

PROGRAM OF THE SECTION ON GEOLOGY AND GEOGRAPHY

Chairman: W. LEROY PERKINS, Indiana State Teachers College

1. The droughts of 1930, 1934, and 1936, and their relation to crop production in Indiana and other states of the Corn Belt. J. E. Switzer, Indiana University.
2. The Geomorph; an earth museum-laboratory. Alfred H. Meyer, Valparaiso University.
3. The mineral wool industry of Indiana. William D. Thornbury, Indiana University.
4. The changing northern and western boundaries of Indiana territory and state. Robert W. Karpinski, Indiana State Teachers College.
5. On the true nature of a polished surface of a gem stone. Frank B. Wade, Shortridge High School, Indianapolis.
6. Regional contrasts in Indiana deaths from violence. (Death rate study No. 4). Stephen S. Visher, Indiana University.
7. The surface geology of Bartholomew and Brown counties. H. P. Ulrich, Purdue Agricultural Experiment Station.
8. The Columbia Basin reclamation project. Wallace T. Buckley, Indiana University.
9. High lights of the Purdue Institute of American Policy and Technology. Frank R. Hall, Purdue University.
10. The nature of some favorable oil-bearing structures in the Pennsylvanian of southwestern Indiana. Clyde A. Malott, Indiana University.
11. Some observed effects of certain atmospheric variations. A. V. Lott, Sellersburg.
12. An exposure of New Corydon limestone in a new quarry at Huntington, Indiana. Fred J. Breeze, Fort Wayne.

The paper by S. S. Visher on regional contrasts in rainfall in Indiana, an abstract of which is given below, was presented in the General Session.

S. S. Visher, Indiana University, was elected chairman of the Section for 1938.

ABSTRACTS

The Geomorph; an earth museum laboratory. ALFRED H. MEYER, Valparaiso University.—Growing interest is manifested in various model constructions showing in miniature some geologic structure, type of landscape, or actual geographic region. Always recognized as one of the most effective aids in teaching the facts of earth science, model earth exhibits have a special appeal at present in connection with the federal and state projects in regional planning. The Geomorph is intro-

duced as a type of geologic-geographic model which not only figures land surface and structural features of the earth's crust but actually reproduces the structural materials of which the earth is composed. Genuine rocks, minerals, and fossils constitute the exclusive covering of the basic skeleton made of corrugated cardboard, papier mache, and plaster. Being composed of actual earth materials arranged in proper natural earth relationships, the Geomorph functions not merely as a public museum exhibit but as a laboratory device regularly used to illustrate the forms and principles of physiographical, structural, historical, and economical geology and geography.

The changing northern and western boundaries of Indiana territory and state. ROBERT W. KARPINSKI, Indiana State Teachers College.—The map by Delamarche of 1785 shows *Indiana* marked in the northwestern part of Virginia on the southeast side of the Ohio River. This marking of the *Indiana Company* was carried on many of the early maps from about 1785 until, in the case of some of the European maps of North America, as recently as 1815. At times a marking of *Indiana* in northwestern Virginia would be found on the same map indicating Indiana in its proper place in the Northwest Territory. This was undoubtedly the first use of the name to represent any considerable area in the United States. Following the proposed Jeffersonian division of the Northwest Territory into ten states, none of which were to carry the name *Indiana*, the next proposal blocked the Northwest Territory off into five regions, the northern limit of the southern tier of states being shown on the Abraham Bradley, Jr., map of 1796, by a line running east and west through the southernmost point of Lake Michigan. The proposed middle state corresponds roughly to the limits which later were to be made for Indiana.

On the Carey map of 1801, *Indiana* territory was marked off. The western limit of the section to be known as the Territory Northwest of the Ohio was not marked; only the Grenville Treaty line was shown running from the Ohio River north to Fort Recovery and then east. Four years later, however, on the Carey map of 1805, Indiana territory was limited on the north by the east-west line running from the tip of Lake Michigan and on the west by the Mississippi River. The so-called gore is visible here. On the map by Carey in 1814, at the southern tip of a curiously deformed Lake Michigan we have the northern boundary of Indiana, Illinois, and Ohio, running east-west, and a very narrow Indiana. Another remarkable feature on this map is the unusual configuration of the Wabash in its lower sections. The correct marking of the Wabash in the section north of Vincennes was to be of some importance in establishing the boundary between Illinois and Indiana. Another map by Carey of 1814 has a much more accurate representation of Lake Michigan and a more normal western boundary for Indiana although it is still a straight western boundary line, instead of following the Wabash in the southwestern section. A new northern boundary for Indiana, in which Lake Michigan occupies about the central section, is noted.

The Arrowsmith map of the United States (1825) has a representation which is characteristic of some of the important Indiana maps for

a period of ten or fifteen years and of Michigan's southern peninsular section for about 40 years. Like the large Mitchell map, it was copied quite frequently by other map makers.

On the Melish map of 1816 we have still another configuration on the northwestern boundaries of Indiana characterized by the indentation where Lake Michigan juts into the central part of northern Indiana and by the southwestern section following the Wabash River. Melish was one of the foremost cartographers during the first quarter of the nineteenth century and the man responsible for one of the earliest maps of Indiana alone.

On the detailed map of Indiana in 1822 by Lucas, we see the southern tiers of counties very well represented with a large Delaware and Wabash county to the north. The City of Indianapolis, for which land was first sold in 1821, is shown. On the Melish map of the United States (1822) we have another one of the characteristic configurations of Indiana and a curious western boundary for Michigan.

On the true nature of a polished surface of a gem stone. FRANK B. WADE, Shortridge High School, Indianapolis.—Evidences obtained from practical experience in the polishing of gem material tend to support the theory that there is more or less "flow" of the surface material and the formation of the so called "Beilby layer."

Regional contrasts in Indiana deaths from violence (Death rate study No. 4). STEPHEN S. VISHNER, Indiana University.—Earlier studies of Indiana death rates have revealed conspicuous regional contrasts in the deaths caused by several diseases and also in total deaths. (Proc. Indiana Acad. Sci. for 1923, 1924, 1935.) This study of deaths due to violence, suicide, and homicide is based on the official data for five years, a total of about 1,000 homicides and 3,100 suicides.

The northern, central, and southern regions show a regular southward increase in homicides in proportion to population if the chief urban county of each is excluded. Southern Indiana has a half more homicides per 10,000 people than does northern Indiana.

The six counties which had relatively most negroes at the last census had an average homicide rate just twice that for the state as a whole. On the other hand, although Lake county has relatively many negroes as well as foreign born, the homicide rate in the six counties with relatively many foreign born was only slightly above the state average. The chief coal-mining counties had a moderately high rate; the most strictly rural counties had a relatively low rate, except in south central Indiana. The most urban counties, except Allen (Fort Wayne), had higher than average rates. The homicide rate is relatively high in the state's peripheral counties and in Marion (Indianapolis).

The distribution of suicides contrasts sharply with that of homicides; suicides are relatively most frequent in the interior counties of the state; none of the peripheral counties have relatively many suicides. The suicide rate is relatively high in nearly all counties which had fewer people in 1930 than in 1900 or 1890. Such counties have relatively many elderly people, and apparently also relatively many dis-

couraged people. Suicides are relatively common in proportion to population in the most strictly rural counties, and among such counties there is a distinct southward increase in regional averages. Marion county is the only urban county with fairly numerous suicides in proportion to population, and its rate is only slightly more than the average for the state.

The surface geology of Bartholomew and Brown counties. H. P. ULRICH, Purdue Agricultural Experiment Station.—A study of the geology of Bartholomew and Brown counties in connection with the soil survey of these areas was made in 1936. Since the geological material is one of the many factors entering into soil formation, it is possible to make detailed and accurate determinations of many of the geological formations without having technical training along this line. The extent and boundaries of Early and Late Wisconsin and Illinoian till and associated stratified alluvial deposits have been determined, as well as the location of sandstone, siltstone, shale, and limestones of the various formations. Particular attention was paid to the location of the probable outer limits of the Illinoian glacial border, as has been indicated by shallow till deposits and land form.

The Columbia Basin reclamation project. WALLACE T. BUCKLEY, Indiana University.—Within the limits set by the relief, rainfall has been the chief limiting factor in the occupation of the Columbia Basin. With the building of the Northern Pacific railroad the early mining, farming, and fur-trading ventures began, about 1880, to give way to a large scale development of the Pacific Northwest, and by 1910 the population had increased to about 400,000, at which point it remained until 1930. In this period it is evident that a static level had been reached in mining, lumbering, and wheat growing. Such slight increases as were detectable could be traced to the effects of irrigation. Large areas of arid land in the central part of the Basin invited exploitation, however, and dry-farming was attempted. It soon became obvious that any extensive agriculture in the section would be based on irrigation. Since 1904 the Columbia Basin Reclamation Project has been kept alive by various business interests, but none of the many proposed projects were able to attract private, state, or federal funds. The present project, centered around the Grand Coulee dam and pumping plant, was at first justified as much for power development and flood and navigation control as for reclamation, but it is evident that it will soon make irrigation possible. It is estimated that the first settlements on the project will occur in 1940 and that eventually 1,200,000 acres will be reclaimed, making possible an increase in population of 400,000.

The nature of some favorable oil-bearing structures in the Pennsylvanian of southwestern Indiana. CLYDE A. MALOTT, Indiana University.—Altitude data on key beds in the Pennsylvanian system of southwestern Indiana reveal a rather surprising number of departures from the simple homoclinal descent of the beds into the Illinois Basin on the west. These departures are in the form of shallow dip-descending or oblique synclines, small anticlines, shallow basins, noses, terraces,

and other irregularities. These features are superposed on the regional westerly dip and locally are so prominent that the regional dip itself is obscure. Ordinarily these features may be interpreted as features of deformation. The positive structures in Posey and Vanderburgh counties indicate that they are the result of differential compaction in the formations where sand masses are present in the dominating shales of the system. Some of the structures appear to be formed by thick sand masses at shallow depths, and are too shallow to contain oil. Others are formed over sand bodies at considerable depth in the system, and oil and gas may be found in the top of the thick sand masses or in shallower horizons higher up in the structures. The St. Wendells and the Vienna oil fields northwest of Evansville are on small anticlinal structures produced over thick sand bodies in the upper part of the Mansfield formation at a depth of about 1200 feet. Short distances away from the axes of the anticlines, the oil-producing sands grade laterally into shales. Younger strata are arched over the oil-bearing sand bodies, and upward through nearly 1200 feet of strata still show anticlinal structures which have closures of 30 to 50 feet.

An exposure of New Corydon limestone in a new quarry at Huntington, Indiana. FRED J. BREEZE, Fort Wayne.—In a new quarry, between the France Stone Quarry and the Kelly Island Quarry of Huntington, Indiana, is an exposure of New Corydon limestone which is now held to be a phase of the Huntington formation. This exposure is at the north wall of the quarry and is 12 to 15 feet in thickness. Beneath the New Corydon beds are somewhat massive layers of very hard Huntington dolomite. At the east end of the quarry the New Corydon beds are missing, but the layers of dolomite show an unusually steep dip to the north. This quarry seems to be excavated in rocks that form the steep northward slope of bioherm.

Indiana regional contrasts in rainfall intensity and some apparent effects thereof. STEPHEN S. VISHER, Indiana University.—The time distribution or intensity of rainfall is of critical importance affecting its usefulness. It has been little studied, largely because its analysis requires much labor. With the assistance of N. Y. A. workers, the official rainfall data for Indiana have been studied in considerable detail. Scores of maps have been prepared concerning various aspects of rainfall intensity. Some of these are of the annual and seasonal frequency of monthly totals of 5 and 10 inches of rainfall. Another series shows the number of days for each of the months having rainfalls of 1 inch a day or 2 inches in two consecutive days. Another series gives the amounts of rainfall received in the greatest rainstorms of one day, of 3 consecutive days, and of 6 days, for the median year of record, for the wettest one-fifth of the years, for the wettest one-tenth of the years and for the least rainy one-tenth. Six maps give the record maximum rain falling in 1 day, in 2 consecutive days, in 3, 4, 5, and 6. Twenty maps give the percentages of the years that have had rainfalls of certain amounts, for example, 2, 3, or 5 inches in 1 day, of 2, 3, or 5 inches in 2 consecutive

days, of 3, 5, and 6 inches in 3 days, of 4, 5, or 6 inches in 4 days, of 5 or 7 inches in 5 days, of 6 in 6, of 8 in 6, of 10 inches in 6 days. An eighth series, of 24 maps, gives the monthly and seasonal distribution of rains of 1 inch a day, 2 inches in 2 days, and of the maximum 1-day, 2-day, 3-day, and 6-day rainstorms. Seven maps give the number of excessive short-period (less than a day) rains by seasons. The final series gives the record precipitation in storms of less than a day's length.

Most of these series are based upon from 40 to 90 weather bureau stations, and a record of from 30 to 46 years. They practically all show a very notable southward increase in rainfall intensity. Although southern Indiana receives in a year less than 50% more rainfall than does northern Indiana, southern Indiana has several to many times as many rainstorms of the various intensities studied, especially in the cooler months, when run-off is greatest. For example, falls of 3 inches in 1 day and of 6 inches in 6 consecutive days are more than 10 times as frequent in southwest as in northeast Indiana.

An analysis of soil erosion indicates that upon comparable slopes, surfaces, and soils, erosion is decidedly more rapid in southern than in northern Indiana. A considerable part of this difference presumably is due to the difference in the amount and intensity of the rainfall. The greater ruggedness in southern than in northern Indiana apparently is partly a result of the differences in erosion associated with the differences in rainfall. The decidedly lower average crop yields upon comparable slopes in southern than in northern Indiana apparently are also related to the more unfavorable rainfall distribution. In the south a much smaller percentage of the rainfall is useful to the crops. Largely as a result of the poorer crop yields associated with the drier and poorer soil, there are noteworthy regional contrasts in the percentage of the land in farms and crops. The comparative poverty and backwardness of the average family of southern Indiana is, therefore, seemingly related to the unfortunate rainfall distribution.