced by Missouri, Iowa, and the eastern parts of Kansas and Nebraska were rapidly settled as the danger from Indians grew less, and the great farms of corn-land spread to the borders of the arid plains. To the north, in western Minnesota and the Dakotas, the wheat was advancing westward. The Coastal Plain

*The statistical diagrams that appear in this article are from Dodge's Advanced Geography, and are used by special arrangement with the author and the publishers.

and its upland borders in Louisiana and Arkansas was a cotton-growing country with river facilities for shipment of the crop to the port of New Orleans. The western extension of the railroads gave further impetus to settlement and trade. In the decade from 1870 to 1880 the last traces of the picturesque frontier period vanished from these prairie lands which had become the home of an agricultural people.

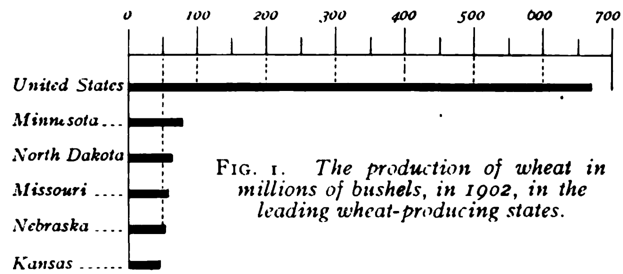

FIG. 1. *The production of wheat in millions of bushels, in 1902, in the leading wheat-producing states.*

The deficient rainfall over the Great Plains determined an industry essentially pastoral and nomadic in character. While scattered bands of Indians still pursued the rapidly dwindling herds of buffalos, the cattlemen invaded these hunting grounds and pastured their droves of "long horns" on the wiry buffalo grass. Then followed the years of the cowboy, the range, and the round-up and the establishment of ranch life from end to end of the region. With cattle came sheep and, as the railroads reached out, wool became an item of growing importance.

The industries of the area embraced by the Louisiana Purchase are essentially agricultural, although considerable mining is done in certain localities, notably that of lead and zinc in the Mississippi Valley, and

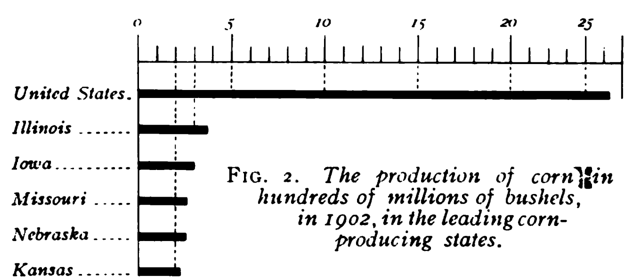

FIG. 2. *The production of corn in hundreds of millions of bushels, in 1902, in the leading corn-producing states.*

the mining operations of the Black Hills district of South Dakota. Crop growing and stock raising and the industries dependent thereon are the leading features of the region.

Some notable facts are available which indicate the vast importance of this area in relation to national growth. That the westward expansion of population found an abundant opportunity in this fertile land is well illustrated by the increase of farms in several states during the decade from 1870 to 1880. Thus in Iowa the percentage of increase of the total number of farms was 59.4%; in Missouri, 45.3%; in Dakota, (then one State) 913.7%; in Nebraska, 415.3%; and in Kansas, 262.7%.*

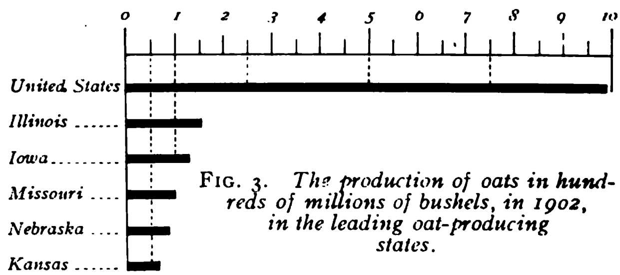

FIG. 3. *The production of oats in hundreds of millions of bushels, in 1902, in the leading oat-producing states.*

An equally significant fact is seen in the westward movement of wheat cultivation, the center of which at present is in southwestern Iowa, having advanced to the Missouri River from a point just east of the Mississippi within the past twenty years. In 1850 the greatest wheat-producing area was in the Genessee Valley, in New York State. In the last decade (1890–1900) the movement has been up the Missouri, under the influence of the rapidly increasing growth of the hard-grained wheat production and the milling industries of the Dakotas and Minnesota. The center of corn production to-day is in southwestern Illinois, just above the junction of the Missouri and Mississippi rivers and not far from St. Louis. The center has shifted scarcely at all in the last decade, owing undoubtedly to two facts—(1) the unavailability of land for corn growing to the west of the 100th meridian due to increasing aridity, and north of the parallel of 42° north, due to increasingly low temperature, and (2) the centrallizing of the live stock industries (fattening of cattle and hogs, meat-producing, etc.) on the Missouri and at Chicago. This second factor is due largely to transportation facilities. Although the corn center has not advanced to within the limits of the Louisiana Purchase its present position close to the eastern border of that area is in large part the result of the immense territory of grazing land to the west, the live stock of which is shipped east to fatten on the farms of the corn belt.

In reviewing the present industrial features of the territory embraced

* Tenth Census.

by the Louisiana Purchase the predominant industries will be considered from the standpoint of the several commodities which form their basis. The commodities may be grouped under three main heads—(1) *Crops* (including corn, wheat, and other cereals, forage crops, cotton, and crops of minor importance); (2) *Live Stock* (including cattle, hogs, and sheep, and the meat-packing industry and wool); (3) *Mineral Resources* and *Mining Operations*.

Crops. Iowa produced 14.4% of the total United States production of corn for the year 1899; Kansas produced 8.6%; Nebraska 7.9%; and Missouri 7.8% of the total. All other corn-growing states, with the exception of Illinois, rank below these four which are included within the domain of the Louisiana Purchase. The yield per square mile throughout the greater part of these states was over 3,200 bushels, as high as in any part of the corn belt. A large proportion of the corn grown in this area is fed to stock, the amount varying with the greater or less demand for meat products. Another considerable portion finds its way to the distilleries at Peoria, Ill. Still another portion enters into starch and glucose manufacture, and a fourth considerable portion into domestic economy. A comparatively small amount finds its way into the export trade of the country.

The wheat-growing area reaches much farther to the northwest than that of corn, as a result of the lower temperature relations of the former cereal. The Twelfth Census reports that four-fifths of all the farms in Minnesota during 1899 produced wheat. South Dakota

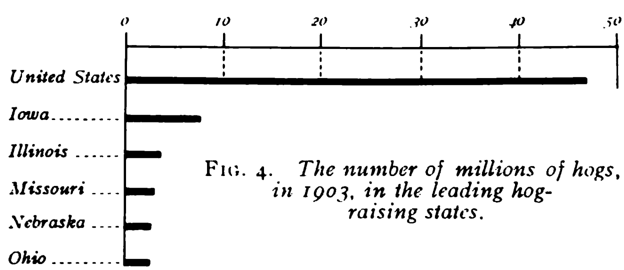

FIG. 4. *The number of millions of hogs, in 1903, in the leading hog-raising states.*

came second with nearly the same proportion, and North Dakota third with almost three-fourths. These three states are in the Spring Wheat area. The Census of 1900 reports Minnesota as contributing 14.5% of the total wheat production of the country, over 5% more than any other wheat-growing State. The great milling industry of the upper Mississippi is a direct result of the expansion of the wheat-growing area in the Northwest and the demands of the mills even overreach the vast supply from the contiguous United States territory and draw wheat from the harvests of Canada and from Washington and Oregon.

Other cereals are grown in this eastern area of the Louisiana Purchase, but to a small extent compared with corn and wheat. Wheat creates an enormous traffic movement from its areas of production

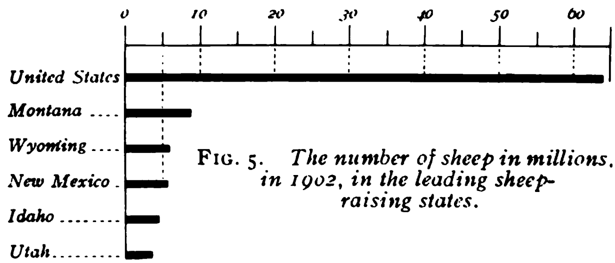

FIG. 5. *The number of sheep in millions, in 1902, in the leading sheep-raising states.*

to the mills and to the disbursing points of Duluth, Superior, and Chicago, and forms a very large proportion of the whole export trade of the country (breadstuffs, of which wheat and wheat flour form the major portion, constitute 20% of the total export value of the United States, being second only to cotton).

In the low-lying coastal lands of the state of Louisiana the sugar cane has long been an important crop. Louisiana is practically the only state producing the cane, its output of sugar for 1901–1902 amounting to 275,000 long tons. The production of sugar beets has developed as an important industry in Nebraska and Colorado, where several large factories are located. The more important centers of beet sugar production, however, lie outside of the Louisiana Purchase area, in California and in Michigan.

Cotton, the largest item in the export trade of the United States (22% in the raw and unmanufactured state), is grown to a considerable extent within the southern area of the Louisiana Purchase. The entire State of Louisiana, the greater part of Arkansas, Indian Territory, and a portion of Oklahoma are all cotton-producing areas of more or less importance. Of the total increase of cotton acreage in the last decade, Indian Territory and Oklahoma, together with Texas, contributed 88.7%, each of the former two adding 371,987 and 239,569 acres respectively to the entire cotton-growing area of the country.*

* Twelfth Census.

The hay crop of the country outside of New York State, which led in the last decade, is contributed largely by Iowa, Kansas, and Missouri. The two former states produced 4,649,378 and 4,337,342 tons each; while Missouri and Nebraska each produced over 2,000,000 tons, with Pennsylvania, Indiana, and Illinois as their only rivals above this figure.

Live Stock. The dry character of the high "plains" has precluded crop growing on any large scale, save where irrigation has been established, and has made this western area of the Louisiana Purchase preëminently a group of "range states." Montana, Wyoming, and Colorado are the great ranch states of the section that lies within the limits of the Purchase. Notwithstanding the great ranges, the character of the pasturage is against fattening for market purposes. As a consequence a large number of cattle are shipped into the western cornbelt section along the Missouri River and, apart from Texas, which is the greatest cattle state in the Union, Iowa, Kansas, and Nebraska report the largest numbers, over five million, four million, and three million head respectively. Iowa, also, stood second in the number of dairy cows, being exceeded by New York.

On the other hand sheep thrive well on the dry pasturage of the high "plains" and foothills. Montana and Wyoming led all other states in the number of sheep, each contributing over 4,000,000 head,

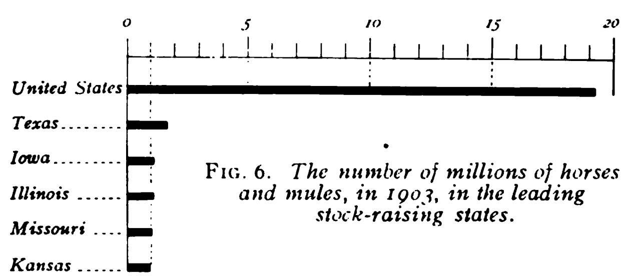

FIG. 6. *The number of millions of horses and mules, in 1903, in the leading stock-raising states.*

and Colorado over 2,000,000 head, out of a total of over 61,000,000 head for the entire country. Most of the wool produced in the United States is used in domestic manufacture.

Iowa, Missouri, Nebraska, and Kansas, together with Indiana and Illinois, raise nearly two-thirds of all the swine produced in the country, Iowa ranking first as a hog-producing state with 15.5% of the entire number.

The centralizing of cattle, hogs, and sheep in the western portion of the corn belt, as a result of the enormous food supply raised there, has given rise to an immense meat-packing industry. This industry, outside of Chicago, is chiefly centered along the Missouri River at St. Louis, Kansas City, Omaha, and St. Joseph. At these five centers the rate of concentration of live stock for one week during the year 1900 reached the enormous figure of 844,000 head (cattle, sheep, and hogs).

Mineral Industries. Mining has been an important factor in the industrial development of the Louisiana Purchase, notably in the Cordilleran Mountain region, in the Black Hills, and in certain localities in the Mississippi Valley. The smelting of metallic ores is a prominent feature throughout the mining districts.

Colorado is the only state that produces iron in any quantities, though Iowa adds a small percentage of brown hematite ore to the total United States product. The iron ore mined in the vicinity of Leadville, Colo., on the western border of the Purchase, contains varying amounts of manganese which is used in the manufacture of spiegeleisen and as a flux in the silver smelters. The steel industry is being rapidly developed in Colorado with a consequent increasing demand for the manganiferous ores.

Montana leads in copper, with the enormous total of 270,738,489 pounds (1900) representing 44.7% of the entire United States product. Montana, Wyoming, Colorado, and South Dakota are all gold and silver producing states. Colorado's gold output increased $2,846,600 for the year 1900, while South Dakota increased its silver output for

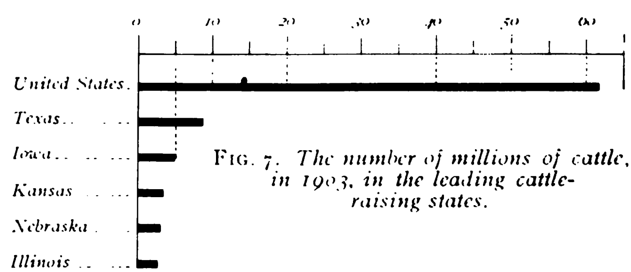

FIG. 7. *The number of millions of cattle, in 1903, in the leading cattle-raising states.*

the same year $390,600. Important lead and zinc centers occur in southeastern Missouri, in the Joplin-Galena district of Missouri and Kansas, and, locally, in the Dubuque district of Iowa. Lithia ore is mined in the Black Hills, South Dakota. The only United States locality where nickel and cobalt are at present mined is the Mine Lamotte, Missouri. Some antimony ore is mined in South Dakota (Black Hills) and tin-ore (cassiterite) is mined to a limited extent in the same region.

Vast areas of coal exist in parts of the Louisiana Purchase; a strip of 98,000 square miles extends, in detached fields, from Iowa to the Mexican border. Petroleum occurs in Colorado and some asphaltum in the bituminous limestones of Indian Territory. Missouri ranks high as a producer of building stones, and Arkansas is a noted center for the production of oil stones of fine grain.

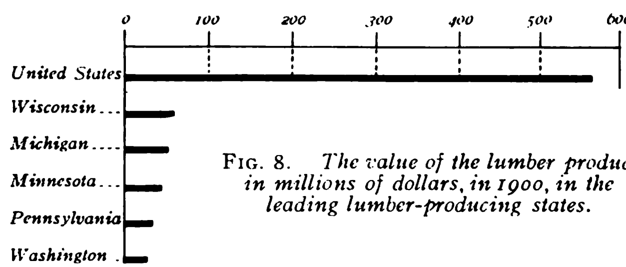

FIG. 8. *The value of the lumber product in millions of dollars, in 1900, in the leading lumber-producing states.*

Concluding Remarks. From this very brief review of the leading industrial features within the area of the Louisiana Purchase it is evident that the region is preëminently the great food-producing section of our national domain. No other area within our boundaries could supply the live stock and the grain that this region supplies to-day. Its effect on national growth and the development of the people has been most remarkable. Without this contiguous western area as an outlet to a growing population the conditions east of the Mississippi must have remained for a long time cramped and undeveloped. If the area had continued in the possession of a foreign power, our record as a people would have been written small upon the pages of history, even though we had acquired the Pacific Slope. The astuteness and foresight of Jefferson and the statesmen of his time cannot be overestimated. More than the mere question of wealth, the effect of this land upon the character of the people has been far-reaching. Within the past thirty years it has become the home of an industrial population that has helped to weld the land into one great national unit. As we stand to-day gazing out over the immense vistas of waving corn and wheat and beyond to the vast cattle ranches, and see the long trains moving the wealth of this land to the consuming and disbursing cities; as we view the manifold inventions that gather in the harvest of the prairies, and hear the hum of industry from hundreds of towns with their thousands of pleasant homes, we catch the sure note of progress—the sign of a virile people that has responded to the opportunities of its environment.

THE VALUE AND DEVELOPMENT OF IRRIGATION IN LOUISIANA PURCHASE TRACT

BY GEORGE B. HOLLISTER
Hydrographer U. S. Geological Survey, Washington, D. C.

DRAW a line from the Canadian border to Texas along the one-hundredth meridian and you will have approximately the boundary between the arid and humid regions of the United States. This line will pass through North and South Dakota, Nebraska, Kansas, Oklahoma, and strike the panhandle of Texas. Eastward the rainfall amounts to twenty inches annually and over; westward to twenty inches annually and less. Of course the location of this line is not absolutely fixed, it swings back and forth with seasons of increased or diminished precipitation. It is, indeed, rather a belt on which there are years of rain and years of drought. The belt can hardly be called arid, it is certainly not humid, so for convenience it is known as the semiarid tract.

This imaginary division, however, is a real boundary. West of it dry farming, that is farming without irrigation, as practised in humid climates, can not be carried on, and nature has here set a barrier more absolute than any sea or mountain. The cause of this peculiar condition, as already indicated, is found in the difference in rainfall. Twenty inches annually is the least amount suitable for farming under ordinary conditions. When the precipitation becomes less, artificial means of increasing it must be resorted to and farming is conditioned wholly by the amount of water which can be controlled from streams and underground sources. Thus the territory of the original Louisiana Purchase is divided into two distinct regions agriculturally, one moist and the other dry. On the one hand the rich prairies of Iowa, eastern Kansas, Nebraska, and Minnesota offer the acme of fertility and produce with a minimum of labor the wonderful grain crops which have added so much to the wealth of our country; on the other hand the dry and parched stretches of the high plains in western Kansas, Nebraska, the Dakotas, and Montana, and the equally dry but fertile valleys of Colorado and Wyoming demand the utmost care and vigilance and large outlays of money in engineering works to supply the natural deficiency of rainfall. And yet, when the proper conditions are met in the arid section, that is, when sufficient water is provided, the fruits and vegetables, as well as the grains which reward the patient tiller of the soil, are the wonder of the farmers of the East.

My purpose is to outline briefly the more important aspects of the value and development of irrigation in the arid and semiarid Louisiana Purchase tract and show how regions practically worthless so far as farm values are concerned, without water, have become in many places veritable garden spots by the intelligent application of the water other than that from direct rainfall. To do this, attention will be called to a number of problems which characterize the irrigation movement in different sections of this area, a region so diverse in physical characteristics.

FIG. 1. *Town well, Woonsocket, South Dakota; 725 feet deep; yields 1,150 gallons per minute; is throwing a stream 97 feet, under a pressure of 130 pounds per square inch.*

THE FLOWING WELLS OF THE DAKOTAS

Although the natural rainfall in North and South Dakota comes perilously near the twenty-inch mark and even falls beneath it in the western portions, nature has provided for certain sections of this state a seemingly inexhaustible supply of water as a substitute. This water is contained in a series of rock strata known as the Dakota sandstones, which underlie the entire area of these states. The Dakota sandstones are a series of soft and porous strata which are capable of containing a large percentage of their weight in water. The great uplift which produced the backbone of the Rocky Mountain chain and also the peculiar crustal blister known as the Black Hills raised this series with others and brought them to the surface high up on the eastern flanks of the Rockies as well as on the sides of the Black Hills uplift. The streams from these upland areas flow across the upturned edges of the Dakota sandstones and a very considerable portion of their waters is absorbed by the porous rock. It passes by slow percolation down under the Great Plains states, sinking with the strata many hundred feet, and obtaining in this way an enormous head or pressure. The rock is not accessible from all portions of the Plains because the overlying material is too thick to be penetrated by wells at economical cost, but through central North and South Dakota, especially along the greater river valleys where the streams have cut into and carried away a portion of the surface, wells have been successfully driven and reach the water-bearing beds at depths of from one to two thousand feet. The result of striking water is most interesting. A true artesian flow is reached, and the water, impelled by the great head above referred to, is forced sometimes as high as ninety feet or more into the air. So great and constant is the pressure that the wells in the Dakotas have been used as a source of power for manufacturing purposes, the generation of electricity, and for numerous other uses of this nature. But especially important are these wells for domestic purposes and irrigation and considerable areas are annually cultivated by means of them. In 1899, over 5,000 acres were irrigated from wells in these states.

While the artesian supply is indeed phenomenal, it reaches only certain portions of the region and irrigation from the rivers is practised along the valleys, chiefly on pasture and wild hay lands. By water from all sources more than 4,800 acres were under irrigation in the Dakotas when the census was taken, in 1899, which showed the remarkable increase of 994 per cent in ten years for North Dakota and 177 per cent for South Dakota, while the value of the crops thus raised amounted to almost $236,000.

THE HIGH PLAINS OF KANSAS

Kansas is a frontier state, agriculturally speaking, for, while the eastern portion enjoys a rainfall sufficient for plentiful crops, its precipitation decreases steadily toward the west until, somewhat more than two-thirds of the distance to the Colorado line, the fatal twenty-inch zone is reached. To the west of this lies a region of magnificent fertility known as the High Plains, with conditions ideal for farming in level expanse of surface, deep loamy soil, and proximity to transcontinental railroad lines. A rich carpet of nutritious grass covers the land, promising yet more luxuriant stands of wheat and corn, and this, with other conditions found by earlier travelers and herdsmen, gave the impression that the region only awaited settlement to yield the phenomenal returns of the prairie lands lying nearer the Mississippi River.

No mistake could have been greater. In spite of the really unusual soil conditions, the region was found to be as treacherous to farming interests as many a desert valley in the admittedly arid states. Hence it has followed that the High Plains are associated with a most interesting chapter in the economic development of the West, and formed the setting in the decade from about 1885 to 1895 of a veritable tragedy of settlement. The great fertility and apparently perfect conditions for farming tempted multitudes to settle and to endeavor to procure a livelihood through agricultural pursuits. Towns sprang up and communities were formed, and for a time there was partial prosperity. This was because there happened to be an unusual amount of rainfall. In many instances the profits were good and farmers enlarged

FIG. 2. *A small reservoir in western Kansas, fed by windmill, which makes it possible for large herds of cattle to live at great distances from a natural water supply.*

their acreage, built additional structures, and bought machinery for which purpose many of them mortgaged their property. For several years these conditions continued, the speculative side being fostered not a little by unscrupulous agents of real estate and banking companies who vied with each other in placing loans for money supplied by eastern capitalists. It was but a few years, however, before the period of excessive rainfall was followed by conditions more normal to the locality and the sweeping hand of misfortune fell upon the region. Many could not believe that the drought conditions would continue and mortgaged their farms more heavily to tide over what they thought would be a temporary dry spell, but, when year after year the crops withered away and large sums of money were lost, the population deserted the region as rapidly as it had come, leaving unharvested crops in the field, deserted houses on the farms, and often entire towns depopulated. The High Plains to-day are dotted with the remains of this exodus. The settlement as made has been likened to an invasion; its sequel resembled a precipitate and disastrous retreat.

Since this time, an effort has been made to locate a water supply sufficient for the region, but thus far it has not been found. The land lies at too high an elevation above the river valleys for irrigation from them, even if there were a sufficient supply to be obtained from this source. On the other hand, no great underground supply has been found, so that it does not seem likely that any considerable area of the High Plains can ever be utilized for farming purposes. There is to be found a limited amount of water from shallow wells, and it may be possible to impound for use some of the spring rains in the numerous sinks and saucer-like depressions which pit the High Plains area.

But the prospects of western Kansas are not all dark. Considerable water in the aggregate may be secured from the shallow wells for purposes of stock and irrigation, which will make it possible to raise by intensive farming on small holdings enough produce to support a family and maintain a herd of cattle.

The future of the tract seems to lie in stock raising, unless crops capable of thriving under dry weather conditions are found.

Irrigation by means of water taken from the streams of the state is carried on to some extent. The Arkansas River has been the chief source of water supply for this purpose, and some of the early irrigating systems of the country drew their water from it. The physical peculiarities of the state make it rather difficult and expensive to conduct water from the rivers to the bench lands. The streams, often broad, have trenched their valleys far below the general level of the surrounding country, and, while large in the springtime, frequently dwindle to insignificant proportions or disappear altogether in the summer season. The census statistics, however, show that in 1899, 23,630 acres were under irrigation, an increase in ten years of 13.5 per cent, with a crop valuation of $226,453.

NEBRASKA, THE LAND OF WINDMILLS

The conditions existing in Nebraska closely resemble those of Kansas. In the east, the state is comparatively moist; in the west, it is dry; in its northwestern portion is found a waste of barren sand hills which almost completely defy cultivation on account of their shifting character. Like Kansas, Nebraska is a typical Great Plains State, a vast and nearly level region swept in the summer season by strong and steady winds. These winds have been taken advantage of by the farmer and have become the source of not a little wealth by skillful management. The windmill, a device used to some extent with success in the East, is a necessity on the Plains. It is found in all the states of this region, but, as its development in Nebraska has become specialized and somewhat typical, it is particularly called to the attention in connection with this state. By it is made possible the profitable raising of stock, as well as the successful cultivation through irrigation, of many acres otherwise practically useless. By it, also, are frequently insured comforts and conveniences of the farmer's house, in

FIG. 3. *Raising sugar beets by irrigation in Nebraska. This new important western crop has been developed during the last ten years.*

the way of running water, found only in the city or the houses of the wealthy. The windmills are of every variety, but they may be briefly divided for our purposes into two distinct classes, the shop-made and home-made mills. Of course, the shop-made mill is more efficacious than the home-made, and the hundreds of them in use add greatly to the water supply of the plains, but the home-made device is of greater interest not only on account of its surprisingly high efficiency, but also from its low cost of construction and the interesting ingenuity employed in its manufacture. Frequently one runs across a mill pumping water for the use of all the cattle on the farm, providing the house with its supply, and furnishing a limited amount for irrigation the entire cost of which, to the farmer, was probably not more than three or four dollars, exclusive of the time it took to assemble the parts. Perhaps the low cost of the home-made windmill, as found on the Plains, is its greatest recommendation. It virtually has its birth from the scrap heap which is found on every farm and is composed of such odds and ends as the sides of boxes, the chains and sprockets of old bicycles, discarded buggy axles, or other articles for which the ingenuity of the farmer finds a place in the strange ensemble.

These windmills are found scattered over the Great Plains in several distinct varieties. There are the Jumbo and the Baby Jumbo, which resemble the paddle wheel of a Mississippi steamer, the lower blades being protected from the wind by a box or otherwise. These mills are usually set facing in one direction and take advantage only of the prevailing wind. The Battle-ax is another variety of mill patterned more after the shop-made devices, with boards nailed to the end of revolving arms; and there are the Merry-go-rounds, Turbines, and other varieties, each individual likely to be of weird and surprising construction. But the remarkable fact which must not be lost sight of is that these homely devices, though crude enough in themselves, add a total benefit in the way of increased water supply to the Great Plains region far in excess of their cost, and form a positive means of agricultural advancement.

As in Kansas, the rivers in Nebraska lie in deep trenched valleys, making the irrigation of the bench lands difficult and expensive. The chief irrigated districts in Nebraska are located along the valley of the North Platte to its junction with the main stream, and also in the valley of the South Platte. A serious difficulty, however, to the increase in irrigation, especially along the South Platte, is that so much of the water is used in Colorado for irrigation purposes before it reaches the Nebraska line that, in the summer season, the stream in Nebraska is practically dry. The census reports show that in 1899 about 148,000 acres were under cultivation by irrigation, a remarkable increase of 1,164 per cent over the number cultivated in 1889. The value of the farm products raised by irrigation in 1899 was nearly $130,000.

COLORADO

The enormous mineral wealth of Colorado is the feature most prominent in the popular estimation of the state, and yet there is a larger acreage under cultivation by irrigation in Colorado than in any other state in the Union, California not excepted. In 1899 over 1,600,000 acres were irrigated—nearly 200,000 more than in California. The Colorado climate, however, favors the growth of cereals and forage crops and particularly vegetables, while that of California is peculiarly adapted to the growth of high-priced citrus fruits, so that the total value of the California irrigated product is somewhat greater than that of Colorado. Nowhere in the country, however, except in Maine, are potatoes grown in such abundance or of such superior size and quality as in this state. The peaches of Canon City, raised by irrigation, are considered among the finest in flavor in the United States, and the watermelons, and particularly the cantaloupes grown near Rocky Ford, have a national reputation.

In the year 1859, Horace Greeley, while on his tour in Colorado, was greatly impressed by the idea that the lands lying to the east

FIG. 4. *Part of a 400-acre irrigated farm at Garden City, Kansas. Fruit, vegetable, and alfalfa crops irrigated from the reservoir in the foreground, supplied by windmills. By the construction of this irrigating system the value of the land was raised from one to fifty dollars per acre.*

of the Rocky Mountains were susceptible of irrigation. After he had returned to New York, he discussed the matter with prominent citizens and gave the proposition great publicity through the columns of the "New York Tribune." The colonization plan there suggested finally materialized in the Union Colony which settled in the Cache la Poudre Valley and founded the town of Greeley. A few settlers were already located in this region, who found a precarious existence in harvesting wild hay and securing pasture in the moister lands of the valley bottoms. These people regarded with scorn the idea which the new colonists entertained of cultivating the bench lands located at greater altitudes along the rivers by the use of water, but ditches were constructed and canal systems laid out, and, in a few years, the faith of the far-sighted leader of the enterprise and the energy of the settlers were rewarded by plentiful returns. To-day the Greeley district, embracing a number of different irrigation systems, is one of the most successful in the state and is noted all over the country for the excellence and large amount of its agricultural produce. The engineering difficulties to be overcome in building these works were great. The settlers were obliged to go into the mountains, build large reservoirs to impound the flood waters of the stream upon which they had settled, and, as the resources of that stream became exhausted, their engineers contrived means of diverting the waters from streams of adjoining watersheds and carrying them across low divides to supplement the flow of the original stream.

The products which were at first raised and the cultivation of which is continued to the present day, with the addition of other crops which have been found profitable, were the great forage crop, alfalfa, and potatoes. Alfalfa is generally considered one of the most valuable of irrigated crops by virtue of its great nutritive quality as feed for cattle, and because of its remarkable rapidity of growth. In the East, the farmer is satisfied with one good crop of hay a season; sometimes he gets two. But alfalfa under irrigation yields five crops during the growing period, though usually not more than three in Colorado.

Potatoes are usually planted in Colorado after ploughing under alfalfa. Two crops can often successfully be produced. Under irrigation, potatoes in the Greeley district grow to proportions unknown in the East. An idea of the great value of the potato crop in this one district may be had from the record of the year 1894, when, in one part of the district, over 600,000 sacks were produced, valued at $330,000. After paying all expense of planting and harvesting, the resulting profit was sufficient to pay the entire cost of the reservoir under which the crop was raised. This was an unusually good year.

Another product successfully grown under irrigation in Colorado is the sugar beet. In 1899 there were 1,094 acres planted in this crop and over 6,600 tons sold at a value of $26,700. Beet raising is comparatively new in Colorado but figures for the present time, were they available, would show a great increase in the industry.

The Greeley district, while the largest and probably the most successful irrigated portion of Colorado, is but one of a number of similar sections in that state, for much land favorably located along the upper branches of the Platte and Arkansas rivers is being reclaimed in this manner. The 1,160,000 acres under irrigation in 1899 was an increase

FIG. 5. *A flume carrying water to the Greely district, Colorado, crossing the stream from which it receives its supply.*

of 80.9 per cent over that irrigated in 1889. The value of the crops raised in 1899 was striking, being $15,100,690, and the cost of construction of irrigation works, $11,758,000. These figures are especially suggestive, showing that, in one year, the value of the irrigated crop was about one and a half times greater than the entire cost of the irrigating works which produced them.

WYOMING, THE GREAT GRAZING STATE

Wyoming is another of the great irrigation states and ranks fifth in the list, though its possibilities lie rather in the direction of grazing and stock raising. The average altitude of the state is high, 5,000 feet or more, it is wind-swept, and the climate cool and dry; everything must be grown by irrigation. In one respect, it bears a peculiar relation to the other irrigation states, for within its boundaries rise nearly all the great streams of the West from which water is used for reclamation. The headwaters of the Columbia, the Colorado, and the Missouri are all found among its mountains, but the physical conditions are such that but comparatively little of this supply is available for use in the state.

Wyoming is preëminently a grazing state, but the last census figures show that 600,000 acres were under cultivation by irrigation in 1889, an increase in ten years of 163 per cent, producing crops worth nearly $2,900,000. In spite of the fact that live stock interests are so large, irrigation is of growing interest, for it is coming to be recognized as a necessary adjunct to the grazing interests. The public range, on account of overgrazing, is rapidly deteriorating in quality so that it is not possible for it to support as large a number of cattle as in former years. This fact is recognized, and it is further understood that the remedy lies in the cultivation of the forage crops by irrigation to supplement as much as possible the deficiency. This is most strikingly illustrated by the fact that in 1899, of the 600,000 acres under irrigation, 560,000 were devoted to hay, alfalfa, and other fodder crops.

THE PROMISE OF MONTANA

Montana stands third in irrigated area. Although needing less assistance from irrigation than other states in the arid West, it seems destined to surpass them all in the amount of land which will eventually come under the ditch. At the date of the last census, the state had over 950,000 acres under irrigation, showing the notable increase of 171 per cent in ten years. Montana contains vast areas of fertile land and is so situated with respect to the sources of a number of large streams that its water supply is more plentiful than that of any of the Western States. Economically, it has had a most interesting history. During the period between 1870 and 1900, it witnessed a remarkable change in agricultural values. In the former year, the value of live stock in the state was at least three times that of all farm land and buildings. In the latter, the live stock interests had gained enormously and were nearly forty times as great as in 1870, but farm values had also increased with such rapidity that they were worth $10,000,000 more than the total live stock interests. At first farming was incidental to stock raising, but, within the thirty years above mentioned, the conditions were completely reversed. This great increase in farm wealth is due largely to the rapid settlement of the valleys and the changed methods which followed the successful application of irrigation to the cultivation of forage and other crops. The interesting statement has been made that, in the course of a few years, the value of the agricultural products in Montana will be greater than those of the mines.

GOVERNMENT RECLAMATION IN THE LOUISIANA PURCHASE TRACT

It is too early to state how the future of irrigation in the Louisiana Purchase tract will be affected by government irrigation. Under the Irrigation Act of June 17, 1902, the engineers of the Reclamation Service have been making a thorough investigation in this region to discover irrigation possibilities.

In the region particularly under consideration a number of projects have been found which seem to be feasible, but, until the surveys are completed and a great variety of facts obtained not only regarding the engineering features of the projects but also concerning business questions, such as the possibility of securing needed lands for reservoir and other purposes, the organization of water users' associations and other matters which require much time to work out, it will be impossible to make any definite statements regarding them.

In a general way, however, it may be said that it appears to be possible to reclaim considerable land in South Dakota from streams rising in the Black Hills; in western Nebraska along the North Platte, in Wyoming, in the valleys of the Shoshone and Snake rivers, and along a number of streams in both northern and southern Montana.

If these projects are found to be feasible and are constructed, the result will be several hundred thousand acres added to the cultivated land in the section. The chances are that much of this land will be reclaimed. What this will mean in the great increase of population that is sure to follow, the increase in business and in land values, the social and political changes that will take place, it is difficult now to predict, but the reclamation of these desert lands by the Government can not but have a profound influence not only on the development of the West but also upon the destiny of the entire country.

GEOGRAPHIC INFLUENCES IN THE DEVELOPMENT OF ST. LOUIS

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THE development of St. Louis has been characterized by a sort of staccato movement; it has been stimulated by a close succession of distinct economic impulses, each quite different in its nature but each nearly related to the geographic environment of the city. The word environment in this connection is a big term, as understood by the anthropo-geographer; it includes not only the city's location and immediate surroundings, but also remote features in the topography, climate, and natural resources of the wide Mississippi Valley. The long westward-reaching line of the Great Lakes with their short portages to the Mississippi streams, the vast system of navigable waterways occupying this central trough of North America, the cold, bleak climate of our Northwest and upper Rockies thickening the fur on the backs of their early four-footed inhabitants, the breach in the western mountain wall just east of the old Mexican city of Santa Fé, the grazing lands of the arid plains, the mineral belt of the Ozark Mountains and of the Appalachians at the sources of the Ohio, the tobacco fields of Kentucky, and the seaport of New Orleans at the terminus of the Mississippi highway, have all been so many conspicuous factors in the environment of St. Louis, potent to modify its history. Now one, now the other, geographic influence has been in the ascendant. In the early decades of the nineteenth century, it was the Rocky Mountain sources of the western rivers with their wealth of beaver skins, while in these recent years it has been the headstreams of the Ohio and Illinois rivers with their wealth of coal. Or the same geographic factor has operated under different guises at different times. The arid plains were, in early days, the feeding ground of the buffalo whose skins and dried tongues were staples of the St. Louis trade, and these same plains, now divided up into ranches, supply the cattle for the great meat-packing establishments there to-day.

The cities of any new or undeveloped country are primarily commercial centers, markets where the crude commodities of its natural resources can be exchanged for the manufactured wares of some more advanced industrial section. The rapidity of their growth depends always, first, upon their command of an extensive system of inland navigation, because rivers and lakes are the sole highways of a new country; and second, upon the productivity of the country for which they serve as a commercial outlet. When such cities have outgrown the first or purely commercial phase and begin to add industries to their other activities, they necessarily possess many qualifications of successful manufacturing centers. The converging routes of communication which they command insure abundant raw materials and the best facilities for marketing their finished products. Moreover, the capital and labor necessary for large industrial enterprises are either at hand or readily attracted. Hence the geographic influences favorable to the earlier or commercial stage of a city's development continue to operate advantageously in the later stage when industries are combined with commerce. We shall follow the working of such geographic factors in the history of St. Louis.

In the early winter of 1763 Pierre Laclede Liguest, with a party of men and a goodly store of merchandise, came up the Mississippi from New Orleans to the French settlements between the mouths of the Ohio and Illinois rivers, to establish somewhere in that vicinity a trading post whence he might exercise his right, formally granted by the French authorities in New Orleans, to the exclusive trade of the Missouri and uppermost reaches of the Mississippi. But hearing that France had ceded to Great Britain all this territory between the Ohio and the Great Lakes, he located his station on the west bank of the Mississippi where St. Louis now stands, at a point nearly opposite the earlier settlement of Cahokia, which had been a gathering place for the French traders of the Mississippi basin.

The fact that impresses the student of early American history is the remarkable insight displayed by the pioneers of this western wilderness into the geographic conditions of the country and into the vast possibilities of certain favored points. Laclede had all the keen scent of his breed; he ran down the one spot destined by nature for the development of a great commercial center. Twenty miles below the mouth of the Missouri, where the volume of the Mississippi is almost doubled by the muddy tide of its great western tributary and where therefore navigation was assured even for the growing river craft of a remote future, Laclede built his little town—in this respect "builded better than he knew." The particular site which he chose was a limestone bank extending for about two miles along the river some twenty feet above its flood water, and rising by natural terraces to yet higher ground in the rear. This was a rare advantage on the Mississippi, because that great stream is generally bounded by high perpendicular bluffs, inhospitable to commerce, as one sees them at Vicksburg, Natchez, or Memphis; or by low alluvial plains, exposed to inundation from the annual floods and at all times teeming with malaria. Hence Hutchins, soon after St. Louis was founded, spoke of it as "the most healthy and pleasurable situation of any known in this part of the country." A few years later (1796) General Victor Collot, a Frenchman traveling in the West, found the new settlement to be endowed "with more facility, more safety, and more economy for trade and navigation than any other given point in North America."

Its location for commanding the commerce of the country was indeed unsurpassed. A central position in the highly fertile basin of the Mississippi insured abundant raw products as the basis of its exchanges, and an active selling market as the inevitable population should respond to the call of these tempting valley lands. Here too was the great river crossroads of the country, affording a navigable course from the falls of St. Anthony to the Gulf of Mexico, and from the forks of the Ohio at Pittsburg to the Great Falls of the Missouri at the first terrace of the Rockies, two thousand miles from north to south and as far from east to west. Short, easy portages or swamp-covered watersheds connected the northeastern tributaries of the Ohio and Mississippi with the Great Lakes, and enabled St. Louis to lay tribute upon the furs of the Canadian North. At this central point of the Mississippi Valley was the meeting of the waters. Besides the Missouri and Ohio, the Illinois opened the way to the Chicago portage of Lake Michigan, and the Tennessee and Cumberland served as primitive highways from the southern Appalachians to the mouth of the Ohio. Here were 15,410 miles of navigable waterway available for large river craft, when steamboats had come into use; but the mileage was far greater in the days of the voyageur's canoe and the keelboat of the trader.

When St. Louis was founded, a tide of French immigrants from the eastern side of the Mississippi, fleeing from British dominion there, gave the little settlement its first marked forward impulse. By 1780 it was a town of over a hundred stone-built houses with a population of eight hundred, almost all French. It drew to itself much of the fur trade north of the Ohio, all that of the upper Mississippi and of the Missouri. As settlement expanded from the east across the Mississippi Valley, the fur trade migrated farther west and was confined for the most part to the Missouri system; but St. Louis derived continually greater advantages from its water communication, with the rapid settling up of the valley and the increasing distances to be covered in collecting raw products and distributing finished merchandise. Through the Ohio it maintained trade connection with Philadelphia and Baltimore; through the lower Mississippi with New Orleans; and through the Illinois and Great Lakes with far-away Quebec.

In the territory east of the Mississippi, St. Louis had competitors in the various Ohio River towns, but in the vast area of the Missouri basin she ruled supreme. It was the fur trade of this country that especially encouraged the development of the city from 1790 to 1840. The hundreds of hunters, fur traders, Indian agents, and military officers scattered over the wild trans-Mississippi country came down from trapping camps or frontier posts in the mountains to St. Louis every spring, when the melting of the snows swelled the volume of the scanty western rivers and made them navigable. Their canoes and pirogues, laden with rich skins, the harvest of their winter hunt, found a ready sale in this bustling market of the West, and went to purchase the comprehensive outfit for the next season's operations. This included the more luxurious articles of food, like coffee (selling before the purchase of Louisiana at two dollars a pound), clothes, ammunition, and cheap wares for barter with the Indians. The sale of these supplies and the incoming peltries greatly augmented the commerce of St. Louis. The skins brought in were beaver, otter, deer, bear, fox, raccoon, wildcat, marten, and lynx; and these served as legal tender in all commercial transactions.

The western fur trade required capital, so big companies were organized in St. Louis—the Missouri Fur Company in 1808, the Rocky Mountain Fur Company in 1822, and the Western Department of John Jacob Astor's American Fur Company also in 1822, besides numerous other smaller organizations. Under their control operations expanded. The Missouri River and its straight-flowing western tributaries made many paths to the rich fur fields far in the heart of the Rocky Mountains, and to the passes which led over the Continental Divide to the sources of the Pacific rivers. Hence at an early date furs from traders' stations and trappers' camps on the head-streams of the Columbia and the Colorado, on Utah and Great Salt lakes, on the upper Missouri, Yellowstone, Big Horn, and Platte rivers found their way to the Missouri, and came down this common highway of the Far West to the growing city just below its mouth.

Though the fur trade was a potent factor in St. Louis' development till 1845 or even a little later, its glory had passed by 1834. But this date had already seen the sturdy beginning of another commercial movement along a different geographically determined line which greatly stimulated the growth of the city. This was the Santa Fé trade, which began about 1822 and initiated the next step in St. Louis' growth. Far to the west of St. Louis and just beyond the eastern range of the Rockies in the high valley of the Upper Rio Grande lay the old Mexican city of Santa Fé, a territorial capital in the days of Spanish supremacy and an active trading point under the less arbitrary rule of independent Mexico. The commerce of the place was considerable, for it supplied all the population up and down the Rio Grande Valley and carried on a busy trade some three hundred and fifty miles to the south with Chihuahua, an important town of northern Mexico. It bought extensively of American merchandise from the markets of St. Louis, which, because of a peculiarly favorable geographical location, controlled the Sante Fé trade. St. Louis lay on the direct line of water communication from the manufacturing eastern states, whose wares it got by the cheap steamer carriage on the Ohio, and then forwarded again by river to the great elbow of the Missouri. Here began the Santa Fé trail, a wagon track eight hundred miles long, which followed the upper course of the Arkansas and Cimarron rivers across the arid belt of the Great Plains, and rose by imperceptible ascent to the gateway in the Rockies leading to Santa Fé. The outfitting point for this trade was naturally at Independence, where the Missouri boat had to be exchanged for the packhorses and ox-wagons of the trail, but St. Louis supplied Independence with merchandise and was the market for the furs, gold, and silver brought in from New Mexico.

At the time the Santa Fé trade opened, the introduction of steam navigation on the western rivers enabled St. Louis to reap the full benefit of her peculiar location and to increase her commerce with the growing demands of the West. By the methods of poling and rowing and cordelling on the old flatboats and keelboats, freight up-stream from New Orleans cost fifty cents a pound. The first steamboat reached St. Louis in 1817; twenty years afterwards freight charges for the same distance had dropped to two cents a pound, while over a hundred and fifty steamboats were entering the port of St. Louis in a twelvemonth. As this city had been an important exchange

FIG. 1. *A typical Mississippi River steamboat. These light draft vessels have a large carrying capacity, and it was through the use of fleets of these vessels that commercial supremacy of the Mississippi River came about.*

point in the old keelboat days from 1780 to 1830, so its commercial activity grew in the days of steamboat supremacy from 1830 to 1860. Below St. Louis the depth of the Mississippi is six feet or more, above it is only from three to five feet. This fact differentiated transportation on the upper and lower river and made St. Louis a point of reshipment. Thus it had a natural monopoly of the trade of the upper Mississippi as well as of the Missouri.

As population poured into the central valley of the continent between 1840 and 1860, the lines of St. Louis commerce increased in number and extent, and river transportation, not yet feeling the competition of railroads, was at its height. In 1845 over two thousand steamboats, aggregating 358,045 tons, besides several hundred keel and flat boats, drew up along the St. Louis wharves in the course of a year. Of these 250 came from New Orleans, bringing fine merchandise of foreign or New England manufacture to exchange for the flour and bacon of the more northerly states; 406 came from ports along the Ohio or its tributaries, laden with agricultural products for the St. Louis market or with manufactured goods which had come in from the Atlantic seaboard by the canals and the Great Lakes. Its increasing commerce, due to the stimulating effect of steam navigation on the western rivers and to the rapid growth of settlement in the vast country tributary to it, is reflected in St. Louis' population, which rose from six thousand in 1830 to over sixteen thousand in 1840 and over one hundred and eighty-five thousand in 1860.

With the rapid decline of river transportation after 1865, following the introduction of railroads, St. Louis had to adjust herself to the new conditions. Though the geographical advantages which she had enjoyed over other western cities now seemed annulled, and Chicago was beginning to win supremacy in the Mississippi Valley, these years saw the beginning of the industrial development of St. Louis. Railroads came into the trans-Mississippi West, but they followed the lines which the river trade had determined; and more than this, in the arid belt of the plains, where shifting, shallow river beds had made water transportation impossible, they supplanted the creeping pace of packhorse and caravan by the express train, and with the settling of the far western states, gave St. Louis a larger and more active market in the wide back-country reaching to the Rockies and beyond. To-day twenty-three great railroads enter the city and two bridges over the Mississippi secure connection with eastern lines, so that few points in the middle West possess superior facilities for rail transportation. These advantages, together with the Mississippi and Ohio waterways, still the most economic means for bringing in raw materials of large bulk, have stimulated the industrial development of St. Louis, while extending the area of its commercial field.

St. Louis had no manufactures of a systematic character prior to 1860. Pork packing and flour milling, those first industries of an agricultural community, were carried on with some activity in those early days; their products, which went to feed the towns and plantations on the lower Mississippi, were packed in barrels and kegs, which were therefore turned out in considerable quantities by the local cooper shops. These industries were closely related to the city's location in the fertile lands of the middle West, in close proximity to the mar-

[illegible]

St. Louis is accessible [illegible] produced one-half [illegible]. Louisville, the rival of St. Louis, is the largest leaf tobacco market in the world, but till recently has lacked the capital necessary for extensive manufacture. A few years ago, however, the Tobacco Trust bought up the chief manufacturing plants in both cities, and with the eye for economic production characteristic of all such big industrial combinations, it is shifting the center of its production from St. Louis to Louisville, nearer the supply of the raw material. Therefore the next census report of tobacco production in St. Louis may show a decline.

In another leading industry of the Middle West, that of slaughtering and meat packing, St. Louis has an active share. The localization of this industry is determined in general by the presence of a climate and soil especially adapted to the production of the corn and hay necessary for feeding cattle, and by the factor of mere area or abundant land, which can be found only outside of the older settled regions with their denser populations. The industry is most highly developed, therefore, in the corn belt of the Middle West, near the cattle ranches of the Great Plains and the stock-raising section of the

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FIG. 2. *Along the water front, St. Louis, as it is to-day.*

upper Mississippi Valley. The meat products of Illinois, Kansas, Nebraska, Indiana, and Missouri constituted nearly three-fourths of the country's total in 1900. These figures indicate the broader localization. Taken more narrowly, we find that this industry must be centered in cities, because it is dependent upon ample railroad facilities for its refrigerator cars, and hence has reached its greatest development in Chicago; but it is steadily migrating westward, following the withdrawal of stock farms and ranches to the abundant lands of the trans-Mississippi and Missouri country before the growing population of the old West. St. Louis has taken advantage of this trend. The products of its slaughter houses have increased in value almost fifty per cent in the last decade and will probably rank yet higher in 1910.

Proximity to the great central corn area and to the barley fields of Wisconsin, Iowa, Minnesota, and northern Illinois has been a potent factor in the brewing industry of Chicago, Milwaukee, and St. Louis, while the steady demand from the large German population in each of these cities has contributed also to the same end. The manufacture of malt liquors is widely distributed in the United States, because the transportation of the finished product, especially in bottles, is relatively expensive, so that breweries are likely to spring up wherever the demand is great; but peculiar advantages stimulate production on a large scale to supply something more than the local demand. St. Louis ranks fifth among the brewing cities of the United States, and sells its finest beers in a wide range of markets in the Mississippi Valley.

The other active industries of St. Louis include the manufacture of foundry and machine shop products, boots and shoes, flour and grist, bread and other bakery products, paints and oils, and men's clothing. All these tell of proximity to an abundant supply of the raw materials. For instance, the manufacture of paints and oils has thrived because of the soft lead, barytes, and other minerals of choice quality, found in the southwestern part of Missouri. Sometimes the demand has been the stronger agent in determining the supply. Back in the early decades of the nineteenth century, the Rocky Mountain trappers, the Santa Fé traders, and, a little later, the throngs of settlers moving westward over the Oregon trail to the Pacific, made a great demand for patent medicines. St. Louis, as the center for this valuable western trade, responded to the demand and manufactured medicines. This industry naturally grew into the manufacture of chemicals and drugs, and as such takes an important place among the activities of the city.

St. Louis now ranks as the fourth city of the United States both in population and in the value of its manufactured products, according to the figures of the latest census; and yet these figures do not tell the whole story, because St. Louis has overflowed across the Mississippi into Illinois and there developed the towns of East St. Louis, Madison, and Granite City. Located just across from their mother city at the eastern termini of the two great bridges over the dividing stream, they occupy favorable sites for transportation and fuel, are operated by St. Louis capital and enterprise, but escape St. Louis taxes.

The rapid growth which always accompanies marked industrial development in a city is evidenced in St. Louis by the increase of its population from 310,864 in 1870 to over 600,000 in 1903. This advance in population and industries is intimately connected with the rapid development of the extensive country to the west, south, and southwest of St. Louis, where the city finds its natural markets. The construction of the embryo state of Oklahoma and the opening up of successive strips in Indian Territory have alone contributed no little to the commercial activity of St. Louis. All this broad area is engaged primarily in agriculture and stock raising, except for the mining in certain favored localities; it therefore makes a steady demand for manufactured wares of all kinds, and for these St. Louis is the nearest producing and selling point. Hence the city commands this commercial field as Chicago does the Northwest, and its growth and prosperity will therefore advance with that of the wide territory which constitutes its market.

DENVER—THE QUEEN CITY OF THE PLAINS

BY C. E. CHADSEY
Superintendent of Schools, Denver, Colorado

IT is said that there are few cities which impress the casual visitor favorably. The unpleasant features of a city are generally among its most prominent ones. The smoke, the filth, the tumble-down, ramshackle buildings, generally prove to be the most forcible impressions received by a stranger arriving in a city for the first time.

Seldom, if ever, is this true of the visitor to Denver. Things ordinarily seem to conspire to produce favorable impressions of Colorado's metropolis. The wonderfully clear atmosphere, the panoramic view of the rugged, snow-capped Rockies, many of whose peaks, plainly visible, are from seventy to one hundred miles distant, the varicolored foothills rising from the level prairie ten or twelve miles from the city, give a setting unsurpassed and of untiring interest. (See Fig. 1.)

This favorable impression is increased when the tourist inspects more closely the city. Denver is so young, its growth has been so rapid and its building ordinances forbidding the erection of frame houses so sweeping that in spite of the large area included within the limits of the city, one can find little of the slovenly or unsightly.

One accustomed to the spacious grounds and stately trees of some eastern cities may wonder why when there was so little apparent need for restricted grounds so few seem to have profited by the opportunity, but the care taken almost uniformly by the householders of their rather limited lawns results in a most pleasing general effect.

Denver lawns, like all Colorado lawns, exist only through careful irrigation, involving more attention than found necessary in eastern cities blessed with more generous rainfall. This doubtless in part accounts for the comparatively small number of spacious lawns found surrounding the average Denver residence.

As compared with the average eastern city, Denver has little in the way of history, but as an example of how in the territory added to our country through the far-seeing statesmanship of Jefferson prosperous, solidly built cities have sprung up where fifty years ago only a few trappers' cabins could be found in the entire territory, its history is of surpassing interest.

For nearly half a century after the cession of the Louisiana Territory to the United States that portion known as the Pike's Peak

FIG. 1. *A panorama view of the city of Denver, showing the rugged snow-capped Rockies, over 75 miles distant.*

country attracted little attention. Some fur companies were early organized and their trappers began to establish stations in Colorado, along the South Platte perhaps in the early twenties. In 1832 a trading post was established near what is now Denver, and while this was followed by other similar settlements in the neighborhood, it was not until the discovery of gold in Colorado that immigration of any consequence commenced. Many stories concerning the first discovery of gold in this territory are in existence, and it is difficult to determine the real origin of the movement westward. Hunters and trappers from as early a date as 1832 had occasionally found gold in the sands of the streams, and probably reports of these findings were circulated in the eastern states for years before they gathered sufficient momentum to secure any serious attention. Probably Colonel Gilpin's report of his observations, made in 1849 through an address given in Independence, Mo., furnished the first really reliable basis for the rumors concerning the existence of gold. These reports, verified by various returning adventurers during the succeeding years, produced the traditional gold excitement as a result of which the city of Denver was founded.

The story of the early attempts to found a city in the vicinity of Denver is of considerable interest. In the fall of 1858 a number of families established a little settlement about six miles from the center of the present city of Denver. About twenty houses were erected and gold digging was attempted in the sands of the Platte at this point. The town was named Montana, but was short-lived as the venture proved unsuccessful and the entire settlement moved down the river in the following spring. About the same time, farther down stream within the limits of Denver, another town named Auraria was established. This settlement proved quite successful and grew with great rapidity. For some time it seemed to be destined to be the leading town of the Pike's Peak country. Here were established churches, newspapers, lodges, and all the organizations ordinarily found in the active western town. A short distance away a rival town company attempted to establish a town to be called St. Charles and prepared articles of incorporation. This venture did not flourish and was soon abandoned.

A little later a new town company was organized and established a town on the site of St. Charles and in honor of the ex-governor of the Kansas territory named it Denver. The date of organization is given as November 17, 1858. (See Fig. 2).

For some time this town was a rival of Auraria, but the founders of Denver were vigorous, energetic men and succeeded in more than holding their own in spite of bitter animosity. The village prospered and in April, 1860, the two towns were united under the name of Denver.

The first census of Denver taken in 1860 seemed to indicate a population of 4,749. It is evident, however, that even at this early date, knowledge of how to pad census returns was entirely equal to the task of producing this remarkable result.

The first railroad running into Denver was in operation in 1870, at which time the city had a population of 4,759, an apparent increase of only ten over the returns for 1860. Since 1870, however, the growth of the city has been most remarkable. In 1900 the census showed that Denver contained a population of 133,359. In 1902, as a result of what was known as the Rush Amendment to the Constitution of Colorado, a number of suburban towns were annexed to Denver, and the entire corporation, now known as the "City and County of Denver," contains a population considerably in excess of the above mentioned figure. This amendment is popularly known as the "Home Rule Amendment" and Denver is, under its provisions, blessed with a degree of home rule possessed by perhaps no other city in the United States.

The remarkable growth of Denver has been due chiefly to the development of the great mining camps of Colorado for which it is the natural supply center. In addition, however, to these great resources a very rich agricultural and stock-raising region is found in the territory to the north of the city which adds greatly to the resources of the state and furnishes a stability to the city which a mining region alone could not give.

As a result of Denver's early prominence as a commercial center for the Pike's Peak country, it followed that when the railroads began

FIG. 2. *The state capitol building at Denver.*

to form their network of communications through the Rockies, the chief railroad center proved to be Denver. More than one western city owes its prosperity as a railroad center to an apparently fortuitous combination of circumstances. In this case, however, the location was eminently suitable for such a development and it is now well established that Denver will remain the chief railroad center of the Rocky Mountain Region.

The climate of Denver is one of its chief glories. Its winters are mild and open. Little snow falls and there are few days during the year when the sun does not shine and outdoor life is not pleasant and agreeable. The air is dry and possesses a tonic quality due to the elevation above sea-level—about one mile. The rainfall is very light, the annual precipitation being about fifteen inches.

As a natural result of these conditions Denver in common with all Colorado has come to be recognized as a highly desirable place of residence for those who suffer from mild pulmonary troubles. Thousands of Denver's citizens originally came to Colorado in search of health, and thousands more come each year for the same reason.

The mean annual temperature of Denver is about 50° Fahrenheit, and the average number of clear and partly cloudy days is 309. Although Denver owes its great growth to its favorable location as a commercial center for the mining districts of the state, it has, through its proximity to the coal fields, come to be quite a manufacturing and smelting center. There are in operation in the city about fifteen hundred manufacturing plants with an annual output of over forty-two million dollars. This statement often creates some surprise, even among Denver residents, as few have been accustomed to think of Denver as in any way a manufacturing city. It is altogether probable that the future growth of the city will depend to an increasing extent upon the development of its manufacturing interests.

GEOGRAPHICAL NOTES

AREA AND POPULATION OF THE STATES AND TERRITORIES WITHIN THE LOUISIANA PURCHASE.

STATE	Area	Pop. 1900	Chief City	Pop. 1900
Arkansas	53,850	1,311,564	Little Rock	38,307
Colorado	103,645	539,700	Denver	133,859
Indian Territory	31,000	302,060	Ardmore	5,681
Iowa	55,475	2,231,853	Des Moines	62,139
Kansas	81,700	1,740,495	Kansas City	163,752
Louisiana	45,420	1,381,625	New Orleans	287,104
Minnesota*	79,205	1,751,394	Minneapolis	202,718
Missouri	68,735	3,106,665	St. Louis	575,238
Montana*	145,310	243,329	Butte	30,471
Nebraska	76,840	1,066,300	Omaha	102,555
North Dakota	70,195	319,146	Fargo	9,589
South Dakota	76,850	401,570	Sioux Falls	10,266
Oklahoma*	38,830	398,831	Oklahoma City	10,037
Wyoming*	97,575	92,531	Cheyenne	14,087

*Included in part in the Purchase.

RANK OF PRINCIPAL MANUFACTURES IN THE SEVERAL LOUISIANA PURCHASE STATES, 1900.

	Rank in Products.
Arkansas	3 in cotton ginning, 6 in lumber and timber products.
Colorado	4 in coke, 5 in copper smelting, 1 in lead smelting.
Iowa	3 in butter and cheese, 4 in food preparations, 8 in planing mill products.
Louisiana	3 in cotton seed oil.
Minnesota	1 in grist mill products, 3 in lumber and timber products, 3 in linseed oil
Missouri	4 in coffee and spice washing, 5 in confectionery and railway cars.
Montana	2 in copper and lead smelting.

AGRICULTURE IN THE LOUISIANA PURCHASE.

	Rank in Union in 1900	Total Value of Crops in 1900	Principal Crops with Rank in each in Union
Arkansas	20	56,803,494	Corn 14; cotton 6; sugar 8.
Colorado	34	16,857,533	Wheat 28; oats 30.
Indian Territory	32	16,691,142	Corn 25; cotton 10.
Iowa	2	192,286,098	Corn 2; oats 1; barley 3; hay 2; potatoes 5; flaxseed 4.
Kansas	5	112,684,696	Corn 3; wheat 5; oats 12; hay 3; potatoes 10; flaxseed 5.
Louisiana	27	61,272,676	Corn 22; rice 1; cotton 7; sugar 1.
Missouri	7	117,012,895	Corn 4; wheat 9; oats 11; hay 4; potatoes 12; flaxseed 6.
Minnesota	4	113,092,602	Wheat 1; oats 4; corn 21; barley 2; hay 7; potatoes 6; flaxseed 2.
Montana	35	10,516,381	Oats 28; wheat 36; hay 20.
Nebraska	8	92,056,580	Corn 5; wheat 8; oats 5; hay 9; potatoes 11.
North Dakota	13	53,928,010	Wheat 2; oats 14; flaxseed 1.
South Dakota	16	44,069,331	Wheat 3; corn 24; barley 5; hay 13; flaxseed 2.
Oklahoma	24	26,612,442	Wheat 16; corn 23.
Wyoming	48	3,119,023	Oats 41; wheat 39; hay 35.

GRAZING IN THE LOUISIANA PURCHASE TERRITORY, 1900.

	Cattle	Horses	Mules	Sheep	Hogs
Arkansas			166,267 (8)		1,713,307
Colorado	1,164,169 (15)				
Indian Ter.	1,263,269 (13)				
Iowa	4,077,351 (2)	1,268,046 (1)			9,723,791 (1)
Kansas	3,567,616 (3)	907,156			3,594,859 (6)
Louisiana			141,645 (9)		
Minnesota	1,305,331 (12)				1,440,806
Missouri	2,345,272 (6)	908,860 (4)	242,095 (2)		4,524,664 (3)
Montana				4,215,214 (1)	
Nebraska	2,421,743 (4)	728,542			4,128,000 (4)
N. Dakota		331,323			
S. Dakota	1,203,659	433,644			
Oklahoma	1,409,627				
Wyoming				3,327,185 (3)	

LOCALIZATION OF INDUSTRIES IN THE LOUISIANA PURCHASE.

CHIEF CITIES AND RANK IN INDUSTRY.

Kansas,	slaughtering and meat packing	(2) 76,829,139	—Kansas City, Kan. (2)
Nebraska,	" " " "	(3) 71,018,339	—South Omaha (3).
Missouri,	" " " "	(5) 42,229,127	—St. Joseph (4), St. Lou-
Iowa	" " " "	(7) 25,296,518	is (6)

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EDITORIAL

THE LOUISIANA PURCHASE

THE Great Louisiana Purchase Exposition now open at St. Louis has been the means of arousing a deep interest in the significance of the Louisiana Purchase in the political and economic history of our country. When this great region of possibilities was first brought to public notice a century ago the geographic significance and importance of the area were imperfectly realized, and since that time few people have fully appreciated the part that geography has played in determining the history and development of this vast domain.

This number of the JOURNAL has been planned to present a brief and concise summary of the past and present geographic conditions of the Louisiana Purchase tract, in order that teachers may have at hand a good working reference volume, which shall be available in their teaching of this important portion of our country, not only during the present period of popular interest in the area, but also after that interest has subsided.

The authors of the several papers here presented are recognized authorities in the phases of geography and history which they have severally treated. Of course only the briefest outline of the vast geographic conditions presented on such an enormous scale in this area can be given in the limited space available. For a fuller and more complete statement the interested reader should consult the several volumes and monographs mentioned in the brief selected bibliography. Yet the papers here presented have a distinct value above any larger treatise, inasmuch as only the salient features pertinent to the requirements of teachers have been selected for treatment, and the needs of teachers have been kept constantly in mind, not only in the planning of the number as a whole, but also in the variety of the several papers.

It is hoped that this number may be of distinct value also to those who are planning to visit St. Louis during the coming summer, and particularly to those who, living amid the varied landscapes of the Eastern States, have never seen the vast and impressive long distance views to be gained in those regions of gentle relief which make up the larger part of the Louisiana Purchase territory.

RECENT PUBLICATIONS

Lectures on Commerce Delivered before the College of Commerce and Administration of the University of Chicago. Edited by Henry R. Hatfield. Pp. viii, 388. Chicago: University of Chicago Press, 1903.

A series of lectures on Railways, Trade and Industry, and Banking and Insurance delivered by experts in the several fields. Full of information on little understood problems in commercial life. Helpful to teachers and the general reader. Valuable for the school library, especially where commercial geography is emphasized.

Early Western Travels, 1748–1846. A series of annotated reprints of some of the best contemporary volumes of travel during the period of early American settlement. To be completed in 31 volumes. Vol. I, 1748–1764, pp. 328; Vol. II, 1768–1782, pp. 329. Cleveland, Ohio; The Arthur H. Clark Co., 1904.

The volumes of this series of reprints of early travels will be of great value to all students of the early geography and history of the Western States. The first volume consists of a series of notes of expeditions into the west. The second volume presents John Long's notes on his life among the Indians of the St. Lawrence Basin and Northern New York. Very interesting for the descriptions of Indian life and customs and valuable for history and geography classes. Inviting reading for any one who is interested in early conditions as contrasted with the present. Well annotated and attractively printed.

Geology. By Thomas C. Chamberlin and Rollin D. Salisbury. Vol. I, *Geologic Processes and Their Results*. Pp. xix, 654. New York: Henry Holt & Co., 1904.

An inclusive and clearly written volume on the more familiar phases of geology. Especially valuable to teachers of physical geography or geology. Superbly illustrated and typographically pleasing. To be reviewed later.

A Text-Book of the Physics of Agriculture. By F. H. King. Pp. xvi, 604, third edition, 1903. Published by the author, Madison, Wis.

Although primarily for the student or worker in agriculture, the book includes much of value to the teacher of geography or nature study. The chapters on soils, the uses of soils, soil moisture, relation of air to soil, on ground water, farm wells, farm drainage, and the atmosphere are simple and extremely valuable.

The Louisiana Purchase and the exploration, early history, and building of the West. By Ripley Hitchcock. Pp. xxi, 349. Boston: Ginn & Co., 1904.

A brief and interesting account of history of exploration and development in the Louisiana Purchase. The appendix contains a very adequate series of statistics and is accompanied by a useful index. The book is particularly timely and pertinent to the scope of this number of the JOURNAL.

Around the World in the Sloop Spray. By Captain Joshua Slocum. Pp. xiv, 213. New York: Charles Scribner's Sons, 1903.

An abridgment for school use of the author's well-known volume, describing his trip around the world in a thirty-six foot sloop. Interesting for adults and children. First hand in formation, clearly and forcibly expressed. An excellent geographical reader describing the ways of people in distant lands.

NEWS NOTES

The Eighth International Geographic Congress.—Mention has already been made in the JOURNAL of the Eighth International Geographic Congress which will convene in Washington on September 8th, where meetings will be held on September 8th, 9th, and 10th. On September 12th the Congress will be the guests of the Geographical Society in Philadelphia. On September 13th and 14th sessions will be held in New York under the auspices of the American Geographical Society and on September 15th an excursion on the Hudson will be given by that society. September 16th will be passed at Niagara. On September 17th the Congress will be the guests of the Geographic Society of Chicago. On September 19th and the following days the Congress will take part in the sessions of the geographical sections of the Congress of Science and Arts at the World's Fair, St. Louis. After adjournment, about September 24th, an excursion is planned to Mexico and the Grand Canyon of Arizona.

It is particularly desired that many American teachers of geography should take part in the Congress. It is believed that the time thus spent will be profitable, not only from the value of papers and discussions during the sessions of the Congress, but in no less degree from the advantage of personal intercourse with the geographers of Europe and America, whom the Congress will bring together. One or more sectional meetings will be devoted to the educational aspects of geography; contributions on this branch of the subject are desired

FIG. 9. *A cross-roads or "four corners." The beginning of a village.*

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FIG. 26. *A view of mountains and highland valleys with a mountain range and peak in the distance.*

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For a partial list of articles that have appeared and will appear during the school year of 1903-1904 see next page.

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Edited by **RICHARD E. DODGE**, Professor of Geography, Teachers College, Columbia University, New York City, and **EDWARD M. LEHNERTS**, Professor of Geography, State Normal School, Winona, Minnesota

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VOL. III. SEPTEMBER, 1904 No. 7

XII

THE FIRST AMERICAN GEOGRAPHY*

BY CLIFTON JOHNSON

IN colonial days geography was spoken of as "a diversion for a winter's evening," and acquaintance with it was considered an accomplishment rather than a necessity. Some rudimentary instruction in the science was occasionally given at the more advanced schools, but the topic was not taken up in the elementary schools until after the Revolution. A knowledge of it was first made a condition for entering Harvard in 1815, and a dozen years more elapsed before Massachusetts named it among the required studies in the public schools. To begin with, it was not introduced as a separate study, but the books were used as readers. The same was true of the early school histories. However, geography presently won a place of its own and kept it in spite of the protests that the scholars' attention was thereby being taken away from "cyphering."

The pioneer of American authors of school geographies was Jedidiah Morse. On the title page of most editions of his books his name was appended with "D. D. Minister of the Congregation in Charlestown, Massachusetts." He was born in 1761, graduated from Yale in 1783, and the year following published at New Haven his first geography. Later he put forth several other geographies, large and small, became a compiler of gazetteers, wrote various important historical and religious works, was one of the founders of Andover Theological Seminary, and for more than thirty years served as pastor of the First Church in Charlestown. He won fame not only in his own country but was recognized abroad as a man of distinguished attainments, and a number of his books were translated into French and German. His *Geography Made Easy*, a small leather-bound 12mo

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of about 400 pages, was for many years by far the most popular text-book dealing with this subject. My copy, dated 1800, is dedicated

TO THE
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Two maps of double-page size are the only illustrations—one a map of the world, the other of North America.

The earlier pages treat of the "Doctrine of the Sphere. Of Astronomical Geography Of Globes and their Use," etc. But soon we

JEDIDIAH MORSE

come to the *History of the Discovery of America*, and then to a *General Description of America*. In the latter chapter is much that is interesting and picturesque. It includes, as do all the early geographies, a good many imaginative travellers' tales picked up from newspapers and other chance sources without any pains being taken to verify them or to inquire as to the reliability of their authors. In fact, it sometimes seems as if the more fabulous the story the better its chance to be recorded in the school text-books. We get very entertaining glimpses of the limitations of geographical knowledge at the time in the following extracts from Morse:

GEOGRAPHY MADE EASY.

A Heading from the edition of 1800

The *Andes*, in South America, stretch along the Pacific Ocean from the Isthmus of Darien to the Straits of Magellan. The height of Chimborazo, the most elevated point in this vast chain of mountains, is 20,280 feet, above 5000 feet higher than any other mountain in the known world.

North America has no remarkably high mountains. The most considerable are those known under the general name of the *Allegany Mountains*. These stretch along in many broken ridges under different names from Hudson's River to Georgia. The *Andes* and the *Allegany Mountains* are probably the same range interrupted by the Gulf of Mexico.

Who were the first people of America? And whence did they come? The Abbe Clavigero gives his opinion in the following conclusions:—

"The Americans descended from different nations, or from different families dispersed after the confusion of tongues. No person will doubt the truth of this, who has any knowledge of the multitude and great diversity of the American languages. In Mexico alone *thirty-five* have already been discovered."

But how did the inhabitants and animals originally pass to America?

The quadrupeds and reptiles of the new world passed there by land. This fact is manifest from the improbability and inconsistency of all other opinions.

This necessarily supposes an ancient union between the equinoxial countries of America and those of Africa, and a connexion of the northern countries of America with Europe on the E. and Asia on the W. The beasts of cold climes passed over the northern isthmuses, which probably connected Europe, America, and Asia; and the animals and reptiles peculiar to hot countries passed over the isthmus that probably connected S. America with Africa. Various reasons induce us to believe that there was formerly a tract of land which united the most eastern part of Brazil to the most western part of Africa; and that all the space of land may have been sunk by violent earthquakes, leaving only some traces of it in that chain of islands of which

Cape de Verd, Ascension, and St. Matthew's Island make a part. In like manner, it is probable, the northwestern part of America was united to the northeastern part of Asia, and the northeastern parts of America to the northwestern parts of Europe, by Greenland, Iceland, etc.

QUADRUPEDE ANIMALS within the United States:

Mammoth. This name has been given to an unknown animal, whose bones are found in the northern parts of both the old and new world. From the form of their teeth, they are supposed to have been carniverous. Like the elephant they were armed with tusks of ivory; but they obviously differed from the elephant in size; their bones prove them to have been 5 or 6 times as large.

A late governor of Virginia, having asked some delegates of the Delawares what they knew respecting this animal; the chief speaker informed him that it was a tradition handed down from their fathers, "That in ancient times a herd of them came to the Big-bone licks, and began an universal destruction of the bears, deer, elks, buffaloes, and other animals which had been created for the use of the Indians; that the Great Man, above, looking down, and seeing this, was so enraged that he seized his lightning, descended to the earth, seated himself upon a neighboring mountain, on a rock, on which his seat and the print of his feet are still to be seen, and hurled his bolts among them till the whole were slaughtered, except the big bull, who, presenting his forehead to the shafts, shook them off as they fell; but at length, missing one, it wounded him in the side; whereupon, springing round, he bounded over the Ohio, the Wabash, the Illinois, and finally over the great lakes, where he is living at this day."

Sapajon, Sagoin. There are various species of animals said to inhabit the country on the lower part of the Mississippi, called Sapajons and Sagoins. The former are capable of supporting themselves by their tails; the latter are not. They have a general resemblance to monkeys, but are not sufficiently known to be particularly described.

The sapajon and sagoin are not as mythical as might be fancied from what the book says of them. They both belong to the monkey tribe, but dwell in South America instead of on the lower Mississippi. Another curious item is this:—

Grey squirrels sometimes migrate in considerable numbers. If in their course they meet with a river, each of them takes a shingle, piece of bark, or the like, and carries it to the water; thus equipped they embark, and erect their tails to the gentle breeze, which soon wafts them over in safety; but a sudden flaw of wind sometimes produces a destructive shipwreck.

Fifty "quadrupede" animals are described in all, and then we have a section devoted to "Birds." Next "Amphibious Reptiles" are considered, after that "Serpents," and finally "Fishes." Here are sample paragraphs:—

The *Wakon Bird*, which probably is of the same species with the Bird of Paradise, receives its name from the ideas the Indians have of its superior excellence; the Wakon Bird being in their language the Bird of the Great Spirit. Its tail is composed of four or five feathers, which are three times as long as its body, and which are beautifully shaded with green and purple. It carries this fine length of plumage in the same manner as the peacock does his, but it is not known whether, like him, it ever raises it to an erect position.

The *Whitsaw* is of the cuckow kind, being a solitary bird, and scarcely ever seen. In the summer months it is heard in the groves, where it makes a noise like the filing of a saw.

Of the *Frog* kind are many species. Pond frog, green fountain frog, tree frog, bull frog. Besides these are the dusky brown, spotted frog of Carolina; their voice resembles the grunting of swine. The bell frog, so called, because their voice is fancied to be exactly like that of a loud cow bell. A beautiful green frog whose noise is like the barking of little dogs, or the yelping of puppies. A less green frog, whose notes resemble those of young chickens. Little gray speckled frog, who make a noise like the striking of two pebbles together under the surface of the water. There is yet an extremely diminutive species of frogs, called by some, Savanna crickets, whose notes are not unlike the chattering of young birds or crickets. They are found in great multitudes after plentiful rains.

The *Alligator* is a very large, ugly, terrible creature, of prodigious strength, activity, and swiftness in the water. They are from 12 to 23 feet in length; their bodies are as large as that of a horse. The head of a full-grown alligator is about three feet long, and the mouth opens nearly the same length. The upper jaw only moves, and this they raise so as to form a right angle with the lower one. They open their mouths while they lie basking in the sun, on the banks of rivers and creeks, and when filled with flies, musketoes and other insects, they suddenly let fall their upper jaw with surprising noise, and thus secure their prey.

The *Rattle Snake* may be ranked among the largest serpents in America. If pursued and overtaken, they instantly throw themselves into the spiral coil; their whole body swells through rage, their eyes are red as burning coals, and their brandishing forked tongues, of the colour of the hottest flame, menaces a horrid death.

The *Joint Snake*, if we may credit Carver's account of it, is a great curiosity. Its skin is as hard as parchment, and as smooth as glass. It is beautifully streaked with black and white. It is so stiff, and has so few joints, and those so unyielding, that it can hardly bend itself into the form of a hoop. When it is struck, it breaks like a pipestem; and you may, with a whip, break it from the tail to the bowels into pieces not an inch long, and not produce the least tincture of blood.

Other snakes mentioned are the "Water Viper, with a sharp thorn tail, Hog nose Snake, Coach Whip Snake, which the Indians imagine is able to cut a man in two with a jerk of its tail, Ribbon Snake, Glass Snake, and Two-headed Snake."

In the list of fishes are noted the "Skip jack, Minow, Shiner, Dab, Hard Head and Mummychog." Of the Lamprey it is affirmed that.

After the spawning season is over, and the young fry have gone down to the sea, the old fishes attach themselves to the roots and limbs of trees, which have fallen or run into the water, and there perish. A mortification begins at the tail, and proceeds upwards to the vital part. Fish of this kind have been found at Plymouth, in New Hampshire, in different stages of putrification.

When the general characteristics of the United States have been dealt with, New England is taken up, and we are informed that in this portion of the republic—

Learning is more generally diffused than in any other part of the globe; arising from the excellent establishment of schools in almost every township and smaller district.

A very valuable source of information to the people is the Newspapers, of which not less than thirty thousand are printed every week, in New England.

Apples are common, and cider constitutes the principal drink of the inhabitants.

Each state is described in detail, including such topics as "Religion, Military Strength, Literature, Curiosities, Constitution, and History." Bridges are constantly referred to—even those over the smaller rivers. We learn, for instance, that across the Piscataqua in New Hampshire a few miles above Portsmouth "has been erected the most respectable bridge in the United States, 2600 feet in length," at a cost of nearly seventy thousand dollars. In Massachusetts ten bridges are listed that "merit notice," and, it is added, "These bridges are all supported by a toll."

Harvard University, the book says, "consists of four elegant edifices," and we are told that "In Williamstown is another literary institution started in 1790, partly by lottery and partly by the liberal donation of gentlemen of the town." Boston had seven schools supported wholly at the public expense, "and in them the children of *every* class of citizens freely associate." Three of these were "English grammar schools in which the children of *both* sexes, from seven to fourteen years of age are instructed in spelling, accenting, and reading the English language with propriety; also in English grammar and composition together with the rudiments of geography." In three schools "the same children are taught writing and arithmetic.

The schools are attended alternately, and each of them is furnished with an Usher or Assistant. The masters of these schools have each a salary of 666 2-3 dollars per annum payable quarterly." Lastly there was the "Latin grammar school" to which "none are admitted till ten years of age."

The inhabitants of Boston at this time numbered 24,937. As usual in speaking of important places a list is given of the "public buildings." There were "18 houses for public worship, the state house, court house, gaol, Faneuil Hall, a theatre, an alms house, and powder magazine." The principal manufactures of the town were "rum, beer, paper hangings, loaf sugar, cordage, sail cloth, spermaceti and tallow candles, and glass."

The final states to be considered in the New England section are "Rhode Island and Providence Plantations," and Connecticut. Perhaps the most interesting bit in this portion is the statement that to Hartford, at the head of ship navigation on the Connecticut River, was brought in boats the produce of the country for two hundred miles above. Railroads were as yet undreamed of, and right through the book navigable streams and canals are treated as of far more importance than they would be at present.

Morse in his first edition devoted a paragraph to the "Connecticut inhabitants." Whether he abandoned it because it gave offence, I do not know. It says:—

> The people of this state are generally industrious sagacious husbandmen; generous and hospitable to strangers, and good neighbours. But they are characterized for being intemperately fond of law suits and little petty arbitrations. The ladies are modest, handsome, and agreeable, fond of imitating new and extravagant fashions, neat and chearful, and possessed of a large share of delicacy, tenderness and sensibility. The above character may with justice be given to the ladies of the four New-England States.

Now we come to "*The* SECOND GRAND DIVISION *of the* UNITED STATES." It comprised New York, New Jersey, Pennsylvania, Delaware, and "Territory N. W. of the Ohio." Special attention is paid to the climate of this tract, which the book says has

> but one steady trait, and that is, it is uniformly variable. The changes of weather are great, and frequently sudden. On the whole, it appears that the climate is a compound of most of the climates of the world. It has the moisture of Ireland in spring; the heat of Africa in summer; the temperature of Italy in June; the sky of Egypt in autumn; the snow and cold of Norway in winter; the tempests (in a certain degree)

of the West Indies, in every season; and the variable winds and weather of Great Britain in every month in the year.

From this account of the climate, it is easy to ascertain what degrees of health, and what diseases prevail. As the inhabitants have the climate, so they have the accute diseases of all the countries that have been mentioned.

Concerning New York City, the book says:—

A want of good water has been a great inconvenience to the citizens; there being but few wells in the city. Most of the people are supplied every day with fresh water conveyed to their doors in casks, from a pump at the head of Queen-street, which receives it from a spring almost a mile from the centre of the city. This well is about 20 feet deep, and 4 feet diameter. The average quantity drawn daily from this remarkable well, is 110 hogsheads of 130 gallons each. In some hot summer days, 216 hogsheads have been drawn from it, and what is very singular, there is never more or less than about three feet of water in the well. The water is sold commonly at three pence a hogshead at the pump. The Manhattan Company was incorporated in 1798, for the purpose of conveying good water into the city, and their works are now nearly completed.

New York then had a population of sixty thousand, which included about three thousand slaves.

In describing the "Territory N. W. of the Ohio" a list is given of its forts "established for the protection of the frontiers," and we are told that

both the high and low lands produce vast quantities of natural grapes, of which the settlers universally make a sufficiency, for their own consumption, of rich red wine. It is asserted that age will render this wine preferable to most of the European wines. Cotton is the natural production of this country, and it grows in great perfection.

Below are fragments of information about the Southern States, "*The* THIRD *and much the largest* GRAND DIVISION *of the* UNITED STATES."

The city of WASHINGTON stands at the junction of the rivers Patomak and the Eastern Branch. The situation of this metropolis is upon the great post road, equi-distant from the northern and southern extremities of the Union. The public offices were removed to this city in the summer of 1800, and here in future Congress will hold their sessions.

In the flat country near the sea-coast of North Carolina, the inhabitants, during the summer and autumn, are subject to intermittent fevers, which often prove fatal. The countenances of the inhabitants during these seasons, have generally a pale yellowish cast, occasioned by the prevalence of bilious symptoms.

A few years since, Tennessee abounded with large herds of wild cattle, improperly called Buffaloes; but the improvident or ill-disposed among the first settlers, have destroyed multitudes of them, out of mere wantonness. They are still to be found on some of the south branches of Cumberland river. Elk or moose are seen in many places, chiefly among the mountains. The deer are become comparatively scarce; so that no person makes a business of hunting them for their skins only. Enough of bears and wolves yet remain.

In Maryland, Virginia, and North-Carolina the inhabitants are excessively fond of the diversion of horse racing. Every spring and fall they have stated races for three or four days, which collect the sporting gentlemen from every part of the country from 100 to 200 miles. Every poor peasant has an horse or two and all the family in ruins, with scarcely any covering or provisions; while the nag, with two or three Negroes rubbing him, is pampered with luxuries to the extreme of high living.

This last item is from the edition of 1784. I make one more quotation from that edition under the heading, "Spanish Dominions in N. America,"—that is, Florida and Mexico,—and then resume consideration of the later book.

In California, there falls in the morning a great quantity of dew, which, settling on the rose-leaves becomes hard like manna, having all the sweetness of refined sugar, without its whiteness.

The greatest curiosity in the city of Mexico, is their floating gardens. When the Mexicans, about the year 1325, were subdued by the Colhuan and Tepanecan nations, and confined to the small islands of the lake, having no land to cultivate, they were taught by necessity to form movable gardens, which floated on the lake. Their construction is very simple. They take willows and the roots of marsh plants, and other materials which are light, and twist them together, and so firmly unite them as to form a sort of platform, which is capable of supporting the earth of the garden. Upon this foundation they lay bushes and over them spread the mud which they draw up from the bottom of the lake. Their figure is quadrangular; their length and breadth various, but generally about 8 rods long and 3 wide; and their elevation from the surface of the water is less than a foot. These were the first fields that the Mexicans owned, after the foundation of Mexico; there they first cultivated the maize, great pepper and other plants necessary for their support. From the industry of the people these fields soon became numerous. At present they cultivate flowers and every sort of garden herbs upon them. In the largest gardens there is commonly a little tree and a little hut, to shelter the cultivator, and defend him from the rain or the sun. When the owner of a garden wishes to change his situation, to get out of a bad neighborhood, or to come near to his family, he gets into his little boat, and by his own strength alone, if the garden is small, or with the assistance of others if it be large, conducts it wherever he pleases.

Among the islands off the coast of South America that are described is "Juan Fernandes 300 miles west of Chili," famous for its connection with Defoe's *Robinson Crusoe.* The book tells how Alexander Selkirk dwelt there and how he was finally rescued, concluding with:—

During his abode on this island he had killed 500 goats, which he caught by running them down; and he marked as many more on the ear, which he let go. Some of these were caught 30 years after, their venerable aspect and majestic beards discovering strong symptoms of antiquity.

Selkirk upon his return to England, was advised to publish an account of his life and adventures. He is said to have put his papers into the hands of Daniel Defoe, to prepare them for publication. But that writer, by the help of those papers, and a lively fancy transformed Alexander Selkirk into Robinson Crusoe, and returned Selkirk his papers again; so that the latter derived no advantage from them.

Part I of the geography closes with "New Discoveries," which it declares "have been numerous and important." Here is one:—

The Northern Archipelago.] This consists of several groups of islands situated between the eastern coast of Kamtschatka and the western coast of America.

The most perfect equality reigns among these islanders. They feed their children when very young, with the coarsest flesh, and for the most part raw. If an infant cries, the mother immediately carries it to the sea side, and, whether it be summer or winter, holds it naked in the water until it is quiet. This custom is so far from doing the children any harm that it hardens them against the cold, and they go barefooted through the winter without the least inconvenience. The least affliction prompts them to suicide; the apprehension of even an uncertain evil, often leads them to despair; and they put an end to their days with great apparent insensibility.

A little farther on we find this about the people of the Friendly Islands:—

Their great men are fond of a singular kind of luxury, which is, to have women sit beside them all night, and beat on different parts of their body until they go to sleep; after which, they relax a little of their labour, unless they appear likely to wake; in which case they redouble their exertions, until they are again fast asleep.

Part II is devoted to the eastern hemisphere. I quote two paragraphs about Lapland:—

The employment of the women consists in making nets for the fishery, in drying fish and meat, in milking the reindeer, in making cheese, and in tanning hides; but it is understood to be the business of the men to look after the kitchen, in which, it is said, the women never interfere.

When a Laplander intends to marry a female, he, or his friends, court her father with brandy; when with some difficulty he gains admittance to his fair one, he offers her a beaver's tongue, or some other eatable, which she rejects before company, but accepts of in private.

The father evidently enjoyed his part of the courting and was loath to end his free supply of liquor. "This prolongs the courtship sometimes for three years," says the book.

I expected when I turned to the pages devoted to Asia that I would find rats named as an article of Chinese diet, but the rat myth seems to have been of later growth. None of the geographies refer to it until Peter Parley in 1830 shows a picture of a pedler "selling rats and puppies for pies." In spite of this lack Morse's information about the Chinese is by no means uninteresting, as will be seen by the cullings which follow:—

The Chinese have particular ideas of beauty. They pluck up the hairs of the lower part of their faces by the roots with tweezers, leaving a few straggling ones by way of beard. Their complexion towards the north, is fair, towards the south, swarthy; and the fatter a man is they think him the handsomer.

Language.] The Chinese language contains only 330 words, all of one syllable: but then each word is pronounced with such various modulations, and each with a different meaning, that it becomes more copious than could be easily imagined, and enables them to express themselves very well, on the common occasions of life.

The Chinese pretend, as a nation, to an antiquity beyond all measure of credibility; and their annals have been carried beyond the period to which the scripture chronology assigns the creation of the world. Poan Kou is said by them to have been the first man; and the interval of time betwixt him and the death of the celebrated Confucius, which was in the year before Christ, 479, has been reckoned from 276,000 to 96,961,740 years.

The descriptions of Africa in Morse's book lack definiteness, except as regards Egypt and the north coast. The rest of the continent, "from the Tropic of Cancer to the Cape of Good Hope," is handled in a single lump. Of the inland countries Abyssinia receives most attention, and we are told that—

The religion of the Abyssinians is a mixture of Christianity, Judaism, and Paganism; the two latter of which are by far the most predominant. There are here more churches than in any other country, and though it is very mountainous, and consequently the view much obstructed, it is very seldom you see less than 5 or 6 churches. Every great man when he dies, thinks he has atoned for all his wickedness, if he leaves a fund to build a church, or has one built in his life-time.

The churches are full of pictures slovenly painted on parchment, and nailed upon the walls. There is no choice in their saints, they are both of the Old and New Testament, and those that might be dispensed with from both. There is St. Pontius Pilate and his wife; there is St. Baalam and his ass; Sampson and his jaw bone, and so of the rest.

It makes the beginning of the nineteenth century seem very barbaric when we read a few pages farther on that—

In the Guinea or western coast, the English exchange their woolen and linen manufactures, their hard ware and spirituous liquors, for the persons of the natives. Among the Negroes, a man's wealth consists in the number of his family, whom he sells like so many cattle, and often at an inferior price.

One page near the close of the volume estimates the number of inhabitants in the world and forecasts the probable population of the United States a century later. It supposes that the number will double every twenty years, and that therefore in 1904 we should be a nation of 160 millions.

In this forecast and in some other respects our author fails to hit the mark, but whatever the book's shortcomings, it was not dull, and it did admirable service in introducing an important study into the old-time schools.

(To be followed by "Later Geographies" by the same author.)

THE SCHOOL EXCURSION AND THE SCHOOL MUSEUM AS AIDS IN THE TEACHING OF GEOGRAPHY*

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IT is my purpose to consider the advisability of using some of the helps in the presentation of the subject of geography which will require the teacher and pupil to go beyond the confines of the schoolroom to obtain them. These helps are not intended to supplant the time-honored text-books and wall maps, but to put new and fuller meaning into them, to make the book and the map the servant, not the master of teacher and pupil.

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Geography is one of the foremost subjects in the curriculum in the study of concrete material. Its subject-matter is objective. It considers the earth in its relation to man. It includes a study of the practical things of everyday life at home and abroad.

To give to the pupil the necessary first-hand knowledge in the study of geography requires that the pupil and the thing to be studied be brought together face to face and at short range. This can be done in one of two ways: by taking the pupil to the thing, or by bringing the thing to the pupil. The first is the most effective way of studying the various topics of home geography and leads to the intelligent and frequent use of the school excursion. The second is the most effective way of giving first-hand knowledge concerning the geography of regions beyond the home locality and leads to the building and constant use of the school museum.

I wish to speak of each of these aids in the teaching of geography not from the theoretical standpoint, but as I have made use of them in classroom practice. My experience with the school excursion has been with classes from the third year through the remaining years of the grammar school in a public school of a thousand pupils in the city of Chicago and in the lower grades of the Training School of Normal, also in the high schools of Chicago and in two of the state normal schools of Illinois. Classes have ranged in numbers from half a dozen to eighty. My use of the school museum has extended over the same range of the curriculum with the addition of the first and second grades.

THE SCHOOL EXCURSION

The school excursion is an expedition made by the pupils of a class under the immediate direction of the teacher for the study of some particular topic in the school work. The pupils are responsible to the teacher for attention, interest, and good behavior to the same extent as in a class exercise in the schoolroom.

Successful school excursions depend upon the hearty coöperation of school officials, principal, teacher, pupils, and parents. All must believe that it is a good thing and work harmoniously and earnestly to make it as successful as other school exercises. The school board and superintendent must recognize the value of such work; they and the principal must willingly permit the use of school time to the extent of a half day at most for the work. The teacher must be as enthusiastic in this work as in any other if she expects to reap educational results. She must have studied the field of investigation previous to the time of the class exercise and carefully planned the steps of the lesson. To fail to do so means great loss in the net results of the lesson. The pupils must feel that an outdoor lesson is of as great importance and value as any other school exercise. Its importance is evident to the pupils when it is clearly brought before them that the board of education, superintendent, and principal have permitted school time to be used for the lesson.

Much better spirit is manifest and much better results obtained when attendance of each pupil on any particular excursion, especially if at considerable distance from school, is left to the voluntary decision of the parent. The excursion is not as effective as it should be if the discussion of results in class does not make every one who did not go wish that he had gone.

In Chicago the rules of the board of education require that no excursion be undertaken without the consent of the superintendent or district superintendent of schools, and that no pupil shall be permitted to go on any excursion without the written consent of the parent or guardian.

Many of the teaching force of the Chicago schools read this rule of the board and say that there are too many restrictions and too much red tape to do anything in the line of excursions. I was inclined to the same opinion until I learned by trial that each requirement instead of being a hindrance was a very decided help in arranging for and carrying out each excursion.

If the pupils said to their parents that Mr. Cooley, our superintendent, or Mr. Lane, our district superintendent, had granted permission to have an outdoor lesson in geography, it immediately lent dignity to the event. It was not so likely to be considered a plan of the teacher and pupils to have a picnic.

The written consent of the parent saves the teacher from any criticism of having taken the pupil off on a useless trip which did not in any way meet with the parent's approval. In order to save trouble to the parents, the pupils carefully copied a letter of request placed on the blackboard by the teacher, carried it home and were remarkably successful in obtaining signature and necessary car fare.

One hundred and ninety-five pupils out of a membership of 200 in fourth and fifth year work were taken in sections of twenty-five to fifty to the Des Plaines River, seven miles away. The five remaining pupils were ill or had work at home immediately after school. All of the forty-eight pupils of the seventh year, save one who had made the trip previously, went to the stockyards and Swift's Packing House. Ninety per cent or more of each class in the high school went on the excursions.

I feel that all excursions taken in connection with the various classes from the third year through the normal school have been more effective as lessons in geography than the same time spent in class-room instruction. Each excursion furnishes the best possible material for class-room instruction for several days or a week after the trip. The region visited need not be peculiar or striking to the ordinary observer. The almost featureless region of Chicago and vicinity is rich in topographic forms in miniature. So is almost every locality.

I will now indicate some of the particular trips taken by classes of various grades and the scope of the work considered in some of these classes.

In excursions of the third year, classes were taken to examine the laying of the cement walks about the school building. They observed the material and its use, also the work of different men engaged.

In another instance while studying the building of homes third-year pupils made trips to a house in process of construction, examined the foundation of brick and mortar, learned that mortar is made of sand and lime, examined the studding, weather-boarding, rafters, roof, arrangement of rooms as indicated by studding, and went to the gravel pit to see how sand is screened and removed from the pit. En route they noted a valley with its divides, slopes, and stream.

While standing at the bottom of the valley by the stream this question was asked: "How many slopes has this valley?" About half of the class said, "Three"; the others, "Two." One who said "Three" was asked to explain. She said, "It has two slopes this way," bringing her hands together to indicate the side slopes, "and it must slope that way," pointing down stream, "or the water could not run off." All others grasped the point made by their little teacher within a minute. In the presence of the reality faulty thinking righted itself.

An excursion to the brick mills was also made by pupils of the third year. The process of brickmaking from the beginning was observed. Not only were the brick mills studied, but their association with the coal mine and gas works was thought out and stated by the pupils. They saw (1) that the brick mill is located where it is, so that it can easily get the clay which has been brought from the mine for making the brick and the coal for burning them; (2) that the gas works are near the coal mine to save cost of transporting coal; and (3) that the coke made by manufacturing the gas is used in the early stages of burning the brick in the kilns. A better illustration of associated industries would be hard to find.

Fourth-year pupils in Chicago were taken on various trips, among others to the Des Plaines River, the Drainage Canal, and through the business district to visit a big store, the Art Institute, Public Library, site of old Fort Dearborn, Water Street, and other places of interest. In the upper grades excursions were made to river, canal, stone quarry, and stockyards.

In the high school, excursions were made especially for the study of physical geography, and included visits to several localities for land forms, the Weather Bureau station for study of meteorological instruments and their use, and the Public Library for its architecture and the various kinds of building stones used in its construction.

A single trip to the Hawthorne stone quarry and the Drainage Canal near by brought out many points very strikingly; among them the following: rock strata, relation of limestone to coral and other animals, relation of Niagara limestone to the Chicago region, relation of mantle rock to bed rock, dip and strike of rock strata, underground water, making of soil by weathering, bed rock scored and striated by glacial action, character of glacial soil, development of miniature valleys in clay banks at the margin of the quarry showing growth of valleys headward, tributaries, lakes, waterfalls, deltas, flood-plains, river terraces, struggle of streams for territory, and other phases of stream action. At the Drainage Canal the great embankments on each side are of glacial drift thrown out of the canal. Here could be seen, in miniature, mountain ranges, mountain peaks made by erosion, mountain valleys and passes, alluvial cones and their relation to mountain valleys. The pupils obtained a conception of the magnitude of the Drainage Canal and an understanding of its purposes and its geographic location.

In the Normal School classes at Normal we have visited Mackinaw Dells for stream work, Sugar Creek and its branches for stream work, drainage basin and divides, the brick mills for a study of different kinds of rock and the use of clay rock taken from the mines near by, and Miller Park for a study of a dam and a reservoir.

During the summer session of 1903 in the Normal School at DeKalb, Illinois, the classes visited a creamery to see butter-making and pasteurizing of milk; Gurler's dairy farm to learn how milk could be so carefully handled as to make it unnecessary to sterilize it, at the same time making it so valuable that it sells in Chicago for twice as much per quart as ordinary milk.

The longest trip made by the students at DeKalb was one of twenty hours to Chicago. The party numbered fifty. The special purpose was a visit to the stockyards and Swift's Packing House. All else was incidental. The students asked that they be taken to as many places as possible so that they might know how to reach them for further study when in the city alone. To indicate the extent to which their request was complied with I will give a brief itinerary of the day's journey.

We left DeKalb early on a Saturday morning in a special car attached to the regular train. The ride of two hours was spent in a study of the topography of that region from the car windows. The succession of till plains, belts of morainic hills, and stream valleys merging into the Chicago Lake Plain to the east were objects of especial geographic interest. A walk of several blocks along South Water Street busy with its early Saturday trade gave us a vivid idea of the labor involved in provisioning a great city.

A ride of forty minutes on the Halsted Street car took us past the court house and the new post-office building, across the South Branch of the Chicago River with its many ships, along a network of railroad tracks, and landed us at the entrance to the Union Stockyards.

We were met at the entrance to Swift's Packing House by three guides furnished by the firm for our party. We spent two hours in visiting the various departments of the packing house. We saw the dressing of hogs and cattle, and the great coolers containing thousands of dressed hogs and beeves. We saw the careful inspection, selection, stamping, and wrapping of Swift's premium hams and bacon. We saw the sausage chopped and stuffed by machinery, the canned meats deftly wrapped, labeled, and packed ready for shipment. We visited the rooms where great vats were filled with various mixtures to be boiled, cooled, and cut into cakes of soap. The butterine factory was a marvel of care and cleanliness to those who had supposed it otherwise.

After dinner our next ride brought us to Jackson Park and the Field Columbian Museum. A little more than an hour gave the members of the party an opportunity to visit the lake shore and to make a hurried survey of the exhibits of the museum. A ride of eight miles brought us to the Art Institute and thirty minutes were allowed for walking through its galleries. A walk through the various departments of the Public Library gave interesting glimpses of this magnificent structure.

It was now five-thirty and all were hungry. After lunch another ride brought us to Lincoln Park and we took a hurried survey of the zoölogical garden, drives, and statues.

I have had no more enjoyable experience in excursion work than with a class of teachers in active service in the city of Chicago during the spring of 1903. I was invited to meet a group of teachers for a lesson in geography once a week after school. At one of these meetings I asked whether any would like to go on Saturday excursions. A number wished to do so and an invitation to meet on a certain street crossing on the following Saturday brought out a dozen teachers to visit the stockyards. Two weeks later twenty-seven visited the Weather Bureau station in the Auditorium tower. Professor Cox took us into his inner room and showed us how he makes weather.

In May twenty-five teachers went forty miles to visit Dunham's Horse Farm—two thousand seven hundred acres and five hundred horses. We were met at the station, driven to the farmhouse, and entertained at dinner. This was followed by as fine an exhibition of horses as the original of Rosa Bonheur's famous Horse Fair. We were then driven over the two thousand seven hundred acre farm with its fine grounds, woods, deer park, great fields of corn, oats, and hay, making our final stop at the railway station. All this was due to the courtesy and generosity of the owners of the farm.

One Saturday in June sixty teachers made a trip along the Drainage Canal by special electric car to Romeo, four miles on canal by boat, visited the controlling works at Lockport, took dinner at Joliet, visited the Des Plaines River to get relation of dam to power house, saw how the Illinois and Michigan Canal crosses the river, examined the lock in the canal by which boats pass the dam, and visited a stone quarry.

The number of pupils, students, and teachers taken on these trips would reach several thousand. No accident or unfortunate event occurred to detract from the value of any of the excursions. The testimony of pupils, students, and teachers has been strongly in favor of such a method of instruction. It is the common method of the German schoolmaster in teaching geography, and can, I believe, be made of great use in our own schools of country, town, and city.

The following brief list suggests some of the possible school excursions: school yard and roadside after a rain, creek or river with its basin and divides, pond or lake, cliff, hills, grove or woods, wheat field, corn field, grist-mill, grain elevator, market gardens, saw-mill, lumber yard, planing mill, brick-yard, park, courthouse, tower of schoolhouse, gravel pit, stone quarry, blacksmith shop, carpenter shop, tin shop, fruit store, department store, foundry, coal mine, telegraph office, electric light works, water works, gas works, dairy, commission houses.

THE SCHOOL MUSEUM

While lessons concerning the local physical features, local industries and home products can be treated first hand by means of the excursion, it is not possible to study by the same means the rubber industry of the Amazon basin, the cocoanut of the islands of the sea, the cork oak of Spain, the cotton fields of the South, the manufactories of New England, and a long list of the topics which lie within the field of geography.

If the pupil is to obtain first-hand knowledge about things foreign to his own neighborhood, the thing must be brought to the pupil. This can be accomplished by means of the school museum.

I shall consider the school museum as I have considered the school excursion, from the standpoint of its actual use in the schoolroom. This brings me to speak of the organization and work of the Chicago Bureau of Geography, which at the opening of the school year in September, 1903, was furnishing sixty schools with small traveling museums, each carried in a single box, usually an egg-crate box, containing specimens, pictures, and printed articles concerning some one particular topic in the course of study in geography.

The Bureau of Geography was organized by forty principals of the Chicago schools for the purpose of collecting, installing, and circulating illustrative material among the schools. Each school represented paid an annual fee of $10, which was later reduced to $5. This money has been spent almost entirely for material with which to install the collections. The raw material has been donated largely by the Field Columbian Museum, wholesale firms, and large business houses in Chicago and elsewhere. The labor of arranging the collections has been mainly volunteer work. Mr. Richard Waterman, who first outlined the plan of the Bureau, has done most of the work in the preparation of the material for the collections.

In September, 1903, the Bureau had 110 traveling museums, representing forty-five different subjects. Some of the most valued museums have been duplicated so that all schools may have the use of one during the year.

Each museum or collection consists of three things:

1. A series of specimens as nearly complete as could be obtained to show the product in its various stages of manufacture from raw material to finished product. Each specimen is carefully installed, numbered, labeled, and catalogued. Whenever the size and shape of the specimen permits, it is placed in a wide-mouthed bottle of standard size and corked. These bottles are placed in a strong pasteboard box

made to order, and partitioned into twelve compartments, each of which holds a bottle. If the specimen is larger it is placed in a pasteboard box without partitions.

2. Pictures on strong cardboard, ten inches by twelve inches. The pictures representing a single topic are placed in a pasteboard box made to hold cards of this size. They accompany the specimens.

3. Printed articles which will aid in the interpretation of the specimens. These may be books, parts of books divided and bound with manila sheets into pamphlets, government reports on a particular subject, selected material from government reports copied by typewriter and bound in manila covers, magazine articles separated and bound, text-books and geographical readers cut up and arranged by topics and the material on each topic bound separately. All the printed matter on the same subject is brought together and placed in a strong pasteboard box of convenient size.

These boxes of specimens, pictures and printed articles, accompanied by a complete typewritten catalogue of the collections, are placed inside a wooden box, the "egg crate," and carried from school to school during the year. A school may keep a collection for one or two weeks. At the end of this time the collection is exchanged for another.

Two objections are strongly urged by some principals and teachers against the use of the same collections by many different schools. In the first place it is not possible to have each collection at the time when the topic is being treated in the regular course of study. In the second place, it is urged that it would be better for each school to build its own museum. I believe that those who offer these objections to the traveling school museum would not do so after using thirty or forty of its collections during a single year.

If the collection is studied before the topic has been reached in the regular course of study, consider how valuable it is for the class to have obtained the first-hand knowledge that comes from a study of things at short range as the basis of the interpretation of the text when the topic is treated more fully later in the year. If the collection chances along while working on the topic, well and good. The study of school-book and museum go hand in hand, each to reinforce the knowledge and interpretation of the other. If the topic has been previously studied, what could afford so good a review as an examination of one of these collections?

To illustrate: A collection consists of raw cotton, ginned cotton, cotton in various stages of spinning, cotton fabrics (ginghams, calicoes, finer cotton cloth, canvas), whole cotton-seed, crushed cotton-seed, cotton-seed oil, and cotton-seed cake. These specimens are accompanied by numerous pictures of the cotton plantation, cotton shipping and manufacture, in addition to much reading matter not only for the teacher, but within the ability of the pupils.

If such material is used for a single class period weeks before cotton is studied in the course, the time is well spent as a preparation for future study. If such a collection can be examined months after the class have studied cotton and passed examinations on the same, how quickly will some vague and indefinite idea come out clearly and distinctly, ever to be remembered with a joy unknown to the pupil who gleans ideas for the purpose of making practical use of them on examination day only!

The financial means and the labor necessary to build and maintain a satisfactory museum are not at the command of each school. Material to be used by a system of schools can be much more readily obtained by request than for a single school. As soon as the authorities of the Field Columbian Museum and the heads of large business houses understood that the material desired is to be made available to thousands of pupils they respond most heartily and generously. They could not do so for 250 individual schools belonging to the same system. Coöperation is as valuable in the building and use of the school museum as in other lines of human activity.

It is important that this material be properly used. These collections may be exhibited to the class by the principal of the school, by the teacher, or by pupils of the upper grades. The one giving the lesson must be thoroughly familiar with the collection, and should have the exercise carefully planned in order to make the presentation effective.

I recall an exercise of this kind in which a seventh-year teacher selected three boys to describe the cork collection. They prepared their parts well. They liked to do the talking because they had something to say. The lesson was appropriate to the work of the sixth and seventh years. The teachers and pupils of lower grades learned that the boys were giving an interesting and instructive exhibition of cork and its manufactured products, and requested that it be given in other classes. The collection was carried to every room in the building, about 800 children receiving the instruction. I saw the boys giving the exercise in a second-year room. Each told in clear and simple language his part of the history of cork. Then each one took a number of the specimens and passing along the aisle showed and explained them to interested groups of children. On the following day there was laid on my desk a written exercise from these second-year children on the subject of cork. They gave in their own way more information about cork than would usually be given in a sixth-year class wholly dependent on books for their knowledge of the subject.

The traveling school museum has, I believe, done more to give the teachers and pupils of Chicago good working material than can possibly be given by an equal expenditure for books. The work has been of such benefit to the schools using the collections that recently, on the recommendation of the superintendent of schools, the board of education has assumed the financial responsibility for the extension of the work to all the schools. The work is now under the supervision of the head of the department of geography in the Chicago Normal School and an assistant has been employed to devote his entire time to the building, circulation, and care of the collections.

Work along similar lines may be done by coöperation among the teachers of a city, county, township, or village. A movement of this kind has been inaugurated by the teachers of St. Clair County, Illinois. At a meeting of the St. Clair County Teachers' Association in February, 1904, a committee who had given the matter careful consideration recommended to the association that the teachers of the county undertake to develop a Circulating Geographical Museum for use among the country, village, and city schools of the county. The recommendation was favorably received and on motion of the county superintendent the sum of $50 was voted from funds of the association to start the work. Nearly all of this money will be used in buying boxes, bottles, picture mounting-cards, and other supplies necessary for properly installing the collections. Each school of the county has been asked to contribute a small sum of money annually for the extension of the work. The work of arranging the collections for use in the class room is being done by the teachers of the county who volunteer their services, and by a student from St. Clair County in the Illinois State Normal University. This student works under the direction of the writer. He gives three hours daily to the work and is paid a small sum for his services.

The following list is given as suggestive of possible collections: Wheat, corn, rice, nuts, spices, cocoanuts, coffee, tea, cocoa, sugar, by-products of the packing house, cotton, flax, manila hemp, rubber, tanning materials, leather, wool, silk, sponge, furs, woods, paper, cork, iron, copper, gold, silver, coal and coke, petroleum, asphalt. Collections may also be made to illustrate a single country or region; *e. g.*, Mexico, Central America, Peru, Hawaii, India, South Africa, and the Philippines.

Correspondence concerning ways and means of introducing the excursion and the museum more largely into the regular work of the school is invited.

If desired we will build a sample traveling museum for the cost of material and labor. Such a collection will serve as a test of its value, be suggestive of method of arrangement, and aid in determining whether to develop the museum on a larger scale.

THE HUMAN RESPONSE TO THE PHYSICAL ENVIRONMENT *

BY J. PAUL GOODE

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WE think of man as living in an environment, the elements of which are largely the subject-matter of physical geography; and we are coming to realize that the true and complete geography is a study, not of physiography and the climate merely, but of the interaction between man and the physical part of his environment.

The term "environment" is so loosely used, and is made to include so much, that we must do some careful defining, to be sure of our ground, before taking up a discussion of our subject. The general conception of environment is the *not-me* which acts and reacts upon me. But this whole universe of forces and influences outside of myself is made up in part of the material world and its forces and in part of the spiritual world and its creations, which are quite as vital in determining my career as are many of the material considerations.

So our environment is to be analyzed in a dual way, as (1) physical and (2) social, or sociological, as Herbert Spencer had it. Over a century ago Montesquieu, in his *Spirit of the Laws*, was fairly convinced of this analysis, though he wrote before there was a science of geology, or physiography, or meteorology to furnish data or establish laws. And again about fifty years later Buckle, in his *History of Civilization*, made a wonderful statement of the significance of the

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purely physical elements in our social evolution, so good a presentation as to have been scarcely equaled since. And even in his time the modern science of geology was scarcely out of its swaddling-clothes, and the sciences of meteorology and geography were not yet born.

Now that the tributary fields have been well worked, observations by millions made and recorded, and laws enunciated, we are able to arrive at a more complete and satisfactory analysis of our environment and make ourselves ready to recognize the effect of the fundamental physical elements.

Let me take up each of the phases of our environment and see its content and its bearing.

The *physical environment* has as its elements:

1. Climatic conditions—as hot or cold, arid or humid.
2. Land relief, or topography.
   (*a*) Barriers—as mountain, or desert, or water.
   (*b*) Character of surface—whether flat plain, or dissected plateau, or mountainous.
3. Soil—of increasing significance as time goes by.
4. Materials and forces available in a given region.
   (*a*) Inorganic—as metals and minerals.
   (*b*) Organic—plant and animal resources.
5. Competition in the realm—whether human or by the lower animals.

The *social environment* has for its sources and influences:

1. Psychic elements.
   The consciousness of kind (Giddings), giving rise to sympathy and coöperation in every stage of evolution from the lowest animal to the highest conventions of modern society.
   The law of imitation (Tarde) is quite as sweeping in its application.
2. Economic relations.
   The pursuit of wealth the keynote of social impulse—Karl Marx, and later exploited by Dr. Patten. Herbert Spencer works along the same lines in his interpretation of our society as a progress from militarism to industrialism.

Progress under these influences is at first unconscious—as truly cosmic as the adaptation of a plant to a new environment. And in all our social organization, even in the highest phases, the purely cosmic, or unconscious, response to the forces in the environment is effective in larger measure than most people would willingly admit.

We have but to look about us and see the measure of heedless unthought with which we have exterminated certain noble animal species, as the bison and the seal; or see the ravenous haste with which we have wasted a continent's resource of forest, and the utterly reckless way in which we are ravishing the stored sunshine of past ages in our coal resource, to see that in very large measure we are as senseless and unconscious as the beasts of the field.

But though at first our evolution has been unconscious, and wholly the result of a chance geographic environment, sooner or later evolution becomes conscious and self-directed, and our noblest ideal for society is that it should become so in constantly larger measure. Lester F. Ward in his *Dynamic Sociology*, F. H. Giddings in his *Principles of Sociology*, and Benjamin Kidd in his *Social Evolution*, all make much of this idea.

All these elements of environment express themselves in social institutions and conventions, which analyze themselves into a half-score of categories:

1. The organization of the family and the status of woman.
2. The idea of ownership in property.
3. Domestication of animals.
4. Agriculture.
5. Dress and adornment.
6. Shelter—leading to styles of architecture.
7. The use of metals.
8. The industrial arts—as in pottery, basketry, weaving, and the long list of mechanical inventions.
9. Forms of government—as military and industrial or economic.
10. Social forms and customs; beliefs; as superstitions, religions.

All these social conventions are in a large measure psychic, but all are secondary, or even tertiary. They are developed *after* they are initiated. All analyses of them come back to *initiation*. And the last analysis arrives at a purely psychological reaction—a nervous response to an external stimulus; that is, to living tissue, acting on a physical environment. And so conditions favoring or inhibiting origins in all these lines are found in the "deal" (borrowing a term from whist) of the elements in the physical environment. The game that may be played, whether aggressive and brilliant or passive and inert, depends very largely upon the cards held. And in the distribution of the elements of the physical environment, and the emphasis laid on each, every realm and age deals out a different combination.

The origins of social institutions, just as truly as the origins of changes in the living body of the plant or animal, are found in the conditions imposed by the physical environment, and ***progress depends upon a surplus.*** This thought is most significant and far-reaching, and has been excellently presented by Dr. Simon N. Patten in his latest work, *Heredity and Social Progress.* The principle of the surplus must be kept in mind at every step in an analysis of the influence of the physical environment. It is operative in the most primal phase of living tissue, and it applies at every stage in evolution up to the highest and most spiritual social institution. It will not be out of place to state briefly some of its principles:

1. A surplus of tissue in the cell gives opportunity for the occupation of more space. Hence a breaking up into multicellular structure and the differentiation of outer from inner tissue, and by an extension along this line of development, giving rise, in due time, to organs.

2. In the same way a surplus of energy in the individual man gives us the genius in one phase of development, and the liberal and iconoclast in another.

3. A surplus of energy in a social class impels to conquest, giving added power and leisure to the conqueror, making culture possible.*

I may add that a surplus of wants go hand in hand with a surplus of wealth and leisure, to make progress continuous. Contentment is a mild name for decay. A protestant is a man with a conviction, plus a good backbone and a stiff upper lip. For such a man laws are made—to be broken. Initiative comes from such men, and progress consists often in getting out of the rut.

The physical environment, then, is important in giving the conditions for initiative and in furnishing the opportunity for a surplus; hence making for or against progress.

The highest point of view in geography is this very study of the physical environment in its influence on man's development, as furnishing the conditions in response to which changes may or must occur (1) in the physical organism of man and (2) in his social organization.

But changes in man's body are almost immeasurably slow. Notwithstanding the fact that our anthropoid ancestors began to abandon quadrupedal locomotion, it may be, over four million years ago, we are not yet wholly adapted in our bodies to an upright posture, as Brinton and others have shown. And the anatomists and physiologists enumerate 107 vestigial organs in our bodies—organs which are more or less useless now, but which functioned once, some of them

* See VEBLEN, *Theory of the Leisure Class.*

dating back to an ancestor far less advanced than the *Pithecanthropus erectus* of Du Bois. We are familiar in our everyday life with many of these relics, such as the nictitating membrane of the eye and the vermiform appendix. It seems, as David Starr Jordan so wittily remarks, that the human body can never quite forget its past, but must carry around in itself perpetually the record of every stage in its physical evolution.

Our bodily response to the physical environment, then, is in many ways almost immeasurably slow. We may not yet name definitely the combinations in physical environment which give us color of skin, head form, peculiarities of hair structure, or cast of features. Yet we may definitely say what conditions stunt the stature and inhibit action. The intelligent farmer or breeder is well assured of the principles along these lines, and the giant Norman Percheron horses are the demonstration of the law of surplus in the physical environment; and just as truly the stunted pony of Shetland and the cayuse of Montana answer for the lack of surplus. Professor Ripley, in his *Racial Geography of Europe*, makes a beautiful application of these principles in the discussion of the influences of the thin soil and the hard conditions in the Auvergne. The response is found direct in the stunted, backward population, the miserable relic of a people pushed to the wall, in ages past, by more powerful tribes that came and evicted them from the rich and favored lower lands. And, again, that hard conditions dwarf stature may be shown in the study of the Jews. Down-trodden, persecuted, and narrowed in opportunities all over Europe, they have found in free and enlightened England an opportunity to take advantage of a surplus; and in the rich end of London, in the few generations they have been there, their average stature has been increased over an inch and a half. Edwin Markham's biting poem on "The Man with the Hoe" focuses our attention on the power of hard conditions to stunt and warp both body and mind.

Now, while the rate of change in man's body is for the most part so slow that, under the merely cosmic response to the physical environment, we must look for results to the effect of hundreds or thousands of years of its influence, on the other hand, changes in man's social organization are taking place under our very eyes. And though some of the social institutions are of as slow growth as many of the changes in man's body, yet the conditions of social organization are often found vitally fixed in the *ensemble* of the elements of the physical environment of a particular region. A people moving from a given region in which a good measure of adaptation to the physical environment has been attained may find itself under the necessity of changing radically many of the social conventions to which it was accustomed, in order to survive. Of this we have record in almost numberless cases where frontiers have been passed by members of an old and static social order.

Such social adjustments, then, are relatively rapid, and there tends to be established a somewhat definite social order in a given type of geographic realm, which imposes itself upon almost any human stock which comes to occupy the region. Out of a dozen such types of geographic regions which might be studied, let us choose one and run rapidly over it, indicating briefly, as we may, the ways in which the physical environment reacts upon man, to limit, direct, and give character to his social status. In such a study of a type region the problem is to see how the elements of the physical environment determine social origins and shape their development. Let us take as a type region the arid area, and show the persistence of its influence in all the phases of social organization.

THE ARID AREA

1. *The Family and the Status of Woman.*—An arid plain in primitive society invites the chase. The animals of the realm are, in the first instance, of necessity herbivores. The scant grass and browse of such a plain calls for nimble deer, fleet of foot and ranging widely. To follow such a food supply, the family of the hunter must be ready to move rapidly and on short notice. This need reduces the family to its lowest terms—father, mother, child—and makes nomads of them of necessity. This life makes man the breadwinner, and woman becomes a slave and chattel. Among the Amerind we have this shown in the Sioux, Apache, and other tribes of the great plains.

In such a region, if the animals are of such a nature as to be more useful living than dead, we come naturally to—

2. *The Domestication of Animals.*—With flocks and herds the food supply is less precarious, and the capacity of the region is greater. The family unit becomes larger. Sons and grandsons may stay in the family group. This provides a larger measure of social culture; but the family is still under the whip of uncertain forage and of migrations to pastures new. So social relations remain the same. We have the patriarch, and women are still inferior.

3. *Agriculture.*—With game scarce, the food supply is sought in plant life, and progress goes hand in hand with a domestication of

plants. This locates the family along a river where water makes agriculture possible. In such a case women are, as a rule, the leaders, and become breadwinners equally with the men, or even superior to them. This means independence and power, and sooner or later social equality. With animals domesticated for draft, and milk as well, or meat, the food supply is made immensely more ample and more secure, and the home becomes static. The population becomes denser, and social customs, laws, and regulations become necessary. Here is the give-and-take of man to man which rubs off rough corners and brings in time refinement and culture. In America the Pueblos illustrate these influences. In Egypt, Assyria, India, and China the earliest steps in civilization passed through these phases of development ages ago.

4. *The Idea of Ownership of Property.*—On the arid plain individual property in *land* is unknown. It is so the world around. The ownership in the Russian steppe region, and many other similar regions in Asia, resides in the village or the community. Our plains tribes have the very greatest difficulty in acquiring a notion of ownership in the land. It is as foreign to them as the ownership of air or sunshine to us. But where soil was from the start the source of bread, land is owned and the thought is easy. It is well known that the private ownership of land is one of the foundation stones of our particular phase of civilization.

5. *Dress and Personal Adornment.*—The sub-arid plain and the pursuit of the deer restrict the material of dress almost wholly to skins. This is in itself a strong demand for simplicity of dress, and holds the dress ideal rather strictly to the law of utility. With the advent of a pastoral life, particularly with the possession of sheep, goats, or camels, the availability of wool invites weaving, thus adding extensively to the variety and quality of the materials for dress. This is in itself a large invitation for advance in the arts of civilization. When agriculture comes in such a region, plant fibers increase the variety and the invitation for development. If the region is cold, at least for a good part of the year, this is a condition which holds an iron hand on the character of dress, and does not permit a wide departure from the fundamental law of utility. The trousers and the close-fitting garment owe their origin to such a physical condition. If the region is hot much of the year, the *need* of clothing is by so much reduced, and the institution of dress is more largely based on the purpose of adornment. The flowing robe, the skirt, and the shawl have their origin here.

In our western civilization we have inherited from both these sources. The conservative and leisure classes retain the display garments, and the workers keep style in dress much more close to the needs of the case. The court, the church, and female society still carry the garb of leisure and of low-latitude arid lands, even into geographic environments where the retention of the style is a serious handicap and the occasion of much suffering. Here is a case of maladjustment to physical environment that flaunts itself in the face of the law of the survival of the fittest—a case where a social surplus is frittered away in useless friction with the physical environment, and energy is lost which might, if applied wisely, lift society and further civilization.

6. *Shelter—Architecture.*—The need of rapid transit in following the deer reacts strongly upon the size and quality of the residence. Necessity requires a small shelter, and of light material, which can be quickly taken down and moved, and as quickly set up as need arises. The materials convenient for such purposes are poles and skins. So the tepee is a perfectly natural response to the conditions. All our tribes on the great plains had made almost a perfect adjustment along these lines when Europeans came. In the pastoral phase, woven stuff adds to variety of building materials, hence of the capacity of the abode, and so invites progress. The Tatar and Kurd have solved this problem.

When agriculture is established, the need for moving the abode does not arise. The dwelling becomes static, and so may be made of a larger variety of materials. The size is not limited nor the weight, so wood may enter more largely into construction, and as in arid lands even wood may not be plenty, sods or stones or baked clay become the building materials. So a massive construction is established because of the nature of the most convenient materials. The sun's heat is the discomfort most necessary to counteract; hence the walls grow thick. There is little rain to be shed; so the roofs become flat, and a type of architecture is evolved. The Pueblos show us a primitive phase, the Egyptians a well-differentiated style, and the Greeks a style which is perfection. But each one of them carries in every lineament the record of a climatic condition of origin. Contrast these styles of architecture of the arid lands with the Gothic, which is an evolution of the tepee adapted to a humid clime.

7. *Use of Metals.*—The presence or absence of metals in a realm has a powerful bearing on the social and economic possibilities of a people. The race very probably came to the use of the metals through

finding native copper. There was a copper age, which grew gradually into a bronze age, and much later, with the accumulation of wisdom in metallurgy, iron came into use. But no people could come into the use of metal without having the metals to call on. They could have developed never so wisely in all lines, but without copper or iron they would have so serious a handicap as to make a high grade of culture out of the question. There are many coral isles in the Pacific with quite as high a culture as we could ask without the possession of the metals. Even after a high civilization is established the presence of coal and iron confers so powerful an advantage as to make their possessors great, willy nilly. Our Pueblos had the handicap of having no metals—a very serious bar against progress.

8. *Industrial Arts and Mechanical Invention.*—Here again we are forced to see that the nature of the materials at hand shapes the possibilities in the way of progress in the long list of inventions. The origin of pottery seems closely connected with a life in arid conditions. Water is a prime necessity. It must be kept on hand. The skins of animals are convenient, but they are short-lived, and there are other obvious disadvantages. A basket lined with clay will hold water, and such a dish burned is pottery. In any case the inventions which may be made depend upon the particular combination of the elements of the physical environments. The savage in England would make his bow of a single piece of yew. The Eskimo, lacking yew, must use his wit, and get a compound bow of bone and sinew—a work of high art.

9. *Forms of Government.*—The form of government grows out of the family organization and the way in which the daily bread is won. On the arid plain the strong hunter or the powerful warrior is chief. The whole life is one of the chase and the conquest of a weaker foe. It is not a long step from the hunting of the buffalo to the hunting of an enemy in the adjoining tribe. The arid realm breeds warriors and robbers—and might is right. In a pastoral society the family *is* the state, in origin, and the father is the head of the government. Conditions are only slightly changed. Women are slaves and inferiors, and any evolution in government from such a foundation will end in the establishment of a hierarchy of rank, with the strongest in the highest places. It is not different in any way from the rule of the barnyard among horned cattle. It is not a question of wisdom or right, but a question of brawn. Such a basis leads to the establishment of aristocracy, which, long planted and gone to seed, gives us the caste system in India. The culmination of all such government

is the absolute monarchy, which is, in every instance, in last analysis, a military despotism.

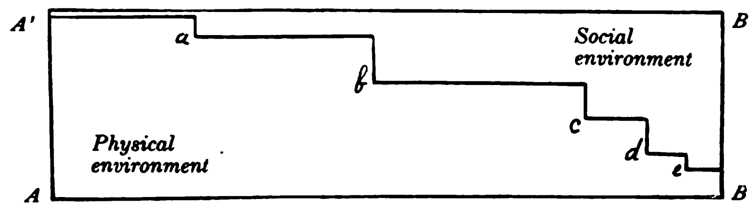
Agriculture and the industrial arts tend to equality among workers, male and female. The tendency is to make the wise man the leader. The whole trend of such a foundation is toward democracy. Our western civilization is in constant swing between these two great tendencies, the one of which we inherit from the arid Orient, the other from the agricultural lands of western Europe. And again, the Pueblos show us a primitive form of government, with the agricultural influence uppermost.

10. *Religion—Social Customs.*—The military organization dominates in religious establishment. In a military society the religious ideals are cast in the same mold. There is the same hierarchy, and every individual is given his station, with emphasis on obedience to the higher power. The supreme deity is the great war leader—the God of Hosts. We borrow this phase of our religion from the arid plains of the Orient. Even our hell and heaven are creations from the experiences born of a life in the hot desert and the delightful oasis.

But the practice of agriculture focuses the attention, not on a mighty conqueror, but upon the clouds. The crops depend upon the sun and the rain, and life and happiness depend upon the crops. Interest is focused on the return of the sun and the coming of the rain or the flood. This builds up a very different religion, which looks for the powers above us, in the sun and in the sky, and leads easily to the conception of the unknown god who rules the winds and brings the rains, and who lives in the sky. And these are elements found in the religion of every agricultural people settled in arid lands: Pueblo, Inca, Persian, Arabian, Hebrew.

RÉSUMÉ

Human development, physical and social, is, at the start, unconscious, a direct response to the conditions of the physical environment —a cosmic process. But the psychic, social element enters, and the experience of the race is gradually capitalized in the form of social institutions and conventions. These become forces competent to shape further progress, but they are clearly secondary, depending for initiation and for direction upon the conditions of the physical environment. Progress in social evolution is a record of a changing ratio between the influence of the physical environment and this growing social environment. This changing ratio shows a growing independence of the physical environment on the part of man, even a domination over it. It may be represented graphically by a parallelogram, the length of which, *AB*, stands for the lapse of ages occupied by human evolution, and this may be four or five million



years, if we may dare try to convert geological ages to years. The vertical ordinates *AA'*, *BB'*, represent in the terminal epochs the sum total of the forces in our environment, both physical and social, and may be most easily thought of in percentage, up to 100, at the top line. With the *Homo alalus* the social environment was at a minimum, almost zero; the physical environment essentially 100 per cent. On the invention of language (*a*) a sudden access of social power makes a large conquest over the physical control. With the discovery of fire (*b*) another conquest over nature changes the ratio, reducing the control of the physical environment. Agriculture (*c*), domestication of beasts of burden (*d*), and every useful discovery or invention, mechanical or social, have changed the ratio, giving us added dominion over the elements of our physical environment. But we can never reduce this environment to zero. Be we never so wise and ingenious, we shall always be directed, and the course of our evolution will be conditioned by its elements. These forces may be unseen, but they are nevertheless potent, and they are eternal.

GEOGRAPHICAL NOTES

"Sensible Temperatures."— On hot summer days people in our large cities constantly complain that the temperatures recorded at the local Weather Bureau stations are much too low, and hence do not really represent the heat which people feel. In cold winter weather there is a similar objection, to the effect that the "official" temperatures are too high. This complaint arises from the fact that the public generally does not yet understand that "air temperature," as recorded by a standard thermometer, at some distance above the ground, in a shelter, protected from rain and sunshine and radiation from surrounding objects, does not and cannot indicate the temperature that we actually feel. The latter, which has been called "sensible temperature," and which, for want of a better term, we shall also thus designate, depends upon a great variety of factors which either do not enter into the so-called "air temperature" at all, or else are of secondary importance. For example, other meteorological conditions, such as the humidity of the air, the wind, the exposure to direct insolation and to reflected heat, and other more or less accidental physical conditions, such as the state of the human body, whether in good health or bad; the clothing, both as to kind and as to amount; the kind and the conditions of occupation; the nourishment of the body; even the mental condition of the individual—these and other factors enter into the account.

The human body is not like a thermometer in having no temperature of its own. It is a heat engine, which has a high internal temperature to keep up. This temperature is maintained by a slow internal combustion, in which the food plays the part of the fuel in the steam engine, and heat is constantly being lost from the skin as well as from the lungs, in the process of respiration and in warming the food taken into the stomach. Helmholtz believed that over three-quarters of the total loss takes place from the skin, and about 20 per cent from the lungs. The loss from the lungs varies with the temperature and with the relative humidity of the air; the higher the temperature and the relative humidity, the less is the loss. The loss of water from the lungs is not directly noticeable. We estimate the moisture of the atmosphere chiefly by the loss of water from the skin, which amounts to about twice as much as that from the lungs.

The loss of heat from the external surface of the body, as has been clearly set forth by Van Bebber (of whose discussion the next few paragraphs are largely a summary), is accomplished by means of three familiar physical processes—conduction, radiation, evaporation. The amount of heat lost by conduction depends on the difference of temperature between the body and the surrounding air, and upon the conductivity of the air. Other things being equal, the colder the air the greater the cooling by conduction; the warmer the air, the less. Hence conduction may be expected to be at a maximum in winter. Secondly, when there is a wind, more heat is lost by conduction. Every one knows that severe cold which may be easily endured when the air is calm may become unbearable when there is even a slight movement of the air. The springing up of a breeze on a bright, cold winter day may change the temperature which we feel from an agreeable one to one which is decidedly chilly, although the ordinary thermometer shows no change at all. The difference between calm cold and windy cold is very strikingly brought out in the reports from arctic and antarctic exploring expeditions. Temperatures of 20°, 30°, even 40°, below zero are described as being comfortable when there is no wind. Nansen, for example, says on one occasion, "The temperature to-day is 42° Fahr. below zero, but there is no wind, and we have not had such pleasant weather for walking for a long time; it feels almost mild when the air is still." Similar statements may be found in abundance in the writings of other arctic explorers, it being frequently noted that the heavy clothing was too warm at these very low temperatures. In the polar regions, then, the feeling of cold and the reading of the thermometer are not in any closer agreement than they are here. Naturally, high temperatures are more comfortable with some wind. Thirdly, the moisture of the air is an important consideration in this matter, for damp air is a better conductor than dry air. Hence, in winter, damp cold is so much harder to bear than dry cold. Hence, the damp northeast winds on the New England coast in winter often feel colder than dry northwest winds which have a lower temperature, although the velocity may be the same in the two cases. Obviously, however, evaporation enters in to complicate this question of conduction somewhat.

The amount of heat lost by the body through radiation depends on the temperature and the radiating powers of surrounding objects, such as walls, pavements, vegetation, furniture, etc. It is conceivable that one should be so placed that the temperature of all surrounding objects, and of the air as well, should be just the same as the body temperature. In such a case the body would lose nothing by radiation. Nor would it lose anything by conduction. The only loss would be by evaporation, unless the air were saturated, in which case the conditions would be unbearable for any length of time. When radiation is checked, as by the presence of many persons crowded together, or by the proximity of hot walls, pavements, etc., the body may suffer serious consequences, as in the case of prostration by the heat and sunstroke, which, as is well known, usually attack people who are exposed under rather special conditions, as, *e. g.*, laborers on sewers and railways, masons and painters close to the walls of buildings, etc. When troops are on the march it has been shown that the men who suffer most are in the middle of the column, where they can lose least heat by radiation.

It is difficult to consider the adjustment of the body to the temperature conditions of the air without taking account of evaporation, which is of very great importance, and is almost always in operation to a greater or less degree. The human body in health has not a dry surface, like the dry-bulb thermometer, but is more or less moist because of the exudation of perspiration through the pores of the skin. When this moisture evaporates, the skin cools through the loss of heat which is required in the process of evaporation. Cramer has shown that the amount of water lost through perspiration during a hot summer day, if a man is kept at hard work, may reach between 7 per cent and 8 per cent of the weight of his body. Other things being equal, there is more evaporation the warmer, the drier, and the less quiet the air. The hotter the air, the greater its capacity for water vapor; the drier the air, the more water can still be evaporated into it; the more wind, the greater the opportunity for evaporation into the fresh supply of air which is constantly brought to the body. If the air be completely saturated at the body temperature, there can be no evaporation; but if the air be saturated below the body temperature, the body warms the air nearest it; in so doing the capacity of the air for water vapor is increased, and evaporation may then begin again. Even if the temperature of the air be 98.6, unless the air be saturated, the body can cool by evaporation. It has been shown that when the air is very dry, human beings can endure extraordinarily high temperature, as in the case of a man who stayed twenty minutes in dry air at 212°. Hot air in motion is much cooler than hot dry air at rest, and hot moist air is oppressive because there is little opportunity for evaporation. According to Blanford, the moist heat felt during a voyage across the Red Sea in August or September, with an air temperature of 90°, is much more oppressive than is the heat in the upper provinces of India during the blowing of the "hot winds," which are dry, when the temperature is 112° to 118°. The excessive dryness of these winds is made use of to keep the air of dwellings cooler by means of wet "tatties" hung over doors and windows. The more moist the air and the nearer its temperature to that of the body, the less difference does wind make. Dry air is in many respects an advantage at all seasons; in winter because it makes the loss of heat by conduction less, and in summer because it increases the loss of heat by evaporation.

Evidently, too, conduction enters into this question, for when the air is moist, evaporation is lessened, but conduction (unless the air be at the body temperature) increases. On the whole, conduction is at a maximum in winter and evaporation in summer. The very dry air of our furnace-heated houses in winter must be kept at a high temperature if we wish to be comfortable in it. We lessen the loss of heat from the body by conduction when we raise the temperature, but the loss by evaporation must be very great, because of the dryness of the air. If our houses were provided with a more moist heat we could be comfortable indoors with considerably lower temperature, because evaporation would be so much decreased. This has been experimentally determined by Dr. Henry J. Barnes of Boston, who found that when the air in his office had a relative humidity of 27 per cent the temperature had to be 70° or 71°, but when, by means of a "humidifier," which evaporated four and one-half quarts of water daily, he had brought the air to a relative humidity of 53 per cent, a temperature of 65° was comfortable. The temperatures in our houses are comfortable at about 70° because the air is calm. If the air were in motion we should be uncomfortably cool, because of the increased evaporation.

The temperature which we feel does not depend solely on the temperature, the moisture, and the movement of the air. It is also influenced by the physical condition in which the body finds itself, for the body is not a passive object. When in health it adjusts itself to surrounding conditions by its own action. At low temperatures it seeks to check the loss of heat from its surface by contracting the pores, keeping the skin dry, and diminishing the amount of heat near the surface of the body. At high temperatures, on the other hand, the pores are opened, perspiration is abundant, and the skin is cooled by evaporation. Furthermore, the relations of the body to the meteorological conditions of the atmosphere are affected to a very marked degree by the clothing. Many interesting experimental studies have shown that the differences between the temperature on the surface of the clothing and the air temperature decrease with an increasing number of articles of clothing between the skin and the outside air. The successive air strata between the different layers of clothing serve to modify the effect of the temperature and humidity of the air. Thus, clothing whose thickness, weight, and texture may be varied at will, keeps the body from losing heat too rapidly to the surrounding air. Rubner has found that the temperature on the skin of a man dressed in the usual number of articles of winter clothing was about the same when the air temperature was 50° and when it was 79°. In this connection the behavior of different kinds of clothing materials in relation to moisture is naturally of considerable importance. Evidently, also, the questions whether the individual is taking exercise, how violent the exercise, and under what conditions with reference to surrounding objects, are all to be considered as controlling factors, for, obviously, on a cold day, two persons will experience very different temperatures if one of them is sitting still and the other is digging a trench.

The factor of exposure to radiation, whether directly from the sun, or from the sky, the surface of the earth, or other objects, also enters into the problem. Unlike a thermometer, which is in a shelter, protected from direct and reflected radiation so far as possible, human beings when out of doors are exposed to these radiations, and their feeling of heat is affected thereby. It has long been known that the energy of direct insolation is of great importance as a climatic factor, independently of the temperature of the air. In times of calm the air temperature may even be quite unimportant. Thus, on calm, clear, winter days, for example, if one sits in the sun, he may feel warm and comfortable while the air temperature is really very low. It is this climatic factor of direct solar radiation which is of great value in giving certain high mountain stations, in the Alps and elsewhere, their reputation as winter resorts. At Davos Platz, for example, and, similarly, in some of our own health resorts in Colorado, invalids may sit out in the sun and be comfortable on the coldest winter days. Reflected heat, as from water, or from a desert surface, or from a white wall, also affects one's feelings of heat or cold.—*Bulletin, American Geographical Society*, March, 1904.

Public Schools in Russia.— According to the latest statistics there are 84,544 public schools in the Empire of Russia, out of which number 40,131 are under the jurisdiction of the Ministry of Public Education, 42,588 under the jurisdiction of the Holy Synod, and the remainder under other departments. Of the pupils, 73,167 were adults, 3,291,694 boys, and 1,203,902 girls. The teachers number 172,000. The maintenance of all these schools costs more than $25,000,000. The average school tax for city schools is $9.50, and for village schools $5 per pupil.—*Consular Reports*, March, 1904.

Cost of Construction of the Trans-Siberian Railway.— The construction of the great Trans-Siberian Railway, comprising a length of 9,042 versts (5,995 miles), has cost 940,259,401 rubles ($484,554,415), or an average of 103,987 rubles ($53,553) per verst ($81,326.84 per mile). The loss endured through the disorders in China is estimated at 10,000,000 rubles ($5,150,000). The Ministry of Ways and Means of Communication has found it necessary to enlarge the rolling stock of the fourth-class service to 7,000 cars, to be used for transportation of laborers, emigrants, and recruits.—*Consular Reports*, March, 1904.

Advisable Omissions from the Elementary Curriculum.— In geography the following subject-matter might well go:

All explanation of the *cause of seasons*, except the mere fact of the changing direction of the sun's rays. There is no social demand for such matter (except possibly teachers' examinations), and it is beyond the grammar school pupil's comprehension, calling into use our second standard.

The *cause of the tides*, leaving the fact only.

Quite probably *one* of our *two treatments of Asia, Africa, Australia,* and *South America*. French and German children study their native country very thoroughly, and Europe fairly well. They attempt comparatively little with the remainder of the world. We would be unwilling to *adopt* their plan. But why could we not have *one good* treatment of these four continents—with more interesting detail than we ordinarily present in either our small or our large geography—and then expect the supplementary *reading* to continue this geographical knowledge? It should be remembered that while we have a large amount of supplementary reading, its content is not usually prescribed. But it should be. This plan might save *one year* of geography work.—*F. M. McMurry in "School and Home Education,"* May, 1904.

Current Articles on Commerce and Industry:

JUNE

Abyssinia, *Consular Rep.*
Asiatic Trade of our Pacific States, *Century.*
Banana: Land where it is King (Illus.), *World To-Day.*
Cossacks: Russia's Unique Troopers (Illus.), *Rev. of Revs.*
Gophers: The Master Plowman of the West (Illus.), *Century.*
Japan during the War (Illus.), *World To-Day.*
Milk, The Making of Clean (Illus.), *Country Life.*
Mississippi River in War (Illus.), *World To-Day.*
Russia, Industrial Life in, *World's Work.*
Russia, Petroleum Industry of, *Consular Rep.*
Standard Oil Co., *McClure's Mag.*
Trust, How it Meets Competition (Illus.), *System.*
Turbine: A New Era of Steam (Illus.), *Rev. of Revs.*

JULY

Advertising, Adventures in, *Sat. Evening Post,* July 16.
Canada's Commercial and Industrial Expansion (Illus.), *Rev. of Revs.*

Cereal Foods, Preparation of, *Sci. Am.*, July 9.
Ceylon Tea, *Comm. Bull. and N. W. Trade*, July 9.
Commerce, Foreign, of the U. S., *Mo. Summary of Comm. and Fin.*
Cotton-Picking Machines Needed, *Sci. Am.*, July 30.
Cowboy, The Truth About the (Illus.), *World To-Day.*
Furniture, Better, Increasing, *World's Work.*
Greek Currants, *Comm. Bull. and N. W. Trade*, July 9.
Laces of France, Hist. of Manufacture of, *Comm. Bull. and N. W. Trade*, July 23.
Manchuria (Illus.), *Century.*
Merchant Princes of Old New York, *Sat. Evening Post*, July 30.
Panama, Solving the Health Problem (Illus.), *Rev. of Revs.*
Russia of To-Day (Illus.), *World To-Day.*
Sheep-Ranching in the Northwest (Illus.), *Country Life.*
South Africa After the War (Illus.), *Sat. Evening Post*, July 9, 23.
Transportation: Reciprocal Demurrage, *Miss. Valley Lumberman*, July 29.

AUGUST

Adulteration of Foods, *Comm. Bull. and N. W. Trade*, Aug. 6.
British Business Methods, Weakness of, *Sat. Evening Post*, Aug. 6, 27.
Cheese Making in the Mohawk Valley (Illus.), *Country Life.*
Cocoanuts, Copra and Cocoanut Oil, *Crop Reporter.*
Colorado, Industrial Conditions in, *The Mfgr.*, Aug. 15.
Cork Making, *Paint, Oil, and Drug Rev.*, Aug. 3.
Great Lakes, Traffic on (Illus.), *World To-Day.*
Herring Weirs of the Maine Coast (Illus.), *Country Life.*
Hop Picking in Central New York (Illus.), *Country Life.*
Japan, Agriculture in, *Nat'l Geog. Mag.*
Lighting, History of Artificial, *Sci. Am.*, Aug. 27.
Louisiana Purchase Exposition (Special Number), *World's Work.*
Luxury, *Sat. Evening Post*, Aug. 20.
Merchant Princes of Old New York, *Sat. Evening Post*, Aug. 20.
Newfoundland and its Fisheries (Illus.), *World To-Day.*
Peru: Its Resources, etc., *Nat'l Geog. Mag.*
Reindeer Industry in Alaska (Illus.), *Sci. Am.*, Aug. 20.
Sheep-Herder versus Cow-Puncher (Illus.), *World To-Day.*
South Africa after the War (Illus.), *Sat. Evening Post*, Aug. 27.
Turpentine, American, *Paint, Oil, and Drug Rev.*, Aug. 24.

SEPTEMBER

Coffee and Coffee Culture (Illus.), *Sci. Am.*, Sept. 17.
Coöperation, *Sat. Evening Post*, Sept. 10.
Coöperation of Employees in the Management of a Business (Illus.), *Bookkeeper.*
Cowboy of To-Day (Illus.), *World's Work.*
German Supremacy in the Chemical Industry, *Paint, Oil, and Drug Rev.*, Sept. 7.
Hawaii, Forests of, *Miss. Valley Lumberman*, Sept. 9.
Holland, How the Dutch have Taken (Illus.), *Rev. of Revs.*
Ireland, The New (Illus.), *World's Work.*
Iron Mines that Give us Leadership (Illus.), *World's Work.*
Japan, Fisheries of, *Nat'l Geog. Mag.*
Louisiana Purchase Exposition (Special Number), *World To-Day.*
Luxury: Food and Drink, *Sat. Evening Post*, Sept. 17.
Dress, *Sat. Evening Post*, Sept. 3.
Merchant: Stephen Girard, *Sat. Evening Post*, Sept. 24.
Mexico, Winter Expedition into (Illus.), *Nat'l Geog. Mag.*
Plants, Hunters of New (Illus.), *Sat. Evening Post*, Sept. 3.
Rice Industry of the U. S., *Comm. Bull. and N. W. Trade*, Sept. 3.
South, The Newer, in Agriculture, *Sat. Evening Post*, Sept. 24.
Steel Manufacture, Developments in, *The Mfgr.*, Sept. 15.
Standard Oil Co.: The Price of Oil, *McClure's Mag.*
Union Stock Yards of Chicago (Illus.), *System.*
Wall Paper, The Manufacture of (Illus.), *Sci. Am.*, Sept. 24.

E. D. J.

Economic Importance of the Coffee Industry.— The following article appeared in *El Cafetal*, New York, August, 1903:

The cultivation of coffee is a branch of tropical agriculture of greater importance and extent than the general public and the planters themselves can imagine. From the results of a careful compilation of statistics recently collated and published from various governmental and private sources for the period from 1900 to 1902, the following data are calculated:

The total number of coffee plantations in the world, large and small, but which can properly be classified as such in the full meaning of the word, reaches 49,000, distributed among the three coffee-producing continents—America, Asia, and Africa.

Their total annual production of coffee amounts to more than 21,500,000 bags, of an average weight of 134 pounds each, or 2,881,-000,000 pounds.

This production represents a total value of more than $255,000,000 annually contributed by the coffee industry to the world's trade and commerce. Such a grand total is realized by the annual net product of more than 1,800,000,000 coffee trees in full bearing.

The land used for coffee growing, exclusive of the area used for the production of other fruit in connection with coffee, exceeds 3,600,000 acres. The value of the property, including buildings, machinery, and other utensils, is more than $1,350,000,000, based on the low values that have prevailed from 1900 to 1902.

The average total number of persons engaged during the year in planting, tending, harvesting, curing, and handling the crop, including office force, reaches 2,220,000 men, women, and children.

The total amount paid annually in wages and salaries to laborers and the office force, exclusive of interest on capital, taxes, etc., exceeds $135,000,000.

Upon these data the following interesting average calculations are based:

The average area of each plantation exclusively devoted to cultivation of coffee is $73\frac{1}{2}$ acres.

The number of coffee trees in full bearing is 36,735 for each plantation.

The average yield of raw coffee (en oro) is $1\frac{3}{5}$ pounds per tree.

The average number of trees planted per acre is 500.

The average production of each plantation is 58,796 pounds of coffee.

The production per acre is $800\frac{1}{4}$ pounds.

The average number of per year laborers and other persons employed on each plantation is 45, or one for every $1\frac{5}{8}$ acres under cultivation, or one person for 818 coffee trees, equivalent to one person for each $1,309\frac{1}{2}$ pounds of coffee produced and prepared.

The average annual salary paid to each employee is $61.36.

The average cost of labor in the cultivation, production, and preparation of coffee is 4.7 cents per pound.

The average value of each coffee plantation, including the value of buildings, machinery, and other utensils, is $27,551, or $375 per acre.

The average return for each plantation through the sale of its entire product of coffee is $5,204, or at the rate of $8\frac{27}{32}$ cents per pound of coffee.—*Consular Reports*, January, 1904.

The Climate of the Argentine Republic.—The Republic may be divided into three general climatic provinces, on the basis of the temperature and rainfall, the Littoral, the Mediterranean, and the

Andine, the axes of greatest elongation being north and south, and each of these three main divisions being subdivisible into northern, central, and southern sections, whose differences depend chiefly on latitude and altitude. With the great extent of the Argentine, embracing as it does 33 degrees of latitude, the differences between north and south are necessarily very great; but there are also extraordinary changes in temperature and rainfall in going from east to west across the country, narrow as it is. Thus, taking the zone of a degree and a half of latitude, which lies north of the Tropic of Capricorn, we find, on the eastern frontier, a mean annual temperature of 73.4°. Crossing the isotherms at right angles, a temperature of less than 57.2° is found at the western limits. As to rainfall, in this same distance of about 500 miles "the aspect of the country changes from the lowlands of the Chaco, covered with a tropical vegetation, to the arid tablelands of Salta and Jujuy, which in turn merge into the Cordilleras, with their highest peaks under the mantle of perpetual snow."

The famous Argentine "zonda" is described as being so dry that people sprinkle their floors and walls to cool the air while it blows. A section is devoted to the temperature of evaporation, which has been called "sensible temperature," and we have never seen a publication which contained tables and charts of sensible temperatures, by months, for a number of stations. Perhaps the most striking feature on any of the charts in the volume is the rapid decrease of pressure south of the 45th parallel, shown on the isobaric maps, the successive isobars running across the country, almost due east and west, close together. This is the natural consequence of the southward extension of South America into the region of permanent low pressure in the Antarctic. The highest relative humidity is found in the north and in the extreme south. In the Andine provinces it frequently happens that the relative humidity does not exceed 2 or 3 per cent. In fact, according to the ordinary psychrometer tables, some observations in this district give a relative humidity of 0 per cent. As this is impossible, it is clear the reduction formulæ are not applicable to such cases of extreme dryness.

Map Drawing in History.—Geography should never be neglected in teaching history. Too often it is taken for granted that the pupil knows the geography of the places. If you are teaching history without map drawing try your pupils and see if they are not thinking of something far away, they know not where. Ask them the relation of one point to another and you will find that they know but little about it. This is one of the reasons that pupils forget their history.

They have nothing but memory. If they have something to relate the incident to it is not hard for them to remember. Test your pupils on the grants of the London and Plymouth Companies. See if they know anything about the location.

Map drawing assists in the arrangement of the thought material. If maps are made of the campaigns of the wars, and careful drill is given, there will be no trouble in having the pupils remember the order of the events. They will remember them by the location of the places on the map. If pupils are taught "Washington's Retreat Through New Jersey" step by step they will always remember it. One step will suggest another.

Some object to this because the pupils cannot draw. If they cannot draw they should learn. Or, it is a good plan to use outline maps in this case. Emphasis should be placed on history and not on drawing. It is often said that pupils must see before they know, and this is most generally true. To get this fixed from the standpoint of the eyes they must do more than look at a map; they must get it fixed on their minds, and to do this there is no better way than to have them reproduce the relations of the places on an outline map.—*The Intelligence*, March 15, 1904.

"Commercial Japan in 1904," a monograph just issued by the Bureau of Statistics, shows that the trade relations between the United States and Japan in recent years have grown with greater rapidity than between Japan and any other nation. Japan sends us mainly what is not grown in this country—raw silk, tea, rice, matting, bamboo, and lacquered ware, etc.—while we in return ship her annually great quantities of raw cotton, oil, iron and steel manufactures, breadstuffs and provisions, tobacco, scientific instruments, etc.

EDITORIAL

THE EMPHASIS OF DETAILS IN SCHOOL GEOGRAPHY

EFFICIENT work in school geography cannot be measured in pages of a text-book memorized, in names of capes or towns glibly recited and accurately located on a map or an atlas, for pupils and adults may be thoroughly conversant with more geographical facts than are necessary in everyday life and yet know little about geography. Although location work is an important phase of geography teaching and has been somewhat neglected in recent years.

geography consists of something more than location and is no longer described as merely the science of distribution.

Pupils must gain from their geography study enough knowledge of places and of the distribution of geographical features to enable them to understand the affairs of ordinary everyday life. It is far more important, however, that they should gain a knowledge of the reasons for geographical phenomena than that they should merely have an extensive information about the distribution of phenomena, a large part of which is valueless information because of little personal use and because it has been gained at the expense of larger, broader, and more useful principles which can be applied daily in the interpretation of the world's work and life.

Teachers are therefore everywhere confronted with the serious problem of selecting from the great mass of possible details the small selected group of the greatest value in making geography real, helpful, and disciplinary.

To teach the general features of a special topic like a continent or the wind systems of the world without illustrating by details, is to leave the impressions gained incomplete and with confused outlines. To give too many details is to surround the salient points with a mist of illustrations and instances so that the valuable truths are lost sight of.

The choosing of details for emphasis is much like focusing a field glass. There is one point where everything is clear. Before that point is reached the truth desired may be seen emerging from a misty environment. To pass the point of accurate focus is to see the truth fading away again in a seeming chaos of irrelevant details.

A teacher who teaches all the ocean currents or all the technical steps in a complicated industrial process is producing confusion and wasting time and energy, while, on the other hand, an equally fatal error may be made by neglecting all the details.

Only experience will show a teacher how many details must be included in reference to a given topic, but she can rest assured that text-books of geography usually contain many more facts than the children should be called upon to learn and that to teach all the details of a given subject is to leave many valuable larger subjects untouched. A choice must be made and it should be made carefully with the thought in mind that information about a little of everything may mean no real knowledge about anything.

REVIEWS

Geology. By Thomas C. Chamberlin and Rollin D. Salisbury. Volume I, Geologic Processes and Their Results. Pp. 8, xx, and 654; plates, 24, with 471 figures in the text. New York: Henry Holt & Co., 1904.

Chamberlin and Salisbury's Geology is the newest addition to the well-known American Science Series, Advanced Course, and will take rank at once as a standard authority in the science of geology. The authors are both eminent teachers, and contributors of the highest rank in geology and physiography.

The present volume treats of processes of earth structure and sculpture. The scope of treatment is indicated by the chapter headings: astronomic geology; geognosy; the atmosphere as a geological agent; the work of running water; the work of ground water; the work of snow and ice; the work of the ocean; the origin and descent of rocks; structural geology; the movements and deformations of the earth's body; extrusive processes (vulcanism); the geologic functions of life.

The style is clear and direct. In the preparation of the work it was the purpose of the authors, as stated in the preface, "to present an outline of the salient features of geology, as now developed, encumbered as little as possible by technicalities and details whose bearing on the general theme are unimportant." And "where practicable, the text has been so shaped that the student may follow the steps that have led to the present conclusions. To this end there has been a frankness of statement relative to the limitations of knowledge, and the uncertainty of many conclusions." This is a very strong feature, from the point of view of a text-book.

In the realm of hypotheses the search for truth is made more sure, if every possible hypothesis which will fit the facts be framed and studied. "Hypothetical and unsolved problems have been treated, so far as practicable, on the multiple basis; that is, alternative hypotheses and alternative interpretations are frequently presented where knowledge does not warrant positive conclusions."

This is the spirit in which the book is written, and as we turn the pages we can see how the students' horizon will be widened and cleared, and how the misty places will not be ignored nor passed over lightly, but openly acknowledged and the possible methods of interpretation indicated.

This volume gives the best brief general statement in any language of wind work in erosion and deposition; the work of running water and the life history of the river valley; the work of ice; crustal movement and deformation.

The pictures *illustrate* the text. Many of them are reproduced in half-tone from photographs direct, and the quality of the paper and the presswork are such as to make the print hardly inferior to the original The twenty-four plates reproduce, in color, portions of thirty-five of the U. S. G. S. topographic maps in the scale and quality of the original— a very valuable feature.

So many are the strong points in this volume that it will be invaluable to every teacher of the earth sciences. J. P. G.

The Indians of the Painted Desert Region. By George Wharton James. Size 5½ x 8½; pp. xxi + 268; 66 full-page plates from photographs. 1903. Boston: Little, Brown & Co.

In this book of generalities one of the most interesting sections of the Southwest has been described.

The author has divided the book into sixteen chapters, among which may be mentioned, The Painted Desert Region, The Hopi Villages and Their History, The Religious Life of the Hopis, The Hopi Snake Dance, The Navajo as a Blanket Weaver, The Wallapais, and the Social and Domestic Life of the Havasupais.

Only a portion of the Great Painted Desert is described, the effort being rather oward the esthetic.

The home life, arts, and ceremonies of the Hopis and Navajos are mentioned n a general way. Although of a different stock the lives of these sedentary and nomadic tribes are so intertwined from contact and intermarriage that their ceremoniology and artistic productions are closely associated. The author has drawn rom reliable scientific sources enough material to round out, with his own notes, everal chapters concerning these tribes. It is to be regretted that his personal observations, which cover a period of many years, were not always verified, as the rrors that result are misleading.

Of special interest are the chapters in which the Wallapais and Havasupais are lescribed. Even in scientific publications there exists a dearth of material relating to these little-known tribes; the information presented is, therefore, an acceptable addition to our current literature.

What the book lacks in accuracy is made up in interest. The mistakes are principally technical and of a scientific nature.

The handling of the photographic plates is deplorable. Many of them are nserted regardless of their bearing on the subject-matter of the chapter in which hey appear. Aside from their positions they are clean cut and convincing and portray with a vivid clearness the topography and ethnography of the desert.

The author has succeeded in presenting the subject in an attractive and instructive manner. Most of the facts can be found in an elaborated form in cientific publications, but the generalizing of the author has brought the region well within reach of the student, the chapters on the Wallapais and Havasupais alone naking it a welcome addition to the school library. G. H. P.

RECENT PUBLICATIONS

Geographen-Kalender, 1904-1905. By Dr. Hermann Haack. Pp. 290. Gotha: Justus Perthes, 1904.

An indispensable reference volume for all geographers. This, the second annual volume, contains a summary of geographical progress and exploration for 1903, a ligest of the literature of the same year, an announcement of the deaths among geographers in 1903, a valuable list of the geographical societies and periodicals of the world, and many helpful statistics. Sixteen maps are appended to show the geographical changes of the year reviewed. Should be in every college and normal school library.

A Brief History of Rocky Mountain Exploration, with Especial Reference to the Expedition of Lewis and Clark. By Reuben Gold Thwaites. Pp. 276. New York: D. Appleton & Co., 1904.

A brief and interesting summary of western exploration by an authority. Should be added to the bibliography of the Louisiana Purchase published in the June number of the JOURNAL. Typographically pleasing and well indexed.

Carpenter's Geographical Reader; Australia, Our Colonies and Other Islands of the Sea. By Frank G. Carpenter. Pp. 388. New York: American Book Company, 1904.

A catch-all volume including brief descriptions of those parts of the world not hitherto included in Carpenter's series of readers, with the exception of Africa, which will form a separate volume. Written in the author's characteristically interesting style and well illustrated. Not sufficiently rich to serve adequately as a reference volume for the upper grades.

New Elementary Agriculture for Rural and Graded Schools. By Bessey, Bruner, and Swezey. Pp. 194. Lincoln, Neb.: The University Publishing Company, 1904.

A simple volume containing much of interest to grade teachers of geography. Especially to be commended for its clear statements in reference to the popular fallacies of the relations between the moon and the weather.

North America. By Israel C. Russell. Pp. 435. New York: D. Appleton & Co., 1904.

A volume devoted to the topography, climate, geology, and life geography of North America. Well written but poorly illustrated. To be reviewed later.

NEWS NOTE

The Cornell Summer School of Geography.—The second session of the Cornell Summer School of Geography came to an end August 18th. In all particulars this session was an advance over the splendid work of last summer. More courses of instruction were given, a much larger number of teachers attended, and even greater interest was manifested. No school has ever offered such a variety and scope of instruction in geography as the Cornell School gave this summer. Practically every phase of geography was treated in the twenty different courses. The faculty consisted of very nearly the same group of men as last summer—Professors R. S. Tarr, Albert P. Brigham, and Charles A. McMurry; Instructors F. V. Emerson, George D. Hubbard, B. C. Butler, Philip Emerson, R. H. Whitbeck, and Frank Carney. Five of these men will present papers before the International Geographical Congress which meets in this country in September. As heretofore, much emphasis was laid upon field studies, more than forty field trips being given. These ranged from one-hour trips in home geography to the two-day excursions to Watkins Glen, Niagara, and Wilkesbarre, Pa.

Dr. Cleveland Abbe of Washington, the eminent meteorologist, was present the entire session and contributed liberally to the enjoyment and profit of the "geography crowd," as the group was called.

The Thursday Evening Round Table Conferences which proved so valuable last summer were continued and accentuated this summer. These were veritable clearing houses of opinions and experiences. Fifty or sixty teachers gathered about the round table and under the leadership of a member of the faculty discussed a series of topics previously selected and distributed in mimeographed form.

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VOL. III. OCTOBER, 1904 No. 8

GEOGRAPHY AND HISTORY IN THE UNITED STATES*

BY ALBERT PERRY BRIGHAM
Colgate University, Hamilton, N. Y.

THAT geographic conditions have power in human affairs is known to all, but their scope and importance are appreciated by few. We cannot ascribe all that we do, or experience, to geographic sources, and we must draw our conclusions with caution, for personal and racial traits come in whose origin we cannot trace. We may safely reject, however, the phrase, "theater of history," as it is commonly used. The earth is more than a mere stage. Ground to stand on, a background to look at, and even machinery to produce new effects do not express the relation of earth to the human drama. The bond is closer, and might be called organic, bearing its share of the complication and mystery that belong to life everywhere.

The writer has elsewhere sought to show the greater relations which obtain between the American land and American life, and can here select but two or three examples which seem to have the force of types, and these will form a basis for the emphasis to be laid upon correlating these two great branches of knowledge in American schools.

We take our people of the western world as we find them. It is a race ancestrally molded by environment, but man must long be studied from the combined points of view of history, geography, and biology before the unknown geographic factor in the equation can be brought out. Given the early Americans, they were affected by local influences which told in the resources of rocks and soils, in climate, in lines of commerce, modes of communication, in the planting and growth of cities. We pass these and we pass also the less obtrusive but doubtless more compelling influences of sea, of relief, and of climate upon the inner man, upon thought, imagination, and moral convictions.

* Presented before the Educational Section of the Eighth International Geographic Congress.

We have taken certain larger regional, and indeed we might say national, exhibitions of geographic influence in the temperate portions of North America. In so doing we must remember that our history is short and that we see it in its making, in its more creative stages. But thus to see it is to have a blurred vision, it may be, of some of its most distinctive characters. Until recently we have had as a nation a migrating frontier, an ever-shifting "West," repeating with variations the features of frontier life, furnishing outlet from the more settled regions, and reflecting the influence of new conditions of society and of new products of the earth, back upon the older populations. Some of these older regions have seen swift changes, therefore, despite the persistence of their soils, their minerals, their reliefs, and their skies. Thus we have widening circles of adjustment in larger and larger fields.

Or, we may say that the process of adjustment is twofold. There are local adaptations, as in periods of first settlement when most of man's necessities are won from the soil at home; and there are adjustments in relation to other regions, hinging upon more favorable communications, and upon products of special regions, the law of competition coming in. The former sort are known and utilized in some measure in the teaching of our schools. We are but beginning to know the latter, and can know them only from the point of view of the historian and the economist.

Our first example is New England. Here nothing less than a revolution has taken place, and indeed it is in progress before our eyes. When the early colonists sought the protected waters of the shore and the fertile lowlands of the Connecticut, or cleared their rough fields and challenged the uplands to give them a living, or snared it beneath the salt waters, there was abundant geographic influence and there was genuine adjustment to the conditions of the land. But if we look at the New England of to-day, we see many new things. The fishing has waned and what there is concentrates itself chiefly at one port. There has been a decline, so called, of agriculture, but perhaps no diminution of the value of the products of the soil. Boston is said to be second in this particular among the towns of Massachusetts. That the growths of the greenhouse must be counted in to make this true, only points to the great fact of specialization of tillage. It is now tobacco in the Connecticut Valley, cranberries on Cape Cod, and truck farming adjacent to innumerable cities, instead of a toilsome struggle to raise breadstuffs everywhere. Fields too steep and too rough with boulders to favor the plow are relapsing into forest, to become valuable to the next generation at least for refreshment, and to later generations, it may be, for lumber as well. Meantime the population of the region has increased, its wealth has grown, and its array of comfortable conditions of living is out of all comparison with the days of the fathers. What now are the larger connections in this chain of events? We find them in early migrations to New York and Ohio, the "West"; in the wheat fields of the Genesee Valley; in the expansive acres of Illinois and Iowa, and in the silver and gold of Colorado and California. Certain industries could be better carried on if New England men and others were to follow the fleeting limit of our country toward the setting sun, and the old New England, mourning less about herself than others have mourned about her, set herself to do the things that she could do best. No water power could be more abundant, no seashores more attractive, and few harbors more inviting than those of New England. Manufacturing, commerce, a considerable range of mineral industries, and the care of resorts among the mountains and by the sea, may not unfairly be said to mark the more assured and final adjustments of life to land in this region whose bread can better be won by exchange than with the plow. Adjustment and control are marked by wider range. But even in her special field of the factory there is a qualification. Abundant as water power is, coal is yet important, and must come by a long haul. And the haul for cotton is yet longer. The South is awakening, and a region which has water, coal, cotton, and labor in juxtaposition is likely to win in the race. Time will impart the needed skill to the southern operative, and New England manufacturing must turn in the main to other lines.

Professor Hinsdale has remarked upon the prodigious importance to the old Northwest of the fact that, on the one hand, it belongs to the upper Mississippi, and on the other is closely associated with the Great Lakes. Thus in a word is summed up much of the history of the prairies. Speaking in detail, we have first what we may call prairie conditions, land that is mainly flat and low-lying, in a forestless state, a fairly moist climate, and, owing in part to its lack of relief, a land fitted to accumulate a soil of surpassing richness. Water power is for the greater part absent, but there is abundant coal. These conditions mean the dominance of agriculture, easy local communications, and the ultimate growth of manufactures. The critical questions of geographic adjustment arise in connection with long-distance transportation. It has been said that the railroads raised up Chicago and determined New Orleans to an inferior position. But this does not tell the whole story. It is true that railways waxed as traffic down the Mississippi waned, but it is difficult to weigh the share that lake shipping has had in making Chicago. It is also true that railways fall back upon geographic conditions—easy grades along the old lake plains to the eastward, the open Mohawk Valley with its Erie Canal, the tidal Hudson, and New York at the western end of the Atlantic Ferry. But it remains to be seen how the old Northwest will be affected by railways to New Orleans and Galveston, by an extended Drainage Canal, and a ship channel across the Isthmus of Panama. In brief, the East and the South have long been striving for the prairie country, for it stands balanced between the one and the other. The easy grades and shorter haul down the Mississippi, added to American developments all about the Mediterranean of the Western Hemisphere, may compensate for the longer passage from the Gulf ports to Europe, and may weaken the bond between the prairies and New York. The more is this result possible now that for more than a generation slavery has been wiped out, and steady assimilation of social conditions between the upper and lower Mississippi regions can proceed. The old struggle is on which gave Washington and the fathers so much concern in their time, as to whether by roads and waterways they could render nugatory the divisive influence of the Appalachian barrier. The sturdy men that won the old Northwest came in by the Cumberland Gap, and the men that subdued and populated it came by the Seneca turnpike or through Pittsburg, but the ancestral homes of New England cannot be forever remembered, nor will the man of the prairies maintain loyalty to New York when his interests point to the Gulf of Mexico.

We take a further example in the development of the arid lands. The basal motive cannot be counted as other than the wealth of minerals in the western mountains. Once prompted to test the possibilities of the dry plateaus of the Cordilleran country, they have been found to have values of their own, making them no longer merely subsidiary to deposits of gold and silver. The Kansas problem and the unhappy inflation of the decade following 1885 had their origin in ignorance of geographic conditions. A temporary increase of rainfall was thought to betoken a permanent and beneficent change of climate. Hence came an era of speculation and foolish spending, of boom towns and excessive railway building, of reckless borrowing and inability to pay interest, of bankruptcy and foreclosure. With this unhappy harvest of distress came wild-cat theories of money, misunderstanding and bickering between East and West, and great loss and suffering on the part of lender and borrower, until the bubble collapsed, until over-population was checked, and most of those semi-arid lands were returned to grazing. Thus we approach the deeply characteristic development which arid-land life must have. There will be tillage where there is water enough for it, and grazing over wide intermediate spaces. And in the areas of tillage population will be dense, will approach the conditions of the town, and the interests of the people will link them to each other in semi-communistic ways. These conditions of solidarity will work themselves out in the school, the church, in economic relations, and in the very life and quality of the men that make up such a society. And the nation itself, by adopting an irrigation policy, has not only prospectively increased its wealth and its census roll, but fosters thereby a modified and highly specialized type of society.

Final, or at least larger, adjustments are hinted at in our expansion of territory, in binding to ourselves, more or less closely, lands across the seas and in the enlarging commercial bonds which join us to other lands. We can hardly emphasize too much the fact that we stand between two oceans. The Pacific now looms in importance and we are pointed back to our primal geographic-historical fact that we fronted Europe and were thus approached on our more open side by several colonizing peoples, of which one, perhaps in defiance of geographic obstacles, became dominant.

We now come to the question whether these great relations between history and geography are properly recognized in the literature of the two subjects and in the schools. We shall do historical literature no injustice by affirming that it is generally deficient in a real understanding of relations to the earth. The *quality* of regions and of national domains is but partly realized. There are plains, there are mountains, there are rivers; there is impressionistic painting, but little photography upon the pages of the historians. In like degree geography has failed to avail itself of the rich interest which history offers, with its wealth of human elements and its causal associations running through time, and its economic and social relations giving easy unity to wide regions or remote nations.

If we inquire for correlation in schools, the answer is little better than negative. Certainly geography should be fundamental and should in some measure precede, while history should follow, and should not only be more intelligible, but contribute new fascination to the geography. The teacher of geography must know the essentials of history, and should be well schooled in the history of his own people, and the teacher of history is but half fitted for his task if he does not know the principles of geography, and if he has not a generous knowledge of the geography of his own country.

Such correlations, whether in the teacher himself or in school programs, are rare. And yet correlation is peculiarly possible with the common plan of one teacher for all subjects in a grade and, in the department system, only requires some planning on the part of directors and teachers. But the teacher will often wait long for aid from his superiors. As it was put by another, "It is no uncommon thing for a class to be studying at the same time the geography of Africa, the history of England, the plant life of Minnesota, while having for their reading lesson the story of Peter the Great." But, barring repressive systems of examination, there is no limit except of time and interest to the amount of history that a teacher of geography may know and use, or to the history teacher's use of geography, each, of course, making the other subject subsidiary to his own. In this respect we seem to be far behind Germany, where the two subjects more often are handled by the same teacher. We need not, however, wonder that we are backward when we see geography just escaping from its thrall as a locational study, and when the first association in this country for improving educational methods in history dates from the Nebraska organization of 1889.

Professor Howard criticises the report of the Committee of Seven to the American Historical Association as disappointing in the matter of correlation. He, however, lays stress here on law and economics, while we would place it without question upon geography. In fact, the one passage of the report that touches geography with emphasis, serious and true as it mainly is, is amusing in its assurance. "Fortunately," says the passage, "it is unnecessary in these latter days to call the teacher's attention to the use of maps, and to the idea that geography and history are inextricably interwoven." This would be pleasant if it were true. The use of wall maps, physical maps, and of an historical atlas is recognized, and we are told that "pupils should not lose sight of the physical causes that have acted in history." But what if nine-tenths of the teachers are densely ignorant of these physical causes! The best thing in the passage is quoted from Hinsdale, who says, with freshness and power, "Groupings of historical figures and scenes around geographical centers make these centers themselves, binding the figures and scenes together, give them a new permanence and solidity." Aside from the one passage there is little reference to geography in the report, and the implication is that locational geography and a rough knowledge of the principal reliefs is all that is needed. Dr. C. A. McMurry, in his "Special Method in Geography," has given pointed expression to the importance and feasibility of such correlation as is here under review.

One of the more satisfactory utterances on this subject is found in the report of the history conference to the Committee of Ten, as follows: "From the beginning the teacher should attempt to connect physical geography with the present political condition of the world; and, in like manner, the study of political geography should constantly bring in the physical features." Even more emphatic is the formal resolution of that conference, "That the study of history should be constantly associated with the study of topography and political geography, and should be supplemented by the study of historical and commercial geography and the drawing of historical maps." Good as this is, we may even read between the lines here the "theater-of-history" idea, rather than the very ground and conditioning element of his ory. Thorpe, in an essay included in the volume on the "Study of History in American Colleges," observes: "That study [history] should be at first chiefly geographical and sociological." He is speaking here of the public school. The College Entrance Examination Board might well go farther in its syllabus of history, than this, "geographical knowledge will be tested by requiring the location of places and movements on an outline map." This might have been written a hundred years ago if history had then counted for admission to college.

What is proposed to be done, in view of the need and of the evident gains of such correlation? We have no scheme to outline, but we hopefully recognize an awakening interest and excellent beginnings. Within a brief time formal works on the interrelations of geography and history have begun to appear. There is a profound interest in this field on the part of all progressive geographers, and a considerable number of pertinent articles have appeared in the geographical journals during the past five years. Several of the later historians have also recognized the intrinsic (if we may so term it) value of geography. To Francis Parkman must be given the honor of being the pioneer in this splendid field. If to him a region is a theater, it is a stage that glorifies with its native colors every deed that emerges upon it, and the reader knows that he has seen no manufactured setting, but the very home and fertile soil where historic deeds have matured. Fiske and McMaster are not far behind the great master of lake and forest, and it is worthy of note that for a part of its next annual meeting the Association of History Teachers of the Middle States and Maryland have arranged a session for the discussion of such problems of joint interest.

These indications point to a vital growth which will bring about the needed organization and will develop suitable school programs. We shall, as time advances, have more teachers of geography and of history, specialists in chosen fields, and neither will be deemed fit for his own subject until his interest and his first-hand knowledge take him far over into the other.

EMPHASIS UPON ANTHROPO-GEOGRAPHY IN SCHOOLS*

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EVERY state or nation includes two ideas, the land and its people, each unthinkable without the other. Even the Sahara suggests, besides its wastes of sand, the group of huts in the palm-grown oasis, the white-robed Arab sitting in the shadow of his tent by a solitary well, the camel with his brown-skinned driver bending before the blast of the simoon, and the long-drawn caravan creeping along a bone-marked trail. Geography is the study of the land and its effect upon its people; history is the study of a people in whose economic, social, and political development the land is an essential and potent factor. Geography lays the stress upon the land, history upon the people. But the land is fully comprehended only when studied in the light of its influence upon the inhabitants, and a people can never be understood apart from the field of their activities, from the climate which determines their housing and dressing, the rainfall and soil which control their agriculture, the isolation or accessibility of their country which defines the amount and character of their intercourse with other lands, and finally the size of their territory, which must always be a factor in the numerical strength of the population.

By the introduction of the human element, geography is lifted out of the dull round of formal studies and the earth becomes the

* Presented before the Educational Section of the Eighth International Geographic Congress.

setting of a great world drama. By the introduction of the geographic element, history becomes vitalized; through it now pulses the life-blood of the people. All the forces and treasures and beauties of nature enter into the chronicle. Its pages seem to smell of the up-turned soil; they are golden with fields of ripened grain and white with fields of cotton; they echo the sound of the pioneer's axe blazing a trail over a mountain pass, the ripple of the voyageur's canoe exploring some far northern stream, the splash of the steamboat on a river highway, the roar of waterfall and the whir of mill-wheel, the lowing of cattle on thirsty plain, and the hum of life in the big seaport; they reflect the persistent and potent forces back of political bodies and legislative enactments in the geographic conditions of the people.

The chief emphasis in the two studies should not be changed; but this is still compatible with a fuller, deeper geographical interpretation of history than is now customary, and a more fruitful anthropological interpretation of geography. Though the newer geographical text-books give an interesting and scientific treatment of earth forms, the sections devoted to the various countries of the world are burdened with masses of economic detail, which in themselves are uninteresting to a child, which are imperfectly presented in their causal relation, and which for a large part are only indirectly, not directly and obviously, the effect of geographic conditions. The result is that the child is swamped in a mire of unsystematized knowledge or is forced along a line of causal reasoning too long and involved for the immature mind to follow. Finally, these facts are selected with little view to history, the next study in the school curriculum.

Economic facts appeal little to the child; their study is proper only for the mature mind, and hence their multiplication in geographical text-books is stultifying. Yet the causal idea back of a group of such facts the child will seize upon and retain. For instance, he is not eager to learn or sure to remember that Troy, N. Y., is an important center for the manufacture of collars and cuffs, Cohoes for knit goods and hosiery, Utica for fine hardware and machinery, but he can grasp the principle that all these are manufacturing towns, because their location on the great canal and valley railroad route between the Hudson River and the Great Lakes renders them accessible to raw materials of all kinds and enables them to send their finished goods to widely distributed markets, while local water power reduces the item of fuel in the cost of production. In the same way the child can readily understand the geographic factors which have made England lead the world in manufactures and which have localized the great manufacturing area in the northwestern part of that country; but he gains little by memorizing a list of the chief industries distinguishing the various English cities. The teaching of geography would gain, therefore, both in interest and educative value, by paying less attention to the mere enumeration of details and more to their scientific interpretation.

This multiplication of economic facts, which has so expanded the text in recent geographies, has crowded to the wall the important study of the map. Earth forms are slighted in their geographical distribution and their effects as phases of geographical environment. The old routine, illogical map questions have not been succeeded by intelligent, logical map questions designed to develop anthropo-geographical principles. The drainage systems of Russia, Germany, China, or America are described in the text, perhaps; but the child is not sent to the map by discreet questions to discover those drainage systems for himself and to estimate their importance for their respective countries. And every child should become an infant discoverer on the cartographical page in order to acquire a self-constructed knowledge of every ocean, continent, and country as the basis for anthropo-geographical deductions. Maps, physical and political, must remain the child's chief repository of facts, to which he can most easily refer and from which he can draw his surest conclusions. Trained to this anthropological interpretation, he finds the otherwise dull page becoming luminous. The facts and principles thus acquired introduce him to contemporary history, the terms and names of which are more or less familiar to him, and by comparative methods into past history. Moreover they deal with themes far more likely to interest him than the weary enumeration of economic data. A list of Cuba's mineral resources or a statement of its commercial exchanges with other countries appeals little to a child, and is not readily associated with the Cuba which he knows best, the Cuba of the map; but if you would arouse his interest, point out the isolation due to Cuba's island character, show him that to this separation from the mainland and to the island's limited size was due in large part its long subjection to Spain, when all the other Spanish colonies in Mexico, Central and South America had gained their independence, either because the vast extent of their territories and their consequent larger populations rendered their uprising more formidable, or, as in South America, continental neighbors like Colombia and Venezuela, Argentine and Chile, sent armies even over the high barrier of the Andes to support each other in the struggle for freedom, while Cuba's seagirt location, accessible only to ships which the new-born Latin republics lacked, kept at arm's length the deliverer, and Cuba's relatively small area could be retained under the crushing hand of Spain. Finally, Cuba's proximity to the United States and her strategic position on Florida Straits become obvious factors in her independence and the guarantee of that independence by the American Government.

In the same way, lead the young student to read from the map the restricted availability of Russia's coastline—its White Sea harbors accessible from the open ocean, but closed by ice more than six months of the year; its Baltic coast, also hampered by a long winter, liable in time of war to be bottled up by Germany, Scandinavia, or the ships of England patrolling the narrow exit; its Black Sea coast, to which the neck of the bottle is particularly small and the cork secured for all naval vessels of the great Muscovite power; its far-northern strip on the Pacific with the often ice-bound port of Vladivostock, where, moreover, the long cordon of the Japanese Islands makes the Japan Sea another Euxine and the Korean Strait another Bosphorus; the significance of the struggle for a maritime outlet on an unfrozen sea in Manchuria; and finally the meaning of the ominous bulge of Russia's frontier south of the Caucasus and the wedge driven into northern Afghanistan, signposts of her proposed advance to the Persian Gulf and the Arabian Sea. Ask the child to estimate from the map the value of the coasts of all the European countries, in terms of length, harbor facilities, availability, and routes of communication with the interior. See how eagerly, from an inspection of the coasts of Germany, France, Russia, and the United States, as interrupted by the intervening littoral of a foreign power, he will reason to the political necessity of a canal to connect the separated coasts, and from a study of a physical map will fix its possible location. Tell the child that the Samoyedes, a retarded people of Arctic Siberia, have twenty-one different words for the color gray, and ask for the geographical reason of this surprising richness in a primitive language.

The map, thus treated, becomes for the young student a great field for comparison, and hence for the deduction of anthropo-geographical principles. Tracing the strategic and hence political importance of the entrances to enclosed sea basins, he reads at a glance the significance of Havana and Key West for the command of the Gulf of Mexico, of Constantinople for the Black Sea, of the Russian fortress at Port Arthur for Pechili Gulf, of the British positions at Singapore, Aden, Suez, and Gibraltar; he groups with these strategic points Denmark's peninsula and island location commanding the channels leading into the Baltic, and readily grasps the fact that this location made the historic greatness of the country in the past, enabling it at one time to levy toll on merchant vessels entering this northern Mediterranean, and has prevented its absorption by one of its larger neighbors, because all these could agree upon the desirability of having this important passway in the hands of a weak and neutral power.

To recapitulate, this interpretation of the map has the following advantages: Its method is comparative and hence scientific; it arrives at anthropo-geographical principles interesting and comprehensible to an immature mind; it deals with familiar, present-day history and leads from the present to the past; finally it is a natural preparation for the study of history, which immediately follows geography in the school curriculum. The American child goes from the study of geography to the history of the United States. He possesses a valuable stock of facts about the climate, location, size, coastline, and topography of his country, ready to serve as the basis for his study of its history, but rarely or inadequately utilized for this purpose by school text-books. The opportunity to apply the pedagogical principle of proceeding from the known to the unknown stares one in the face; but the valuable ready-made foundation is ignored, the child begins immediately on the superstructure, and his history hovers in the air.

The geographical element in history as taught to-day in the schools —taught often, too, in compliance with the requirement of college preparation — is for the most part superficial and inadequate. It consists chiefly in memorizing geographical locations, in very imperfect map-drawing, yielding to the student scant profit in proportion to the expenditure of time and effort, or in filling in outline maps, guiltless of any suggestion of topography, with political boundaries and sites of towns and battles. The study is not in the least interpretative; it makes a demand upon the memory, not upon the reasoning power. The teacher asks the student to locate the battles of Oriskany, Ticonderoga, and Saratoga in the Revolution, and is satisfied with the answer that they were in the central part of eastern New York, overlooking the important fact of their location along the two great valley routes between flanking mountain barriers from Lake Ontario on the west and the St. Lawrence on the north, converging upon the upper Hudson, that great river highway through the heart of the Colonies. In the War of 1812 the land battles of Saranac River and the naval engagement off-shore are located by the student near the northern end of Lake Champlain, but are not shown to be a repetition of the battles of Ticonderoga and Valcour Island in the previous war, pushed a little farther north on this same great Champlain-Hudson route. Or the numerous naval conflicts in this same war are located vaguely in the wide waste of the Atlantic, with no regard to the great trade routes determined by prevailing winds and ocean currents, which were followed in that day by English merchantmen seeking the West or East Indies, and which therefore were infested by American vessels preying upon English commerce. I remember distinctly, when a child of ten years old, studying the dreary list of naval engagements in this war, with the names of vessels and commanders on either side, and wondering in my childish mind where all these battles were, and why they were anywhere. If I learned that the conflict between the "Constitution" and the "Guerrière" took place southeast of Sable Isle in such longitude and latitude, I was not much wiser, because the significant fact in this location was carefully suppressed—namely, that this battle was fought near the southern entrance to the Gulf of St. Lawrence, where American vessels throughout the war were lurking about to intercept English supply ships on their way either to the St. Lawrence River and the British forces in Canada or to the British naval base at Halifax.

The geographic factors in the history of Greece receive more attention in school text-books than those of any other country; but here only the more obvious influences are discussed, the political subdivision of the country due to physical subdivision by mountain barriers and arms of the sea; the indented coastline, the fringing island groups, and the proximity of other lands resulting in the seafaring and colonizing propensities of the early Greeks; the effect of climate, quality of atmosphere, and scenery upon the artistic development of the Greek mind. But other equally important influences are past unnoticed. The marked colonizing tendency of the people was a result also of the restricted territory of the little peninsula and the limited amount of arable soil in a country of rugged mountains and sterile plateaus. In a country where to-day only eighteen per cent of the surface is under cultivation, population must at an early date have begun to press upon the limits of subsistence yielded by primitive agriculture. Emigration from congested districts necessarily followed, and foreign commerce was resorted to to increase the earning power of the states. In all these points ancient Greece presents a geographic and hence economic parallel with the history of Phœnicia, Norway, England, and—barring the quality of the soil—with Holland.

But, as Ratzel says, "The most important fact in the geography of Greece was its location at the threshold of the Orient," and yet this factor is never brought out in its full significance. Greece was the part of Europe most accessible to the ancient centers of civilization in Egypt and southern Asia; upon it converged all the great routes from the East, which poured into the Hellenic world the intellectual and commercial wealth of the Orient. The Mediterranean and Black Sea termini of every such route were marked by Greek colonies—Trebizond, Sinope, Byzantium, Smyrna, Miletus, Antioch, and Naucratis in the Nile delta. Over the eastern rim of the Ægean rose the sun of Greek culture, flooding with light the islands of that sea, the Asia-fronting shore of the peninsula, and the eastern slopes of the Pindus Mountains, while a gray, uncertain dawn long defined the westward-reaching shadow of the massive range. Then, by its position midway between the productive countries of the East and the newly opened lands of the western Mediterranean, Greece became the great middleman of the early world, the distributing center of products and ideas, just as twenty centuries later the Hanse towns of the North Sea and the neighboring Baltic became the agents of Mediterranean commerce and culture for the less developed coast regions of northern Europe.

When the maturer student has acquired a knowledge of general history and passes to the advanced study of physiography, as now taught in some high schools and colleges, he commands the material for broader anthropo-geographical conclusions, which in turn give him a larger outlook upon history. The study of the physical features of fiord coasts and countries will gain immensely in interest if followed by a comparison of the influence of fiord environment upon the Indians of southern Alaska, the people of Iceland, Greenland, and Norway, as also upon the economic development of British Columbia, Washington, and Maine. A study of continental islands is complete only with a comparison of the isolating influence of an island environment in Japan, England, Iceland, Corsica, Madagascar, Cape Breton, and Cuba, and with an analysis of the striking and not fortuitous parallels in the history of England and Japan. The study of enclosed sea basins requires a comparison of early maritime development in the Mediterranean and the Baltic; the study of mountains, a comparison of their isolating effects in the survival of moribund languages in the Alps, Pyrenees, Caucasus, the Highlands of Scotland, the mountain districts of Wales and Ireland, and in the persistence of a seventeenth century English in the remoter parts of the Southern Appalachians to-day. All mountain peoples are found to have certain characteristics in common, especially a love of political and personal freedom, which explains the existence of small, independent mountain states like Switzerland, Andorra, Montenegro, Nepal, and Bhutan; the fierce and protracted resistance to conquest made by the ancient Samnite tribes of the Apennines, the Highland clans of Scotland, the tribes of the Caucasus and Himálayas, and the Albanian mountaineers of Turkey; and it accounts for the habitual disregard of governmental authority displayed to-day by the people of the isolated Southern Appalachians in matters of clan feuds and illicit distilling.

By comparison of different periods also, the same geographic factor is seen to operate continuously, though under new aspects, caused by a change of other conditions. For instance, certain mountain passes and the river valleys leading from them down either slope have determined the routes across the Appalachians, whether of "buffalo trace," or Indian war-path, or the well-beaten trail of the pioneer, or the wagon road of the early western emigrant, or the line of the railway seeking the easiest path across the wide-stretched barrier. In the same way that deep furrow between the mighty Caucasus and Anti-Caucasus Mountains which served as the ancient route of communication between the Black Sea and the Caspian, and brought the gold of the East to mythical Colchis, sees to-day the railroad which brings the petroleum of Baku and the rugs of Bokhara to the Mediterranean lands. The geographic conditions which made a maritime power of ancient Greece still enable the modern country to lead in the carrying trade of the eastern Mediterranean. The arid plains and mountain slopes of the American West, once the grazing lands of the buffalo and deer whose skins figured prominently in the early exchanges of the busy little towns at the elbow and the mouth of the Missouri River, to-day raise the cattle and sheep to supply the great slaughtering and packing industries at St. Louis and Kansas City.

These geographic forces are stable, persistent; they operate from day to day and from century to century. They constitute the soil in which empires are rooted, and they rise in the sap of the nation.

PRACTICAL WORK IN SCHOOL GEOGRAPHY*

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NO line of development in modern education has been more remarkable than the growth of science teaching by the laboratory method. "Study things themselves; learn by first-hand experience," is a universally accepted principle. The general principle is established and the working out of the details is progressing rapidly. A decade of experimentation by practical teachers has yielded well-organized plans of work in chemistry, physics, and biology. Laboratory courses in these sciences have been outlined and are practiced with pretty general satisfaction. But what about geography? Certain it is that in this field matters are in an unsettled state, at least in America. There are people who question whether geography is really a science at all. There is lack of agreement as to what should be included under the term and what excluded. Any one who has attempted to define the scope of geography has found how elusive and elastic are its boundaries, and how numerous its ramifications into all other fields of knowledge.

Physical geography is accorded a place among the sciences, but it does not so readily lend itself to the laboratory treatment in schools as do chemistry or biology or even physics. In the very nature of the science, laboratory practice cannot form so large a part in the study of physical geography as it does in the other sciences named. In the broader field of general geography, this is even more largely true.

Glance down the table of contents of a school text-book. It is evident that geography treats of an almost endless list of places, activities, phenomena, and relations, scattered over the entire earth, and that most of these cannot be studied at first hand unless we travel over the entire earth. Deserts, mountains, oceans, glaciers, and a thousand

* Presented before the Educational Section of the Eighth International Geographic Congress.

more of the real things with which geography deals cannot be brought together for study in one place. Manifestly a very large part of a student's geographical knowledge must be gained at second hand unless he is able to travel extensively. Principles, processes, and type forms may usually be found illustrated near home. Particularly is this true of the physical side of the study, and also of the commercial. The meteorological phase of the subject is, of course, well suited to first-hand study in almost any school. Every locality furnishes opportunities for some outdoor studies and these opportunities should be used to the utmost. Such studies are the lifeblood of school geography.

Regarding indoor laboratory work in physical geography, one scarcely knows what to say. Very few schools indeed have achieved any notable success along this line. The laboratory manuals thus far produced are confessedly unsatisfactory, and each one differs radically from every other.

In the geography of the elementary school, systematic laboratory work is as yet unknown, but observation and experience are impressing upon us that there are forms of practical work which enrich our geography teaching and enhance its value. It is with these elementary exercises that this paper chiefly deals. For convenience we may classify the exercises as follows:

1. Manual exercises, including—
    (*a*) Modeling in sand, clay, or pulp.
    (*b*) Map making and ordinary map drawing.
    (*c*) Making of special maps such as, for example, those showing productions, rainfall, or industries, including the filling in of printed outline maps.
    (*d*) Graphic representation of important statistical facts, such as relative areas of countries, population of cities, exports, etc.
2. Observational exercises, including—
    (*a*) Study of pictures; the use of the stereoscope and stereopticon.
    (*b*) Study of relief models and contoured maps.
    (*c*) Study of raw materials and their finished products.
    (*d*) Indoor study of common rocks, soils, ores, etc.
    (*e*) Visits to mills, quarries, markets, etc.
    (*f*) Weather observations and records.
    (*g*) Field trips chiefly for the study of natural forms and phenomena of a geographic character.

It is not to be hoped that all of the above will be emphasized in any one school. Such a condition would probably be worse than emphasizing none of them.

Sand molding has proved its worth in primary grades. A month ago I secured an expression of opinion from forty or more teachers from some twenty different states as to the value of the sand table. There was hearty agreement that its use is essential to clear teaching in the primary grades. Only a few of the teachers cared for the sand table beyond the fifth grade. Map modeling in pulp or putty by grammar-grade pupils may be worth while as an exercise in manual training, but not as an exercise in geography.

Map drawing, which formed so large a part of the geography work a generation ago, seems to have been largely crowded out of the modern grammar-school curriculum. The group of teachers referred to above were in general agreement that the expenditure of a large amount of time by the pupil on a single map, laboriously executed, is not profitable. But the rapid sketching of maps, done free hand by the pupil, was heartily endorsed by all. The outline maps sold by various publishers were generally approved by the teachers. These give correct outlines of states and countries in which the pupils, usually from memory, place cities, rivers, or mountains; shade areas of ample or scanty rainfall; indicate the industrial, farming, grazing, lumbering, or mining sections, the great trade routes,—in short, any of the larger facts in which *location* is a matter of importance.

The practice of graphic representation in geography is worthy of more attention than most teachers give it. Statistics are to be avoided in geography teaching; yet, to a small extent, they must enter. To teach the exact population of cities or the areas of states is manifestly unwise; yet, to know something of the relative areas of a few of the most important states and countries and the relative population of a few important cities is useful. The graphic representation of a few selected areas of states and countries by proportional squares often opens one's eyes to long-cherished errors which he gained by studying maps constructed upon different scales. How many Rhode Island boys realize that, if their own state be represented by a small square, more than 200 like squares are necessary to represent the area of Texas? It may be disappointing but it is also educative when a pupil who lives on the banks of the Hudson or Delaware draws a line of any convenient length to represent the length of his river, and then draws another in proportion to represent the

Mississippi-Missouri, and finds that it takes fourteen of the former placed end to end to equal the latter. A graphic representation would reveal to the pupils of New Jersey that if sixteen mountains as high as the highest in their state were placed on top of one another, the pile would scarcely equal Mount Everest in altitude. The value of graphic representation lies in the vividness of the impressions which are left on the mind by making these diagrams, and it should not be forgotten that the vividness of impressions diminishes as their number increases.

The second group of practical exercises may be termed observational. Most of them are studies of real things. Picture study is an imperfect substitute, but the substitution is often unavoidable. We cannot see the Alps or the Alhambra in America. I judge that enough pictures are used in teaching geography—perhaps too many. If the pupil is shown a great number of pictures rapidly, no clear mental pictures are retained.

My suggestion is :

First, a careful selection of a relatively small number of clear pictures which present truly *typical* scenes at home and abroad. Second, that these pictures be used for actual study, each picture being accompanied by a few written questions which shall direct the pupil's attention to the salient things in the picture.

Regarding the study of relief models and contoured maps little need be said. Teachers find them so generally lacking in the human and life elements that they do not appeal to younger children. Secondary and collegiate students may use them to marked advantage.

The study of raw materials of manufacture and their products in various stages of completion, and also the study of common rocks, ores, soils, etc., may or may not be highly profitable. It is a noticeable fact that when these objects are taken from the school collection and studied, interest soon lags. On the other hand, it is equally noticeable that if the specimens were collected by these pupils themselves, they are a genuine center of interest. They study them and talk about them eagerly. They may yawn over a lesson on specimens brought from the school museum, but be on the *qui vive* of interest over like specimens which they themselves have collected on a trip. In observational studies, interest is absolutely essential to good results; only the interested observer really sees what he looks at.

The last and most important phase of practical work in school geography is found in the visits to mills, quarries, markets, river banks, falls, or anywhere else where the pupils may see with their own eyes the actual things and processes about which they are studying in geography. As a trip to Europe differs from the printed description of such a trip, so, in a general way, does field geography differ from book geography. Weather observations, systematically made and recorded, form the reasonable basis for elementary meteorological studies. These studies of things just as we find them is the most valuable kind of education. In large cities and with large classes, field trips are, of course, so difficult to provide for that most teachers do not undertake them. However, we found in the recent session of the Cornell Summer School of Geography that more than half of the teachers present make a practice of taking their classes on field trips or factory visits, and practically all of these teachers were from large cities. I asked a great many of them, "Do you really feel that these trips pay for the time and trouble involved?" and I received in all only one negative answer. But the fuller discussion of field work in geography is assigned to another, and I must not encroach.

I have used or seen used in the class room every exercise recommended above. I have faith in them. They are, however, means to an end and not an end in themselves. Their value in practical use will depend upon the clearness with which the teacher sees the end which she is really aiming at in using them; the definiteness of her purpose and plan; and her good sense in deciding what to use and what not to use.

SUMMARY

1. Scientific teaching calls for the first-hand study of things wherever possible— the laboratory method.

2. Physical geography lends itself to laboratory treatment, but not to the same extent as do some of the other sciences.

3. In general geography most of the facts must be gained by studying about things rather than by studying the things themselves.

4. The value of geographical study is increased by the use of available field and laboratory exercises. These are both manual and observational.

5. Map sketching and outline-map exercises by pupils are a valuable means of expressing and impressing geographical ideas and a convenient means by which the teacher may test the accuracy of the pupil's knowledge.

6. Graphic representation through diagrams aids in correcting faulty notions and in getting correct ideas where statistics are involved.

7. The systematic study of pictures is a profitable form of geographical work.

8. Relief models and contoured maps are better adapted to secondary and collegiate students than to elementary students.

9. The study of specimens of any kind is most satisfactory when the pupils collect the specimens which they study.

10. Field trips, whenever possible, are the most valuable form of all practical work in geography.

PHYSICAL GEOGRAPHY IN HIGH SCHOOLS*

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PHYSICAL geography, though in one sense as old as the hills themselves, has been looked upon and is still considered a comparatively new subject. It has a brief past, a period which was not formative and preparatory, but which rather represented a cycle of inactivity preceding renewed activity or revival. Its present we are in the midst of—a period also brief— characterized by activity and accomplishment such as should be characteristic of the youth of any life—characterized also undoubtedly by some of the mistakes which necessarily accompany experiment. Toward its future we are now looking forward, to be characterized, we hope, by increased activity and accomplishment, by steadiness and stability also. It is my purpose in the following paper to give very briefly an account of the past, the present, and of what we hope for in the future of physical geography in the high schools of our country. Twenty years ago physical geography was a subject which appeared in the curriculum of public and private schools as one to be pursued for a term of from sixteen to twenty weeks if so elected by the pupils themselves. These pupils had passed through the preliminary steps of political geography in the grammar schools, where the emphasis had probably been laid upon arbitrary memory efforts in the study of political and natural features, and now found themselves confronted with new and more difficult problems in their high-school geography.

To the standard text-book of that time (Guyot's) the modern physical geography owes much, and to it also, I believe, many of the more mature students and teachers of phys'cal geography trace their first

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interest in the subject and their first inspiration along such lines. Concise, interesting, vivid, giving cause and effect their due share in the treatment of the successive problems of physical geography, those of us who studied or taught it still find its very language coming often to our lips, making a ready tool for rapid work. Other books most frequently used two decades ago were Warren's and Maury's. These books were all similar in style—in outer form the type geography of our childhood; within, the subject-matter was arranged in double columns of alternating coarse and fine print, with no attempt at illustration. They were much less attractive to the eye than our newer books. The problems which, when strictly classified, we designate as meteorological were less empirical than those of physical geography proper. Here, however, explanation was not omitted—on the contrary, much more difficult explanations were given than are now attempted. It was not upon the text-books, then, that the burden of responsibility for the unsatisfactory condition of the subject in schools rested. This was divided between the school authorities, who gave the subject no consideration, and the teacher, who, chosen for convenience sake, was often wholly unfitted for the work.

As a result of this low standing of the subject, and the low standards set for the teacher, the presentation naturally lacked much that we now consider essential. The method was purely a text-book method. Each topic was presented as a complete unit—a chapter to be opened, committed, and finished with little reference to the preceding or to the future topics; cause and consequence were but little dwelt upon, and the laboratory method was practically unheard of. Notwithstanding the adverse conditions under which it labored, physical geography was considered an interesting study from the very character of the subject-matter. The whole thing lacked vitality—lacked reality. It was presented as a series of spectacles, the most sensational being most emphasized and longest remembered. Too much emphasis was laid upon externals—too little upon structure, process, and gradual change. the idea of the impermanence of the everlasting hills was scarcely grasped, and the classification of land forms according to their phase of development was not attempted. Systematic botany and zoölogy were at their zenith, but classification in geography was almost purely arbitrary and based upon externals. Only great teachers recognized any other. Outdoor observations were purely accidental or incidental at the best, and there was only the most casual connection between the actual outdoors and the mountains and hills, the rivers and valleys of the book. Definitions were much insisted upon, and partook of the general empirical character of the teaching; they were most arbitrary and quite satisfactory if one could accept them.

The aim of the teaching of physical geography was a somewhat shifting one, in keeping with its transitory position in the course. It could hardly have been called a culture subject, nor was it as disciplinary as some of the other sciences of the schools. It was too often a stop-gap or a makeshift, and its results tallied closely with the skill and effort put into the work of preparation and teaching.

During the last fifteen years, or perhaps, more accurately speaking, during the last ten years, physical geography has made great progress. First, in popularity—it is now taught in nearly all good city schools, and appears on the curriculum in many of the smaller schools of New England and New York, while the Central West is undoubtedly more progressive in this respect than is the East. Its popularity among pupils has increased also with its wider field and with the improved methods and facilities for teaching. Its appeal to pupils, whether of mature or immature minds, is unquestioned.

Its position in the school course is a varying one, but it is a much more secure one than formerly. Ordinarily it is offered as an elective, in some schools to the first-year pupils, in others to those of the second year, while in others it is taught as a more advanced subject to the juniors and seniors, or again it may be given early in the course and then reviewed and enlarged upon later in preparation for college. There is something to be said in favor of each of these methods, even from a disinterested standpoint, and in view of the needs and requirements of each individual school there is much to be said as a reason for putting it either in the first, second, or third years. In a year's study of physical geography, whether it be early or late in the course, we find it practicable to study type land-forms, to describe them, follow their history, classify them, learn something of their human value, and finally to apply the type to other lands. We study briefly the ocean with its main features and motions, and lastly the atmosphere and its phenomena. This study is, of course, all elementary, and yet the results attained compare very favorably with those in more advanced classes—they are encouraging and very real. It enables the pupils to interpret what they have already seen; it opens their eyes and their minds to much that they have never seen; it arouses a questioning attitude and a new alertness; it makes travel doubly interesting and it is not easily forgotten. I have put elementary meteorology last in order as I do in teaching, but it is by no means last in importance or interest, and should be included in every course in physical geography, no matter how elementary.

Within the last ten years, also, new text-books have been published which mark a new epoch in the teaching of physical geography. Put forth by men of acknowledged attainments and leadership, the best ones among them bear the hall mark of authority. Attractive in form, scientific and accurate, and increasingly practical, our present-day text-book in physical geography marks the most rapid advance in value and the quality of teachableness. The very nomenclature of the modern text-book is in itself an indication of the difference between the new and the old in physical geography. Doctor Crothers has said in a recent essay that a noun is known by the adjectives it keeps, and this is quite as true in physical geography as in literature. A young river or a drowned river, a young or a subdued mountain, at once conveys a picture to the present-day student of physical geography. But a few years ago such nouns did not keep company with such adjectives, and the terms would have been quite unintelligible even to students of the subject. Cuesta and Peneplain are new nouns which convey their own meaning without associating adjectives. Progress has been made also in supplementary material to which pupils may be sent as to original sources. This is in the form of monographs on geographical subjects and state and town geographies or geologies, all of them too few in number, considering their excellence.

Under the guidance of some of the more recent of our best text-books physical geography *must* be taught as a laboratory subject, and is at once taken out of the realm of the abstract and the empirical. Laboratory work and laboratory equipment have made less rapid advance than text-books, and along this line there is the most inviting field for progressive work. Field work as a branch of laboratory work also offers most promising opportunities for the activity of original minds.

In the presentation of a subject which has the status of physical geography in the high schools of to-day the teacher is a most important element; this is undoubtedly true always, but less strikingly so in subjects where lines of work are already very definitely laid out. The work of physical geography demands a teacher technically trained, progressive, judicious in experiment, enthusiastic, and open-minded. With the emphasis now laid upon professional training, the increasing demand for technical preparation, and the increased opportunities for preparation along special lines, the number of teachers especially prepared for this subject is increasing, and with this improvement in the teaching force the quality of work done has also improved. In the more advanced schools, a college course, years of special study on the subject, or summer study at home or abroad, now fit the teacher of physical geography.

Both the impulse toward better work on the part of the teacher and the opportunities for doing better work have come from above rather than below. Because to our leading colleges, and oftentimes to single individuals in those colleges, do we owe both inspiration and opportunity. Harvard, Cornell, Chicago, and Columbia, and an increasing number of other colleges, now give courses in geography which are most valuable to teachers and advanced students, while the summer schools offer opportunities for brief but intensive work to the larger number who cannot avail themselves of the full college courses. To college professors also we owe our text-books, and, in large measure, our present tendency toward laboratory work.

If in all or most of our high schools these things were true; that there was laboratory equipment for physical geography; that it occupied an acknowledged place in the school course; that abundant time was given to it; that the text-book was scientific and satisfactory, and the whole subject in the hands of a competent teacher, then we might say that physical geography had indeed made great strides. These things *are* true in many schools, and increasingly true each year, but the fact remains that there are also many schools — some of them among the largest and best equipped—where methods of teaching prevail which are more representative of the past than of the present—a condition of things which is the result of the plan of school administration. In such schools insufficient time is given to the subject; it is frequently introduced in the school course to serve a temporary exigency; no trained teacher is provided, and in some cases no text-book. This, however, is not a permanent condition—it simply means that the whole subject is in a transitional stage. A lecture course in a high school or a brief course based wholly on the book is merely a beginning, which must soon of necessity lead to better things. The conditions now are very hopeful, and I feel almost inclined to say that those who shape the work in physical geography at the present day hold the schools in the hollow of their hands. College preparatory high schools, where the traditions are most strongly classical, have introduced and are introducing physical geography as a subject opening a comparatively new and hopeful field. Schools which offer a general course for the sake of numbers of pupils, who finish their school career with the high school, have introduced it or are ready to do so, as a practical subject suited to the needs of many pupils. Schools which attempt to do both these things must of necessity make it a part of their work and the manual training schools also. There is a very wholesome attitude of mind among people in general toward outdoor subjects, an attitude, too, which demands a certain vitality in our treatment of outdoor things, a breadth, and strength, and largeness such as can well be used when one studies the big things of nature.

The course of the high school itself is in a somewhat unsettled stage; old traditions are giving way and much that is new is being added. The work in the New Geography, so called, has been notable for its individuality, if I may so term it; one man in a college here and there has sent out teachers who, acting in the inspiration thus received, have carried the work to widely separated schools. This work has been individual not only in the sense of large dependence upon one personality, but both methods and results have been stamped with individuality.

This period has had the advantage of independence and opportunity and so it will continue to have. Until very recently no effort has been made to unify the subject work in any way. Valuable suggestions leading to greater uniformity of treatment have been made by the Committee of Ten. The outlines prepared by the National Educational Association and by the College Examination Board have also been steps toward a certain uniformity, and in New England informal conferences, participated in by teachers of geography and geology, have looked toward the same end. This individualistic phase through which we are passing is about to give way to a period of greater unity. We have been working toward the same ends, but we have pursued diverse means. By experiment, comparison, and elimination we have established certain principles of work, even in the laboratory and field work where the greatest divergence has existed. From our various experiences I think we may safely be said to agree on a few simple fundamental principles. Among others, that the subject should be largely a laboratory subject; that the laboratory work should consist partly of outdoor work, the character of the latter to be largely controlled by the natural features of the locality; that the time given to it should equal if not exceed that given to text-book work; that it should follow the order of subjects as given in recitations and should precede the recitation if possible. Our work should proceed from the general to the specific, aiming to cultivate power of inference, independence in thought, practical observation, and the ability to visualize from type forms. It should acquaint the pupil by means of description, map, or model with a large number of type forms, which he will at the end be able to classify and extend to a wider application. Both text-book work and the laboratory work should be most definitely laid out in order to obtain the best results when dealing with the immature minds of our high-school children.

Some believe that *the* text-book of physical geography is still to be written, and as this is undoubtedly true of all subjects in the school curriculum, it must needs be true in so new a field as the new geography. The great need of the immediate future is a laboratory book which shall follow quite definitely the order of work in our best text-books. Such a book would be of the greatest help in systematizing the subject and also in giving courage to teachers who have not had special training, and who dread to initiate work with which they are themselves unfamiliar. A beginning has been made and the need will soon be met by a satisfactory book of suggestion and outline. I hope the time will never come when forty exercises in physical geography shall be laid down as a necessity for the secondary schools sending pupils to college, for from the very nature of our laboratory work and material no arbitrary outlines can be followed in detail. Outdoor observations on the Atlantic coastal plain must of necessity differ from corresponding work in the old land of New England or the delta of the Mississippi. Among our immediate needs, also, I would place additional monographs on geographical subjects, and an increasing number of state and town geographies, all of them up to the standard of those at present published.

The position of physical geography in the school curriculum must be a surer one, though not necessarily an unchangeable one, that can only be dictated by the needs of the individual school. More time also is needed for its proper development. In schools which give the most attention to the subject a year is now allowed for it, and this is well; but if an opportunity could be given to large numbers of the entering class in high schools to study physical geography in an elementary way, and then this could be followed by a half year of advanced study later in the course, it would be better. In the crowded condition of the high-school course I doubt if this would be practicable in many schools. The value of physical geography being proved both as an informational and disciplinary subject, our experts in school administration will in the end give it a recognized place. Let the number of schools where geography is taught increase just as rapidly as it can be taught and taught well. It is already popular in large schools; it ought also to extend to country schools. It can be taught without elaborate equipment in such schools where working material is ready at hand and where outdoor observations can be most easily made.

As the years go on and the need both of professional and technical training among teachers is made more manifest in the schools, this demand will extend with even greater force to the teaching of physical geography, and knowing something of the liberal manner in which the teaching ranks are recuperated each year we need not fear a dearth of teachers with the necessary equipment even in this comparatively new field.

The teacher of the next few years will still have great opportunities for original work and will at the same time have as a foundation for work the practical results of others' experience. He will find a stronger popular sentiment in favor of natural sciences and a greater willingness on the part of school authorities and among the pupils to work experimentally both out of doors and indoors, and the subject will all the time be a progressive one. An opportunity to watch development and to see actual results is a greater opportunity than that of taking a subject at its height and with only the possibility of keeping it up to that point or struggling against its decline. Without desiring that the work in physical geography shall be one of absolute uniformity, it will yet be an improvement in the future to maintain a greater uniformity of general principles, a more vigorous attack and a surer touch in treatment to emphasize the process of growth and change, to recognize the human side more fully, and to build up a system of classification which shall enable the student to grasp the subject more comprehensively and give to him a working standard with which to measure the world wide.

We look back upon a period of disintegration and decay, when old methods proved their futility and gave way before the new. We are in the midst of a period marked by experiment, by rapid growth and accomplishment. We look forward to a period of increased vitality, increased accomplishment, increased certainty.

GEOGRAPHICAL NOTES

State Geography — Cause and Effect — Search Questions.— The following questions were prepared with two aims in view: First, to aid in the intensive study of one's own state; second, to aid the pupil in gaining an appreciation of the "causal sequence" in geography.

The questions are designed for use in the later part of the grammar school course, when the home state is being studied in detail, as is done in many schools. In the New Jersey State Model School this is done in the eighth, or last, year.

1. To what extent did *physical conditions* determine the boundaries of the state? Note Michigan and New Jersey for examples.

2. Did the physiography of the state favor or hinder early exploration and settlement? Note, for example, the contrast between Ohio and West Virginia in this particular.

3. What valleys, passes, gaps, or rivers favored travel in the early days? Note, for example, the Cumberland Gap and the Mohawk Valley.

4. What barriers retarded travel and still do? Note, for example, the mountains of Pennsylvania or the Cumberland Plateau of Tennessee.

5. What *natural* routes of travel has the state? These are generally river valleys or lakes.

6. To what extent have these become trade routes? Are the valleys occupied by railways? By canals?

7. To what extent are the large cities and the manufacturing industries found along these natural highways of travel? For example, nearly all of New York's large cities are along the route of the Erie Canal and New York Central Railroad.

8. Does the state occupy an advantageous position for commerce and manufacturing? For instance, New Jersey's greatest asset is its position between New York and Pennsylvania.

9. In what ways has the state's position proved advantageous for trade and manufacturing? Contrast, for instance, Maine and Vermont with Connecticut and Ohio.

10. To what extent has the industrial development of the state been affected by its mountains? Have the Adirondacks and Catskills of New York, for example, been a help or hindrance to the development of the state? What of the mountains of Pennsylvania, West Virginia, Colorado?

11. If the state was covered by the great continental glacier, what have been the chief effects of the glaciation, (*a*) as to soil, (*b*) as to drainage, (*c*) as to waterfalls and water power, (*d*) as to clay deposits of commercial value?

12. What are the leading factors in determining the climate of the state? What is the average annual rainfall?

13. Show how the farming industries of the state are influenced by the climate and rainfall. Note, for example, the Chautauqua grape belt of New York, the tobacco area of Connecticut, the wheat belt of Kansas.

14. To what extent are the rivers of the state used for commerce? For water power? In the lumber industry?

15. What are the great natural resources of the state (soil, forests, minerals, water power, fisheries)?

16. Trace the relation between the natural resources and the manufactures of the state. In some states, as North Carolina or Minnesota, there is a close relationship between the productions of the state and its manufactures; in others, as New Jersey, there is only a slight connection.

17. To what extent are the manufactures of the state influenced by the nearness of great markets like New York and Philadelphia? Note, for example, the manufactures of Connecticut and New Jersey.

18. What cities of the state are noted for a particular kind of manufacturing? For example, Paterson, for silk; East Liverpool, Ohio, for pottery; Minneapolis, for flour.

19. Is there a natural reason for the concentration of these industries in these particular cities? What is that reason?

20. What cities in the state are predominantly commercial cities? What ones are predominantly manufacturing cities?

21. What parts of the state are especially engaged in (*a*) fruit-growing, (*b*) dairying, (*c*) gardening, (*d*) lumbering, (*e*) general farming, (*f*) special farming? What are the chief reasons in each case?

22. Has the state valuable mineral deposits, as coal, iron, salt, petroleum, etc? How have these affected the growth of the state in (*a*) population, (*b*) wealth, (*c*) manufacturing, (*d*) railroad mileage?

23. Has the development of the state been rapid, slow, uniform, or intermittent? What are the reasons? What advantages has it for future growth? Why?

24. Are the effects of canals and railroads in developing the state plainly visible? Note, for example, the effect of the Erie Canal in New York.

25. How has the physiography of the state affected canal and railroad building? Contrast, for example, the difficulties to railroad building in the mountain and plateau states with those in the prairie states.

26. What great trunk-line railroads traverse the state? Note the route or routes followed by them and account for the selection of the routes.

27. Are the great cities of the state all on trunk-line railroads? Is there a good reason for this? Explain.

28. If yours is a seacoast state, has the coast been rising or sinking in the past? What effect has this had upon harbors? Contrast the drowned coast of Maine with the rising coast of New Jersey or the Carolinas, for example.

29. How has the presence or absence of good harbors affected the commercial development of the state? Show why trunk-line railroads seek to have termini on good harbors.

30. If the state is bordered by one of the Great Lakes or by the Mississippi River, show how this has influenced the industries of the state.

31. How has the physiography of the state or its position affected its part in the nation's history? For example, the Champlain Valley of New York has been the scene of eleven military campaigns. The valley is a natural highway between Canada and the North Atlantic States.

32. On the whole, what natural causes have been most important in promoting the growth of the state in population, wealth, and industry?

R. H. WHITBECK.

The Geographical Field in Indiana.—The discussion of geographical subjects in text-books is usually so general or so brief that unless the work can be supplemented by much work in the local field for the purpose of illustrating, verifying, and objectifying the points studied the results may be vague and disappointing.

Home geography is particularly valuable to the beginner, whose knowledge may be appropriately developed in literal harmony with the pedagogical maxim, "Proceed by easy steps, from the near to the more remote—from the known to the closely related unknown."

The study of Indiana geography would thus become one of the essential topics of the subject. In the school geographies used in the State the Indiana supplement usually appended should be made the center of most careful and complete study.

In this connection a brief outline of the geographical processes, features, and relations to be observed and studied in the State may profitably be considered by teachers of the subject.

In general the surface features of the State depend upon the position of the rock strata of the region. These were formed of sediment from some land surface carried by streams and currents into a sea which overspread that part of the earth's surface now comprising the greater part of the Mississippi basin. These rock layers are estimated to be from three to five thousand feet thick in Indiana. They slope or dip gently to the southwest. They are composed of shales, sandstones, limestones, and conglomerates. Observation of these rocks may be made in places where streams have cleared away the loose soil from the surface of the underlying rock or where holes have been drilled in search of gas, oil, water, or coal. If a hole could be drilled through the stratified rocks, igneous or metamorphic rocks would be found below. In the southwestern part of the State seams of coal are interstratified with the beds of rock. In the east central part the rocks penetrated by the drill give forth accumulations of gas and oil, probably derived from the fossil remains of animals formerly living in the sea and entombed in the rocks as they were forming.

As soon as the land rose above the surface of the sea in which these rocks were formed, streams took their way across its surface and began to trench their channels into the earth. The agents of weathering began to break up, dissolve, and oxidize the rocks so that a mantle of loose material was gradually formed where not swept away by running water, wind, or by its own weight on steep slopes. By these different processes the surface was gradually changed from a comparatively smooth plain to a country of hills and valleys. The surface was roughest where the rocks were hardest, for there the streams made narrow, steep-sided valleys and left high, steep ridges between. A belt of such hard rock extends from near New Albany in the southern part of the State in a northwest direction through Floyd, Washington, Jackson, and Brown counties, forming a chain of high, rough hills called "knobs." These hills are only the most conspicuous of a very rough region embraced in the counties named and in several others to the west and southwest. This is an excellent region for the study of valleys. The surface has been literally cut to pieces in all directions. Along the valley sides the edges of the rock strata correspond in number, order, and kind, indicating their former continuity. Over the whole State this work of valley making has progressed, but the farther north we go the smaller the valleys become because there they are much younger, as is the whole surface.

Streams and their valleys are valuable features for observation because of their occurrence in close proximity to all points. They furnish examples of great variety, with their numerous features, such as flood-plains, terraces, sandbars, islands, falls, gorges, etc.

The northern part of the State was formerly much rougher than at present, resembling, probably, the present hilly southern region. This was before a comparatively recent and very important event in the physical history of the State. This was what is called the "glacial period." The climate from some cause not certainly known became colder and a great sheet of ice began to gather in the region of Hudson Bay and creep southward, bringing with it the soil and stones of the region whence it came.

This creeping ice-sheet ground and scraped the rocks in its course and many elevations were lowered, while in many places the valleys were filled with the debris of the glacier called "glacial drift." This drift covers about five-sixths of the State to a depth averaging one hundred feet. A depth of five hundred feet has been found near Kendallville, Noble County. This material in most places is clay with stones of various sizes and many kinds mixed through it. The boulders scattered here and there, over many fields in the glaciated region, are among the most easily and commonly observed signs of glacial action. These stones are generally of igneous origin and must on that account have been brought from beyond the borders of the State, as no igneous rocks are native to Indiana. Many of these boulders are planed and grooved by being dragged along in the bottom of the glacier. Any gravel pit or road cut, and many plowed fields, will furnish a collection of dozens of varieties of rocks, such as granite, gneiss, syenite, lava, quartz, etc. Occasional masses of copper, grains of gold, diamonds, and other precious stones are found in digging wells. It is quite common to find portions of trees at various depths up to fifty or sixty feet. It should be remembered that in the northern two-thirds of the State the people dig cellars, wells, and ditches, plow, dig, and plant in the glacial drift. They make mud pies of it as children, and are buried in it after having lived upon it all their lives.

The surface of the drift region, though monotonously smooth, is diversified here and there by various superficial features. Among these are moraines or ridges of clay or gravel formed along the edge of the ice-sheet at many places as it melted away. These moraines are often discernible only as gentle, wavelike undulations, but they are generally found in ranges or belts extending across the country for long distances. They are numerous and conspicuous in the northeastern part of the State, where several concentric ridges run roughly parallel with the west shores of Lake Erie. An immense moraine parallels the shore of Lake Michigan at a distance of ten or fifteen miles from it. All hills, mounds, and ridges in the drift region except the sand dunes and ridges in the northwestern part are morainic in character. Care must be taken not to confuse these features with the bluffs found along the streams in all parts of the State.

Many of the morainic ridges are partly composed of sand and gravel, and domes or mounds of this material frequently form the most conspicuous elevations. Some of these heaps of gravel form the highest points in many square miles of area. They are often more or less perfectly stratified, and the pebbles in them are smooth, rounded, of many varieties, and generally of igneous origin. These facts show that the piles are due to running water, probably streams running off the edge of the ice or into holes or cracks in it and filling them with sand and gravel washed from the ice. When the glacier finally melted away the heaps became rounded down by gravity and weathering into their present outlines. Sometimes the sand and gravel have been deposited in extensive sheets, probably as deltas at the edge of the ice. Moraines composed mainly of sand and gravel are called "kames." Examples are abundant and any gravel pit not in a stream valley will repay a visit.

Cotton Cultivation.—The recent shortage in the supply of American cotton has led to an investigation of the possibilities of growing cotton in other parts of the world, so that Great Britain, and other countries as well, may not be dependent upon the United States. A British blue book has been issued recently which is devoted to "Cotton Cultivation in the British Empire and Egypt." In this volume the present condition of cotton production in the areas named is summarized. The report will prove valuable to a large number of persons. Among the most promising of the experimental districts for the growth of cotton the following are named: British Central African Protectorate, Uganda, the West African Colonies and protectorates, the West Indies, and perhaps Fiji, British North Borneo, and Cyprus.

In a paper read before the Manchester Statistical Society on February 10th last, Mr. J. A. Hutton, vice-chairman of the British Cotton Growing Association formed in June, 1903, for the promotion of cotton fields within the British Empire, made an encouraging report upon the results and the prospects of cotton cultivation in Nyassaland. The climatic conditions are there favorable, the wet season from November to April favoring germination and growth, and the dry season securing good conditions in the picking.—*Scot. Geog. Mag.*, July, 1904. R. DEC. W.

The Winter of 1903–04 in the Great Lakes Region.—The winter of 1903–04 was the coldest that has been experienced in the Lake Region since the beginning of the Weather Bureau observations in 1871. It was characterized by severe and continuously cold weather, devoid of thaws on the one hand and of periods of exceedingly low temperatures on the other. Individual months with lower monthly mean temperatures are on record, and lower minimum temperatures have also been registered, except in western New York. The precipitation was almost wholly in the form of snow, the snowfall being above normal in all districts; the greatest excess, 48 inches, was in the Huron Basin. The ice on the lakes was larger in amount than usual; the ice fields were more extensive and disappeared later than during recent years. In Lake Superior the lighthouse supply steamer "Amaranth" was fast in the ice off Whitefish Point as late as May 22, 1904. Although certain newspapers reported that the lake was frozen over solid during the winter, such was not the case. In Lake Michigan the Ann Arbor car ferries were caught in an ice field and imprisoned for nearly two months off Two River Point, Wis., and there was considerable difficulty in operating steamers between Chicago and Milwaukee and between Milwaukee and Grand Haven. In Lake Erie a car ferry was imprisoned in the ice off Conneaut from January 2d until March 11th, when it was destroyed by fire. The *Meteorological Chart of the Great Lakes*, No. 1, 1904, from which these facts are taken, contains some excellent illustrations of the ice in the lakes. R. DEC. W.

Bermuda.—*Area and Population.*—The area of the colony of Bermuda is about eighteen square miles, of which about 3,000 acres are under cultivation. Its length is twenty-six miles; its width (in the widest part), three and one-half miles; its shape, that of a fishhook. There are two ports, St. George, at the eastern end of the land, and Hamilton, in the center, inside the great sound.

The permanent population is about 17,500; to this may be added the strength of the garrison, laborers on public works, the naval and dockyard contingent, and officials and their families, estimated at, say, 5,000.

The North Atlantic squadron (British), which remains in these waters but a part of the year, may have on board from 1,500 to double that number, depending on the fleet of ships that may come into the ports.

The tourist element is to be counted on as adding, according to the records in the steamer company's offices, some 2,500 more that visit these islands in a twelvemonth.

Imports.— The local dealer therefore has as a basis on which to make his estimates for the season's business a local and transient population of about 27,000 people.

For these reasons the imports of Bermuda are comparatively very large, those for the calendar year 1902 amounting to $2,658,418, of which the imports from the United States amounted to $1,583,714; from the United Kingdom, $746,906; and from Canada, $246,511.

The nearness of New York insures prompt delivery of goods and enables dealers to visit frequently the northern markets.

Commercial travelers know the trade and are prompt in availing themselves of opportunities for placing orders.

The Dominion of Canada also comes in for a share of this trade, via the Halifax and St. John lines of steamers.

The United Kingdom and the continent of Europe supply principally the finer woolen and silk and fancy dress goods.

Products and Exports.—Bermuda holds a unique place in the western world. It is a little country, with absolutely no manufactures or railways, with agriculture alone as its industry (the annual export of potatoes, onions, bulbs, and vegetables being about $500,000), with no business but that of selling goods at retail and in a limited way the warehousing of wines and spirits; nevertheless Bermuda is of importance in the Western Hemisphere.

Bermudan Defenses.—It is the western outpost of the British Empire, considered impregnable, well defended by fortifications, but more completely by its chain of reefs that can only be passed through in daylight, needing then a skilled pilot to guide all vessels into port.

On the land the imperial government is carrying on large and important works. At the naval station and dockyard the appropriation of £500,000 ($2,433,250) was made, to be expended in five years. Other large appropriations have been made, and for very heavy amounts, for fortifications, barracks, officers' quarters, and other public works, all of which work is now started and some is well under way. The weekly pay rolls for this work is largely spent in the towns and means business activity and prosperity to all classes of the population.

Bermuda as a Health Resort.—Bermuda is also a favorite winter resort for a large number of strangers who come hither to escape the rigor of a northern climate, and who spend their money freely in every conceivable way. Of late years a crowd of visitors come in the summer months, eager to enjoy all the delights that Bermuda offers so bountifully. All this brings trade to the stores, life and activity everywhere—to hotels, boarding and lodging houses, and to the farmer and the artisan, and added to the great outlay of money made by the national government may explain why it is that Bermuda can afford to import so heavily, pay its bills, and continue to prosper.

Eggs and Poultry.—The imports of eggs and poultry seem to be inexplicable, considering the ease with which poultry can be raised here. In 1902 there was imported in eggs alone some $8,000 worth, and poultry in proportion, and this was done even with a duty on eggs, recently imposed, of 6 cents per dozen. The price of this commodity never goes below 30 cents per dozen and that for a short time only, soon rising to 50 or 60 cents per dozen. It would seem that here is an opportunity for some skilled and enterprising man to establish a paying business.—*Consular Reports*, March, 1904.

Poultry and Eggs.—Few people have any adequate idea of the extent of this vast industry, because it is generally considered on a small scale as a mere side issue to something else. Viewed in the aggregate the totals are so vast as to require comparison with other great industries to aid the struggling comprehension to grasp the situation.

The latest available statistics show that last year the poultry and eggs produced in the United States were worth more than all the gold and silver mined in the world during the same year. Except for the year 1900, the egg product alone of this country has exceeded in value that of its combined gold and silver output for every year since 1850, which takes in the entire bonanza period of our history. That, with the poultry product, also exceeds in value the wheat crop of twenty-eight of the most fruitful states and territories.

Consider the discussion raised by politicians over threatened ruin to beet sugar and wool. How earnestly they appealed for higher tariffs and made protests against reciprocity propositions! Yet in 1902 our whole sugar production amounted to only about $20,000,000, while the wool industry is only about a third as important as the egg and poultry industry. In Missouri alone, the fourth poultry state in the Union, recent statistics show that the poultry products in a single year exceeded all the other products of that state combined by about $17,000.

Prof. George F. Thompson of the agricultural department estimates the total value of the annual output of eggs in this country at $145,000,000 and the value of poultry at $139,000,000. The value of the combined poultry and egg product is thus nearly double that of the precious metals.

Recent statistics show that Iowa easily leads in the production of eggs, its yearly product being 100,000,000 dozen. Ohio comes next with 91,000,000 dozen; Illinois is third with 86,000,000 dozen, and Missouri fourth with 85,000,000 dozen.

A crate of eggs contains thirty dozen. A refrigerator car will carry about 4,000 such crates. Some one fond of figures calculates that to transport the annual egg production of the United States would require a train of cars long enough to reach from Chicago to Washington, 868 miles, and then have a few cars left for another train. If you like to mix your eggs with multiplication and division you can figure out the correct solution of the egg train problem.

Packing Poultry and Eggs.—A single large packing company, the Armour's, has nearly 100 cold-storage warehouses scattered through Iowa, Illinois, Missouri, Kansas, and Nebraska. Most of them are fully equipped with machinery for dressing poultry and employ experts to examine the eggs. A recent writer thus explains what is done there:

The buyer who goes around in a wagon picking up eggs, chickens, and butter from the farms and the country grocers brings his load to one of these cold-storage warehouses, where it is placed in cold rooms until it can be examined. Every egg and every chicken is carefully scrutinized. The eggs are divided into three classes. The "firsts" are packed in cases and shipped by refrigerator cars to Chicago, Omaha, or Kansas City and stored away to remain until they are needed. There are storehouses in Chicago that will contain 350,000 such cases. The "seconds" among the eggs are packed in a similar manner, but are shipped immediately to market, while the "thirds" go to the tanneries and other manufacturing establishments to be used for various purposes.

Poultry is treated in the same way, and spring chickens are stowed away until they are needed to meet the winter demands. The "spring" chickens or "broilers," as they are better known to the market, can be had the year round. This is not entirely due to the cold-storage system, however. The introduction of incubators is responsible for much of it. An incubator can be made to hatch out a brood at any season of the year, and modern poultry farms are so arranged that the chicks can be protected from the cold and fattened in the winter as well as in the spring and summer. Notwithstanding the incubator, October, November, December, and January continue to be the biggest months for buying poultry, while April and May are the largest months for eggs.

It is estimated that 4,000,000 cases, each containing thirty dozen eggs, were stored over last winter in the cold-storage warehouses of the United States, and 100,000,000 pounds of poultry, killed during the fall and early winter, were packed away and preserved for the higher prices of the late winter and spring months. The volume of this business runs up to the enormous total of over $1,000,000,000 a year.

Cold Storage of Eggs.—To-day the prices of eggs are definitely controlled by the cold-storage houses. The demand seems to be always equal to, if not greater than, the supply. It is estimated that every five years the consumption of eggs doubles, and only the success of cold storage keeps down the prices. In cold-storage houses eggs may be kept for an indefinite time as fresh as if they were just laid. The secret of success in this matter lies in careful sorting and packing of the eggs at a uniform temperature.

An old picture in the Dresden gallery represents a Dutch housewife "testing eggs," and shows that the modern method was in vogue more than a hundred years ago, except for the substitution of a strong electric light for the oil lamp. The interior of the egg is examined by the light which shines directly through it. If a perfect ball of rosy red is found floating in clear liquid in a clean shell the egg is fresh. If there is a slight vacuum at one end it is fresh enough for ordinary use. Evaporation has set in, but for cake-making and for many purposes this egg is better than a perfectly fresh one. Finally, when the egg has decomposed, the yolk sticks to the shell; it is stale and unfit for use, though it may not be odorous. Eggs which this test shows to be practically fresh may have been laid for months, while those that have not been properly stored will not bear "candling," though laid only a few weeks before.

The cold-storage houses begin to store eggs in February and stop storing after June until cold weather comes again. In the hot, sultry weather of August eggs, like all other perishable products, spoil easily, and are usually unfit for storage purposes by the time they reach market.

The first eggs to reach the great packing houses come from the far South. In March the Middle States send in their eggs for storage. In April and May eggs from the North and Eastern states reach market in great quantities. Before the end of June there are often a thousand carloads in market to be stored for the dull season "when hens will not lay."

At these packing houses the temperature is kept at thirty degrees Fahrenheit by means of pipes through which brine circulates, just as steam does in modern houses. The secret of storing eggs successfully consists in keeping them at two degrees below freezing point, in surroundings of spotless cleanliness, and in sorting those that have begun to be stale from the strictly fresh.

Preparing Poultry for Market.—The *American Cultivator* says a poultryman of Sydney, Ohio, has a contract with a Cleveland commission firm to furnish 100 dozen eggs each day, with the date stamped on them. The contract price is 20 cents a dozen. It is certainly worth this man's while to have his hens attend strictly to business, as they are evidently doing, for he is filling his orders as regularly as clockwork.

This same man has a different contract with another firm. He agrees to furnish daily 300 young chickens weighing one and one-half pounds each, for eating purposes. He gets $3 per dozen for these broilers. He manages to keep up with this big undertaking by using thirty improved incubators, that are not all filled at the same time, but are proportioned so that some of them can discharge fresh chicks each day. A large and competent flock of barred Plymouth Rock hens are kept constantly on duty laying eggs with which to stock these hatching machines, and 450 eggs are placed in them each day.

In connection with the incubators there is a row of pens numbered from one to ninety. Each day the little chicks from the machines are turned into the first pen. They are advanced one pen each day, and when the last one is reached they are ninety days old, weigh one and one-half pounds, and are ready for the market. They are herded from the incubators through all of the pens without being touched until they are ready for the frying pan. A certain proportion of the eggs do not hatch, nor do all that are hatched live to make the trip through the ninety pens, but the percentage of loss is comparatively small, and the breeder finds that the 450 eggs which go into the incubators every day easily net him 300 perfect broilers at the coops, which are shipped to the city daily from pen No. 90. In order to carry out this system and meet his contract it will be seen that the poultryman has something like 13,000 chicks constantly on hand, to say nothing of the hundreds of dozens of eggs tied up in the incubators, or of the great flock of laying hens that supply the eggs. But he gets to market with his daily order and is reported to be making a profit of $25,000 annually.

Studying the Business.—By intelligent management, not the kind that vaguely wonders what sort of luck they'll have this season, but by a clear understanding of the care of poultry and the various details of the business, poultry raising, even on a small scale, can be made to realize what a shrewd business person would deem enormous profits, often as high as 75 or 80 per cent.

To furnish proficiency an unusual school has been established at Waterville, N. Y., the Columbia School of Poultry Culture, with college and university graduates on its faculty and special courses in the care of waterfowl, geese-growing, turkeys, pheasants, guinea and pea fowls, pigeons, and bees, in addition to the regular course with chickens. This school is conducted in connection with a poultry plant that annually raises 5,000 chicks and winters 2,000 layers.

International Egg Trade.—The 1901 issue of the *Yearbook of Agriculture* reported more than 233,000,000 chickens on farms in the United States, and while this poultry and its egg products are mostly for the home market, yet we make large exports of eggs. The United Kingdom, the largest importer of poultry and eggs in the world, buys in nearly twenty countries about 40 per cent of the eggs consumed there. Russia is rated as the largest exporter of eggs in the world. Japan imports many from China, where they are cheap. Denmark has a large export egg trade. Many Danish eggs are marked on the shell with a stamp so the person selling them can be identified if they are inferior. Italy is a large egg exporter.

It is only recently that we in the United States considered it worth while to impose a duty on foreign eggs, and when that was done it was rather to make our tariff schedule symmetrical than because of any conviction that it was necessary.—*Intelligence*, March 15, 1904.

EDITORIAL

CLUBS OF GEOGRAPHY TEACHERS

MANY teachers have returned from their summer vacations full of enthusiasm for geography because they have visited a new and interesting region, or have come under the inspiration of a leader at some summer school or teachers' institute. They are full of a desire to make their work in geography more efficient and to do something to make the value of geography more appreciated in their community.

One very helpful way in which advance can be brought about is through the formation of a club composed of all the teachers in a community who are especially interested in geography. Such clubs have been formed in many places and have proved of great value not only to the teachers interested, but their work has helped the whole community. A club to be effective should be as simply organized as possible. There should be no long lists of officers, and the initial plans should be simple and easily accomplished. A leader or a committee to plan work and keep the movement going, and subcommittees to carry on special lines of work, is probably the most effective organization at the beginning. With increased strength and increased confidence the plans of work may be elaborated.

The chief advantage of such organizations is the opportunity for exchanging ideas as to ways of teaching and of becoming better acquainted with one's colleagues. The opportunities for mutual help are, however, almost unlimited. The different committees can bring to each meeting brief summaries of the literature pertaining to the different fields in which the individual members are interested. Such summaries should be presented in such a form that others may readily make use of the references in their class work. Maps and illustrations should be reviewed in the same way, for no geography teaching can be effective unless based on the best maps and a few of the best pertinent illustrations.

Another way in which such a club can be of help to the individual members and to the community is by furnishing suggestions to the officials of the town or city library as to the purchase of geographical books for general use. The club can also help by summarizing such books and bringing them to the attention of pupils and parents by notices posted on the school or library bulletin boards, or both. Many libraries contain many books of great value geographically, but are little used for geographic reference because the resources are unknown. Many librarians neglect geography or, in their innocence, buy books that can only be classified geographically as trash, and would be glad of interested advice even though it be partial.

The opportunities also of helping in organizing a strong course of study in geography, and in planning and conducting excursions for pupils and teachers, are almost limitless in any locality. In fact any club will find so much to do that the danger is they will do little through trying too many things at once.

There are two primary facts that must be borne in mind by any club: First, that a few things well done are more beneficial than many things just touched superficially; and, second, that geography is a wide subject and should be treated as such. In spite of our school texts and the advance along certain lines in America within the last few years, geography is not all physical geography or economic geography. Geography, as a subject of discipline or of culture, is many-sided, and no student of geography, and particularly no teacher of school geography, can afford to become so much of a specialist in one branch as to neglect all reference to the other sides of what may be called general geography.

The editors of the JOURNAL will be glad to know of the organization of Teachers' Geography Clubs, and will help in the work in any ways they can.

REVIEWS

Commercial Geography of the World Outside the British Isles. By A. J. Herbertson. Pp. 268. London and Edinburgh: W. & R. Chambers, 1903.

Herbertson's "Commercial Geography of the World" is a companion volume to his "Commercial Geography of the British Isles," published in 1899, and noted in this Journal, Vol. IV (old series), p. 38.

Teachers in America are, or should be, acquainted with many contributions to Educational Geography from the pen of Dr. Herbertson, primarily for use in the United Kingdom, but of great value in America. This latest volume from his pen is not as serviceable in America as some of his other volumes, but is a good book of reference for all.

The first fifty-seven pages form an excellent summary of the general principles of geography necessary as a basis for the understanding of regional commercial geography to which the rest of the book is devoted. These introductory chapters are well arranged, simple and readable, and remind one of his excellent and indispensable volume entitled "Man and His Work."

The chapters devoted to Regional Commercial Geography are simple and logically arranged, but for American teachers are not as serviceable as several of the commercial geographies by American authors.

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EXCURSIONS IN COLLEGE GEOGRAPHY*

BY WILLIAM HARMON NORTON

Professor of Geology, Cornell College, Mount Vernon, Iowa

THE excursion in geography is based on two fundamental principles of education. It has long been recognized that first-hand knowledge must form the foundation on which all other knowledge of a subject rests. Nor is it questioned that in higher education training in research is more than information. Learning is not enough to make the scientific scholar; he must be trained to observe, to arrange, to compare, to draw inductions, to propose hypotheses and test them, to solve the problems of his science.

If the application of these principles has been less thorough in geography than in other sciences, it is only because of the difficulties inherent in our subjects. The phenomena with which we deal are for the most part too large to be brought to the laboratory for observation and experiment. If we study them first hand and with the technic of research it must be in the field.

The excursion, therefore, in the earth sciences has the same place as the laboratory has in other studies; it gives first-hand knowledge and definite and accurate conceptions of reality; it teaches the methods of investigation. The field has a smaller place in teaching geography than the laboratory has in other sciences; but this is not because its value is underrated, but only because it is less manageable than the laboratory as an educational instrument.

As outdoor laboratory work the excursion meets with climatic difficulties. In latitudes of severe winters it is suspended during much of the college year. Our schedules must be arranged—perhaps I should say disarranged—so as to bring the topics where field work is most needed at the beginning or at the end of the year's courses. The field work thus crowded into a few months of fall and spring

* Read at the Eighth International Geographic Congress.

is restricted further by the weather, and how serious this restriction may be, those teachers know who have experienced an October or a May of rainy Saturdays. The uncertainty of the weather makes it difficult to arrange our programs in advance, and the field meet designed to introduce or to illustrate a given subject must often be postponed until it has lost its pertinence or be given up altogether.

Nor is it easy to avoid conflicts with the other engagements of our students. In most schools the excursion cannot be assigned definite place on the college roster, and the regularly scheduled exercises of each day hold the right of way against it. The excursion cannot be limited to the hour or two allotted to other college exercises, but requires often half a day at least. Conflicts are therefore numerous where it must be foregone in favor of recitations or other scheduled exercises. It is thus usually deferred until the Saturday holiday, where it competes with athletic sports and unduly lengthens the working week both of student and instructor. In some schools the employment of student assistants permits an excursion to be scheduled on the college roster for four afternoons a week, and the student registers for field work on that afternoon of each week in which his time is free. Such a delightful comity prevails in several universities that students are excused — "cheerfully excused," one correspondent writes me—by their departments for absence on excursions, though of course the work is to be made up later. But I see no general relief in sight from these conflicts until the excursion comes to be considered as a college sport instead of an essential part of scientific education. When the field day in geography is once placed on the same plane with football, our students can be taken by the day and week hundreds of miles away and excused from all their classes meanwhile.

Certain difficulties are more or less inherent in the excursion. The number participating may make it impossible to give close supervision and direction to the individual student. Our young people, exhilarated by their unaccustomed release from sedentary tasks, tend at first to look upon the excursion as an outing and to take an attitude of mind more suited to a picnic than to serious study. As the field meet is held more often, and as students are sent out in small parties each in charge of an assistant, such difficulties diminish, and they practically disappear with thoroughly interested students and those in advanced courses. To meet these difficulties, however, requires all the qualities of the successful class room and laboratory instructor raised to the *n*th power. The important problems must be set clear in view, investigation must be directed, and the attention of the class is to be held under circumstances which cannot fail to be distracting. To make the exercise to all who take part in it one of earnest intellectual effort without impairing its natural pleasure taxes a teacher's skill if not his patience, and requires a thorough knowledge of the local field, studied preparation of methods, and experience in this kind of work.

So various are the subjects studied in the field and the purposes in view, that even in elementary courses no uniform methods are adopted. Any lecture is certainly out of place. A short demonstration may be useful in closing the exercise, or such a review may be postponed to the recitation hour when the students' papers on the excursion are presented.

In general, the end of the excursion is best met by whatever method rouses the student's interest and effort and leads him to describe accurately what he sees and to think out clearly the causes of it for himself. That field work has the greatest zest, I think, to which the student brings for solution problems which have already risen in the lecture room and laboratory. He holds in mind various hypotheses by which the facts might be explained, together with the critical phenomena which would decide in favor of one hypothesis or another, and his search for these decisive evidences can hardly fail to be diligent and fruitful.

In many cases problems cannot well be brought before the student until the field is reached, but here also they may be set forth with advantage early in the exercise rather than at its close. Facts which might seem trivial so long as they were unrelated details of observation gain dignity when they are seen to lead up to large conclusions. Thus in the study of the not uncommon sections in the middle west of the United States, where deeply decayed rock mantled with residual clay is overlain with till, the question whether the rock decay is older or younger than the deposit of the till may be raised as soon as the general relations of the section are well seen. With this problem in view the discovery of fragments of residual clay kneaded in the till becomes to the student one of the first importance, proving the clay preglacial and that a continental glacier may move over rotten rock and its residual clays and leave them disturbed but little.

Some topics may best be opened in the field without the preparation of any previous study. Investigation of a section of the drift may well begin class work on glaciers. The characteristics of loess are better learned at outcrops than from any text-book. Care is needed to advance no step beyond the facts open to observation and the inferences which may be drawn clearly from them. Least of all in the field is there place for the dictum: Thus saith the authority. If questions rise to which the facts before us give no answer, let them go unanswered for a while and trust to an awakened curiosity to continue the search. The active, investigative attitude of mind is to be encouraged, not the passive attitude, the listening ear.

Individual effort is stimulated by requiring of each student a formal report of his work. His field notes are written fully on the spot. With beginners, suggestive questions are needed at every step, and before any subject is left some notes may well be read for correction and addition by the class, while the appeal in case of disagreement can yet be made to Nature. Sketches, maps, and diagrams are prepared, and may be inspected also as far as possible, on the spot. Some pains are taken by the instructor to have the reports conform to the rules of scientific writing. The uninitiated need warning to avoid all that is subjective, to omit references to the weather, the route, and incidents of the trip, and to describe in simple phrases the things which they have studied, stating logically the inferences which they have drawn.

Even in elementary courses considerable is taught of the use of instruments—the compass, the hand level, the aneroid, the clinometer. Distances are paced, dimensions and angles of slope are estimated by the eye as well as measured afterward. Contour sketching is practiced in the field and the data taken for the preparation of maps and sections.

In more advanced courses, study, mapping, and technical description are made more systematic. Small areas are mapped with the plane table. Students are given special areas to work out independently and their final reports rise to the dignity of theses.

There is one general preparation for the excursion which I am convinced is greatly needed. If our students do not "tackle" well the problems of the field, it is probably not only because of their inexperience in outdoor study, but also because they are unaccustomed to solve problems in the class room. Lectures, library references, and text-book recitations do not encourage the investigative attitude of mind. The departure most needed in our text-books and our teaching is the wider, freer use of problems, whose function in our inductive science will be that of the exercises of inventional geometry. If, for example, the means of discriminating contemporaneous lava flows from sills have been worked out in class room and laboratory exercises, one of the best possible preparations has been made for an excursion to some outcrop of the traps of the Newark system of the Connecticut Valley or of northern New Jersey, often visited by students.

The scope of the excursion is limited. The field accessible to the most favorably located school is far from embracing all the phenomena of earth science. All topics cannot be studied in the field, nor need any topic be studied there alone. But if the excursion secures even a little first-hand knowledge, that leaven will permeate and vivify the entire body of knowledge of our science. A little field study of land forms, sufficient to make the subject real, to develop the topographic sense, to give some few type specimens for reference, to bring into clear view the slow, sure workings of earth forces in the present and in ages past, to train in methods of research — even a little field work will lay the foundation on which the superstructure may be raised by other means.

Models and photographs are only a step removed from Nature. To study a good model, such as that by Howell of the Chattanooga district, might almost be called field geography. The photograph projected by the lantern of the glacier, the sea cliff, the lava flow, the desert dunes, or the dissected peneplain, gives almost the sense of reality of the view of the thing itself, and is to be studied by much the same methods of the excursion—as phenomena to be described, presenting problems for solution. When contour mapping has been well learned in the field, topographic maps and charts open up the land forms of a large part of the world to laboratory study.

Every college teacher knows how greatly the excursion is still needed even in its elementary exercises. Our students have not seen things nor have they learned to see things. Only a small per cent of college students, at least in the western states, have done field work in secondary schools. The attention of most of our students has never been called to the phenomena of our science. Of course they have not seen them, any more than they have seen the structures of leaves and flowers, unless they have studied leaves and flowers in botany. The training which students have received in other studies is not our training and cannot take its place. As one's memory for faces is not strengthened by committing vocabularies, so a critical observation of Greek accents, or of organic tissues under the microscope, does not make the student ready to read the lessons of the sky line and the profiles of hills and valleys. On the whole the conceptions of the college student in our science as he comes to us are faint and hazy—undertimed, under developed, and unfixed negatives—and are derived largely from words and not from things. His education has been largely bookish. The study of nature in the field throws the average student into a new element where the support of authority is wanting, and he is decidedly uncomfortable until he has learned to swim. Our students crowd about the instructor to obtain some authoritative word for their field notes far more eagerly than they turn to investigate a section for themselves. The conception derived from books of what they ought to see blurs the impression on the retina of the thing itself. Thus students standing in the dry channel of a little brook have told me that the pebbles were well water worn and rounded, while in fact they were subangular stones washed from the adjacent bank of drift. The university student who, on a field trip to an interesting Ordovician shale, packed with fossils, flat lying, and hardly altered from the sea mud it once was, cried out after the instructor's demonstration, "But, Professor, where is the volcano which threw out all this stuff?" is an exceptional case, but I infer that she was studying volcanoes at the time.

From communications from many American colleges and universities giving in detail the field work done in earth science, I am assured that the excursion holds an increasingly large and valued place. In a number of elementary courses outdoor laboratory work counts one-third. In general our best higher schools can say in the words of one of my correspondents, "We have all the excursions we can get in."

It is in the University Summer School, or Summer Quarter, where the students' entire time is at command, that the excursion has developed to its best. Field courses are offered by a number of our schools, in which small parties of advanced students spend five weeks or more of the summer in camp in the serious study of some area. Among the regions where such investigations were in progress in the summer of 1904 were eastern New York, central Wisconsin, the Lake Superior region, The valley of the Mississippi bordering Illinois, the Black Hills, the Big Horn Mountains, the Colorado Rockies, the Great Basin ranges of Nevada, the Grand Canyon of the Colorado

River, and the Hawaiian Islands. An equally thorough training for the cadets of our science is afforded where, as at least in four states of the Union, the State Geological Survey is so closely connected with a university that capable students are employed on the field work of the survey during the summer vacation.

It is from these university field courses and from work on the United States geological survey, the geological survey of Canada, and the various state surveys that young American geographers are now graduated.

RESPONSE TO SURROUNDINGS—A GEOGRAPHIC PRINCIPLE

BY R. H. WHITBECK
State Model School, Trenton, N. J.

PROFESSOR DAVIS, giving a modernized extension of Ritter's view, says: "The essential in geography is the relation between the elements of terrestrial environment and the items of organic response." He would not confine geography to the study of the earth as the home of *man*, but would carry the inquiry so far as to include the relations between the earth and all living things.

It does not require a scientist to note how prevalent is the principle that living things—plant or animal—are singularly adapted to their environment. It is, however, a relatively modern view to look upon all organic forms as a response to that environment. Once men thought, and not unnaturally, that all living creatures are made *for* their particular surroundings. We now see that they are as truly made *by* those surroundings; nor does this view exclude the operation of a divine intelligence in nature.

Modern geography, when dealing with the science maturely, is seeking to trace and establish the relations which exist between living things and their physical surroundings. As man is the most important and most interesting of earth's inhabitants, he is naturally the center of interest in the study of geography. But, owing to man's superior intelligence and his power over his surroundings, it is not always easy to determine how far his activities are governed by his earth surroundings and how far he has subjected them to himself. The oceans and the mountains were once very serious barriers to human intercourse. Now man has largely vanquished these barriers, as such.

With creatures lower than man, however, physical environment amounts almost to actual control. The various species of plants and animals have each responded to a particular set of surroundings; every organ is delicately adapted to just these surroundings. They are the creatures of their environment and, for the most part, they cannot exist outside of it.

Life seems to be the most aggressive and insistent thing in the world. It is found almost everywhere, in the cold climates and in the hot; in the dry and the wet; in the earth, under the earth; in the air and in the sea. No matter what the conditions may be, some creature is happy there. It just suits him, for he is made for and by just such a place. The bird lives in the *air* and so requires some organ to get the oxygen from the air for his use; hence, lungs. He moves in the air, hence he has acquired a fluffy coat of feathers, light, hollow bones and relatively large wings. If he varies his habits and swims, he has webbed feet. If he wades, he has long legs and neck. If he scratches, he acquires sharp toes.

The fish anatomy is a response to a different kind of environment; not air, but water—a much more dense and buoyant fluid. The fish doesn't need feathers, and hollow bones, and feet; so his epidermis develops scales in place of feathers; his appendages become fins instead of wings and feet; and he gets oxygen by means of gills instead of by lungs. He would have had lungs if they suited his purpose better than gills, but they do not. The bird swims in air and the fish in water, fluids of different density, hence the difference between the bird's fins and the fish's. Furthermore, the anatomy of the bird, for example, is not simply a response to an aërial life, but it is a response to an aërial life on the *earth*. The earth's atmosphere has a particular composition and density. Were there different proportions of oxygen and nitrogen in the air, or were the air of different density, the whole bird anatomy would have been different. So, also, in the case of all breathing things. The structure of birds on Venus or Mars, if birds there be in those worlds, is a response to a different set of conditions from those on the earth; hence those birds are not like the ones with which we are familiar.

The distance of the earth from the sun, the density of its atmosphere and the inclination of its axis largely determine the intensity and distribution of the heat that we get from the sun. In these particulars no other planet is circumstanced like the earth, and it follows that no other planet supports life of the same kinds that flourish here.

But not alone do some creatures respond to aquatic surroundings with scales, fins, and gills; and some to aërial surroundings with feathers, wings, and lungs; and still others to a terrestrial home, with hair, legs, and feet, but there are a myriad of variations in these responses. The camel has fitted itself for a desert life with padded feet, calloused breast and knees, protected eyes and nostrils; with a system of stomachs marvelously adapted to long activity without water, and a hump of stored-up fat for a long journey with little food. Was the camel made for the desert or by the desert? Both.

The tree that grows in the open, spreads its branches. Its trunk is relatively short and its branches broad. The same tree growing in the forest is tall, with branches far above the ground and relatively short. In each instance the tree is developing the shape that best facilitates its efforts to get light and air. The whole plan of a tree is a response to its habitat. It gets food in solution from the soil, and the tree adapts the number, length, and distribution of its roots to the kind of soil in which it lives. That it may expose the largest possible amount of surface to the light and air, the tree sends out a million leaves, broad, thin, light, and so disposed as not to shade one another to an unnecessary extent. If the tree grows far up on the mountain side, it is exposed to winds and snows. A tall tree with wide branches would invite its own ruin, so the tree on the high mountain slope grows short and gnarled and very tough, almost hugging the mountain side. Wherever the plant grows it adjusts itself to the conditions in which it must live.

The cactus lives in the arid lands. At the best it can secure but little moisture. The air and soil are dry and hot most of the year. A little rain falls and the cactus must make this little go a long way. It must contrive to hold all the moisture it can get. Leaves on plants are evaporating surfaces, so the cactus will have no leaves; it dispenses with them; its stems grow thick and massive and they branch but little. It exposes the smallest possible amount of surface to the hot sun and thus the cactus lives through the hot, dry season. It has responded to its particular environment.

Man, too, feels powerfully the influence of his physical surroundings and out of those surroundings he develops many of his traits of character. One type of man lives in the cities of the plain and quite another type in the mountain defiles of Switzerland or Scotland. The sunny skies and soft air of Italy nourish music and poetry and art, but the rock-bound coast of Norway breeds a race of vikings. The rocky soil and the cheerless winters of New England intensified the cold philosophy of the Puritan; and the softer air and warmer suns of the South had a part in creating the gentler and finer manners of her people. The tonic force of our northern winters has not a little to do with the restless energy, the dash, and the push of northern enterprise.

A writer in this journal has pointed out that the success of the English and Americans on the sea is, in part, attributable to the superior skill attained by their seamen in the uncertain waters of the prevailing westerlies; while the disasters which have so often attended the navies of France and Spain are equally attributable to the inferior skill of their seamen, trained more largely in the belt of the trade winds, where conditions are more uniform and less trying to the sailors.

Says Professor Geikie* of the Scotch Highlander: "Placed in a glen often narrow and rocky, and separated from his neighbors in the next glens by high ranges of rugged hills, he has had to contend with a scant and stony soil and a wet, cold, uncertain climate. . . . Like his own granite hills he has grown hard and enduring, not without a tinge of melancholy suggestive of the sadness which lingers among his wind-swept glens and that hangs about the birken slopes of his lonely lakes."

It is true that man, with his superior intelligence and freedom of movement, may choose where he will live, and then, by his knowledge of the arts, he may greatly modify his natural surroundings—make a Biltmore in the mountain wilderness of North Carolina or irrigate the desert of Southern California into an orange grove or vineyard. Yet he can never get away from the influence of the skies, the soil, the climate, and the scenery amid which he lives; and when these influences have borne their ripened fruit in the settled characteristics of the people, it will be seen that a people that has lived many generations amid any set of surroundings is mentally and physically a response to those surroundings.

* *The Scenery of Scotland*, p. 436.

TRANSPORTATION

PART III

BY JOHN THOM HOLDSWORTH
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THE RAILROAD ERA

THE third great period in the history of American transportation is the railroad era. Extending from about 1830 to the present this period has witnessed one of the most striking developments in the entire history of industry. Though it covers but the span of a human lifetime, yet it has marked the working out on this continent of industrial and commercial achievement more signal, more far-reaching than that of any similar period in modern times. In these seventy years the country has grown from a few scattered states with a total population of twelve million and an annual commerce of $134,000,000 to an empire whose 80,000,000 people have spread over the entire land, pushing the railway ahead

FIG. 14. *The Conestoga wagon, the predecessor of the freight car in the Middle Atlantic States*

of them or dragging it after them, and exploiting its every resource, animal, vegetable, and mineral, until to-day the foreign commerce totals the amazing sum of $2,500,000,000, and the domestic trade almost fifteen times as much. In this great evolution no single influence or agency has contributed so much as the railway.

An English observer writing of our transportation says: "It has been a magician's wand, calling towns into existence on the naked prairie, raising towns into cities and cities into world-famous hives of wealth and industry. It has conjured up fortunes out of nothing and multiplied values ten, twenty, aye, often a hundredfold.

The cuts and maps for this article have been used by permission of D. Appleton & Co., New York, from *American Railway Transportation* by Emory R. Johnson.

Millions of well-fed, well-paid laborers enjoy its blessings without ever thinking to what they owe them. The busy factories of New England and the mammoth stores of Chicago have sprung from it as directly as the silver mines of Colorado or Nevada. The wealth-creating power of North America is to a very large extent the product of its wealth-distributing facilities. But for the capacity of the railways to carry wheat from the Missouri River to the Atlantic coast for a few cents per bushel there would have been no wheat farms west of Chicago, and many of the richest agricultural states in the Union might still have been in possession of the buffalo and the red Indian." "The railway is the best measuring-stick with which to mark the industrial advance of the American people."* The writer quoted above says further: "Not only did American railroads open up the country and lay the foundations of a prosperous agriculture, but they created directly or indirectly most of its staple industries. They furnished the best market for domestic iron and steel. They supplied cheap fuel to every industrial center. They were the principal importers of foreign labor and capital. They provided the materials for a distinctively American stock market, out of which grew in its turn an American system of finance. For years the history of the railroads was the history of the country."

The influence of the railway in the development of our vast grain fields, cotton plantations, slaughtering, mining, quarrying, and lumbering industries—in that great territorial division of industry which has given this country first place among the industrial nations of the world—may be traced most satisfactorily, perhaps, by noting the stages in our railway growth.

The history of American railroads may be divided, roughly, into four periods:

1. Construction 1830–1850
2. Consolidation 1850–1870
3. Combination 1870–1896
4. Merger or community of interest . . . 1896–

THE CONSTRUCTION PERIOD

The tram road was the immediate predecessor of the railroad in this country. The first of these, opened in 1826, was used for hauling stone for the Bunker Hill Monument from the Quincy granite quarries to a wharf on the Neponset River. The Mauch Chunk

* Lawson, *American Industrial Problems.*

tramway, opened in 1827, was intended for the transportation of coal. In 1828 the Delaware & Hudson Canal Company opened the Carbondale & Honesdale tramway connecting their coal mines with the D. & H. Canal. The first locomotive seen in America was imported for use on this road.

The first full-fledged railroad was the Baltimore & Ohio, a section of which, fifteen miles long, was opened in 1830. At first, horse power and even sails were used, but in 1831 the company purchased an American locomotive for its road. The system was slowly extended until in 1835 it boasted a total length of 135 miles. By 1834, however, the Charleston & Hamburg, a South Carolina road chartered in 1829, had 137 miles in operation, and for a short time enjoyed the distinction of being the longest line in the world under one man-

FIG. 15. *The stage-coach, generally used for passenger travel before the introduction of the railroad*

agement. Pennsylvania had by 1835 about 200 miles of railroad, mostly coal roads; New York, New Jersey, and Massachusetts about 100 miles each, and Virginia a few short lines. In 1836 a line, subsequently to become a part of the powerful New York Central, was opened between Albany and Utica, and six years later Buffalo was reached. Meantime lines had been extended from Boston and New York to Albany, so that railway communication was effected between the Great Lakes and the seaboard. As early as 1834 the western end of the Camden & Amboy road was opened, and in 1837 regular communication between New York and Philadelphia was established. In the same year Philadelphia and Baltimore were connected by the Philadelphia, Wilmington & Baltimore. The Philadelphia & Reading, built chiefly as a coal road, was completed in 1838. Philadelphia was connected with Columbia in 1834 by the Columbia road, the first division of what is now the great Pennsylvania Railroad System.

New England was especially active in railway building during this period. By 1835 three lines radiated from Boston; one to Providence, another to Lowell, and a third to Worcester. The whole line from Boston to Albany was completed in 1842, and constituted the first important through route in the country. Writing of railroad construction in this period, Hadley says: "If we look at the railroad map of the United States in 1850 we find that the New England system has developed its main outlines; that the Middle and South Atlantic States have seized the idea of their lines of development, but have not as yet carried it out, while the States of the Mississippi Valley are just making their first experiments in railroad construction. In Ohio, part of the Cincinnati, Sandusky & Cleveland had been built about 1837. But it had for a long time stood alone. It was not until 1848 that through rail communication, by any route whatever, was secured from Cincinnati to the Lakes." *

The railroads of this period, then, were for the most part local affairs, carried on without any system. Each locality operated its own road. Geographically it may be noted that the railways constructed in the first ten years radiated from the leading seaports, Philadelphia, New York, Boston—Philadelphia leading as a terminal city. As shown by the accompanying table, railway mileage increased from about 30 miles in 1830 to 2,818 miles in 1840, and at the end of this period aggregated a little over 9,000 miles.

YEAR	MILEAGE	INCREASE
1830	23	.....
1835	1,098	1,075
1840	2,818	1,720
1845	4,633	1,815
1850	9,021	4,388
1855	18,374	9,353
1860	30,626	12,252
1865	35,085	4,459
1870	52,922	17,837
1875	74,096	21,174
1880	93,296	19,200
1885	128,361	35,065
1890	166,817	38,456
1895	181,065	14,248
1900	194,321	13,256

* *Railroad Transportation*, p. 36.

THE CONSOLIDATION PERIOD

The financial panic of 1837 gave a severe shock to railway enterprise and there was, consequently, a marked falling off in the annual mileage increase down to 1848. But in that year the discovery of gold in California awakened a new interest in railway construction throughout the country. During this period, too, the South and the Middle West developed rapidly, thereby creating a demand for extended and improved facilities for transportation. Railways shared in the marked prosperity of the first decade of this period.

"The year 1850 marks the beginning of a rapid welding of short connecting railroads into long lines under a single ownership." During this period many new lines were built, especially into the new West, and the demand for uninterrupted travel and shipment resulted in the coalition or consolidation of local lines into through routes.

Map V. *Railroads in the United States in 1850*

Chief among these through lines were the following:

1851—Erie Railroad reached Lake Erie.

1852—Michigan Central and Michigan Southern lines opened, connecting Chicago with the East.

1854—Chicago & Rock Island pushed through to the Mississippi.

1855—Chicago & Galena, the nucleus of the Great North-Western system, opened, followed by the Chicago & Alton, the Chicago, Burlington & Quincy, and the Illinois Central.

1858—The Hannibal & St. Joseph reached the Missouri River.

At about the same time the Pennsylvania Railroad got through connection with Chicago by the extension of the Pittsburg, Fort Wayne & Chicago.

This rapid extension of railroads into new and sparsely settled regions was greatly stimulated by the policy of land grants. Vast areas of public lands were freely granted by State and National governments to induce corporations to undertake railway construction. This policy was followed for nearly thirty years, and was responsible for the construction of many lines in the West earlier and more rapidly than otherwise would have been the case. State aid to the railroads took various forms. Some made large grants of lands received from the National Government; some gave bonuses of cash or securities. A few states undertook the construction of railways as a state enterprise. Most often, however, assistance was given through the large purchase of railway stock.

The National Government was even more generous in its aid to railway building. In 1850 the first large grant of land from the public domain was made, the Illinois Central being the recipient. The railway corporation was given the right of way, 200 feet wide, and also alternate sections of land six miles back on each side of the road. During the next few years similar grants were made to companies in Missouri, Arkansas, Wisconsin, Iowa, Florida, Mississippi, and other states. "Eight million acres were granted under Fillmore, nineteen under Pierce."* After the Civil War, economic and military reasons alike called for a railroad to the Pacific. In 1862 Congress incorporated the Union Pacific Railroad, granting it and allied companies a money subsidy of $30,000,000 and land grants aggregating more than 30,000,000 acres, an area greater than the entire state of Pennsylvania. Congress made grants to over twenty companies during the next ten years. The Atchison, Topeka & Santa Fe received 3,000,000 acres in 1863, and a little later the Atlantic & Pacific received a grant of 42,000,000 acres. An almost equal grant was made to the Northern Pacific, and large grants to the Texas & Pacific and the Southern Pacific. Up to 1871 these grants from the public domain amounted to about 150,000,000 acres. Parts of these lands have reverted to the United States through the failure of the companies to comply with the conditions of the grant. Professor Johnson, summing up the policy of land grants, says: "Unquestion-

* Hadley, p. 37.

ably the United States was more liberal than it need have been, and if the public had chosen to wait twenty years the railroads in the Central West and between the Mississippi Valley and the Pacific Ocean would have been constructed by private capital. The liberal donations of public land caused the railroads in that section of the country to be built earlier than they would otherwise have been constructed, the West was settled up more quickly, and the Government has been able to dispose of many parts of the domain it did not give away at an earlier date, and possibly more advantageously than they could have been sold had none of the land been given to the railroad corporations."* Thus rapidly railroads were developed in the upper

MAP VI. *Railroads in the United States in 1870*

Mississippi Valley, particularly in the five years following 1868. The crisis of 1873 checked railway expansion everywhere, but with the revival of business the Southwest and Rocky Mountain regions experienced a similar development. The increase in four years of the mileage in the southwestern states was 168 per cent as compared with an increase of only 24 per cent east of the Mississippi.

While these transcontinental routes, backed by land grants, subsidies, and local subscriptions, were being pushed across the plains and over the mountains, the earlier roads of the East were slowly being shaped by consolidation into a few great trunk lines. This

* *American Railway Transportation*, p. 318.

process of welding short, local roads into through lines had become an economic necessity. As through traffic, and particularly the through grain trade, steadily increased, the expense and delay of frequent transshipments made consolidation imperative. The first consolidation of importance was in 1853, when eleven different roads between Albany and Buffalo were united to form the New York Central. Gradually the system thus formed acquired control of numerous branch lines. In 1869 Cornelius Vanderbilt, who had foreseen the great future of this road and had become its dominating genius, consolidated the Hudson River Road and the New York Central, and soon afterward gained control of the Lake Shore & Michigan Southern, the Michigan Central, the Canada Southern, and other roads, thus uniting under one management over 4,000 miles of railroad between New York and Chicago.

The nucleus of the present Pennsylvania System was made by similar consolidations carried out largely by Thomas A. Scott, who became vice-president of the road in 1860 and president in 1874. During the twenty years of his executive service the system was extended westward to Cincinnati, Chicago, and St. Louis, northward to Lake Ontario, eastward through New Jersey, and southward to Baltimore. By the absorption of other lines it gained control of over 7,000 miles of railroad, comprising properties formerly owned by over 200 companies.

By 1874 a third great trunk line, the Baltimore & Ohio, under the skillful management of John W. Garrett, had been extended to Chicago. Two more trunk lines, parallel to these, soon followed: the Grand Trunk on the north, and the Erie, which Vanderbilt had sought in vain to bring into his system. Thus by 1874 there were five great trunk systems actively competing for the growing business between the Mississippi Valley and the Atlantic ports.

Toward the end of this period great rival systems were developed west of Chicago and St. Louis. These systems, instead of running parallel like the great trunk lines of the East, radiate from common centers, reaching out in all directions for the grain and other produce to be brought in to the primary markets. Thus from Chicago radiate the St. Paul, the North-Western, the Rock Island, the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fe, the Chicago & Alton, and the Illinois Central. The railway net about St. Louis shows a similar radiation.

(*To be continued.*)

WHAT A CHILD SHOULD GAIN FROM GEOGRAPHY

BY R. P. IRELAND
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ANY answer to the question, "What is essential in geography?" or "How much geography should a pupil know at the end of his course? must be viewed rather as a shot at a moving target and not as an attempt to put a fence about a particularly fertile bit of ground. The needs of pupils another year and at another place are sure to differ from their needs here and now. Diplomatic relations, inventions, explorations, and feats of engineering are some of the factors which are sure to place a new emphasis on some product, place, or people.

At the outset nearly all of the ordinary facts of geography must be examined and their importance rigidly questioned. I say *nearly* all, because it is hardly open to question that the continents, the oceans, a few mountain and river systems, most European countries, and half a dozen great cities are indispensable facts. The rivers of Siberia, the tunnels through the Alps, the tides in the Bay of Fundy, and the capitals of several countries are examples of various classes of facts whose worth may be questioned.

Then we may proceed *according to time and place* to select much that is unessential and discard it. Thus the fact that Newfoundland is a crown colony, *distinct from Canada*, is of vital importance to this city (Gloucester, Mass.), but it would be of no particular value in many sections. Whatever tends to show the "causal relation," the reasonableness of things, is generally worth while. Many children may prefer memorizing a list of products, for example, to inferring what should be produced under given conditions, but this cannot be considered. The matter has too much bearing upon their happiness and usefulness in adult years to be decided upon such a basis.

Pupils can hardly be grounded too thoroughly in home geography. This should include such diverse facts as the differences in the vegetation of various parts of near-by fields and pastures, and the relation between the primary and secondary industries of the town. It should include to a considerable extent the sources of the commodities used in the town as well as the destinations of those produced. Enough physiography should be given that the present appearance of local features may be understood. The progress of minor changes, such as the variations in ponds and brooks or the sliding of a boulder or a tree down a bank, should by no means be omitted. When more distant regions are considered, less detailed study is possible, but there should be nothing magical or capricious about the phenomena of foreign lands. Certain books of travel and some teachers seek to interest children by conveying the impression that in China or Australia everything in nature is topsy-turvy. This is entertaining, but it adds nothing to scholarship. The "wonders" of foreign lands are frequently only larger examples of local features. The hackneyed statement concerning the leaves of certain Australian trees is brought to an everyday basis by observing the behavior of corn leaves and some others in time of drought. Unless some such association can be made there is little use in alluding to the feature at all.

Mathematical geography need be considered only so far as it is required for use in other parts of the subject. A true conception of much of it is unattainable even to adults, but a working knowledge of certain features may be acquired. This, plus the ability to avoid confusing such points as the cause of the change of season with the cause of day and night, is about all that is needed. In some cases where the cause as a whole cannot be understood certain surface observations may be used. Thus it is easily seen that the sun's path from the eastern horizon to the western horizon is shorter in winter and longer in summer. Most children have learned in some form that there are astonishingly long periods of light and darkness and of daylight at the poles. Using this, a fairly correct inference may be made as to the length of day and night at such points as Montreal or St. Petersburg. With regard to latitude and longitude the most important point is that pupils should distinguish one from the other, and the next point is that a given reading should suggest some position on the earth or, what is more likely, on a globe. This association will not occur unless the use of the globe is habitual in the class room.

Just how much political geography is requisite is the hardest part of our question. Certainly no question relating to a geography course has been so poorly answered at times. The number of geographic names held, ready for use, by the average well-educated adult is probably much less than is commonly supposed. To test this let almost any two teachers whose work for a few years has concerned different continents give each other a fairly sharp quiz.

As indicated in the commencement of this article a few facts may be put in a favored class, but most must be rigidly questioned and good reason found for including them. Most countries may be included without question, but Montenegro, Guatemala, etc., might be overlooked without loss. A few years ago Korea or Abyssinia might have been left out. National capitals may be divided in a similar manner. The burden of memorizing state capitals should be dropped as that of state boundaries has been. The amount of possible interest a place has for a pupil will determine in many cases whether it is to be studied or not, even though the interesting feature may not be of great importance to adult minds. It ought to be unnecessary to suggest here that the possession of a city charter does not increase the importance of a place in a geography course.

As we reach places of historic importance I believe we should do more than is generally done. Brief accounts of some of the more important events of foreign history may well be included. Warren Hastings and Lord Clive will interest, as Cortez and Pizarro do. The stories of the Roman and the Mohammedan conquests of Europe are decidedly worth while. Such terms as Finn, Syrian, Bohemian, a large number in all, are in everyday use, yet ordinarily neither map nor text sheds much light on their meaning. This omission should be remedied.

In the foregoing paragraphs I have suggested not so much what a pupil should know as what standards should guide the teacher in selecting work for him. Our most urgent work as framers of a course lies rather in bringing the facts into close relation to the pupil's life rather than in the selection of facts.

WHAT THE CHILD SHOULD KNOW OF GEOGRAPHY AT THE END OF HIS GRADE COURSE

BY AMOS W. FARNHAM

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PLACE. Geography is pre-eminently a place study. Place involves direction and distance. The child should know the use of the terms right, left, nearer, and farther. He should know how to determine actual directions by the aid of noon shadows, the North Star, and the mariner's compass; and to determine represented directions by the aid of parallels and meridians. He should know how to determine actual distances in units of linear measure, and represented distances in units of angular measure, which units he should readily translate into more familiar units of linear measure. He should know that a line drawn longitudinally through the center of a noon shadow is a part of the meridian of the object that casts the shadow; that a line drawn at right angles to the meridian and through the center of the base of the object casting the shadow is a part of the parallel of that object; and that the exact number of this parallel may be known by determining the height (in degrees) of the North Star above the horizon as seen by an observer on this parallel. He should be able to estimate distances in units of time, according to the means of travel, whether express train, trolley car, carriage, steamship, etc. He should be able to make a practical use of his *place* knowledge, when occasion requires, by giving and receiving clear and exact information regarding the location of streets, roads, and buildings of his neighborhood; the location of the towns of his county; the counties of his state; the states of his country; and the principal countries of the world. He should know the location of the cities of his state, of the great cities of the world, of important land and water forms, and of the noted pleasure and health resorts, and for what these resorts are noted.

GOVERNMENT

The child early learns that he is under the control and protection of government,—government of home, school, and society. He learns that the boundaries of his district are political boundaries, and that certain district officers control the district schools. A knowledge of municipal and town government follows; and later, a knowledge of state and national control. The child should know that public highways and bridges are constructed and maintained by government; that canals, chartered corporations, penal institutions, boards of health, and public charities are under governmental control. He should know that his government constructs, maintains, and controls the harbors, harbor lights, breakwaters, life-saving stations, weather bureaus, custom houses, and post offices of his country, and he should know the relation which all these bear to the commerce of his country. He should know the various kinds of national governments, and that that government is the best government that is "of the people, by the people, and for the people."

EARTH FORMS

The earth is composed of land, water, and atmosphere. Each of these earth elements contains portions of the other two. Each is influenced by the others. All are necessary for the existence of plant, animal, and man. Hence the child should know the hills and meadows, the streams and ponds, and the atmospheric phenomena of his neighborhood. He should know the relation of hill and meadow to the run-off, to ground water, and to evaporation; he should know the relation of the streams and ponds to drainage; the relation of winds to rainfall, and of rainfall to vegetation. He should know what soil is, how to tell the different kinds of soil, and the relative capacity each kind of soil has for heat and moisture. He should know what soil is best adapted for each crop raised in the near-by fields, the time of sowing and harvesting, and the use made of each crop. He should know the relation of local relief to the use of farming implements and machines, as well as to the different modes of transportation. He should understand map representation of relief, drainage, soil, rainfall, temperature, winds, land and water transportation routes, latitude and longitude. From given data he should be able to make intelligent deductions regarding the industries of a given place.

THE THREE KINGDOMS OF MATTER

The child should know that all matter can be grouped under three heads, namely: animal, vegetable, and mineral. He should be able to catalogue under these three heads all substances with which he comes in contact. He should know from what kingdom each article of his food comes, each article of his dress, of the furniture of his room, and each part of the house that shelters him from the weather. He should know the relation of each kingdom to each of the others.

THE EARTH AS A PLANET

The child should know the shape of the earth, the size, the motions, and its relation to the sun and moon. While none of this is geography, it all has a direct bearing on geography. He should know of what the surface of the earth is composed, the relative amounts of land and water, and what the effect upon life would be if these relative amounts should be greatly changed.

COMMERCE

The child early learns that if he prefers a ball to the knife he owns, and his playfellow prefers a knife to the ball which he owns, that each may satisfy his want by making an exchange. Or the child may have a handful of marbles but no top; his playfellow may have two tops but no marbles; an exchange of a part of the marbles for one of the tops will satisfy a want of each.

He knows that farm produce is taken to the city and exchanged for sugar, coffee, cotton cloth, nails, etc.; that strawberries are exchanged for bananas, and apples for oranges.

He should know why rice is not grown in New York, cotton in Illinois, and wheat in Florida. He should know the importance of these products, the conditions which favor their growth, and the great demand for them; and that where they can be grown successfully there they will be grown. He should know that only a comparatively small area of the continents is adapted for the growth of each, and that each product is needed throughout the extent of every continent; hence the need of extensive cultivation, and of means of communication and transportation.

He should know that the increase in population and the advancement in civilization demand a greater quantity and better quality of food and shelter materials; that the demand calls for improved machines; and that improved machines and manufacture call for the exercise of inventive power and skilled labor.

The child should know what states of his own country and what countries of the world lead in the principal productions of food and shelter commodities. He should know where the great centers of industry are and why they are there. He should know where are the great shipping and receiving ports, where are the great commercial routes on land and on sea. He should know what irrigation is and its use, from his own kitchen garden to the great systems of the West, of India, and of Egypt. He should know the relation of irrigation to commerce.

SOURCES OF INFORMATION

The child should know the use of his text-book on geography: the use of the pictures, the diagrams, the various kinds of maps (not political only), the text, and the pronouncing vocabulary. He should know the use of the gazetteer, the dictionary, the encyclopædia, the topical index of standard works of reference, and the card catalogue of his school library. He should know how to use these sources of information that he may read the daily paper and current literature with interest and with profit. The intelligent use of sources of information should develop the reading habit, and make the study of geography lifelong.

GEOGRAPHICAL NOTES

Geographic Features of Alaska.—An examination of a chart of the world will show that the latitude of Alaska corresponds approximately to that of the Scandinavian Peninsula. Point Barrow, the northernmost cape of Alaska, is in about the same latitude as North Cape. Dixon Entrance, which marks the southernmost point, is nearly on the same parallel as Copenhagen. Sitka, the capital of Alaska, is in the latitude of Edinburgh, in Scotland.

To consider the longitude, the meridian passing through the most western of the Aleutian Islands passes near the New Hebrides and through New Zealand. Cape Prince of Wales, the most westerly point of the mainland, is nearly as far west as the Samoa Islands.

Alaska stretches through 27 degrees of latitude and 54 of longitude. Its east and west dimensions, measured to the extreme limit of the Aleutian Islands, is almost exactly equal to the distance from Savannah on the Atlantic coast to Los Angeles on the Pacific. Its most northerly and southerly points are as far apart as the northern and southern boundaries of the United States.

Alaska, the northwestern extremity of the North American continent, forms in its main mass a peninsula nearly rectangular in outline, cut off from the continent by Mackenzie Bay on the north and the Gulf of Alaska on the south. South of it lies the Pacific Ocean.

On the west it is bounded by Bering Sea and Bering Strait and west and north by the Arctic Ocean.

The territory is extended west and southwest by its two peninsulas of considerable size—the Seward Peninsula, with which the Chukchee Peninsula divides Bering Sea from the Arctic Ocean, and the Alaskan Peninsula, which, continued in its archipelagoes, the Aleutian Islands and Commander Islands, cuts off Bering Sea from the Pacific Ocean. The coast of Alaska is of two distinct topographic types. Northward from the Alaskan Peninsula shallow-water conditions usually prevail, the coast line is very regular, and the land slopes gently from the shore. Eastward and southward from the Alaskan Peninsula the shores are usually abrupt, with many embayments and islands. This Pacific coast region is included in the glaciated area of Alaska, while along the western and northern coasts glaciation is either entirely absent or only of local character.

The Pacific coast line forms a deep reëntrant angle, which is occupied by the Gulf of Alaska. It is bounded on the east by the Panhandle of the territory, usually called Southeastern Alaska, and on the west by the Alaskan Peninsula. It will be shown that the axis of the dominant mountain chains undergo, too, a marked change in direction, and are parallel to the crescent-like bend of the southern coast line. A study of the geology goes to show that this is the topographic reflection of an important structural feature.

A clear conception of the main features of the topography of Alaska can be obtained by comparing them with those of the western United States. A broad mountainous belt, called by Major Powell the Pacific Mountains, including the Coast Ranges of California, Oregon, and Washington, the Sierra Nevada and the Cascade Mountains, extends along the western margin of the United States and is continued by other ranges northward into Canada. East of this lies the Great Basin or Central Plateau region, which also finds its counterpart in British Columbia to the north. The eastern limit of the plateau region is marked by the Rocky Mountains, which again, like the western Pacific Mountains, extend into Canada. To the east of these the Great Plains extend northward to Arctic waters.

Dr. George M. Dawson and others have shown that these four topographic provinces of the United States, which are fairly well defined throughout western Canada, find their continuation in similar geographic features in Alaska. The general trend of the highlands in Alaska, as in the United States and Canada, is parallel to the coast line. Attention has already been called to the great southwest bend of the Alaskan shore line near latitude 60. The orographic features of the mainland experience a similar change in direction, continuing parallel to the shore line.

Alaska is thus divisible into the same four geographic provinces as those of western Canada and the United States. The lines of demarkation between these provinces are usually sharply drawn. Each is of a predominant topographic type, though each may be subject to many minor topographic subdivisions.

A mountainous belt skirting the Pacific coast of Alaska and British Columbia, extending inland from 50 to 200 miles, forms the most western of the four provinces, which, in conformity with Major Powell's classification, I will call the Pacific Mountain system. It properly includes the mountainous Alexander Archipelago and Aleutian Islands, and a number of other island groups which lie adjacent to the coast. The Pacific Mountains belt is made up of four distinct ranges: The Coast, St. Elias, Alaskan, and Aleutian. These are often separated by broad valleys or indentations of the coast line, and while the topography of the system is mainly rugged and mountainous, it includes several large basins, like that of the Copper River.

East and north of the Pacific Mountains is the Central Plateau region, limited on the north and east by the Rocky Mountains, corresponding with the Great Basin region of the western United States. The term plateau can only be assigned to a part of this province, and not even that by strictest usage. Its dominating topography is a gently rolling upland of low relief, compared with the mountain systems, in which the rivers have trenched broad channels. The inter-stream areas mark a former plateau surface, which the erosive agents have dissected. This plain slopes gently toward the axis of the basin, and the axis is tilted to the north and west. Its surface is interrupted by a number of mountains and mountain groups, which rise above the general level. Within this belt are also a number of lowland areas of considerable extent, which lie below the upland surface. Among these the flat of the middle Yukon is notable. The lowlands which extend along Bering Sea adjacent to the Kuskokwim and Yukon rivers are included in this province.

To the east and north is a broad mountain system but little explored, which forms the third of the geographic provinces. It is, as has been shown, the northern extension of the Rockies. These, like the Pacific Mountains, also undergo a marked change in direction.

Trending northwestward from the United States and Canada, they swing to the southwest at the Arctic shore, which they touch again north of Bering Strait. The system is represented in Alaska by the Endicott Mountains, and probably by several other ranges as yet unsurveyed.

The fourth province is that of the plains lying east of the Rockies, which in Alaska is represented by the Arctic Slope region, lying between the western extension of the Rockies and the Arctic Ocean. This province, like that of the western United States, is really a slightly elevated plateau, dissected and more or less rolling, which slopes to the north from the foothills of the Rocky Mountains. A featureless coastal plain, of varying width, separates the northern boundary of the plateau, which is marked by a scarp, from the Arctic Ocean.

About one-fifth of the drainage of Alaska is toward the Pacific Ocean, nearly one-half toward the Bering Sea, and the rest toward the Arctic Ocean.

The map shows the Yukon to be the master stream, and the outlines of its basin correspond in a general way with the boundaries of the Central Plateau province. The headwaters of this mighty river, the fifth in size of the North American continent, lie in British Columbia far to the southeast of Alaska, where they fight for mastery on one hand with the water courses flowing into the Pacific and on the other with those belonging to the Mackenzie drainage basin, flowing into the Arctic Ocean. The general course of the upper Yukon and its tributaries is northwest as far as the Arctic Circle. It then makes a great southwest bend and pours its great volume of muddy waters into Bering Sea, nearly 3,000 miles from the source of its longest tributaries. The valley of the Yukon occupies the medial line of the plateau province, and with it makes the same great bend to the southwest parallel to the swing of the two mountain systems to the north and south. The relief, which is measured by the altitude of the remnants of the plateau above the floor of the valley, is greatest near the international boundary and decreases both above and below. A narrow valley characterizes the upper Yukon proper, which broadens out at the so-called Yukon Flats, near the big bend, and contracts again below in the Ramparts, and then broadens out below the mouth of the Tanana.

The northern and eastern limits of the catchment basin are generally defined by the crest line of the inland frontal ranges of the

Rocky Mountain system, but this does not always hold true, for the Peel River, a tributary of the Mackenzie, has its source west of the Rockies. On the other hand, the Macmillan River finds outlet in the Yukon drainage after traversing one of the ranges of the Rocky Mountain system. The southern and eastern divide of the Yukon basin is even of greater irregularity. On one hand some of its tributaries find their sources to the south of the ranges of the Pacific Mountain system, and on the other a number of large rivers emptying into the Pacific have their headwaters inland of this barrier.

The Yukon River forms the great natural highway of Alaska. In summer 3,000 miles or more of navigable waters are found within its basin, and in winter the frozen surface of the river affords a route of travel for dog teams. It was along the rivers that the pioneer could best journey, for on his crude rafts or boats, built of the timber which grew on the banks, he could transport necessary supplies, and later the steamboat succeeded to that propelled by hand.

The Kuskokwim, flowing into Bering Sea, is second only to the Yukon among Alaskan rivers, and includes probably upward of 1,000 miles of waters which are navigable for steamers. Its basin lies west of the Alaskan range and entirely within the plateau province.

The Pacific drainage embraces two classes of rivers: First, those whose catchment basins lie entirely within the coastal zone of mountains, and second, those whose courses reach into the interior region and traverse the mountains on their way to the sea. Of the first the Sushitna and Copper, and of the second the Alsek, Taku, and Stikine are the most prominent examples.

The Arctic Ocean receives the waters of a small part of the plateau provinces through short rivers draining the northern part of the Seward Peninsula and some larger ones flowing into Kotzebue Sound. Much of the larger part of the Arctic drainage consists of that received from the interior valleys of the Rocky Mountain ranges and from their northern slopes. Under the former are comprised the drainage basins of the Noatak and the Kobuk, both streams including navigable waters which are bounded both north and south by the mountains of the northern system. The second class of waterways includes the northerly flowing streams which receive the drainage from the seaward slope of the Rockies. The Colville, the largest of these streams, properly belongs to both classes, for its source lies well within the front ranges, which it traverses in a narrow valley, and it also receives a large amount of drainage from the northern slope of the Rocky Mountains.—*National Geographic Magazine*, May, 1904.

A Great Tunnel.—During the life of the present generation the Alps have been pierced four times by tunnels, the latest of these being the greatest of them, the tunnel under the Simplon Pass. Work on this great enterprise began in 1898, and a French geographical journal, quoted by the New York *Sun*, announces that on the fourth day of May the Swiss and Italian workmen, who have been approaching one another from the opposite ends of the tunnel, knocked down the slight barrier of rock which still separated them. The Jura-Simplon Company agreed to have the tunnel ready for use in five and a half years. They have spared neither time, money, nor skill in the endeavor to fulfill their contract, but the difficulties they have met have been enormous, and the Swiss Government, rightly taking these difficulties into account, has extended the time for the completion of the tunnel to April 30, 1905, and has given the company a supplementary credit, increasing the payment for the tunnel from $14,000,000 to $15,600,000. The first of these great Alpine tunnels in point of time was the Mont Cenis tunnel in France, which is nearly eight miles long and was fourteen years in construction, being finished thirty-four years ago. Next came the St. Gothard, nine and a quarter miles long, which was nine and a half years in construction, and was completed twenty-four years ago. Then came the Arlberg, six and a half miles long, three and a half years in building, and completed twenty-one years ago. The Simplon is twelve and a half miles long, its greatest altitude above the level of the sea being 2,314 feet, while the altitude of Mont Cenis is 4,248 feet. The work has been done, as all work of the kind is done on the continent, with artistic completeness. The station at Brieg was finished some time ago and is an admirable structure. The valley which approaches the tunnel from the Italian side was one of the most beautiful in northern Italy, but has been hopelessly scarred by excavations, cuts through the rock, and the litter and disfigurement attendant upon railroad building, to say nothing of a great village of Italian workingmen which has grown up near the entrance to the tunnel. This entrance is approached by a series of smaller tunnels which extend all the way from Lake Maggiore. The greatest obstacles which the enterprise has been compelled to meet have been water and heat. During the first three months of 1902 the work on the Italian end advanced only fifty feet, so many were the springs that were met and so great was the volume of water which had to be cared for. The heat has been in many places prostrating, the temperature ranging from 95 to 107 degrees. It was necessary to shorten the hours of work and to provide buildings with facilities for hot and cold baths, so that when the miners came out of the tunnel they should not be at once exposed to the keen Alpine air. The completion of this tunnel will give direct communication between Milan and Paris and London and points all the way to Brindisi. The Mont Cenis furnishes the shortest and quickest route from France and northwestern Europe to Genoa. The chief route between Central Europe and Italy is that through the St. Gothard, and travel from Paris and Genoa to Austria passes largely through the Arlberg. With the completion of the Simplon tunnel the Alps have been practically annihilated for purposes of travel and traffic. — *The Outlook*, June 11, 1904.

British India.—*Agricultural Conditions.*—The peninsula of India, which in area is about one-half the size of the United States, has a population of nearly 300,000,000, about 200,000,000 of whom depend, directly or indirectly, for a livelihood on agricultural employment.

The area of the holdings is on an average exceedingly small, seldom more than a few acres and often mere gardens. Of course there are some exceptions, Zemindars and a favored few having larger holdings.

The holdings are held by different kinds of tenures, generally leasehold; seldom in fee simple. The fee being, as is the case in the presidency of Bombay, in the government, the tenant is not permitted to alienate or encumber his title.

The farmer of India, or "ryot," as he is called, is in utter darkness as regards education, and is poor and underfed. He is industrious and, under the circumstances, outside of famine years gets good returns from the soil. He lacks ambition or desire to improve his material condition or methods of labor. He cuts his crops according to the signs of the moon or the custom practiced by his forefathers. Oftentimes the grain is overripe, and grass or fodder has lost its nutriment and turned to straw on the stock before it is harvested. The system of timely cutting and curing grass and fodder is quite unknown to him.

He has little knowledge of green manures. Much of the excrement of the bullocks is used for smearing walls and ground floors of their houses and for making cakes for fuel.

Life in the villages has been modified but little since the most ancient times. All ryots, or farmers, live in villages, and to them one must go to understand the life of the Hindoo.

Hand Labor vs. Machinery.—Farm labor is plentiful and cheap, and is paid from 2 to 4 annas (4 to 8 cents) per day. The farm is so small and the ryot so poor—taxes and famine years claiming all his savings—that he is generally in debt to the money lender for marriage ceremonies for his children or memorial celebrations to his ancestors.

Agricultural Implements in Use.—The agricultural implements used by the ryot are of the most primitive and ancient patterns. Hand sickles are universally used to cut the crops; grain cradles are never and scythes seldom seen in India.

The grain is thrashed by pounding with a club or tramping by cattle, and winnowed by being tossed in the air so that the wind may blow out the chaff.

With a few exceptions in large cities, the grinding of grain is done by women on hand mills, after the manner shown in Biblical pictures of the time of Abraham.

The plow consists of an upright piece, made from a curved limb of a babul tree, with an iron point, having mortised into it a beam lengthening into a tongue, and which is tied by a rope on the yoke of the oxen. The plow is made by the village carpenter, at a cost of 3 or 4 rupees ($1 or $1.30). The plow is drawn by one or two yoke of oxen, and it simply stirs the ground. The monsoon rains do the rest.

Water is drawn from wells for irrigation purposes by bullocks pulling down an incline. The water is raised in leather bags, connected to the ox yoke by a rope running over a pulley.

An implement universally in use on the farm and generally for all sorts of digging, scraping, and raising of dirt is the "pharwa." It is somewhat similar to the hoe; the blade, however, is broader, thicker, and deeper. It is hammered out by the village blacksmith, and has a short, straight handle.

If earth is to be moved any distance it is dug up by the pharwa and scraped into a shallow, round, bamboo basket, which is then placed on the head of a coolie "woman," who carries it to place or dumps it into a bullock cart.

Spades are not in use because the native, being barefooted, cannot press it into the ground. Shovels, which require more strength to shove them than to pull the pharwa, are likewise never used by the native.

How to Increase American Trade.—Under the foregoing conditions we cannot expect to sell in India mowers, reapers, binders, steam separators, gang plows, and such agricultural machinery as prove of great value on an American thousand-acre farm.

There is, however, no doubt but that there is a considerable opening for hand machinery, farming implements, and other labor-saving devices, such as hand fanning-mills, cheap plows, ox yokes, dump carts, horse powers, feed or fodder cutters, small thrashing machines, carriages, cultivators, cane mills, oil engines, belting, iron hand-pumps, brick machinery, grindstones, sickles, wind-mills, pumps and towers, carpenters' tools, safes, hardware, electrical supplies, and cotton machinery.

Roads, Animals, and Vehicles.—The main highways and city streets are well made, usually of macadam, thoroughly drained, and rolled by heavy steam rollers imported from England. Famine labor has been utilized in their making. India, being tropical, is never disturbed by the upheaval process of frosts and ice.

The vehicle of transportation is the bullock cart. It is native-made, simple, heavy, and clumsy. The tongue is mortised into the axle, and upon this T the rack or box is permanently fastened; the end of the tongue is bound stiffly to the ox yoke. The latter is a simple, round piece of timber three or four inches thick and about four feet long. It rests on the neck of the bullock, wooden or iron pins being run through its ends to keep it from slipping off the neck of the animal. The load on the cart is balanced so that the yoke is held down, and a rope around the neck of the ox takes the place of an oxbow and keeps the cart from tipping backward. The cart is dumped by simply unfastening the rope around the neck of the oxen.

The oxen, being of the high-hump, sacred variety, are peculiarly fitted for this barbarous yoke, which conveys every motion and jolt of the cart to the neck of the oxen. A Yankee ox-yoke would be a blessing to these dumb brutes, and at the same time it would increase their efficiency. These ox carts, or "bail-ghari," are universally used in the cities as well as in the country for all kinds of draying and hauling grain, hay, dirt, brick, stone, bales of cotton, steel constructional beams, or teakwood logs forty feet in length; everything and anything is carried upon them.

The native "reckla," or covered two-wheeled cart, drawn by trotting oxen, is much in use in the cities for the transportation of natives. In the cities a "victoria," or "ticca-ghari," drawn by one horse, is generally used by the Europeans and better class of natives as a hired street conveyance. It is native-made, the springs, axles, and, perhaps, some other parts being imported from England. In Bombay it is fitted with rubber tires and forms a convenient and cheap mode of street conveyance.

In the country and interior towns the conveyance for Europeans is the "tonga," a two-wheeled cart with a seat facing the rear for two persons, who ride with back to the driver. They are drawn by two small native horses, with a kind of yoke fastened on the back or neck. The European in India generally supplies himself with a fine victoria imported from England. It is drawn by a span of Persian or Australian horses.—*Monthly Consular Reports*, December, 1903.

The Practical Use of the Globe in Teaching Geography.—I propose to describe a series of lessons that I have given during the last term to a form of boys whose average age is fourteen years. If the illustrations that follow appear to you to be exceedingly elementary and self-evident, please remember that the whole object of this paper is to show how these elementary ideas may be arrived at in a practical way, and to indicate briefly the method adopted in the course of lessons I have mentioned. I did not therefore deal with those abstruse mathematical calculations which are so dear to the hearts of mathematical masters, but confined myself to those broad principles which are so necessary.

I need hardly point out the necessity of constantly using a globe in geographical teaching. Some people still ask with surprise whether we wish to revert to the system of the old-fashioned ladies' school, in which "deportment and the use of the globes" figured as important items on the prospectus. Mediæval pedants are always depicted with a globe, but in recent times globes have almost disappeared from our schools. This is very remarkable and perhaps can only be accounted for by the great improvement that has taken place in the production of wall maps and atlases. The excellence and cheapness of maps account perhaps for their almost universal use, while the greater cost of globes and the difficulty of using them with large classes tend to make globes less popular. Geography is a subject peculiarly suited to the training of the powers of observation and imagination. How can we expect a boy to realize that the parts of the earth he is studying are curved surfaces when we constantly put them before him as flat surfaces? It is of little use to ask a question occasionally in an examination paper (perhaps once a term or once a year) as to the shape of the earth, and then to ignore the subject as if it had nothing to do with the work of ordinary geography lessons. What is absolutely necessary is to have a globe always in view so that it may be constantly referred to. Any kind of globe is, of course, better than none, but the most useful kind, and the one which I myself use, is a globe with a slate surface on which the outlines of the continents only are marked in white paint, while the circles of latitude and longitude, at intervals of 15°, the tropics and the Arctic circles, are incised. This globe, twenty inches in diameter an mounted with the axis inclined, was made by Messrs. Philip & Son of Fleet Street, and is excellently adapted for the lessons described in this paper. Each lesson was studied with the globe at considerable length, the boys having to observe and find out as much as possible for themselves; no text-books were used, but after each lesson a description of the work was written out and, where possible, diagrams were drawn. I am very anxious that the method that was followed should be clearly understood, because I am obliged to introduce, as I go along, much that was only taken at the end of the term when revising what had been done. No lantern slides were shown, except for purposes of revision at the end of the course.

In the first lesson the boys examined the globe and noted such facts as the following: (*a*) That all the lines drawn on the globe are circles. (*b*) That the equator and all circles passing through the poles divide the globe into hemispheres. (*c*) That all the other circles divide the globe into unequal parts. (*d*) That the land masses are nearly all north of the equator.

In the next place, taking an unmarked globe to represent the earth, we found that the position of the poles depended on the axis of rotation. On being asked how the axis of rotation should be inclined, boys are generally ready to reply: "At an angle of 23½° to the vertical," instead of to the vertical to the plane of the earth's orbit. Simpler than this is to point the axis toward the north polestar. Here one naturally asks: "How can the position of the north pole be found on a starlight night?" Many boys when asked do not know at all, and of those who can sketch the seven stars in the constellation of the Great Bear very few have ever actually seen the constellation. One boy who said he had seen it explained the position as, "Above the left-hand fence of our back garden." He had so far never realized that he had been looking toward the north, while at the same time he showed a lamentable lack of power to describe what he had seen in a definite and intelligent way.

We now drew a circle around the globe midway between the poles to represent the equator. If a place is 40° north of the equator it must lie somewhere on a circle; but this is all we know, unless we are further told its distance east or west of a given circle passing through the poles. Hence the following facts: (*a*) That the equator and the prime meridian are the only circles necessary to determine positions. (*b*) That all other circles are drawn on globes simply for convenience in measuring positions. (*c*) That all these circles depend on the rotation of the globe. Here, then, follow exercises in finding positions on the globe when the latitude and longitude are known, reading the latitude and longitude of a given place, finding the difference of time at given places, and so on. The boys take great interest in doing this; in fact, they will often practice by themselves, and, if the class is small, it is always possible to let them stand round the globe and do these exercises, with very satisfactory results.

In order to fix the cardinal points in the class room, the boys themselves should find the north-south line by means of equal altitudes of the sun from the shadow of a stick, and then draw this line on the floor of the class room. The determination of this line took us a fortnight to accomplish; that is, we began and tried day after day for a fortnight. We then got a magnetized needle and found the direction of the magnetic north, and on measuring the angle between this direction and the geographical north, it was found to be about 15°, a sufficiently accurate result for 1903.

The globe was then placed so that its axis was pointing toward the north polestar, and it was decided that the globe must be revolved from west to east, and never from east to west. The room having been darkened, the light of a small lantern was next turned on to the globe, and it was seen that the line dividing the dark from the light side was a vertical circle. On revolving the globe, the phenomena of sunrise, sunset, meridian altitude of the sun, etc., were roughly demonstrated, and after this diagrams were drawn to show the length of day and night throughout the year for any latitude. Having drawn a series of diagrams for various latitudes, we at last came to 90° N., and, while drawing the figure in the usual way, viz., observer in center, horizon, N., S., E., W. points, and so on, one boy suggested that in this case these points might be omitted on the ground that an observer of the north pole would be looking south in whatever direction he turned.

By holding the axis of the globe vertical and allowing the light of the lantern to fall directly on the equator and carrying the globe round the light, it is at once seen that under these conditions the sun would be always vertical on the equator, and the days and nights would be equal throughout the year. But from experience we know that the sun is only vertical on the equator twice a year; that it is vertical over places 23½° N. on June 21st, and over places 23½° S. on December 22d, and that the length of day and night varies throughout the year. To account for these phenomena it is necessary to incline the axis 66½° to the plane of the ecliptic. Having placed the globe with the north pole turned away from the light, and having noted the northernmost point reached by the light, we turned the globe around and found that we had traced a circle, viz., the Arctic Circle, and that in this position all places within it were in darkness. Similarly, all places within the Antarctic Circle were illuminated. As the globe was moved round the lantern through an angle of 90° the light was seen to creep gradually into the Arctic Circle and to reach the north pole, while the direct rays of light were at that moment vertical on the equator. Similar observations were made as the globe was slowly moved into other positions in its course round the illuminating body. Here it is most important to insist that the equator, Tropics of Cancer and Capricorn, and the Arctic Circles are not drawn on maps and globes arbitrarily but are due to the apparent motion of the sun, *i. e.*, to the varying positions of the earth in its annual revolution round the sun. Boys rarely realize this.

We next considered the effect of parallel rays of light striking the surface of the earth, and hence accounted for the fact that in the Northern Hemisphere we have the summer season when the earth is farthest from the sun. By using a small globe to represent the moon, eclipses may be shown very effectively, as also the phases of the moon.

I have as yet only described those lessons in which the globe has been the most prominent object; but in ordinary geography lessons a globe is indispensable. We can at once compare the area of one country with other countries, for all are drawn to one scale. The position of one country with regard to other countries can be seen at a glance. Trade routes can be pointed out, and distance by alternative routes can be compared. While agreeing with Professor Reclus that projections on flat surfaces should be banished from our schools and that only maps drawn on curved surfaces should be used as being more in accordance with nature, it seems to me that for the present we must be content to compromise matters by using the most up-to-date maps in conjunction with a globe; so that, by constant comparison between the two, boys may become accustomed, when looking at a map, to picture in their imaginations the curved form of the portion of the earth's surface they are studying.—*The Geographical Teacher*, June, 1904.

First Lessons in Geography.—Within the last decade or two great changes have taken place in methods of teaching geography. The results of modern geography teaching must correspond to modern methods as shown in the pupil's idea of the earth on which he lives. To study geography in olden time was to learn the contents of the text-book. To study geography in the present day is to gain, as far as possible, an objective knowledge of the earth and to imagine and reason from the known to the unknown.

In country schools there is fine opportunity for pupils to learn by observation the natural forms of land and water. The brook, the river, the pond, the lake, the slope, the hill, and other features of the surface of the earth in the vicinity of the school, are in themselves object lessons if the minds of the pupils are trained to see for themselves.

The first lessons in geography are properly nature stories without the use of a text-book. Such lessons in nature study are usually found in the courses of study for city schools. In ungraded schools all the pupils who are not studying the printed book in geography may be placed in one class. Even the youngest pupils need not be excluded from the simplest lessons, particularly those which are objective, for they can gain practical ideas which will create a taste for the further study of the earth.

The teacher of oral geography may select from the natural features of the district some one prominent for study. When possible, study slope first, for a hill is an object of interest pleasurable when connected with the play of the children.

Flowing waters are also objects of interest to children, affording them sport. The teacher may illustrate the terms source, course, and mouth of a stream, in the schoolroom, and take her class for field study later, or she may give the first lesson from Nature's book, and follow with oral lessons in the schoolroom. Lessons on a stream may be succeeded by lessons on a watershed. In the meantime, instruction should be given on the points of the compass. Great care should be taken that the pupils know the directions north, south, east, and west, outside of the schoolroom as well as in it. This result can be accomplished by questioning the class about the direction of the road or street in front of the school, or the direction from the schoolhouse of another school building, or of the homes of individual pupils. Lessons in map reading may be given by the teacher placing a line on the board from south to north, and another north to south, the two lines being continuous but for a little space intervening. These lines are to represent rivers, the space between the lines the height of land where each river has its source. Each stream may be named after some pupil in the class. Questions will test the pupil's ability to imagine slope. They may be sent to the board to point to the source, the mouth, to show which river flows north, which south. In a similar way forms of land may be taught, as valley, plain.

When features of the earth not found in the neighborhood are to be taught, the good teacher of geography will have a supply of pictures to illustrate the subject. Frye's *Brooks and Brook Basins* is a most helpful book for the teacher commencing oral geography.

In the winter months when field studies cannot be pursued, the teacher may read from *Seven Little Sisters.* This is a book most interesting to all children, as it gives them the first glance at children differing from themselves living on other parts of the globe. It is a known fact that the children they study about become real personages to the pupils who learn of their habits and customs. The teacher reads and the pupils afterward reproduce, either orally or in writing. However, before this part of oral geography is taken, some ideas must be gained by pupils about the shape of the earth. Any common sphere may be used to lead up to the globe. On the globe locate the point where they live. To some children, even bright ones, it is a wonder that we live on the outside of the earth. No definite size of the earth should be given thus early, only that it is very large.

In the spring-time lessons in market gardening and farming may be given, covering the kind of products raised. A few lessons on some of the products may be taught. Such lessons illustrate one occupation of man. A game may be used which is imaginative, as are some lessons in the kindergarten, in which the products of the garden or farm are sold and other products bought. Such a game would illustrate another occupation of man.

If there are manufactories in the vicinity of the school, one or more talks may be given on what is made in these, and an exercise follow in which all articles in the schoolroom which are manufactured may be named. This exercise illustrates a third occupation. Afterward pupils may name persons whom they know who are engaged in agriculture, in manufacture, in commerce.

After such preparation in studying real objects in geography as slope, stream, plain, the points of the compass, the shape of the earth, stories of other children who live on the earth, and what kinds of work men and women do, we may commence the study of a map. Let the children make a map of the district or the part of it in which the school is located. It will mean more at first to the children if made on the floor, or on paper or cloth placed on the floor, as the points of the compass can be kept true. If made on paper or cloth, it may afterward be hung against the wall, telling the children that men have agreed to call the top of the map north. When the first map is understood the teacher is ready to begin the study of the state in which the class live, as Ohio. If the pupils live near one of the limits of the state, commence with that boundary, as in the northern section we should begin with the southern shore of Lake Erie; in the southern section with the Ohio River. The teacher may place the outline of the state on the board. If she can do it in the presence of the class much more interest will be aroused. After the outline is drawn, pupils may travel from the school north to Lake Erie, south across the Ohio River to West Virginia or Kentucky, east to Pennsylvania or West Virginia, and west to Indiana. Such exercises must be frequent. The teacher may tell the children that these are our neighbors and we must know their names and which way to go to visit them. The class may next study the flowing streams. They may commence in the part of the state in which they live; that is, all living south of the watershed would first study the Muskingum, the Scioto, or the Miami rivers. Which one of these to study first would depend on the location of the pupils studying. The study reviews the idea of slope. The study of rivers flowing in the opposite direction develops another slope, and the fact that here is a watershed. At the proper time the Ohio River is studied, and Lake Erie. If the surface of the map is colored, brown being used for high land and green for low land, the surface of the state can be well shown. The teacher should develop the idea of a state. No better lesson can be given combining civics and geography than Sir William Jones' poem, "What

Constitutes a State?" Children should memorize the first half ending with

"Men who their duties know,
But know their rights, and, knowing, dare maintain."

Lessons may follow on Ohio, its climate, soil, products, vegetable and mineral, the occupation of its inhabitants, its leading cities, railroads, and canals. If an electric road passes near the school, the pupils might study about the towns it connects, or if several suburban lines enter the town where the school is located a map may be made of these. In the meantime pupils may draw the outline of the state, its principal rivers, and locate its leading cities. They may also model in sand. Molder's sand is suitable for modelling. But children have made a model of Ohio in the playground without the presence of the teacher, because they were so much interested in their lessons in geography. When such studies in oral geography have been pursued, pupils are ready to take a text book and use it intelligently.

I cannot believe but that in geography the starting point is at home. Working with younger pupils from the near and known, interest is developed in the first study of geography which grows with their growth.—*Ohio Educational Monthly.*

Acclimatization of the White Race in the Tropics.—With the present rapid [illegible] the views up [illegible] of the white race [illegible]. Two striking [illegible] race, against [illegible] greatest [illegible] peoples. [illegible] King [illegible] Commission [illegible] region should not merely follow the plan of their school course of study, but should go deeper and attack the problem as a problem in geography primarily, and in geography teaching only when they have mastered the geography. Workers in this field would do well to take as a guide a little book like Herbertson's *Man and His Work*, or like Professor Davis' article on Home Geography in the JOURNAL OF SCHOOL GEOGRAPHY for January, 1897, for both of these are full of suggestions as to how to see relationships in the geography about one.

The topic of home geography is so new that it is not yet understood and there is much work to be done. It cannot all be done by remote geographers. The local students must help themselves by adapting the suggestions of others to their own localities, and in so doing will gain vigor, interest, and a love for nature as well as geography.

REVIEW

North America. By Israel C. Russell. Pp. x and 435. Appleton's World Series. New York: D. Appleton & Co., 1904.

Russell's *North America* is primarily a volume for the general reader and does not form as valuable a book of reference as could be desired. It includes extended accounts of the topography, climate, plant and animal life, geology and aborigines of North America, but is extremely deficient on the political, social, and economic sides. This lack, however, is not due to the author, but to the fact that the volume was planned to cover the whole continent and hence all parts of the geography could not be included in the space provided. This is particularly unfortunate, for the portions of the subjects treated are more readily available in the existing literature of geography than are the subjects omitted or seriously condensed.

Although all the chapters are extremely readable (except where fine writing is indulged in) the most valuable for teachers are those on the plants, animals, and aborigines. In the chapter on topography and climate Professor Russell has not followed the classifications usually adopted by workers in these subjects. Hence teachers who want to pass from the book to the detailed literature will find the chapters less usable than they might be.

The illustrations are few, much fewer than they might well be, a lack which has been thus far characteristic of the series. The maps are well drawn and executed and are valuable adjuncts to the text.

Though the volume is not of the standard teachers have long needed, it is extremely valuable for reference and should be in every school library.

R. E. D.

being reached, and the effect of the transpiration of water vapor, are noted. It is only through the constant reiteration of the right view of the position of the forest in relation to climate that the common and highly erroneous ideas of the climatic influences of forests can be successfully combated.—*R. DeC. W.*

EDITORIAL

HOME GEOGRAPHY

HOME Geography, now recognized as being the fundamental phase of any rationally ordered course of study in geography, is based upon the well established principle of teaching, that a child must begin with that which is near and personal and work out to the remote and unfamiliar features of the world which cannot be personally seen and directly studied. Home geography as taught, however, is not always made as foundational as it might be for the reason that teachers do not choose the topics to be presented with sufficient care, and do not draw out the relations between the many features of their geographic environment so as to make the study thought- and question-inspiring.

Home geography should not include all the features of the home region just because they can be seen from the school window. For then home geography becomes a mere catalogue of facts taken in a chance order and is deadly as a subject for provoking interest and observational study.

The difficulties of teaching the subject are many, for no phase of geography is so complicated and difficult to present understandingly as that great complex of physical, biological, and social facts which make up the geography of the home region. A great step in advance can be made if interested teachers will get together and study the home geography of their own locality, and prepare an abstract or even a paper of some length for their colleagues to whom geography teaching is a bugbear.

The home geography of no two regions is alike, and the subject cannot be presented in exactly the same way in two different places. The relationships to be seen and the points to work for are practically the same, but the details, the flesh to clothe the skeleton of principles, vary according to the locality.

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FINAL RESULTS IN THE STUDY OF GEOGRAPHY

BY JACQUES W. REDWAY, MOUNT VERNON, N. Y.

THE American boy begins the study of geography at the age of five or six years; at the age of twelve or thirteen he closes his text-book and makes an end to the systematic study of the subject so far as his school course is concerned. During the first three years of this course the work is mainly to develop the perceptive faculties, and he becomes familiar with geographic forms, earth substances, form factors, etc. He may or may not be old enough to comprehend that these are either topographic or climatic in character. It is of very little use to attempt to force this categorical classification upon him unless he can understand it, and the understanding of it is a matter, not of "brightness" but of mental development.

During the fourth, fifth, and sixth years he undertakes the systematic study of geography. During this period he gets a superficial knowledge of peoples and the countries in which they live; the chief thing accomplished is the acquisition of a vocabulary of geographic names. From three-fourths to four-fifths of all the place-names he becomes familiar with he learns at this time. And a reason therefor is not hard to find; between the ages of ten and twelve the memory faculty is stronger and more active than at any other time of life. A moment's reflection is sufficient to show that this sort of work is not the real study of the subject, but only a preliminary preparation for it. In its intrinsic value it is not equal to the knowledge gained in the first three years of field work. The unfortunate part of it is the fact that not far from three-fourths of the public school pupils never pass this stage of geography study.

In the seventh and possibly in the eighth year the pupils who remain in school take the subject upon a basis that ought to be naturally broader. They are supposed to learn not only about countries and industries, but they should also know that those same industries depend mainly upon either climate or on topography, or on both climate and topography. The boy should know it not only in the abstract, but in the concrete as well. He should know it by discovery, and the discovery should result from the study and investigation made in his own neighborhood. Let us take several illustrations.

Suppose the locality is the prairie region of Illinois: Wheat is the staple product. The wheat-farming is there because the staple foodstuffs can be cultivated and harvested on a level plain, covered with alluvial or diluvial soil, more economically than in any other locality. That is, topography, a geographic feature, has controlled a great human activity.

Suppose the locality embraces the corn belt: The corn does not thrive best, we will assume, south of the latitude of Oklahoma because the days are not long enough to bring about the high temperature which corn requires. It does not thrive in the latitude of Minnesota because, in spite of the long days, there are occasional cold nights in August that arrest the process of fructification; that is, a crop of tremendous importance is controlled by climatic conditions.

Suppose we consider the coal regions: In this case climatic conditions were the proximate causes of the growths of vegetation that now constitute the coal. Geologic and physiographic forces of a complex character resulted in the topography that now makes the coal available as a source of energy. The old denuded Huronian ranges, their present topography resulting from physiographic process, yield their contents of iron ore. The Great Lakes, a natural basin, constitute a line of such low resistance that upon their surface the ore may be hauled very cheaply. Because of all these conditions iron ore fit for making the best Bessemer steel may be delivered at the smelteries at a cost varying from $1.75 to $3.25 per ton. As a result of these fortuitous conditions this region has become a center of steel manufacture that practically fixes the price of steel rails for the world. So, also, the cotton region, the grazing region of the plains, the mining region, and the humid lowlands of the Pacific coast offer excellent illustrations. An inspection of a good relief map of the country, beginning with the Sound Valley and ending with the lower flood plain of the Colorado River, is sufficient to show that this is an area destined to become one of the great food-producing regions of the world. In other words, topography and climate are the chief factors that control a certain human activity and make both economic and political history.

Let us consider a foreign country, the conditions of whose political organization are unique—Austria-Hungary: The pupil learns of its general surface features and what may be expected of its productivity so far as latitude permits. He also learns that the population of the country consists of races that are very diverse in character. The Czechs hate the Huns and the Huns hate the Czechs; they both unite in most cordially hating the Germans of Austria. Why, then, are they held together under a single political organization? Until the pupil knows this he is not armed with the knowledge of the geography of Austria-Hungary that he ought to have. The chief explanation of the political entity of the empire is to be found in the valley of the Danube River. On the southeast and east are the grain fields of Roumania and Bulgaria; on the west and northwest is the dense population of the manufacturing centers of Europe. The Danube, a line of least resistance because of its topography, is one of the great trade routes of Europe. So important is it that the Iron Gate, the water gap in which the river breaks through the Carpathian Mountains, is controlled by an international commission. Now the commerce of this region is so extensive that the community of interest overbalances race hatred. Hence Austria-Hungary holds together because of commercial interests mutual to the diverse races.

In the case of Germany we may see the effect of a commercial product in relation to geographic environment on the one hand and to political history on the other. The sandy Baltic plain has a topography that has resulted from interesting physiographic processes. It is indifferent land for the cultivation of ordinary food crops, but for the production of sugar beets the soil is scarcely equaled elsewhere. So well adapted is the land for this crop that many square miles formerly devoted to other crops in the past few years have been given up to the cultivation of the sugar beet. Indeed, one might say with but little exaggeration, that the foundations of the empire are beet sugar and Bessemer steel. [illegible] the development of beet sugar manufacture, moreover, it is very easy to trace the [illegible] and the Spanish-American War.

Now when we consider the [illegible] features of the [illegible] world we shall find that modern political organization is very largely for the protection, encouragement, and development of the [illegible] industries of a people; that is, production, manufacture, and commerce. Furthermore, these industries in the main are very largely controlled by the conditions of geographic environment; that is, by climate and topography. These are the fundamental propositions in the study of geography and if the pupil may have forgotten everything else that he has learned in his school course, he can easily rebuild a good working knowledge of the subject upon them. Without an understanding and comprehension of these principles his knowledge of the subject is incomplete, imperfect, and fragmentary.

There remains to be considered the way in which the inculcation of these fundamental principles can best be accomplished. To comprehend them a certain maturity of mind that comes only with years is essential. The German schoolboy has this sort of knowledge because he has about four more years of work in the systematic study of geography than the American pupil. Indeed, as a rule, his knowledge of the subject much surpasses that of the American boy even in matters pertaining to the geography of the United States. The American boy closes his study of the subject usually in the eighth year. In many schools, notably those of New York, he quits it at the end of the seventh year, just about the time he is old enough to begin these fundamental principles. In many cases, more especially in the elaborately graded schools, the conduct of the study is bent mainly to the work of preparing for the examinations. "He studies to pass and not to know; he does pass and he does not know."

RESULTS OF AN ELEMENTARY COURSE IN GEOGRAPHY

BY PHILIP EMERSON

Principal of Cobbett School, Lynn, Mass.

NO more important consideration concerning the teaching of geography exists than the question as to what results the course in this study should secure to pupils. The content of text-books and the methods chosen by the teacher are dependent upon its decision. It is fundamental to the construction of a course of study.

The graduate of a grammar school should have definite knowledge of the most important facts concerning the earth and its peoples as a result of his work in geography. Most boys and girls may forget the facts of mathematics they learned after the fifth or sixth grade and rarely miss the knowledge. If they fail to remember the essentials of geography presented in upper grades they are poorly prepared to read newspapers and periodical literature or to converse confidently on current events. They should be equipped with the knowledge requisite to enable them to share in the larger life and thought of their times.

In years agone, and in belated schools of both city and country extremely close to the present day, too, about the sole result of the geography course was a summary knowledge of many brief, unrelated facts as to location, products, and the like. How many capes and capitals, distant bays, and little rivers pupils pored over their maps to find! Happily, ere long most were forgottten, because, having little life importance, they were but lumber in the mind. In some school systems reaction from such teaching has resulted in a general failure to learn the locations of places having prime importance.

We may agree that a graduate should know the location of the countries of the world, perhaps a hundred of its important cities definitely and in similar manner the larger physical features and those of great influence on life, not forgetting really leading productions. Much more will be known in a rather general way, for instance that Sheffield is somewhere in the industrial district of England. The class of facts first mentioned should be so known that the pupil will habitually picture in his mind any continent and locate country, city, or river upon it so as to consider it in its true geographical relations. The ability to draw a good sketch map rapidly is proof of the mental picture and its degree of accuracy. There should be built up in a pupil's mind broad general outlines of the continents and their life, accurate so far as they go, but with no attempt to elaborate details. This latter aim would prevent accomplishing the main purpose.

But what cities and mountain ranges should be well known? some teachers ask. Why, those that the teachers themselves have found referred to again and again in papers, magazines, and books—by travelers, historians, and the commercial world. Geography studies the relations of man to his environment, and facts are important according to the closeness of their relation to man's life. There is no need that some authority should make a list of the places of first importance. Were a hundred people to make lists of the hundred cities of the world that a pupil should be able to locate closely, they would certainly agree in their choice of the majority. Most text-books emphasize rightly the facts of prime importance.

Geography secures to the pupil more than knowledge of mere facts; it gives knowledge of the relations, the causal connections, between facts concerning man and those as to his natural environment. A pupil should not only have knowledge of successive instances of relations between man's life and the earth; such knowledge should be organized into the more fundamental general truths of geographic relations. In this direction results are as yet unsatisfactory. The text-books state few general principles clearly; geography in its higher reaches has not been fully developed as a science. Naturally the pupil has only indefinite conceptions of the fundamental laws illustrated by the specific cases he has learned.

The relations of man to the earth have been slowly established through the changing reactions of history. These relations are often intricate and hard to comprehend. Even the simpler truths of geographic relations that are taught can be better understood, perhaps alone understood, when relations are viewed from the standpoint of their development. One result of an elementary course in geography should be some knowledge of geographic facts and relations of past time—history if you will, yet not history in its central purpose. The pupil will know the world not merely as the sum of present facts and relations, but as having developed from a different past toward a more perfect future. These larger general truths of the evolution of the relations of the different peoples to their home lands are of at least as much importance as the actual facts taught concerning present geography. When the child has become a man or woman of middle life, the facts he learned at school will have become in considerable part untrue; capitals and boundaries change, new centers of life develop, areas of production and routes of distribution wonderfully change. Principles of geographic evolution true for past development control present changes, and knowledge of such general truths of the science, geography, constitutes a guide to the understanding of current events of the world and one's home community that should be furnished in some measure to every graduate of our schools.

It is even more important that graduates should know how to study for themselves than that they know certain life facts and general truths as to their earth relations. Geography provides the earliest and best opportunity of the elementary school to train children to

[illegible]

[illegible] teaching. It lacks the definiteness [illegible] a text or texts secures. Although [illegible] part of every year, new topics or sections should be [illegible] class study, or discussion, of maps, pictures, and other sources of knowledge, under the teacher's active guidance [illegible] the work [illegible] and pupils perceive its spirit and methods [illegible] subjects for independent study, and [illegible] may follow without preliminary teaching. Students may thus be trained to know how to study the pictures, maps, and text of books when they enter the secondary school or leave school for life work.

Geography affords a large and neglected opportunity for training children to use their eyes and other senses in thoughtful study of objects. Field lessons should be continued through the grades until pupils will naturally question how the human life of any [illegible] presented community is related to its environment, [illegible] certainly question how any new district [illegible] modified by [illegible] forces. Laboratory exercises with [illegible] arranged sets of specimens of raw materials and finished products whose immediate [illegible] stand the relations of [illegible] study in developing the children's [illegible] Students entering [illegible] to study the earth and [illegible]

Pupils completing [illegible] facts and principles [illegible] more than [illegible] acquisition [illegible] ration [illegible] own and [illegible] important [illegible] acquaintance [illegible] [illegible] the [illegible]

[illegible]

earnest and broad patriotism, intelligent devotion to the development of the economic and social possibilities of the home community, comprehension of the resources and relations of the nation that shall complete the work of history in securing wise citizenship, appreciation of fellow lands and peoples that shall make patriotism broad enough to know the rights of other nations and the duty of our people toward other races.

In summary: the knowledge gained during an elementary course in geography should be so limited and systematized as to be definite and permanent; it should be so gained as to open attractively a limitless field of knowledge and to inspire an earnest and practical effort to relate one's own life to its environment.

FOUNDATIONAL EXPERIENCES

BY ARTHUR P. IRVING

Buckingham School, Springfield, Mass.

AT the opening of the last school year all of our classes took up geography work and we determined if possible to lift the study above the merely word work so often found. To make the study more real to the pupils was our aim.

The first step was to find out what the children offered us to build upon, not in the way of previous book knowledge but in actual observation and experiences. We also noted that ideas of the oceans, lakes, rivers, and mountains predominate in geography. Therefore we set out to learn just what the children knew at first hand of these fundamental features by having them write answers to the following questions. Some of these questions are necessarily local, covering prominent features of this section:

OCEAN—

1. Have you been on the shore of the ocean?
2. Have you tasted of the water of the ocean?
3. Have you waded into the water of the ocean?
4. Have you seen the rise and fall of the tide?
5. Have you sailed on the ocean?

LAKE—

6. Have you seen a lake?
7. Name the largest lake you have seen.
8. What is the taste of lake water?

RIVER—

9. What large river besides the Connecticut have you seen?
10. Have you seen falls in a large stream?
11. Where are these falls you saw?

MOUNTAIN—

12. Have you been on Mount Tom?
13. Have you seen a greater mountain than Mount Tom? Name it.
14. Have you ever lived outside of the Connecticut Valley? If so, where?

The answers of the children are tabulated by grades and rooms. In the following chart the total number of each grade is given except for the seventh grade, which for our study is given in detail. Many of the questions could be answered by yes or no. The upper number of the fractional form in the chart signifies yes and the lower number no. The results of some of the questions do not appear on the chart.

FOUNDATION EXPERIENCES IN GEOGRAPHY

		OCEAN					LAKE					RIVER		MOUNTAIN		
Grade	Room Number	Have Seen	Tasted	Waded In	Seen Tides	Sailed On	Have Seen	Tasted	Seen Ocean, Not Lake	Seen Lake, Not Ocean	Seen Neither	Besides Connecticut	Seen Large Falls	On Mount Tom	Greater Than Tom	Lived Outside Connecticut Valley
VI	4 5	$\frac{36}{40}$	$\frac{23}{53}$	$\frac{32}{44}$	$\frac{29}{47}$	$\frac{23}{53}$	$\frac{50}{26}$	$\frac{24}{52}$	8	22	18	$\frac{40}{36}$	$\frac{39}{37}$	$\frac{48}{28}$	$\frac{29}{47}$	$\frac{17}{59}$
VII	3	$\frac{22}{20}$	$\frac{17}{25}$	$\frac{19}{23}$	$\frac{19}{23}$	$\frac{18}{24}$	$\frac{38}{4}$	$\frac{20}{22}$	0	16	4	$\frac{28}{14}$	$\frac{32}{10}$	$\frac{32}{10}$	$\frac{15}{27}$	$\frac{18}{24}$
	2	$\frac{15}{19}$	$\frac{12}{22}$	$\frac{13}{21}$	$\frac{13}{21}$	$\frac{13}{21}$	$\frac{20}{14}$	$\frac{9}{25}$	5	10	9	$\frac{15}{19}$	$\frac{17}{17}$	$\frac{23}{11}$	$\frac{7}{27}$	$\frac{12}{22}$
	1	$\frac{23}{16}$	$\frac{14}{25}$	$\frac{16}{23}$	$\frac{20}{19}$	$\frac{19}{20}$	$\frac{33}{6}$	$\frac{22}{17}$	5	15	1	$\frac{27}{12}$	$\frac{34}{5}$	$\frac{24}{15}$	$\frac{26}{13}$	$\frac{20}{19}$
	7	$\frac{25}{9}$	$\frac{18}{16}$	$\frac{21}{13}$	$\frac{18}{16}$	$\frac{21}{13}$	$\frac{25}{9}$	$\frac{13}{21}$	5	5	4	$\frac{26}{8}$	$\frac{24}{10}$	$\frac{23}{11}$	$\frac{16}{18}$	$\frac{12}{22}$
Total		$\frac{85}{64}$	$\frac{61}{88}$	$\frac{69}{80}$	$\frac{70}{79}$	$\frac{71}{78}$	$\frac{116}{33}$	$\frac{64}{135}$	15	46	18	$\frac{96}{53}$	$\frac{107}{42}$	$\frac{102}{47}$	$\frac{64}{85}$	$\frac{62}{87}$
VIII	8, 9, 10	$\frac{76}{34}$	$\frac{64}{46}$	$\frac{65}{45}$	$\frac{62}{48}$	$\frac{64}{46}$	$\frac{76}{34}$	$\frac{49}{61}$	18	18	16	$\frac{64}{46}$	$\frac{47}{63}$	$\frac{84}{26}$	$\frac{57}{53}$	$\frac{43}{67}$
IX	11 12	$\frac{48}{12}$	$\frac{40}{20}$	$\frac{43}{17}$	$\frac{43}{17}$	$\frac{42}{18}$	$\frac{52}{8}$	$\frac{37}{23}$	7	11	1	$\frac{43}{17}$	$\frac{36}{24}$	$\frac{51}{9}$	$\frac{32}{28}$	$\frac{34}{26}$

Upper number of fraction is number of pupils answering Yes.
Lower number of fraction is number of pupils answering No.

While considering these answers we must bear in mind that Springfield is about a hundred miles from the ocean; that no lake of any size is very near us, the nearest ponds even being so situated that many of the children do not see them; that Mount Tom (1,218 feet) is ten miles away, easily reached by electric cars and clearly seen from most parts of the city; and that the Connecticut River is at our door, although not much of a factor in the business of the city, as in Hartford and Holyoke. Again, these children are all in the upper grades and from pretty well-to-do families.

In grade VI over half of the pupils have no first-hand knowledge of the ocean and eighteen have none of lakes either. About half have not seen falls of any size and a large number have not been much above the common level of the land hereabouts.

Let any teacher think over her geography outline and consider such facts of the mental condition of her pupils and she must sit down in blank discouragement or spring up with a grim determination to overcome these difficulties so far as possible by good teaching. One of our teachers expressed it when she said she realized for the first time how dim were the visions which the children had from her teaching, for she had taken too much for granted.

A little better condition is shown in grades VII, VIII, and IX, but in every grade and room the per cent of those lacking fundamental concepts is large, very large, and must be reckoned with in class presentation.

In grade VII are given the statistics of each room to show that the deficiencies are everywhere present and not confined to the highest or lowest divisions of a grade.

The statistics of this school as such are of little use to teachers of other schools. They merely suggest that every teacher must know her own class and present to her a simple way of getting such knowledge. It would be interesting and helpful to have such a study of the whole city, yet after all each teacher is concerned chiefly with her own class. By the conditions herein presented the teacher is challenged to do good work. The first step is to know the conditions; the next is to govern ourselves accordingly. That the teachers of this school have overcome these difficulties would be far too much to say. But different and more thoughtful teaching has been going on. We are right in the stage where we would like to have some show us how to do more. The way, however, is not all so dark as one might think. We can make use of well known devices, well selected pictures, and good word pictures from any source. Talks by children who may have seen different places are of great interest to the others. For illustration, in room 7 we found a number of pupils who had seen lakes ranging from Forest Lake, Whalom, Quinsigamond to lakes Champlain, Erie, Michigan, and Great Salt Lake. And for rivers we got experiences from the Chicopee and Westfield to the Nashua, Charles, Penobscot, and Mississippi. Several had seen Niagara Falls. Seventeen had lived outside of the Connecticut Valley, as in New Hampshire, Montreal, Providence, Long Island, Buffalo, and in England. For mountains we ranged from Wachusett and Greylock to Mount Washington and the Catskills.

I am fully aware that our course of study calls for North and South America in grade VI and for Europe, Asia, and Africa in grade VII, etc. But how can children ever know and visualize anything of these remote places until they know what is about home? Those children whom Doctor Hall mentions who thought of berg as a place of amusement, from Pefferberg, the name of a saloon in their neighborhood in the city of Berlin, were better off in the use of a geographical term than some of our upper grade children. They had at least a concrete idea under the word. We hope also to see the time when we can ask the pupils of the ninth grade to point out a plain or plateau without having them charge up and down a streaked map of remote Asia or Africa while all the time our own city is largely situated on such a form.

So at last we drop into a plea for and a trial of a broader study of local and neighboring conditions. Not that local geography is meant which confines itself to the fourth grade and then forgets that the pupils ever had a local habitation. We might as well study phonics in grade II and then never require it again.

A distant and foreign land must be interpreted in the thought and terms of the home country. Understand the Connecticut River and you understand all rivers. This thought applied in every grade must help overcome some of the difficulties.

WHAT SHOULD GRADUATES FROM ELEMENTARY SCHOOLS KNOW ABOUT GEOGRAPHY

BY ISAAC O. WINSLOW
Principal of Thayer Street School, Providence, R. I.

THE determination of the course in geography for elementary schools is a process of selection and elimination. In the rapid development of the subject in recent years a great amount of the "new geography" has been added, while but little of the old has been abandoned. The result is that we have an impossible amount of subject-matter included in the course and in the textbooks, and the attempt to accomplish the whole leads to confusion. The necessity of selecting imposes an unnecessary burden upon the ordinary teacher and requires greater ability than she possesses. The few artist teachers are able to shape their own work, but while we are theorizing about the few we are neglecting the many.

Of all the work that might be regarded as belonging in the geographical sphere of education, to determine what parts are of greatest worth to the average child as a preparation for life is the task that lies before us. There ought to be a more general agreement with regard to the several divisions of geography—astronomical, mathematical, physical, historical, political, descriptive, and economic—upon the question what there is in each division that for its practical utility, or its value in culture, the average child should be expected to know at the time of leaving the elementary schools.

With regard to astronomical and mathematical conceptions, too much is generally expected of young children and but little is accomplished. By the simplest forms of illustration, with the globe and a diagram, and by observations of the sun, the most elementary notions of the motions of the earth and its relative positions should be thoroughly established in the mind of the child as a permanent possession. Upon this basis he should be able to understand the causes of the changes of the seasons, the alternation of day and night, and the variation in the length of the days. A little practice in thinking where the sun would appear to be in the heavens, at noon, to one situated at the equator, at the tropical circles, at the Arctic Circle, and in various countries of the world, at different seasons of the year, will serve to effect a transition from the artificial illustrations to an imagination of the realities.

There is great danger of attempting too much in physical geography and of teaching it at the wrong time. Pupils of the high school grade may find interest in this part of the subject, when pursued for its own sake and with extended applications in detail, but for elementary pupils this is wearisome and unprofitable. It is not difficult, however, to awaken an interest in scientific principles and facts which can be easily understood and which have an evident relation to human welfare. A good understanding of such elementary principles is necessary as a general basis for causal explanations. In setting forth these principles it is not necessary to give all the causes that produce a given effect. A clear idea of one cause is better than a confused notion of several, and satisfies the demand for explanation.

We should give a clear idea of the cause of the movement of the air, in general, and of some particular applications, such as sea breezes and land breezes. The latter part of the course should include an explanation of the prevailing winds of the earth and their changes with the seasons.

With regard to temperature, two points are important, the difference due to elevation, and the difference between inland regions and those near large bodies of water. An explanation of the curves in isothermal lines, at various seasons, furnishes good practice in the application of these principles.

The child should be able to give, first, the general causes of the appearance of moisture in the atmosphere in the form of fog, mist, clouds, and rain, and secondly, the most common of the particular causes, as when a body of air rises, or passes over mountains, and when the trade wind meets the land. These points should be so thoroughly understood that an application may be readily made under any specified conditions.

A causal explanation of the physical features of the earth requires a brief account of geological history, including the formation of the earth's crust by cooling, the principal agencies of erosion, the formation of new strata, the effects of upheaval and depression, volcanic action, the effects of rivers in wearing down their beds, transporting detritus, and forming flood plains and deltas, the work of waves on the coast, and the principal effects of the Ice Sheet. It is impossible to avoid an elementary consideration of these principles without abandoning the attempt to give explanation and reverting to a static treatment of geography, or mere description. On the other hand it is necessary to guard against the temptation to enter into details too minutely. Brief and simple explanations, if clear and correct as far as they go, are not open to the charge of superficiality.

The aspect of supreme importance, to which mathematical and physical considerations are subordinate and in which the highest interest of children centers, is the treatment of the people of the earth, of the geographical reasons for their activities, and of the causes and results of their abode in the various regions.

As an introduction to the life of the people of a country and as a means of awakening interest in them, it is of great advantage to give a brief account of their origin and of the development of their leading characteristics. A brief statement of the great national facts in the history of the Swiss people, for example, an account of their patriotism and their struggle for liberty and independence, arouses an interest in their present conditions as nothing else can.

The culmination of both interest and value is in the customs and occupations of the people, especially as resulting from natural conditions. Children are eager to learn what manner of life the people of a country are leading, what they are doing and why they are doing it. A strict regard for the limits of the field would confine us to such activities of the people as are geographically determined, but it is unnecessary to be greatly troubled upon that point. The objection to passing beyond the boundary lines has a stronger basis in the question of economy of time, than in that of sinning against principles. The teacher himself should have so clear a view as to know the boundaries of the field, but should not hesitate, at times, to pass beyond them. The production of wheat in the Dakotas and Minnesota is a fact geographically determined. Routes of transportation of the wheat, if affected by geographical conditions, are also legitimate. The water power at Minneapolis may furnish an excuse for mentioning the bare fact that wheat is there converted into flour. Precise geographers of a certain type are ready to cry out against anything further, and yet the practical teacher who fails to weave in details by briefly describing the methods of handling the wheat and the process of manufacturing flour, misses an easy opportunity to clothe the subject with life and to strengthen the memory by vividness.

The commercial phases of geography belong preëminently in the elementary course. To account for the leading productions of a country without explaining what becomes of them is to leave the thought in suspense. A study of the system of exchanges of the great staple products among the various countries is as easy and interesting as the spontaneous play of childhood. Thorough practice in thinking out the leading commercial routes and the products transported over them serves as the best kind of final review and fixes in mind a most concise knowledge of world relations. Recently there has been a tendency to enlarge upon physical geography in the elementary schools while, on the other hand, commercial geography has generally been regarded as a high-school subject. There are good reasons for reversing this. The graduate from the elementary schools should be sufficiently acquainted with the practical world of the present day to have in mind a fairly complete scheme of commercial relations and exchanges. On the other hand, with a good understanding of the simplest elements of physical geography he can afford to postpone an elaborate treatment of that subject.

Such an industrial and commercial view of the world will serve to emphasize the most important part of "sailor geography." Mere convenience requires one to be familiar with minor localities in the vicinity of his home and within the circuit of his practical life, but aside from this the indiscriminate cramming of names and locations is worse than useless.

Since the capital cities are not always the largest cities of countries and states, there is neither practical nor disciplinary value in the ability to recite them. The memory should not be burdened with the names of more cities than are often mentioned in the newspapers or in books commonly read. Every city of this class should be associated, in the child's mind, with some special industry or attraction for which it is noted.

Great exactness should not be required in the matter of locations or boundaries, except in the case of the home state or country. The ability to name, in order, the succession of states along the border of the country or along a river, or those through which one would pass in traveling from a given point in a given direction, embraces all that is of much value in this kind of knowledge. If children can give the countries and the parts of the countries in which the important mountain ranges and rivers are situated, there is little additional advantage in more exact details. The knowledge of capes, gulfs, and bays and other forms on the coast should be confined to those whose names are of frequent occurrence. The most effectual means of fixing locations in the memory is practice in filling outline maps, or making maps quickly from memory.

The suggestions herein set forth may seem to propose a course unnecessarily brief and simple, but they will be appreciated by those who have had experience in ascertaining how little of all the geography that is studied in school is retained in after life. It is true of many subjects of study that much is gained from what has been once learned and for the time forgotten, but in geography facts forgotten are nearly a total loss. In this department it is best to strive to know the few things well.

COMMERCIAL IMPORTANCE OF CONTINENTS*

BY GEO. D. HUBBARD
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AFRICA has been styled by a leading traveler, "The Coming Continent." In what sense may it be thus named? Perhaps because of its rapid development; perhaps because many European nations rushed precipitously, less than two decades ago, to possess themselves of a portion. Certainly not as a place into which the peoples of temperate climes may overflow, since most of the great continent is climatically unfitted to be their home. Certainly not for its people, because its unnumbered millions belong to low, savage, restless, workless, or nomadic, marauding types. And certainly not on account of its mineral wealth, although the output of gold and diamonds is something prodigious, because these minerals never have been the basis of the permanent development of any country, nor indeed can be. The nations whose greatness is due to mineral industries base them on coal and iron. Certainly not as a market for manufactured articles because most of the natives, who constitute a large percentage of the 130,000,000† souls, make all the clothing and tools for which they have use. Wherein, then, lies

*NOTE.—After the continents have all been studied it is well to sum up the work in various ways, and to introduce comparisons and contrasts between them as to size, population, position, and other characteristics. The theme of the accompanying paper may be suggestive along this line. The countries of a continent or states of a nation may serve as a basis for a similar study.

† A mean of the estimates for Africa's population.

the importance of this massive, dark continent? It really has great possibilities. Can we not find them in the relation to the other continents, which it is destined to bear in the business world? This discussion is opened in order to set forth the geographic conditions upon which is based the economic interdependence of continents and of zones.

The loudest cry of all the leading life centers, agricultural as well as manufactural, has come to be, "A market for our products or we perish." With this in view, let us look at the field. The market hunter seeks primarily for people. This is the first element in a market, for wherever the density of population is high, there a considerable quantity of various commodities are used. It is because some writers have gone no farther than this that an error has been made.

A second element includes the needs of the people unmet by home productions. Regions differ immensely in this factor. Climate, occupation, and customs established by constant or repeated contact with elements of the environment help to determine the needs. For example, a resident of central western Europe must have cotton, woolen, and silken clothing, gold rings, feathers, books, elegant carriages, and tempting viands with beautiful pottery upon which to serve his menu. The central African native uses but little cotton, no wool or silk; ornaments of iron, bone, or even wood, make very good substitutes for the costly golden treasures. A chicken's feathers equal those of an ostrich. And as for "tempting viands" and the associated chinaware—native, uncultivated fruits and vegetables eaten uncooked from the hand are all that could be desired. For books he knows no use, and when he takes his outing he walks. Since what little work he does is hand work, machinery is not in the list of his needs. Therefore, the wants among these people are extremely few.

The third element consists of the present products of the region. Notice the last two regions mentioned. The European can make all his clothing and to spare, if he only has the raw materials. He grows the wool-bearing sheep and tends the tiny silk spinner, but his climate forbids the growing of cotton, hence he must buy that. His feathers and furs must be imported. The gold he can dig in many places, but in insufficient quantities; so that, too, must come to him. He has learned to collect the raw materials of his food from all the corners of the earth, and in them he has built up a great commerce. The clays and sands of his own hills and valleys and the coal of his mines enable him to make his own chinaware and ornaments. The wants unmet by the home products or by goods made from the latter are practically all raw materials. Hence we say France and Germany are manufacturing nations. But the African finds a strip of homemade grass cloth sufficient for all his clothing. The feathers in his hair or hanging from his girdle are from native wild birds or from his own poultry yard. His ornaments have always been homemade from native products until Europeans taught him different. Now he wants strips of calico, green or red cotton parasols, and all sorts of gewgaws from abroad. These flummeries constitute his great unmet wants. In almost all other respects the products of his land are sufficient.

With these principles in mind, turn to the several continents and see what part to expect them to play in the world's great commercial system, for by virtue of commerce and commercial centers all other life centers are united and vivified. In the following table the items are brought together for comparison:

Continents, Etc.	Density of Pop. per Sq. Mile	Needs or Wants Beside Those Met at Home	Surplus Products
Europe	97	Many; highly specialized; foods, and raw materials for factories.	Many classes of manufactures.
Asia	48	Many; less specialized; all sorts of manufactures and machines, some food.	Many raw materials; special food stuffs, a few types of manufactures.
Pacific Isles	42	Ornaments, civilization, development and associated machinery and equipment.	Mineral and agricultural raw materials.
Africa	15	Ornaments, civilization, development and associated machinery and equipment.	Raw materials.
North America ..	12	Many; highly specialized; foods and raw materials.	Manufactured goods and raw products, as grains, cotton, etc.
South America ...	6	Many; less specialized; manufactures and machines.	Raw materials, especially tropical agricultural products.
Australia	1¼	Manufactures.	Agricultural and mineral products—grains, wool, and gold.

From the table it appears that Europe is most densely settled, and, judged on this point alone, should be the best market. It is true that its people use by far the most manufactured goods per capita as well as per unit area, but they also make the most. Their special need is for raw materials to be made into foods for home use, and into textiles, hardware, and machinery for use and for export. Asia is a continent only half as densely settled, but by a people whose wants are many and whose productive power is good, especially along agricultural and certain manufactural lines. Hence their need is for general manufactures and their surplus is raw materials. And since Asia's area is several times greater, the actual number of consumers is millions above that of Europe. These people should meet those of Europe and exchange commodities. Asia is pre-eminently characterized as a market for manufactures, hence to a manufacturing nation it must seem like "the coming continent."

The Pacific Isles, however, with nearly as high a density of population, have very few unmet needs, while they possess facilities for turning out a large quantity of tropical food products and raw materials to supply the manufacturing industries of Europe and America. These islands should be looked to, not as markets for manufactures, but as sources of raw materials. It is true they buy almost nothing but manufactured goods, but the list is mostly made up of machinery, carriages, beer, flour, and petroleum, and the total is very small compared, for example, with the Australian colonies. All the Dutch East Indies imported, in 1901, goods to the value of $2.50 per capita, while in 1902 the Australian commonwealth imported to the value of $54 per capita. The continent of Africa belongs in the same category. The people of both countries lack all urgent needs, a lack due to the hot, enervating climate, the uncultured condition of the mass of the population, and to the prodigious productivity of the soil.

In North America great nations occupy broad tracts. The people are extremely progressive; the invigorating climate, by its severity, creates wants for clothing, fuel, houses, and food. The people have developed manufacturing to an extent, in many localities, comparable with that in Europe. The country is not thickly settled, hence there is magnificent opportunity for the production of raw materials. North America produces as much of this class of commodities as it uses, but ships some out and buys others to meet special manufacturing demands, then makes up much more goods in many lines than are needed. Therefore the continent may be classified as a producer of raw materials and also of mill products. For this reason Europe is invaded to sell goods of the first class and Asia to sell those of the second, while our merchants join hands with the Pacific Isles and Africa in order to purchase raw materials.

South America and Australia, with their sparse populations and broad acreage, are preëminently producers of raw materials and purchasers of manufactures. But they differ between themselves so much in climate that as continents they must always differ in the general character of the products. The former will supply, largely, tropical fruits, vegetables, and forest products, while the latter will produce sheep and wool with southern South America; and gold and wheat, by means of which it can buy the needed manufactures.

In conclusion it may be said that the climate, soil, density of population, and the social and economic conditions of the people differ widely in the several continents, and disclose the basis for intercontinental commerce and exchange. Goods must cross the meridians from one temperate country to another because of the enforced difference in output and in the respective needs of the people; and for the same reason they must cross the tropics. Temperate countries, while great producers of raw materials, are preëminently the manufacturers of the world. Tropical lands, while making nearly all that they need, are preëminently producers of raw materials which must waste unless sent to factories in the temperate zone. Just as our continued prosperity depends upon our finding a market for our specialties (manufactures), so the development of tropical lands depends upon their finding a market for their specialties (raw materials).

LATER GEOGRAPHIES*

BY CLIFTON JOHNSON

THE old-time geographies until nearly the middle of the last century were never larger than 12mos and some of them were diminutive 32mos. Up to 1820 they were as a rule bound in full leather, but occasionally the wood or binder's board of the sides was covered with dull blue or marbled paper. Buff-tinted papers with the title and more or less other printing on them were substituted on nearly all the later books. Illustrations also began to be used, at first sparingly, but soon very generously; and instead of being designed for the older pupils the books were made with special reference to the needs of the younger children.

For a score of years after geographies began to be introduced into the schools they depended largely on the use of a globe to make clear the divisions of the earth. It was not long, however, before nearly every book was accompanied by an atlas, and this continued customary to about 1850. Not many of these atlases have survived. They were flimsily made, with paper covers, and the wear and tear of daily use made an end of them. The usual size was either about six by nine inches or nine by eleven inches. Comparatively little color was used on the maps, and even at their newest the atlases must have looked dull and uninteresting. To modern eyes the oddest features of the maps are the vacant or mistaken outlines of the northern coasts of this continent, and the general blankness of all its western portion, with Mexico making a great sweep up into the present domains of our republic. Some of the African maps, too, are given a strange appearance by the portrayal of an immense line of mountains—the "Jibbel Kumra or Mts. of the Moon"—extending in a continuous and perfectly straight chain from east to west entirely across the broadest part of the continent.

Jedidiah Morse was the pioneer among American authors of school geographies, as I have explained in the previous chapter. The earliest rival to contest the field with Morse's books was a small volume of questions and answers compiled by Nathaniel Dwight and published at Hartford in 1795. Our own continent is confined to

*Reprinted by permission from "Old-Time Schools and School-Books," published by The Macmillan Company, New York.

the final third of Dwight's Geography, while Europe, Asia, and Africa have the first two-thirds. How very remote and unfamiliar many portions of the globe still were can be judged from the fact that most of the capital cities in Africa and some even in Asia and Europe are located by giving their distance and direction from London. Thus, "Petersburgh the capital of Russia is 1140 miles north-east from London. Pekin the capital of China stands eight thousand and sixty-two miles south-easterly of London." Monomotapa, the capital of a country of the same name "on the sea-shore in the southern part of Africa, is built with wood. covered with plaster and stands about 5,200 miles south-easterly from London." Other curious bits from the geography follow:

Q. What are the Russian funeral ceremonies?

A. They are singular: The priest prays, and sprinkles the corpse for eight or ten days; it is then buried with a passport to heaven, signed by the bishop and another clergyman, which is put between the fingers of the deceased, and then the people return to the house whence they went, and drown their sorrow in intoxication. This they commonly do for about forty days, during which time the priest says prayers over the grave.

Q. Are there any lakes in Scotland?

A. There are many; but two are very remarkable: One near Lochness is on the top of a hill almost two miles high. This lake is small, but it has never been sounded, nor does it ever freeze. About seventeen miles distant is another lake which is frozen all the year.

Q. What are the persons and characters of the Scots?

A. They are generally lean, raw-boned, and have high cheek-bones, which is a characteristical feature.

Q. What are the diversions of the Scots?

A. They are all of the vigorous, athletic kind; such as dancing, *goff* and *curling*. The goff is a species of ball-playing performed with a bat and a ball, the extremity of the bat being loaded with lead, and the party which strikes the ball with fewest strokes into a hole prepared for the purpose wins the game.

Q. What are the customs and diversions of the Irish?

A. There are a few customs existing in Ireland peculiar to this country. These are their funeral howlings and presenting their corpses in the streets to excite the charity of strangers, their convivial meetings on Sunday, and dancing to bag-pipes, which are usually attended with quarreling.

Q. What curiosities are there in France?

A. A fountain near Grenoble emits a flame which will burn paper, straw, etc., but will not burn gun-powder. Within about eight leagues of the same place is an inaccessible mountain in the form of a pyramid reversed.

Q. What are the animal productions of Poland?

A. Buffaloes, horses, wolves, boars, gluttons, lynxes and deer. Besides these there is elk, which is said to be destroyed in the winter by flies who get into his ears and live upon his brain.

Q. What curiosities are there in Portugal?

A. There are lakes into which a stone being cast causes a rumbling like the noise of an earthquake.

Q. What do you observe of the inhabitants of Guinea?

A. They are chiefly pagans and idolaters. In Eyo, where the people are governed by a king who is not absolute, when they are tired of him, a deputation waits on him and informs him that it is fatiguing for him to bear the burden of government any longer, advising him to take a little rest. He thanks them and retires to his apartment as if to sleep, and directs his women to strangle him; and after he expires they destroy all things which belonged to him or to themselves, and then kill one another. His son succeeds to the government, and on the same terms.

Q. Give a concise description of the Giages and Annians.

A. The first inhabit a part of the Congo coast; the latter live in the Macaco. The people are cannibals. They kill and eat their first-born children; and their friends who die are eaten by their relations. The king of Macaco resides in Monsol, where there is a market in which human flesh is sold, although other meat exists in plenty. They esteem it a luxury, and it is said an hundred prisoners or slaves are daily killed for the king's table.

Q. What are the characteristics of the Hottentots?

A. They are the most abject of the human race. They besmear their bodies with soot and grease, live upon carrion, old leather, shoes, and everything of the most loathsome kind; dress themselves in sheep's skins, untanned, turning the wool to their flesh in the winter, and the other side in the summer. Their dress serves them for a bed at night, for a covering by day, and for a winding-sheet when they die.

Q. What is the temper of the New England people?

A. They are frank and open, bold and enterprising. The women are educated to house-wifery, excellent companions, and housekeepers; spending their leisure time in reading books of useful information.

Q. What are their diversions?

A. Dancing is a favorite one of both sexes. Sleigh-riding in winter, and skating, playing ball, gunning, and fishing are the principal; gambling and horse-jockeying are practiced by none but worthless people who are despised by all persons of respectability, and considered as nuisances in society.

Q. Are there any slaves in Massachusetts?

A. NONE.

One geography that had a marked individuality of its own was a thick little volume, mostly in verse, entitled *The Monitor's Instructor*, published at Wilmington, Delaware, in 1804. Speaking of himself in the third person in the introduction the author says, "Unpractised in poetry in a great degree, he has ventured thereupon supposing it to be, in general, rather more taking, with youth, than prose; and though not the most flowery cast, it will, he hopes, answer the end."

Now let the muse some incense bring,
As we the works of nature sing,

is the way he begins, and below are extracts culled here and there from succeeding pages:

America (our native) streams,
Shall first awhile become our themes,
Both lakes and rivers, great and small.
Which in th' Atlantic Ocean fall.

After naming the more important coast rivers, the book remarks:

Now o'er these streams thus having glanc'd,
And hastily, thus far advanc'd,
Not having left the sounding shore,
Next their main sources shall explore;
And on the wing which poets feign,
Soar to each mount, skim o'er the plain,
To find the little purling rill,
And which the largest rivers fill.

* * * * * *

One river, of enormous size,
To west of Mississippi lies. . . .
The river this call'd Missouri,

And tow'rd south-east its courses lie,
  This river, from what I can see,
Can't less than the Ohio be.

Skipping to where the book is describing leading towns, we find these lines:

  An island is well known to fame,
Manhattan is this island's name. . . .
On sou'west end New York doth stand,
Investing all that point of land. . . .
Not fully regular it's plann'd,
Yet very elegant and grand. . . .
The streets present diversity,
And suited to conveniency,
The Broadway has still more of taste
Than any street in all the place. . . .
A street three-score and ten feet wide,
And gently rising from the tide,
Its edifices bold and grand,
Present themselves on either hand;
The most magnificent of all,
Known by the name of Fed'ral Hall,
For pleasantness, it is agreed,
And health, few places this exceed.
In summer come, on every side,
The cooling breezes from the tide.
For winter mildness few excel
This city, of same parallel.

In the prose portion of the book are several curious "paradoxes." Here is one of them:

Three men went on a journey, in which, though their heads travelled 12 yards farther than their feet, all returned alive, with their heads on.

The *Solution* explains that "If any person should travel round the globe, the space travelled by his head will exceed that his feet travelled" by about the number of yards mentioned.

The next geography from which I make selection is by Benjamin Davies. It was published in 1813. The first two paragraphs quoted come under the heading "New Holland." This was the accepted name of Australia until the middle of the nineteenth century. The Dutch discovered the continent in 1616, but its size and shape were only vaguely known until Captain Cook explored most of the coast in 1770.

Some suppose that this extensive region, when more thoroughly investigated, will be found to consist of two, three or more vast islands intersected by narrow seas.

INHABITANTS. The black bushy beards of the men and the bone or reed which they thrust through the cartilage of the nose gives them a disgusting appearance; which is not improved by the practice of rubbing fish oil into their skins as a protection from the air and moskitos; so that in hot weather the stench is intolerable. The women are marked by the loss of the two first joints of the little finger of the left hand; as they are supposed to be in the way when they coil their fishing lines.

MANNERS AND CUSTOMS IN THE UNITED STATES. Travellers have observed a want of urbanity, particularly in Philadelphia; and in all the capital cities, an eager pursuit of wealth, by adventurous speculations in commerce, by land-jobbing, banks, insurance offices, and lotteries. The multiplication of inns, taverns and dram shops, is an obvious national evil that calls loudly for legislative interference; for in no country are they more numerous or more universally baneful. Schools are spread everywhere through the well-settled parts of the country, yet the domestic regulation of children and youth is not duly regarded.

LANGUAGE. The English language is the general one of the union, and is cultivated with great assiduity in all the principal cities and towns. All the classical authors in the English language have been reprinted in America, many of them have passed through several editions, some with great elegance and correctness.

BOSTON is built in a very irregular manner, on a peninsula, at the bottom of Massachusetts bay.

SOUTHERN MANNERS AND CUSTOMS. The inquisitive traveller as he progresses southward no longer beholds so great a proportion of hardy, industrious, and healthy yeomanry, living on terms of equality and independence; their domestic economy neat and comfortable; their farms well stocked; and their cattle sleek and thriving. On the contrary he discovers the farmhouses more thinly scattered, some of them miserable hovels; the retreats of small proprietors, who are too indolent or too proud to labor; here and there a stack of corn-fodder, and the cattle looking as miserable as their owners. A few miles distant perhaps he finds a large mansion house, the property of the lord of two or three thousand acres of land, surrounded by 50 or 100 negro-huts, constructed in the slightest manner; and about these cabins swarms of black slaves. But it is just to observe that many of the gentry are distinguishable for their polished manners and education, as well as for their great hospitality to strangers.

Cummings's Geography, 1814, apologizes in its preface for adding another "to the number of geographies, already so great as to obstruct, rather than promote improvement." This preface is very long, and is chiefly made up of directions "designed to assist teachers, who have had but imperfect, or no geographical instruction." It advises them to "let the pupils always set with their faces towards the north." Then with their maps before them they will be in proper position to get the points of the compass straight in their minds.

Early in the lessons we are informed that the "Alleganies are in some places immense masses of rocks, piled one above another in frightful precipices, till they reach the height of more than 10,000 feet above a level with the ocean." In reality not a peak reaches 7,000 feet.

During the previous decade Lewis and Clark had made their journey across the continent, and we now find mention of the "Stony Mountains." It was a number of years before the name Rocky was substituted for Stony. On the maps they were sometimes labelled the Chippewan Mountains, and Workman's Geography, in 1805, says the ranges "that lie west of the river St. Pierre are called the Shining Mountains, from an infinite number of chrystal stones of an amazing size with which they are covered, and which, when the sun shines full upon them, sparkle so as to be seen at a very great distance."

In the descriptions of the states, we learn from Cummings that the western part of Pennsylvania abounds with excellent coal, but we get no hint of its having any commercial importance. Indeed, coal mining as an industry did not begin until 1820. Before that time coal was in the same category as were petroleum and natural gas, which the book calls "curiosities."

Concerning the Andes in South America, we are told, "These amazing mountains, in comparison with which the Alps are but little hills, have fissures in some places a mile wide, and deep in proportion; and there are others that run under the ground, and resemble in extent a province."

When we come to Europe, we are made to realize the intense cold of the Lapland winters by the statement that, "In attempting to drink the lips are frequently frozen to the cup." It is affirmed, too, that if there is a crust on the snow, "The Laplander travels with his reindeer in a sledge two or three hundred miles a day." Another queer bit is this about the roads in Flanders, an old-time province, which included all the coast region of Belgium and extended into France and Holland. "They are generally a broad causeway, and run several miles in a straight line till they terminate in a view of some magnificent building." These views no doubt gave pleasure, but I think I should have preferred to have the roads continue.

Presently we find the following paragraph:

In the ocean there are many dangerous whirlpools. That called the *Maelstroom*, upon the coast of Norway, is considered as the most dreadful and voracious in the world. A minute description of the internal parts is not to be expected, since none, who were there, ever returned to bring back information. The body of the waters, that form this whirlpool, is extended in a circle about thirteen miles in circumference. In the midst of this stands a rock against which the tide in its ebb is dashed with inconceivable fury. At this time it instantly swallows up everything that comes within the sphere of its violence. No skill in the mariner, nor strength of rowing, can work an escape; the vessel's motion, though slow in the beginning, becomes every moment more rapid, it goes around in circles still narrower and narrow, till at last it is dashed against the rocks and instantly disappears. Nor is it seen again for six hours; till, the tide flowing, it is thrown forth with the same violence with which it was drawn in. The noise of this dreadful vortex still farther contributes to increase its terror, which, with the dashing of the waters, makes one of the most tremendous objects in nature.

Country Store, exhibiting the Productions of Various Countries.

Frontispiece.
From Willard's *Geography for Beginners*, 1826.
Reduced one-third.

In another geography of the period we learn that even "the bellowing struggles of the whale have not always redeemed him from the danger," and that "the bottom is full of craggy spires." The real maelstrom is caused by the current of the Great West Fiord rushing between two of the Loffoden Isles. Ordinarily it can be traversed without apprehension, but when the wind blows directly against the current, the sea around for several miles is violently agitated and extremely dangerous.

Adams's Geography, 1818, is divided into three parts—Part I, "Geographical Orthography," consisting of ten pages of names of states, rivers, towns, etc., to be used as spelling lessons; Part II, "A Grammar of Geography," fifty pages, being an epitome of main facts "to be committed to memory"; Part III, "A Description of

Cataract of Niagara.
From Worcester's *Elements of Geography*, 1828.

the Earth," making up the body of the book, "to be read in classes." The first four excerpts are from Part II, the rest from Part III.

A Mountain is a vast protuberance of the earth.

Europe is distinguished for its learning, politeness, government, and laws; for the industry of its inhabitants, and the temperature of its climate.

The *White Mountains* are the highest not only in New Hampshire, but in the United States.

Switzerland is a small romantic country, lying upon the Alps, and is the highest spot in Europe. St. Gothard is the highest mountain.

Navigation on the *Mississippi* is attended with many difficulties and dangers, from the sudden crooks and bends in the river, the falling in of its banks, and more especially from the SAWYERS, so called, which are trees whose roots have by some means become fastened to the bottom of the river, in such a manner, that, from the continual pressure of the current, they receive a regular vibratory motion from the resemblance of which to a saw-mill, they have derived their name. Their motion is sometimes very quick, and if they strike a boat, it is immediately upset or dashed to pieces. Vessels are from five to thirty days on their passage up to *New Orleans*, 87 miles; although with a favorable wind, they will sometimes descend in 12 hours. From New Orleans to *Natchez*, 310 miles, the voyage requires from 60 to 80 days. Ships rarely ascend above that place. It is navigable for boats, carrying about 40 tons, and rowed by 18 or 20 men to the falls of *St. Anthony*.

The number of post-offices in the United States in 1811, was 2,043. The mail was carried 46,380 miles in stages, and 61,171 miles in sulkies and on horseback.

Natural Bridge of Virginia.

From Worcester's *Elements of Geography*, 1828.

Several mineral springs break forth in different parts of the United States. The most celebrated are those of Saratoga and Ballstown in the state of New York. The latter place is much frequented by gay and fashionable people, as well as by invalids.

Beer is the common drink of the inhabitants of *New York State*. The forests abound with bears, wolves, deer, and elks.

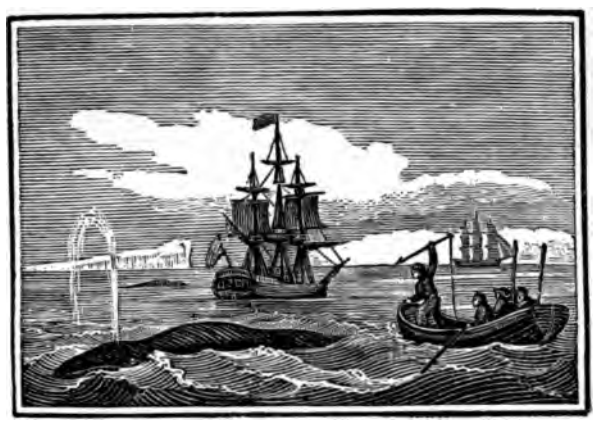
Many of the towns and plantations in *Maine* are destitute of any settled minister. Missionaries sent among them have been affectionately received.

Water is brought to *Philadelphia* in a subterraneous canal, from the Schuylkill, and is then raised by steam 30 or 40 feet to a reservoir on the top of a circular edifice, from which it is distributed by bored logs to the different parts of the city.

Pittsburg is supplied with foreign goods chiefly by land from Philadelphia and Baltimore. The price of waggon carriage this distance is from 5 to 6 dollars a hundred pounds weight. The number of inhabitants, in 1810, was 4,768.

A decade later, when Pittsburg had a population of seven thousand, the geographies speak of it as "one of the greatest manufacturing towns in the Union."

I quote further from Adams, beginning with what he has to say of "the floating mills for grinding corn, which are frequently seen on the Ohio River."



Whale Fishing.

From Worcester's *Elements of Geography*, 1829.

The mill is supported by two large canoes, with the wheel between them; this is moored wherever they can find the strongest current, nearest to the shore, by the force of which alone the mill is put in operation. It is floated up and down the river whenever a customer calls.

The exports from *Ohio*, consisting of flour, corn, hemp, flax, beef, pork, smoked hams of venison, whiskey, peach brandy, and lumber are mostly sent down the Mississippi to New Orleans. Those boats which descend with the produce rarely return, but on arriving at New Orleans, are taken to pieces and sold for lumber.

Cincinnati is a pleasant, flourishing town. It contains about 3,000 inhabitants. In this town is fort Washington, which commences the chain of forts extending to the westward.

Detroit, the capital of Michigan Territory, is a place of considerable trade, which consists chiefly in a barter of coarse European goods with the natives for furs. The town is surrounded by a strong blockade, through which there are four gates. The streets are generally

Treck-Shuit.

From Worcester's *Elements of Geography*, 1829.

crowed with Indians in the day time; but at night they are all shut out of the town, except such as get admittance into private houses, and the gates are closed.

St. Louis, the capital of the Territory of Louisiana, contains about 200 houses and is well fortified.

The people of *Norway* are justly famed for honesty and industry,

Bridges in Chili.

From Woodridge's *Rudiments of Geography*, 1829.

and retain their strength so long, that a Norwegian is not supposed incapable of labour, till he is upwards of 100 years old. The inhabitants in some of the interior parts it is said live till weary of life.

In all the northern parts of *Russia* the winter cold is very terrible. Birds in the act of flying have sometimes been known to drop down dead from the atmosphere in consequence of it; drivers of carriages are frequently frozen to death upon their seats without being able to change their position. At Petersburg, only two months in the year are entirely free from snow.

The CONDOR is undoubted the largest bird that pervades the air. When it alights on the ground, or arises from it, the noise it makes

PETER PARLEY
Going to tell about Geography.

Take care there! take care boys! if you run against my toe, I'll not tell you another story!

Frontispiece to *Peter Parley's Geography*, 1830.

with its wings is such as to terrify and almost to deafen any one who happens to be near the place.

Among the animals peculiar to South America, the most extraordinary is the SLOTH, or as it was called by the way of derision, the swift Petre. It is about the size of an ordinary monkey, but of a most wretched appearance. It never stirs unless impelled by hunger; it is said to be several minutes in moving one of its legs. Every effort is attended with a most dismal cry. When this animal finds no wild fruits on the ground, he looks out with a great deal of pain for a tree well loaded, which he ascends moving and crying, and stopping by turns. At length, having mounted, he plucks off all the fruit and throws it on the ground, to save himself such another troublesome journey; and rather than be fatigued in coming down the tree, gathers himself in a bunch, and with a shriek drops to the ground.

A similar description of the sloth in Dwight's Geography includes the statement that "It is so many days travelling from one tree to another, that it frequently grows lean during the journey."

Peter Parley's Method of telling about Geography, 1829, was a thin, square little book with leather back and flexible pasteboard sides. For years it had an immense circulation. The style is simple and

English.

A Chinese selling Rats and Puppies for pies.

From *Peter Parley's Geography*, 1829.

colloquial; there are numerous pictures and a variety of maps and diagrams. Perhaps the portion best remembered by those who studied the book is a rhymed review of the earlier lessons, beginning—

The world is round, and like a ball
Seems swinging in the air,
A sky extends around it all,
And stars are shining there.

Pains are taken to inculcate good morals and religion, and we find in treating of Asia considerable Bible history with appropriate comments. "This history," the author says, "is exceedingly interesting, and is all true. A great part of the history of almost all other nations is false; but the Bible tells us nothing but what is worthy of belief."

The Malte-Brun Geography, 1831, was also written by "Peter Parley," but the materials for the book were drawn chiefly from the large work by the noted French geographer, whose name gives the book its title. Selections that show something of the character of the book and of the times follow:

Norwegian.
From *Peter Parley's Geography.*

Occasional bands of white hunters and trappers range the Missouri Territory for furs. Some of them extend their expeditions to the foot of the Rocky mountains, and some to the shores of the Pacific.

White Bear.
From Olney's *A Practical System of Modern Geography,* 1831.

The herds of buffaloes that are seen in this territory sometimes amount to 10,000 each. When the herd is moving, the ground trembles, and the grumbling and bellowing of the multitude is heard for miles.

They are found so useful, that, for carrying passengers from one place to another, they have, on many routes, taken the place of stage-coaches. When the cars first began to run, it was amusing to see the astonishment of the horses and cattle, as the engines came snorting, smoking, and puffing over the road. You have heard of the

Scene in Illinois.
From *The Malte-Brun School Geography*, 1842.

rail road from Boston to Worcester. Near the latter place is an Insane Hospital, which commands a view of the road. When the first car came into Worcester, a crazy man was looking out of the

Pilgrims landing at Plymouth.
From Goodrich's *A National Geography*, 1845.

window. "Upon my word," said he, "that's a strange-looking beast and travels desperate fast for such a short-legged crittur."

Peter Parley's National Geography, 1845, was the earliest, I believe, to take the large, flat quarto shape. This form enabled it to include good-sized maps and do away with the necessity for a separate atlas; and in a few years the 12mos had been entirely abandoned. The chapters of the *National Geography* were enlivened with poetical introductions, and there were occasional other verses. The following selection, the last I have to make from the geographies of our forefathers, is this jingle description of "a general custom of moving, in the city of New York, on the first of May."

Bustle, bustle! Clear the way!
He moves, they move, we move, to-day;—
Pulling, hauling, fathers calling,
Mothers brawling, children squalling,
Coaxing, teasing, whimpering, prattling;
Pots and pans and kettles rattling;
Tumbling bedsteads, flying bedspreads,
Broken chairs, and hollow wares,
Strew the streets—'Tis *moving* day!

Battle of Lexington.

From Mitchell's *A System of Modern Geography*, 1850.

GEOGRAPHICAL NOTES

Trade and Commerce in Persia.—Persia at the present time, with the exception of the carpet trade and, to a very limited extent, printed and plain cotton goods, is without manufactures. This means that nearly all the products of the mine and loom are of foreign make and composition. This provides a market of considerable extent for imported goods, which has been, and is even now, monopolized to a great extent by England and Russia. Other countries are represented, but to a much smaller extent. American goods reach Persia through the organized channels of European trade, with foreign labels and trade-marks, the extent of which cannot therefore be ascertained.

American lamps, clocks, watches, and locks have a steadily increasing sale in the Teheran bazaars, especially locks, which excel in mechanical complexity, combined with lightness and convenience of handling (important considerations), anything hitherto put on sale. Phonographs and electric fans are curiosities in demand. American hand pumps and cooking and warming stoves find appreciative purchasers and should, with proper management and competitive enterprise, soon monopolize the market. Our exploiters of the trade of Persia should aim at creating demands by the supply of novelties, of which we have a great variety; and by the use of new means and machinery reproduce old lines of goods at less cost than others and, if possible, in more attractive designs and appearance. This could include both vegetable and mineral raw materials. There is no competition from within worth mentioning, except in carpets, which should never be imported, for in the beauty of the dyes, the purity of taste in design, the harmonizing and shading of colors, and the durability in the wear the native article is unapproachable.

Agricultural machinery of a simple, portable make, such as horse-power threshing machinery, winnowing and chaff-cutting machines, plows, and harrows, will meet with a considerable sale as soon as their utility and advantage over present methods are known. Much more interest is now being evinced in tilling the land and nourishing, harvesting, and threshing out the crops than was the case in former times. American manufacturers and merchants can, with the vast and diverse sources of supply at their disposal, outstrip any other country in stimulating and meeting Persian demands.—*Consular Reports*, March, 1904.

EDITORIAL

WHAT A CHILD SHOULD GAIN FROM HIS SCHOOL COURSE IN GEOGRAPHY

THE papers appearing in this and the preceding numbers of the JOURNAL, and devoted to the problem of what a child ought to gain from his school geography work, are the first of a series which will be continued later. The Editors of the JOURNAL have felt that this topic was one of the most important in school geography, and have therefore secured the assistance of a number of geography teachers, geographers, superintendents, and authors of school texts.

We have been discussing the content of school geography and the methods to be followed for many years, but there has been but little consideration of the ends to be attained. Each worker has made his own decisions as to the aims of his school geography work, and has endeavored to have his course measure up well to the definition of geography as generally adopted. Unfortunately, however, not enough consideration has been given to the important point as to what of permanent value geography study should contribute to a child's training. We have been anxious to have each year's work effective in promoting a pupil's general information concerning the world, we have tried to make the work interesting and thought inspiring, but we have neglected altogether too much the disciplinary side and the giving of training as to how to learn more geography after the school course is [illegible]. We have worked for the present and not enough for the future.

It is hoped that this series of papers will be of great value in showing the trend of thought among writers as to what geography should do for a child. [illegible] of these papers will be welcomed by the Editors.

REVIEWS

Handbook of Commercial Geography. [illegible] edition. [illegible]

[illegible]

Primarily a reference volume for advanced students, it is too advanced and inclusive for school use. It is, however, a volume which is of great assistance to any teacher of general geography and a necessary *vade mecum* for any worker in commercial geography. The introduction and the first sixty-three pages of the text form a splendid summary of the principles of geography, which determine or influence commercial conditions, and should be read by every student of geography.

The rest of the book first treats of the different products involved in commerce and then of the commercial geography of the different countries. Under the topical treatment the conditions are described that make for the success or failure of the product concerned; this is followed by a statement of the geographical distribution of the product, and usually by a comparative statement of the status of the product in the different countries. In the regional treatment a full and valuable consideration is first given to the general geography of the country, followed by an adequate treatment of the commercial conditions. This form of treatment makes the book valuable for reference by the student of general as well as commercial geography, and is a very strong factor in a generally satisfactory book.

An appendix contains a comprehensive series of statistical and other reference tables available for comparative study. Unfortunately some of these statistics are not as new as the date of the edition would warrant. R. E. D.

Stories of Discovery. By Edward E. Hale. Pp. vi and 292. New edition, revised. Boston: Little, Brown & Co., 1905.

A new edition of Doctor Hale's well-tried volume of Stories of Discovery is a welcome addition to the available and trustworthy volumes for supplementary work in history and geography. The eleven chapters summarize the work of Columbus, Da Gama, Magalhaens, and Drake; the voyages to the Atlantic Coast, in the Pacific, to the source of the Nile, and to the mouth of the Niger; give the history of the voyages in the Arctic and the Antarctic, while one chapter is devoted to the conditions in the early history of the Mississippi Valley.

Recent discoveries in the Far North are only mentioned, the current expeditions in Antarctica are not even alluded to, and even the work of Stanley is only mentioned as having been brought into public light because of the recent death of the eminent discoverer. These deficiencies are deeply to be regretted, for they make the new edition more new in name than in fact. R. E. D.

NEWS NOTES

Resolutions Adopted by the Eighth International Geographic Congress, September 13, 1904.

Rules for Geographic Names.—Local names are, as far as possible, to be preserved not only in those regions where already established, but also in wild regions. They should, on this account, be determined with all the accuracy possible.

Where local names do not exist or cannot be discovered, the names applied by the first discoverer should be used until further investigation. The arbitrary altering of historical, long existent names, well known not only in common use but also in science, is to be regarded as extremely unadvisable, and every means should be employed to resist such alterations. Inappropriate and fantastical names are to be replaced, as far as possible, by local and more appropriate names.

The above rules are not to be rigorously construed, yet they should be followed to a greater extent than heretofore by travelers and in scientific works. Their publication in periodicals as the opinion of the Congress will probably prove of great weight. Although in recent years many official systems of determination of geographic names have been enunciated, we have still evidence of the very slight influence which the wishes of the International Geographic Congresses exert over the decision of the official authorities. To this geographical societies are urged to give wide publicity.

Introduction of the Fractional Scales on Maps.—The Seventh International Geographic Congress expressed the urgent wish that upon all charts, including those published by the lands still employing the English and Russian systems of measurement, along with the scale of geographic co-ordinance, that the scale of reduction should be expressed in the usual fractional form, 1:x, and that the latter be added to all lists of charts covering land and sea, and requests the executive committee of the Congress to bring this decision to the attention of all governments, geographical societies, and establishments engaged in the publication of charts.

The advantage to be derived from the support of this resolution, which has its origin with the editor of *Peterman's Mittheilungen*, and the extensive dissemination of the resolution, is at once evident. In English publications a custom has arisen of adding a statement of the ratio 1:x to the usually employed x miles to one inch. In America the custom has arisen of going even a step beyond this, namely: The addition of the ratio of reduction has led to the direct application of the decimal system in the units of measure adopted upon the charts.

To this geographical societies are urged to give wide publicity.

The Decimal System.—The Eighth International Geographic Congress expresses itself in favor of a uniform system in all geographical researches and discussions, and it recommends for this purpose the employment of the metric system of weights and measures, as also the employment of the centigrade thermometric scale.

It is moreover highly desirable that there should always be added to statements of the Fahrenheit and the Réaumur scales their equivalent upon the scale of Celsius.

Similar is this question of the metric system which reaches even more deeply than the former into the well-established customs of daily life, and has proved not without value in promoting international uniformity and simplicity. Although the metric system of weights and measures has made slow progress, and this alone through the portals of scientific work, its application to geophysics and geography has already made a fair beginning. In England a special organization, entitled the Decimal Association, has taken charge of the matter. The Commonwealth of Australia has entrusted the subject to a commission. We are without knowledge of the efforts in this direction thus far made in Russia.

To this geographical societies are urged to give wide publicity.

Standard Time.—*Resolved,* In view of the fact that a large majority of the nations of the world have already adopted systems of standard time based upon the meridian of Greenwich, as prime meridian, that this Congress is in favor of the universal adoption of the meridian of Greenwich as the basis of all systems of standard time.

Publication of Photographs.—It is suggested by the lantern slides shown by Mr. Siebers, and by the photographs by Mr. Willis, that it is desirable that in these, and the cases of other exploring travelers, photographs of geographical significance might be published, and accompanied by short explanatory notes, so that they may form collections of representative physical features of different parts of the world.

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