16. "Results of Studies of Ordovician Rocks East of Allegheny Front in Pennsylvania," *by C. E. Prouty.*

The Ordovician rocks adjacent to the Allegheny Front consist of 6,500 feet of limestones, dolomites, and shales. The rocks become increasingly clastic upward, reflecting the growing movement that culminated in late Ordovician orogeny on the southeast. The Lower Ordovician consists of 2,775 feet of dolomite with two relatively thin limestone members. The homogenous lithology does not permit as detailed zoning as middle Ordovician limestones. However, a few lithic and faunal zones persist over fairly wide areas and are useful as mapping units. Some units may be helpful in subsurface geology in the adjacent Allegheny Plateau area. Middle Ordovician rocks, 1,375 feet thick, are divided into 15 major units which may be subdivided. Upper Ordovician clastics, 2,350 feet thick, consist largely of thick shales, claystones, siltstones, and sandstones which are not readily subdivided into characteristic zones.

Favorable reservoir rock in the Ordovician is limited. However, coarse calcarenites of the Trenton and Black River may offer some promise. The foetid odor of hydrocarbons is noticeable throughout much of the Ordovician, especially in some of the clastic limestones. Coarse-grained limestones and dolomites are generally darker than the denser carbonates, the darkness of color roughly proportional to increasing grain size. The relationship of the hydrocarbon content to grain size in these rocks deserves further study. Beekmantown and Upper Cambrian dolomites show small carbonate-lined cavities having foetid odor, a few showing oil stains. The Upper Cambrian Gatesburg contains numerous coarse sandstone beds which probably offer better potential reservoir rock than Ordovician units.

Several conclusions regarding the nature of the Ordovician rocks beneath the Allegheny Plateau may be based on outcrop data and paleogeographic probabilities. Gatesburg sandstones likely thicken and coarsen westward beneath the plateau. The Beekmantown dolomite probably thickens for a short distance beneath the plateau, with the limestone phases becoming more dolomitic. The Chazy probably thins and disappears in the central plateau area. Lower Black River units thin while upper Black River units thicken beneath the plateau for a short distance. Most Middle Ordovician units become more magnesian westward beneath the plateau. Upper Ordovician units become less clastic and thin westward.

17. "Subsurface Upper Devonian Sections in Southwestern Pennsylvania," *by R. E. Bayles.*

With the exception of small inlier areas along the axes of Chestnut Ridge and Laurel Ridge anticlines, the Upper Devonian rocks of southwestern Pennsylvania are concealed beneath a mantle of Mississippian, Pennsylvanian, and Permian sediments. Thus, the study of this very important group of rocks becomes a problem for the subsurface stratigrapher over a third of the surface area of Pennsylvania. Drilling, in recent years, along Chestnut Ridge and Laurel Ridge anticlines, and also in the broad plateau area between Laurel Ridge and the Allegheny Front, has yielded many excellent sections based on detailed examinations of drill cuttings. Some of these sections, in a generalized graphic form, together with additional ones located in the oil- and gas-producing area west of Chestnut Ridge, are assembled into cross sections which illustrate the facies variations in the Upper Devonian sediments of southwestern Pennsylvania. The Conewango (uppermost Upper Devonian) age of the Devonian rocks exposed in the inlier areas of Chestnut Ridge and Laurel Ridge anticlines is confirmed. With the exception of the Huntersville chert and Oriskany sandstone, which are Lower Devonian in age, the producing sands of southwestern Pennsylvania all appear to be younger than the highest sub-Catskill marine beds exposed along the Allegheny Front, which are generally considered as being late Chemung in age.

18. "Aerial Magnetic Survey of Appalachian Plateau in Central Pennsylvania," *by H. R. Joesting, F. Keller, and E. King.*

The aeromagnetic map of central Pennsylvania, covering 1,800 square miles, is dominated by two large positive anomalies which apparently originate within the deep-lying crystalline rocks. Minor magnetic irregularities also occur, and these are attributed to shallower sources.

In the comparatively small area under consideration, the anomalies are essentially unrelated in position and form to the sedimentary structures which trend northeast-southwest. Their probable causes are discussed and estimates of their depth of origin are made.

19. "Evolution of Thought on Structure of Middle and Southern Appalachians," *by John Rodgers.*

The first men to comprehend the structure of the Appalachian Mountains were the brothers, Henry D. and William B. Rogers, who from 1835 to 1842 studied them from northern New Jersey

to southwest Virginia. They worked out the Paleozoic stratigraphy of the area and by means of it deciphered the folds of the middle Appalachians and the thrust faults of the southern Appalachians. They attempted to explain the structure as the result of great explosions on the southeast but, beginning with Dana, geologists have come to ascribe the structure to lateral compression.

Since the time of the Rogers brothers, many structural ideas have emerged from the study of the Appalachians, such as the geosyncline, underthrusting, erosion thrusts, the competence of strata. Prominent among the many investigators was the group of geologists headed by Willis and Hayes who, late in the nineteenth century, worked out several of the low-angle large-displacement thrust faults of the southern Appalachians and attempted to explain the mechanics of Appalachian structure.

In recent years there have been developing two schools of thought on the depth of Appalachian deformation. One school holds that all large folds and faults extend down to and are supported by the basement; the other holds that the deformed rocks have been stripped completely off the basement along one or more great bedding-plane thrust faults.

20. "Structures of Basement Rocks of Pennsylvania and Maryland and Their Effect on Overlying Structures," *by Ernst Cloos.*

The folded Appalachians are paralleled by an eastern "hinterland" of intensely dislocated and metamorphosed crystalline rocks. Fossils have not been found and the area has not been studied in as much detail as is desirable. This is due to its seemingly hopeless composition of uniformly crystalline rocks, poor exposures and the great attraction exerted by better exposures and more spectacular geologic objects farther west.

The age of the crystallines is largely undetermined and they may be either basement of the appalachian geosyncline and its folds or their highly deformed crystalline axis. Some of the crystallines—the Baltimore gneiss and its equivalents—seem to be pre-Cambrian but most of the overlying metamorphics probably belong to the crystalline axis and the lower Paleozoics. The pressing problem is the determination of age relationship and thus the extent of what may be called a basement.

If a preliminary division of the crystalline axis into a basement and an overlying metamorphic series is accepted it is readily seen that the trends of the crystallines above deviate from those of the basement below. The gneiss appears in elongate and well defined uplifts of limited size and generally showing dominating vertical components whereas the schists seem to have moved forward and were possibly thrust over less metamorphosed Paleozoics following the general Appalachian trends.

There is no major break and no unconformity between the fossiliferous Paleozoics and the schist but a gradual southeastward increase of the intensity of metamorphism. The parallelism of structures is striking.

Appalachian folds within the crystalline axis are generally overturned northwestward but at numerous places virgation is southeastward.

The crystalline axis exerts a very strong influence on the overlying folds. Cleavage dominates, folds are overturned uniformly and this domination reaches as high as the Ordovician in some parts of the lower Paleozoic section. Farther away from the axis this influence declines and folding becomes more symmetrical, less uniform and at many places locally influenced by individual folds and their elements.

21. "Geological Factors Involved in Secondary Recovery," *by Maynard M. Stephens.*

Appalachian Basin Guide-Book

Copies of the Guide-Book to the Geology of the Northern Portion of the Appalachian Basin are now available. The book contains a detailed road log of the field trip of the Mid-Year Meeting of the A.A.P.G., October 6–9, 1948. It contains, besides 58 pages of road log, a special paper by Frank M. Swartz on the general character of the Paleozoic sediments of the area, an oil and gas map, relief map, structure sections, topographic sheets, geologic map, structure index map, six columnar sections for various parts of the region, oil and gas production curves, and eight glacial maps of New York state. Its size is $8\frac{1}{2} \times 11$ inches, with leatherette cover and wire-o binding.

The price of this 121-page Guide-Book is $5.00, and copies may be secured by writing to Geo. C. Grow, Jr., 545 William Penn Place, Pittsburgh 19, Pennsylvania. Orders should be accompanied by remittance, and checks should be made payable to Pittsburgh Geological Society.

Note.—*A scholarly presentation of Appalachian geology; a guide to geology along the famous Pennsylvania Turnpike, the Susquehanna River, and type localities in New York; a valuable book for field students and college classes, as well as practicing geologists.*