by its distinguished author, though the supplementary treatment was far from convincing.

This general subject was discussed at some length by the undersigned in a paper on "A Geometric Basis for Physical and Organic Phenomena" which was printed in SCIENCE for October 11, 1918. The same was afterwards privately reprinted under a general title, "Fundamentals of the Cosmos," with an addendum in which was outlined a still farther simplification of the basic principle referred to. This may be concisely formulated as follows: *In an aggregate of an indefinite number of points with equal intervals between neighboring points throughout, a grouping that will give both complete symmetry and maximum concentration or minimum total space occupied is impossible.* Herein is to be sought the key to the apparently anomalous or irregular forms which Mr. Lewis finds. His observations of the actual shapes of organic cells found in nature are exceedingly interesting and significant, but the conclusion he suggests that "cells in masses are typically tetrakaidecahedral" should, I think, be understood as meaning that this is a form to which natural organic cells often approximate; not one which they will ever be found actually to attain in groups or aggregates.

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THE BIG STONE GAP SHALE OF SOUTHWESTERN VIRGINIA

THE stratigraphic relationships of the Big Stone Gap shale and its bearing on the Chattanooga shale problem have long been an outstanding geological question. Ulrich, Bassler, Schuchert and others have regarded both as Mississippian in age. Kindle, David White, Butts and others have regarded them as Devonian. But neither group has been able to offer conclusive proof of its position. In Virginia the Big Stone Gap shale lies at the top of the Portage and, where recognized in the past, has always been overlain by lower Mississippian beds (Grainger and Price formations). Stose[1] made an effort to solve the problem by tracing the Big Stone Gap shale up from the southwest and the Chemung formation down from the northeast, but at no locality was he able to find them together.

The writer's studies in Tennessee[2] had led him to believe the Chattanoogan series entirely Mississippian, as held by Ulrich. Partially completed studies of the Big Stone Gap shale, especially in the vicinity of Mendota, have led him to alter that decision. Six miles northeast of Mendota a series of sandy shales and shaly sandstones were found above the Big Stone Gap shale, forming a ridge traceable for a considerable distance to the northeast, where it lies everywhere higher stratigraphically than the Big Stone Gap shale. In the shaly sandstones were found *Camarotoechia orbicularis, C. contracta* var. (identical with the small variety from the Maryland Chemung), and *Productella* cf. *hystricula,* all typical Chemung forms found in the middle Chemung of Maryland. The Big Stone Gap shale near Mendota is thus definitely Devonian in age.

The Big Stone Gap shale has been recognized for some ten miles northeast of Mendota, where it is found to be accompanied by an increasing number of sandstone and sandy shale beds. It would thus seem to be probably lower Chemung in age. Near Saltville a similar black shale was found in the base of the Chemung and is here tentatively correlated with the Big Stone Gap shale.

The completed study will be published shortly as a separate paper.

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A STOCK FOR THE MANGOSTEEN

ON the hacienda of Mr. John R. Schultz, Calauan, Laguna, Philippine Islands, in May, 1924, I inarched a seedling of the mangosteen, *Garcinia mangostana* L., on a plant of a native species of *Garcinia,* locally called *Bunag.* A successful union was rapidly established, and the grafted plant had made a good start when last I saw it shortly before leaving Manila for the United States in January, 1925. Photographs recently received from Mr. A. W. Prautch, Bureau of Agriculture, Manila, show that the plant now reaches to a man's hips and is in excellent condition.

The success obtained in this graft is of more than ordinary interest in view of the fact that for a period of some 25 years attempts repeatedly have been made to graft the mangosteen on more than twenty species of *Garcinia* and related plants, all, except the instance recorded, ending in failure.

The mangosteen is one of the most highly prized fruits in the world, but is particular in its climatic requirements, has a weak root system, and is of very slow growth, especially in the nursery stage. Therefore, unlike many other fruits, the mango, for instance, the mangosteen has never become widely disseminated, and still is grown on a comparatively restricted area and in small quantities, notwithstanding its unsurpassed eating qualities and good shipping qualities.

The *Bunag* not only is a plant of vigorous growth which may be expected to force the grafted plants

[1] Va. Geol. Surv., Bull. 24, 1923, pp. 48 to 52.

[2] *Amer. Jour. Sci.,* Vol. 7, 1924, pp. 24 to 30.