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THE RATIONAL ELEMENT AS AN ORGAN- IZING PRINCIPLE IN GEOGRAPHY

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IT is the conviction of the writer that there is no failure in teaching more serious than the failure to generalize. The character of certain subjects, and the method of instruction, make them especially subject to such omission. Geography is exceedingly liable to suffer from the teacher's neglect to organize and generalize. The climax of all good teaching is reached in these processes, and any instruction that stops short of them fails accordingly.

In a deductive study, like geometry, every conclusion is a general truth, not only applicable to but necessary in any further development of the subject. Each conclusion is a premise in a succeeding theorem; the subject tends to unify itself. Inductive studies place more responsibility upon the teacher. Because the content of geography is so broad and varied, and because its nature, phases, and values have been so poorly understood, it has doubtless suffered more from a lack of organization than any of the common school subjects.

The old geography devoted itself almost wholly to *fact* study. Vast numbers of items were learned "empirically," as ends in themselves. There was so little sequence, aim, and reason in the subject that it fell far short of a science. It was composed of cross-sections of geology, astronomy, zoology, botany, etc., but the subject-matter was not articulated for a purpose. The old question of "what and where are the following" is suggestive. Isolated and unrelated facts, interesting in themselves but often valueless, because they did not bear upon any generalization, engaged the attention of the student.

The view of geography to-day is—thanks to the scholars in our leading

universities—rapidly changing. Without attempting to summarize the new view of geography the writer, for the sake of discussion, ventures the following definition:

Geography is the science that treats of—

1. The earth's crust in its present condition.
2. The forces which fashioned this crust.
3. The adjustment and adaptation of life to the crust.

This view of the subject suggests a strong rational element. The study of any region necessitates the consideration of *three* sets of factors or processes. These may be designated as inorganic, dynamic, and organic. The inorganic phase considers the earth's envelopes in static conditions—as the crust, its topography, rocks, soils, minerals; the atmospheric and aqueous envelopes as related to rock-weathering and oxidation, and to plant and animal life. The dynamic deals with the interaction of these envelopes as influenced by heat, gravity and planetary motion. This phase includes the subjects usually treated in dynamic geology. The organic deals with life as fostered by particular combinations of local influences.

It may be said by some that these limits are too broad, but any adequate study of a man's environment leads to all of these investigations. If mere *fact* is the goal of geographical study, then the "why," the rational side of geography may be lopped off and we shall then return to the old basis of teaching the subject. If, however, an *understanding* of the earth as a *habitat* is the object of geographical study, then certainly much value must be placed upon reason and relationship.

Without taking cognizance of the "causal nexus" it would be quite impossible to organize the subject-matter of geography. Careful selection and arrangement of data must precede induction, inference, conclusion. The rational element is the thread upon which the facts are strung. The empirical facts of the old geography were lost as readily as beads from a broken string, but perhaps the loss was not great, because facts learned after such manner are insignificant. Significance comes when order is established, when, as Dr. Harris says, one fact is made to explain another to which it is related. An arrangement of facts to show logical sequence is *organization*. It assists the memory, clarifies and intensifies the meaning, and leads toward a classification of geographic material.

Men succeed best in industrial life when they best adjust themselves to their environment. To some degree man may modify an unfavorable condition; that being done, the best adjustment is effected when human effort is applied most harmoniously to the remaining natural conditions. Failure

to succeed follows a failure to interpret natural conditions aright. The poor success of the early Puritans is an apt illustration of a poor adjustment to physiographic conditions. The influence of geography on political and industrial history is now generally conceded. It is to this theme that Prof. Brigham and Miss Semple have so successfully lent themselves, and scores of examples could be given to show how natural resources and environment have eventually determined man's residence and occupation. The study of adjustment is one of the most interesting and fruitful phases of geography and emphasizes strongly the rational element. It is held by some that in seeking causes there is danger in going beyond the limits of geography proper, and of entering the domain of pure science. If a bit of science is here or there necessary to explain a condition, then let it strike sharply against the geographical fact of which it becomes a legitimate part, standing in the relation of cause to effect.

Prof. Dryer recognizes the rational side of geography in the following definition of the subject: "The business of geography is first to determine accurately the distribution of each and all the factors of geography (land, water, air, plants, men) and, second, to discover the causes which have brought about the distribution of each; and, third, to explain the relation of each factor or group of factors to all the rest."

Hence cause, relationship and consequence seem to merit special emphasis. Says Prof. Davis: "Another step of equal importance . . . is the change from the empirical to the explanatory or rational or genetic method of treating the elemental facts that enter into geographical relationships." And again: "The mere existence and location of cities stated independent of their controlling environment fail to become truly geographic as long as they are stated without reference to their cause." Empirical facts in themselves are stern things and offer little freedom to mental action; but facts of relationship challenge the mind to solve a problem, to theorize, to speculate and eventually to induce from what seems to be a heterogeneous mass of facts, a universal law. As soon as this is done, the individual facts arrange themselves in as orderly array about the *law* as do bits of iron about a magnet. May we not call this arrangement and subjection of facts under a general law, organization?

Diastrophism and gradation have been the prominent physiographic processes in Illinois. Let us notice their control over distribution of population, and industrial history. By nature's accidents much of Jo Daviess County, the extreme northwest of Illinois, escaped the grinding and planing of glaciers; but eroding and denuding agencies have removed the later deposits and left exposed the Niagara limestone, Cincinnati shales and the

Galena limestone. Galena—lead sulphide—is found in crevices and pockets of this deposit. The city of Galena owes its growth almost entirely to the mineral from which it was named, and its recent decline is the direct result of the exhaustion of the mines. The rough and deeply dissected surface has made a re-adjustment to agricultural pursuits impossible.

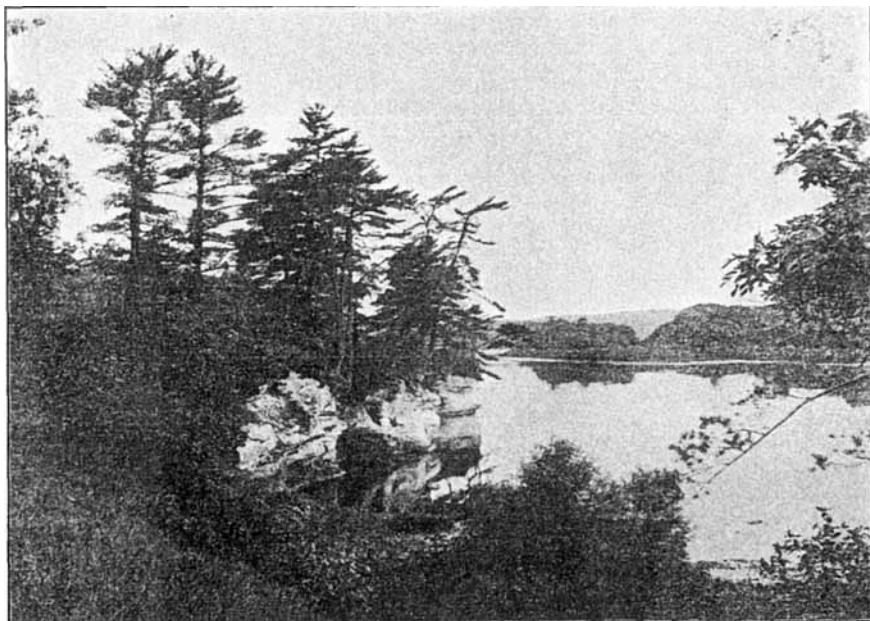
The anticlinal fracture which crosses Illinois in a southeast direction from Stephenson County to Livingston, intersects Rock River a few miles south of the city of Oregon, in Ogle County. For several miles along the



Castle Rock, bank of Rock River, near Oregon, Ill. A Bluff of St. Peter's Sandstone

river this disturbance has brought to the surface St. Peter's sandstone. The beautiful white and buff cliffs fringing the crystal waters have made the region one of rare picturesqueness, an ideal location for the summer homes now building in the vicinity. This sandstone affords unlimited material for the manufacture of glass. The fracture repeats the beautiful scenery where it crosses the Illinois River a few miles east of the city of La Salle. Starved Rock and Deer Park, as well as Castle Rock and Ganymede, have national fame. But it is the effect of this fracture upon

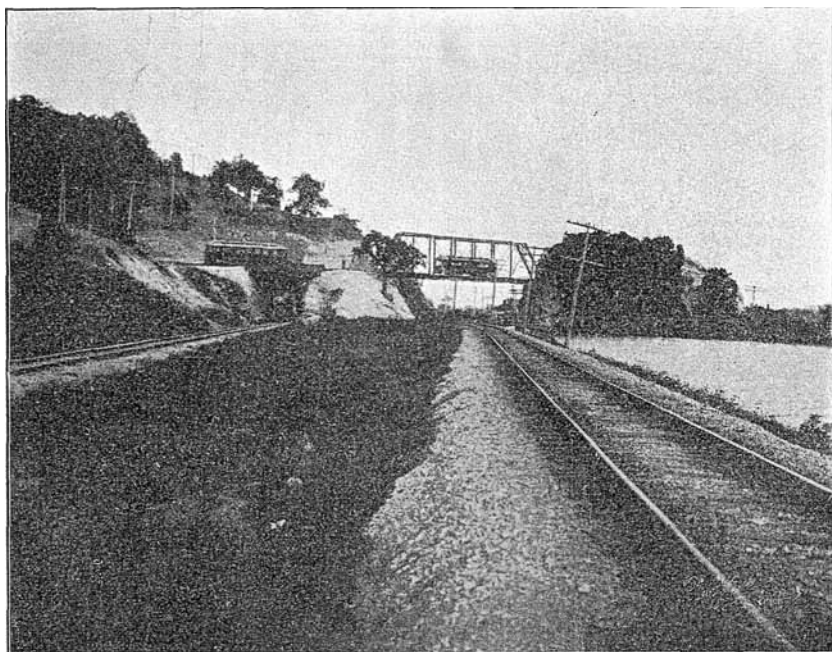
human affairs that concerns us now. The disturbance here brought to the surface the coal measures, St. Peter's sandstone and the calciferous division of the Potsdam, the latter not appearing again within the confines of the State. La Salle is a great mining town and much of the coal is used in smelting zinc ore brought from Wisconsin, Kansas and Missouri. The Illinois and Matthiessen Companies' plants are said to be the largest in the world. Much glass is made from the St. Peter's at Peru, La Salle, Ottawa and Streator. The lower Potsdam is utilized in making Portland cement of excellent quality. East of La Salle where the Rock Island &



Rock River near Oregon, Ill.

Pacific R. R. has tunneled through a hill, the geographer can see the outcropping coal measures, the Trenton limestone, the St. Peter's sandstone and the calciferous division of the Potsdam. The industries of La Salle are directly attributable to this diastrophic movement of the earth's crust, which lifted the coal measures several hundred feet and exposed the early Silurian deposits, making mining easier and more profitable and furnishing abundant material for the manufacture of glass and cement. From the sulphur in the imported zinc ore much sulphuric acid is made as a by-product. So important are natural resources that several railroads and a canal at an early date competed for its traffic.

By another of Nature's accidents the lower carboniferous and Devonian deposits are wanting in northern and northeastern Illinois. The absence of these formations exposes the Niagara limestone in many places, it being hidden only by the alluvial and drift deposits. As the later deposits and coal measures appear farther south it is quite likely that this region was not submerged below the great Paleozoic Sea, which covered the central and southern parts of the State, and in which the various formations of the Devonian, lower carboniferous and the coal measures were successively

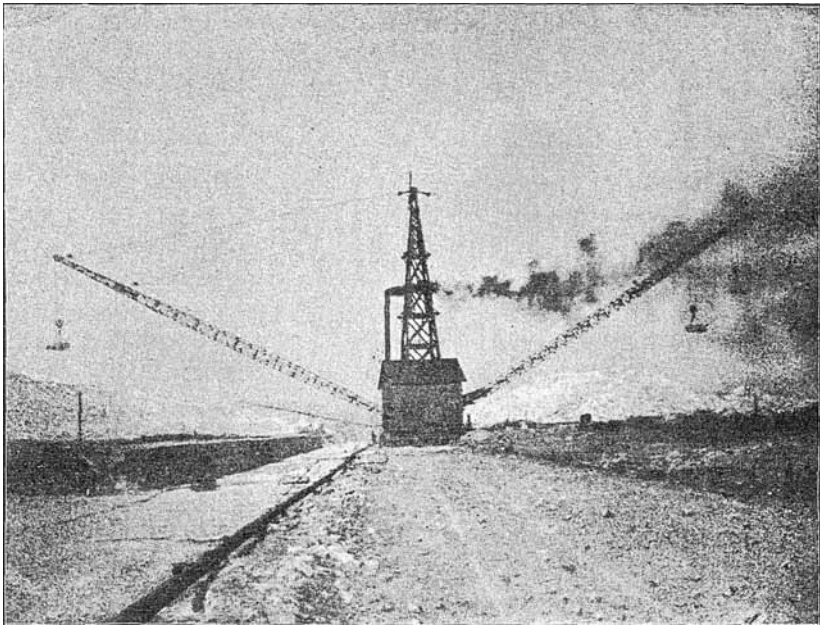


A Geological Study near La Salle, Ill.

deposited. It seems almost providential that so useful a rock should have been left so near the surface, and in such abundance near the site upon which man should later erect one of the world's metropolises. The quarries of Joliet and Lockport constitute one of the leading resources of Will County, and furnish employment for hundreds of men. The excellent quality and abundance of building stone have curtailed the use of brick, Joliet stone being a staple building material in this section of Illinois. "Dimension stone" from this region is shipped to Chicago in large quantities. The Illinois penitentiary at Joliet, built of Niagara limestone, is a constant reminder to the traveler as he passes through the city, that the

quarries constitute one of Will County's chief resources, and "breaking stone" has assumed a double meaning, especially to those whose interpretation of the meaning of freedom is too generous. The falls in the Des Plaines River, the Niagara limestone, useful in building, in manufacturing lime, and in smelting, and the proximity of coal fields in Grundy and La Salle counties, have combined to make Joliet a thriving industrial and commercial center.

The great Drainage Canal of Chicago, considered one of the engineer-



Scene in construction of Drainage Canal. Niagara Limestone cut near Joliet, Ill.

ing feats of the age, owes its existence to the results of Nature's play. The retreating glacier left its last great barrier in the form of a semi-circle, skirting the southern end of Lake Michigan, and known by the name of the Valparaiso Moraine. This barrier compelled the waters of Lake Michigan to find a new route to the sea, but the drainage from the surface of this ridge cut a notch through the soft drift and made a channel which carried the water southward to the Illinois. It is in the valley of this stream, the Des Plaines, that the Drainage Canal has been constructed at a cost of thirty-five million dollars. Thus, what at first seems to be a great achievement of man, on a more careful consideration, appears to be

only the discovery of one of Nature's great provisions, and the subsequent modification and adaptation of it to serve the needs of mankind.

Instances of physiographic influence could be multiplied. The illustrations given may, to some, seem trite, but they illustrate what the writer considers the richest and most productive phase of geographical study, and emphasize the value of the rational element as a co-ordinating and organizing principle. Mr. George D. Hubbard of Cornell University, in his paper, "A Case of Geographic Influence upon Human Affairs," submits a fine illustration of an agricultural adjustment to physiographic conditions in his study of the Shelbyville Moraine. The influence of physical environment on social life and customs has been discussed by Prof. J. Paul Goode in a valuable paper¹ on "Human Response to Physical Environment."

Modern educational methods react against formalism. The repetition of rules and formulæ is now subordinate and incidental to a comprehension of ideas. The laboratory method in science has substituted for the "letter that killeth," the "spirit which maketh alive." Even the study of a language, with its multiplicity of forms, is successfully approached from the thought side. Why should facts in geography be taught arbitrarily? The whole subject of physiography has to do with cause, and the responses of the organic world are results of effects of certain local sets of conditions. Thus, the "causal," or the "rational," is prominent throughout the subject of geography. Is not, then, this element the logical basis for organization? The value of types is manifest here as in other departments of science. But a type is only a concrete illustration of a general principle which obtains, in slightly modified form, in a multitude of instances. Its value lies in the fact that the student, through cursory examination and hasty comparison of the new example, recognizes the principle and classifies his information.

An instance of *readjustment* to physiographic conditions might be noted in northern Illinois, in the region of the Iowan glaciation. Here, in an early day, wheat was a leading product. Along the Rock River and its chief tributaries, the Kishwaukee and Pecatonica, flouring mills were numerous. The demands of wheat for phosphates and lime so impoverished the soil that its cultivation long since ceased. For some time wheat was imported from Minnesota to keep these mills running, but the inability to compete with larger and better equipped plants near the wheat fields led to the complete abandonment of the industry. Some of the mills were converted into "feed mills," which found employment in winter but were idle in summer, or ceased to grind altogether. Many have either fallen or

¹ Elementary School-Teacher, January, 1904.

been torn down. In the larger towns, the mills, owing to a large production of oats in the region, became "cereal food" mills. The writer can remember when the Baltic and Big Thunder of Belvidere, Fisher's mill at Cherry Valley, and Shirley's mill were all busily engaged in the manufacture of flour. The Baltic and Big Thunder degenerated into feed mills, the Cherry Valley mill is idle, and only rusty shaft and crumbling stone now mark the site of Shirley's mill. At Oregon, on Rock River, one flour mill was burned, one has been converted into a cereal mill, and another, for many years idle, has recently become the home of a metal and plating company. Instances of this kind could be multiplied. Even as I write, almost in sight of my window, an old mill, weather-beaten and dilapidated, tells the story of industrial readjustment.

Unorganized geographical material has but little value and significance. The educational value of geography increases as the rational element is recognized. The work of the earlier geography is, indeed, to observe, to learn facts, and to gather material; though to some extent, even in this phase, the causal idea may be recognized. When, however, considerable information along various lines has been gained, it seems to be the true function of geography to induce from this information as data, definite general principles. The student may still continue to gather and learn facts, but the time has come when he should have a place to put these facts in orderly arrangement. This comparing and relating of data to strengthen and clarify meaning and to establish general principles which shall serve as categories for the reception of new material, constitute organization as applied to geography. A student who has mastered a few general principles, may then proceed to some extent in a deductive way. Knowing a few general truths relating to a region, he should be able to deduce with considerable accuracy the details of life conditions that prevail, and, looking backward, he should be able to read in outline its geological history. Is it not obvious, then, that the rational element, viz., reason and relationship, should be the major organizing principle of geography and that with the recognition of this principle will increase the educational value of the subject?

MODERN GEOGRAPHY TEACHING

The "Sailor Geography" of the past, with its burdensome details of isolated bits of information, has given way to methods that recognize geography as a logical study admirably adapted to train the perceptive powers, the imagination, the reason, as well as the memory of form and fact. While not necessarily the center from which all teaching should radiate, geography is easily and naturally correlated with other studies.—*Outline in Geography, Stockton, Cal.*