it at any other point; for his relation to our space is nearly the same as our relation to a plane. If ghosts are four-fold beings, the erratic nature of their movements may become more comprehensible in the course of time. An ordinary knot could in four-fold space be readily untied by carrying one loop out of our space and bringing it back in a different place. In fact, a knot in our space would be simply a loop or coil in four-fold space. A flexible closed shell could be turned inside out as easily as a thin hoop can with us; and many other apparent impossibilities become mere child's play. But the realization of four-fold space cannot be learned by giving attention to such little curiosities as these. Only a systematic and continued study of the figures and motions of higher space can be expected to give results of

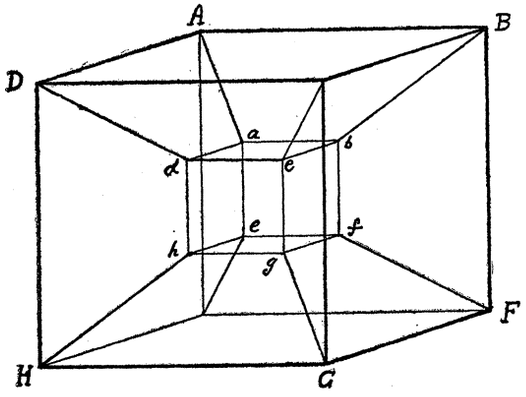

FIG. 4.

educational value. And when (or, if) our conception of four-fold space becomes clear, we shall be ready to recognize the existences and motions of the fourth dimension if there be such.

THE TUSKALOOSA FORMATION.

PROFESSOR LESTER F. WARD has recently spent a couple of weeks in Alabama in making a study of the Tuscaloosa formation, both as to its stratigraphy and its fossil plants. While in Alabama the professor made Tuscaloosa his headquarters, and from there made a number of short excursions in company with Dr. Eugene A. Smith to places of interest. At Cottondale, some eight miles east of Tuscaloosa, there is a fine locality for the collection of fossils, chiefly well-preserved leaf impressions. Professor W. M. Fontaine, a number of years ago, spent some time here and collected a great number of these leaves, which are now in the hands of Professor Ward for study and description.

Between Cottondale and Woodstock there are many occurrences of the Tuscaloosa sands and clays, which are now only outlying remnants, upon the rocks of the Coal Measures, of what was once probably a continuous mantle. Although there are many places where excellent clays for economic purposes are to be seen, none of them thus far examined have been found to contain the leaf impressions. From their position, these beds, occurring between Cottondale and Woodstock, appear to be the oldest of the Tuscaloosa series, and the leaf-bearing beds thus appear to be tolerably well up in the formation, although wherever seen, at Cottondale, Tuscaloosa, Snow's, Shirley's Mill, Glen Allen, etc., the leaf-bearing clays rest directly and unconformably upon the Coal Measures, usually within thirty or forty feet of the lin of contact of the two formations.

The other localities mentioned above, except Glen Allen, being away from the railroad lines, had to be reached by private conveyance.

Snow's, about seven or eight miles west of Tuscaloosa, was first examined by Dr. Smith seme years ago, and Professor Fontaine made a large collection here also. In the gullies near Snow's there is fine opportunity for seeing the strata of the Tuscaloosa formation, in vertical section. One of these is more than one hundred feet deep. Shirley's Mill, eleven miles south-east of Fayette Court House, was first made known as a plant-bearing locality by Dr. George Little, who visited it last year while making an examination of the Tuscaloosa clays, for the Geological Survey of the State. Dr. Little bro ght back a few fine leaf impressions from here, but Professor Ward was the first to make a systematic collection of the fossil plants. Glen Allen, on the Kansas City, Memphis, and Birmingham Railroad, was first examined and a small collection made by Dr. Smith several years ago, but here again Professor Ward was the first to collect on a large scale. The leaves are in a dark colored clay that at certain stages of wetness is tough and intractable, but when properly dry yields beautiful specimens at every st. ke of the hammer. The same is true of the clays near Shirley's Mill, and at both these places one can in a few hours load a wagon with fine cabinet specimens.

The Tuscaloosa formation is now generally considered a member of the lower Cretaceous, in part at least equivalent to the Potomac of McGee. While the fossils have not yet been sufficiently studied to decide their exact equivalence, many of the leaves appear to be identical with those occurring in the Amboy clays of New Jersey.

While in Tuscaloosa Professor Ward had an opportunity also of collecting some rare living plants. Upon the banks of the Warrior River, a few miles above the town, under the guidance of Drs. Bondurand and Hall, he was able to obtain *Neviusia Alabamensis*. *SedumNevii*, *Croomia pauciflora*, all comparatively rare, the first named having been found only in this locality. In Dr. Smith's yard is growing the *Croton Alabamensis*, recently discovered on the banks of the Cahaba River, and of interest as being the only shrubby Croton in our North American flora. This one grows to the height of eight or ten feet and makes almost impenetrable thickets. When slightly bruised the leaves and stems give out a fragrance somewhat like that of the flowers of the crab-apple.

An excursion was also made by Dr. Smith and Professor Ward to a little village, Havana, some twenty-five miles south of Tuscaloosa, long known to the former as an interesting locality, where, in a rocky glen under overhanging cliffs, grow two rare ferns, *Asplenium ebenoides* and *Trichomanes radicans*. The former has been noted from only three other localities, all in different States of the Union. Near Havana there are some great gullies, locally known as "The Caves," in which the micaceous sands of the uppermost of the Tuscaloosa formation are laid bare. These sands are remarkable for their brilliant colors, red, pink, purple, and yellow. In this respect they called to mind the similar bright hues of Gay Head in Massachusetts.

E. A. S.

MR. W. J. HUSSEY of the Ann Arbor Observatory has received an appointment as astronomer at the Leland Stanford, Jr., University.