SECTION ON GEOLOGY AND GEOGRAPHY

Chairman: S. S. VISHER, Indiana University

About fifty persons were present throughout the greater part of the session of this section. All papers were presented as scheduled. Professor Thomas M. Bushnell, of Purdue University, was elected chairman for 1939.

ABSTRACTS

Some little appreciated features of the desert. E. R. CUMINGS, Indiana University.—Most people who travel through the arid and desert regions of western United States and northern Mexico regard the desert as monotonous or fearsome—a hot, dry, and uninteresting region to be hurried across as quickly as possible. To the geologist who understands the play of weathering and fluvial processes that have shaped desert features, such regions are intensely interesting and even beautiful. The present note, which lays no claim to originality, is intended merely to call the attention of members of the Academy to some of these features—particularly the bolson (intermont basin), pediment, bahada, playa, and fan-bayed and pan-fanned mountains—and to the processes of sheet-flood and stream-flood which have produced these features. Adequate descriptions of these features and processes may now be found in the literature, particularly in the writings of W. M. Davis, W J McGee, D. W. Johnson, and A. C. Lawson, and in the Physiography of the Western United States, by N. M. Fenneman (1931), and the Treatise on Sedimentation (2 ed., 1932) by W. H. Twenhofel and others.

No New Corydon in the Huntington Quarry. E. R. CUMINGS, Indiana University.—The "new" quarry, mentioned by Mr. Breeze (Proc. Indiana Acad. Sci., vol. 47, p. 147) as containing an outcrop of the New Corydon formation, was worked many years ago, filled with water for many years, and pumped out and reopened about 1935, or '36. It exposes the same members of the Liston Creek formation as the France Quarry just west of it, now filled with water, and runs up into a bioherm at its east end. There is no New Corydon formation and no Huntington formation in this quarry.

The taxonomy of Indiana soils and its relation to other natural sciences. T. M. BUSHNELL, Purdue University.—In pedology the soil is defined as a natural body, occurring on the surface of the earth, characterized by conformable layers resulting from modification of parent material by physical, chemical, and biological influences acting through various periods of time. In other words, Soil = material $\times$ forces $\times$ time; but this broad generalization is limited because of the dominance of certain minerals as parent material and by the circumstances which

condition the way the forces act upon the materials. Certain broad world relations result in climatic zones in which certain temperature and moisture conditions are important in soil formation. However, local relief brings about aeration, oxidation, and leaching of convex land forms, while nearby concave land forms may be more or less submerged by water, which results in reduction and in accumulation of organic matter, all of which results in very different soils. The nature and distribution of parent materials are related to many branches of geology. The nature of the forces and the way in which they work on the materials involve physics, chemistry, biology, and climatology. Ecology plays a large part in the way the biological factor affects soils. Since soil taxonomy involves the systematic arrangement of soils according to characteristics which more or less directly result from genetic factors, it follows that certain soil categories become good evidence of past or present existence of various geological, climatic, and ecological facts, and the soil map patterns may show very distinctly the distribution of these facts which belong to other sciences.

The Hazleton Bridge formation of the Upper Pennsylvanian of southwestern Indiana. CLYDE A. MALOTT, Indiana University.—A locally quite fossiliferous formation consisting of 20 to 25 feet of shale, locally containing one or more thin coals, a thin limestone, and a black shale, succeeds the Merom or Inglefield sandstone of the upper Pennsylvanian system in Knox, Gibson, and Vanderburgh counties, Indiana. An excellent exposure of this shale formation occurs near the south end of the White River bridge on U. S. Highway 41 at Hazleton, and the formation may well be named the Hazleton Bridge formation. In this vicinity it occurs between two thick, massive sandstones, the Merom or Inglefield below and the Dicksburg Hills above. The latter receives its name from the circumalluviated hills one mile or more north and northwest of the Hazelton bridge outcrop. Good exposures of the Hazelton Bridge formation occur in the White River bluffs and deep ravines east of Hazleton and in the eastern end of the Dicksburg Hills along U. S. Highway 41 one mile north of Hazleton bridge; in the hills northwest and southeast of Patoka; at many places west and northwest of Evansville, where the formation is 80 to 100 feet above the West Franklin limestone; in the vicinity of Vincennes near old Ft. Knox and along the Robeson Hills bluff of the Wabash River in Illinois; and also at the Embarrass River bluff one-half mile east of Lawrenceville and along the south bluff of Indian Creek two miles south of Lawrenceville, Illinois.

Karst features in the badland shale areas of Petrified Forest National Park, Arizona. CLYDE A. MALOTT, Indiana University.—Numerous small sinkholes occupy many of the slightly rounded and nearly level spur surfaces between the steep-sided ravines in the bare badland Triassic shale areas of the "First Forest," Petrified Forest National Park, east of Holbrook, Arizona. The sinkholes vary from a few inches in depth to as much as 10 feet, making mere dimple depressions to basins 15 or 20 feet across; and in places more or less longitudinal compound basins occur which have many sinkholes. The sinkholes are

variably distributed and do not make any obvious pattern. The shale surfaces are entirely bare of vegetation and consist of a loosened friable veneer over the firm clay shale below. The sinkholes appear to have been formed wholly mechanically and entirely independent of solution. No limestone or other soluble beds are present. Apparently these upland clay shale spur areas dry out in the arid climate, and shrinkage cracks penetrate deeply below the surface. When the infrequent rains occur, much of the water falling on the inter-ravine surfaces enters the shrinkage cracks and reappears at lower levels in the ravines. The partly weathered, friable surface material apparently is carried little by little through the subsurface shrinkage cracks, and the sinkhole hoppers are formed. It may be questioned whether or not these sinkhole forms should be classed as karst. Certainly the region is not a karstland, but karst features frequently occur in regions which are not karstlands. My own view is that these features may well be referred to as karst features, since they are dependent upon the diversion of surface waters to underground routes, a phase present in all karstlands and in the development of many karst features.

Recent oil and gas discoveries in Indiana. M. M. FIDLAR and GORDON F. FIX, Indiana Department of Conservation.—During the past year, four new areas of oil or gas production have been discovered as a result of increased activity in the industry in Indiana. The new oil fields are the Prairie Creek pool in southern Vigo County and the Heusler and Point pools in southern Posey County. None of these three new oil fields have been outlined, and the approximate productive area can not yet be estimated accurately. In the Prairie Creek field, thirteen wells are producing oil at depths of 2,130 to 2,175 feet from three pay horizons in the Devonian limestone immediately underlying the New Albany black shale. Four wells in the Heusler pool produce from the Waltersburg sandstone (Upper Chester) at an average depth of 1,790 feet. The wells in the Point pool obtain oil at an average depth of 2,700 feet in the McClosky oolitic zone of the St. Genevieve limestone, as well as from the Waltersburg sandstone, at a depth of 1,900 feet. The new gas area, the Ogle field, located in central Sullivan County, has four new wells producing gas from a Pennsylvania sandstone at an average depth of 795 feet. The combined initial production of all new wells drilled in the four fields described above total 1,941 barrels of oil and 7,350,000 cubic feet of gas per day. Even though settled production per day will be much lower, these recent discoveries are expected to increase substantially the annual oil and gas production of Indiana. It is also expected that additional important discoveries will be made during the next few months.

Reclamation in the Yakima Valley as a clue to the prospects for the Columbia Basin Project. WALLACE T. BUCKLEY, Indiana University.—The completion of the Grand Coulee Dam will mark another step toward the reclamation of 1,200,000 acres on the Columbia Plateau. The results already achieved in the Yakima Valley indicate that the completion of this project will permit an increase of 312,000 in the population of eastern Washington. Forage and cereal crops now occupy about three-

fourths of the crop land of the several federal projects in the Yakima Valley, but as a source of income the fruit crop ranks first. The already extensive livestock industry is growing. The cereals produced, chiefly wheat, are not sufficient to meet local needs. The expansion of the fruit industry has been limited by a series of unprofitable years, and high freight rates and poor marketing facilities still stand in the way of its development. At present there is an apparent trend toward meeting a general deficiency in dressed meats, corn, and truck crops. At the present rate of population growth, the western states will require the production of about 10,000,000 acres within the next generation. Speculation in land values in the Columbia Basin will probably be rigidly controlled. Settlers will be selected as to experience in farming under irrigation and as to financial stability, and overdevelopment of the land beyond the available water supply will be prevented.

The Far Eastern conflict from the viewpoint of a geographer long resident there. FLOY HURLBUT, Ball State Teachers College.—Six factors of especial significance are: (1) the density of population of both Japan and China; (2) the limited resources for industrialization available in Japan; (3) the advantages of Japan over China due to more stimulating climate, more compact area, greater modernization, greater centralization of government, and greater militarism; (4) the fact that China has resources needed by Japan and affords a large, convenient market for Japanese manufactures; (5) Japan's attempts to break by force the drastic boycotts of Japanese goods in China; and (6) the close timing of Japan's aggression to take advantage of European difficulties. Although Japan is conceded great military superiority, its success to date suggests that its goals are still remote. Appreciation of Chinese qualities and geographic advantages leads not only to a sympathetic attitude but to belief that, in the end, Japan will not accomplish its objectives.

Climatic changes during post-Pleistocene times as indicated by fossil pollen in Indiana bogs and lakes. J. E. POTZGER, Butler University.—The pollen records from Indiana bogs show little fluctuation in climate, progress being remarkably uniform from cool-moist to warm-moist and warm-dry. In the western part of the state a warm and very dry period is indicated by prominence of grass pollen in later deposits. The conditions which controlled spruce-fir forest (cool-moist) changed comparatively rapidly in all parts of the state. Interpretation of climate is made difficult by the fact that pollen of oak and maple cannot well be defined to species and both of these genera have representatives of dry and wet habitats.

Further studies of certain atmospheric variations. A. V. LOTT, Sellersburg.—A circulation in any medium can occur only when a flow in a given direction is completed by a return flow in an opposite direction. This fundamental principle seems to be inseparably connected with all major air-flows throughout the world. When it operates in connection with another principle which causes air masses to become elongated

in the direction of their most rapid motion, it causes great variations in the weather and the climate over widely extended areas. The complete development of an air-flow under the influence of these two principles apparently results in the formation of a complete climatic cycle. In North America the temperate climate becomes sub-arctic and then glacial. The glacial climate may be followed in certain sections by mild moist conditions, which are eventually replaced by another return to arctic cold. The arctic conditions eventually become sub-arctic and then temperate, and the cycle is completed. Charts show just how glacial and interglacial periods may develop in North America.

Geographic background of the Gallup, New Mexico, intertribal ceremonial. FRANK R. HALL, Purdue University.—Several aspects of this annual indigenous ceremonial reflect the geographic environment, for example, the costumes, ornamentation, implements, vehicles, and foods. It affords a view of the native—inherent rather than imported—arts, beliefs, modes, and other factors in Indian life.