Hiddenite, Mt. Mitchell, and Spruce Pine, in North Carolina, and to Amelia Court House, Virginia, where they were joined by Dr. Wherry.

Mr. Trudell gave a humorous account of the experiences of the trip, illustrating his talk with numerous colored lantern slides and specimens. [This will be written up as the second of the series of articles on "Famous Mineral Localities" in the February number of this magazine.]

Mr. Gordon reported a trip to Beemerville, Sussex Co., N. J., Amity Orange Co., N. Y., and Paterson, N. J. The Amity region is one that has been pretty thoroly gone over, but a few specimens of small spinels, phlogopite, wernerite, hornblende, tremolite, chondrodite, etc., are obtainable occasionally in the stone fences that mark off the farms of the region.

At Paterson, in addition to material usually obtainable, there was found göthite, in small black balls on quartz (hitherto mistaken, at times, for diabantite). If the balls are broken they show the radiating structure, and are inside brown in color, but covered on the surface with a soft black powdery substance. Stevensite is abundant; but attention is called to the fact that slightly altered pectolite, especially if dark gray, is being called stevensite, whereas this term should be applied only to amorphous waxy material. Minutely crystallized thaumasite is abundant. Specimens were obtained of very minute crystals of anhydrite associated with small crystals of thaumasite and gypsum, the latter sometimes twinned.

Mr. Warford reported the Society's trip to Phoenixville. A few specimens of quartz, pyromorphite, barite, etc., were obtained. One of the old mines, the Montgomery, is to be reopened, the work of pumping it out having begun.

SAMUEL G. GORDON, *Secretary*

ABSTRACTS OF MINERALOGIC LITERATURE

THE GEODES OF THE KEOKUK BEDS. FRANCIS M. VAN TUYL. *Am. J. Sci.* **42** (1), 34–42, 1916; abstract reprinted by permission from *Chem. Abstr.*, **10** (17), 2189–2190, 1916.

The geode bed consists typically of an impure siliceous dolomitic limestone at the base, usually containing large and well developed geodes, followed by an argillaceous shale with more numerous but less perfectly developed ones; both members are about 20 feet thick. The composition of the lower member at Keokuk is given. The primary minerals found in the geodes are quartz, chalcedony, calcite, aragonite, dolomite, ankerite, magnetite, hematite, pyrite, millerite, chalcopyrite, sphalerite, kaolinite, and bitumen; alteration products are limonite, smithsonite, malachite, and gypsum. Tabulation of 14 mineral successions observed shows the normal sequence to have been: first a thin chalcedonic shell formed, upon which deposited quartz or more chalcedony, followed by calcite and the minor minerals. The alternation of crystalline quartz and chalcedony in some geodes was probably produced by changes in the condition and amounts of SiO_2 supplied; changes in temperature and pressure cannot be appealed to because closely adjacent geodes frequently do not show the same alternations. The position of calcite is subject to variations; it usually rests on an inner lining of quartz or chalcedony; and in some geodes calcite of two generations appears, the earlier often brownish and associated with sphalerite. The geodes have been regarded by many authors

as replacements of sponges or other organisms, but there is no evidence that they are to any extent of fossil origin at all; thus, of several thousand examined, only one was found which showed any trace of fossil structure, that one being an enlarged crinoid head. [The author does not review the various amateur explanations, which, tho almost incredibly absurd, are nevertheless interesting. One is the gas-bubble theory, according to which the geode cavities were made by carbon dioxide or other gases, like the bubbles in dough; another the ball-of-grass theory, according to which balls of grass were rolled about by the wind, and ultimately fell into the depositing sediments, late, decaying, leaving cavities (the absence of grass in the Mississippian period not being considered). A summary of old theories was published by Mr. Elmer Benge in the *Mineral Collector*, vol. 4, p. 97, 1897. EDITOR.]

The geodes are believed by Dr. Van Tuyl to be the result of replacement of calcareous concretions which are abundant in the beds in places, and have the same exterior form and relationships as the geodes. These were formed on the sea bottom, since lines of stratification do not pass thru them and no evidence of expansion is encountered about their borders. The process of solution must have begun in the interior and proceeded outward, for partially hollowed specimens are found. The most active solvents were probably CO_2 and H_2SO_4, the latter arising from the decomposition of pyrite. The kaolinite often found was evidently originally imbedded in the calcite of the nodules, and remained behind when the more soluble calcite dissolved. The calcite nodules must have been removed during a period when the beds were above ground-water level, and the deposition of the bulk of the minerals of the geodes when this level had again risen; this is shown to be in harmony with the known geologic relationships of the region. The second generation of minerals, chiefly calcite and pyrite, the bitumen, and the weathering products were evidently formed at a much later time. "The process of geodization evidently consisted of the inward growth of crystals upon the inside walls of cavities left by the solution of the imbedded concretions. The growth was necessarily accomplished by deposition from a solution which filled the interior completely. As this solution became depleted in its mineral content more was introduced by some process of diffusion and a continuous deposition resulted. In some instances a very impervious wall was developed, and growth must have been extremely slow; but in the majority of geodes numerous feeding channels in the walls afforded ready passage to the solutions after they penetrated the siliceous shells. The mineralogical variation of geodes which may occur in close proximity to each other is difficult to account for. It must either be assumed that the process of geodization was a very local one, and that each individual geode possessed only a small sphere of attraction, or that a peculiar localization of conditions favored in some instances the deposition of mineral matter more widely diffused thru the mineralizing solutions."

E. T. W.

EXCHANGE NOTICE

J. C. UTMAN, 701 2d Ave., E., Ashland, Wisconsin. Fine specimens of hematite, limonite, psilomelanite and other manganese minerals, native copper, and aragonite, from the Michigan iron and copper mines, offered in exchange for New England minerals, lead and zinc minerals, good calcite or quartz specimens.