support of this purely hypothetical acceleration; much is made of a suggestion that acceleration is likely to occur because *Lophophyllum* appears late (Carboniferous) in the geological history of the Rugosa. The author then produces what he considers evidence in favor of a primary tetrameral plan. This rests entirely upon a decalcified silicified specimen of *Streptelasma profundum* (Owen) in which no doubt was left in the author's mind that four of the strongest septa extended farthest down into the base of the calice. No sections are given, and no other suitable material seems to have been at command.

I, likewise, have in my possession numerous decalcified silicified specimens of *S. profundum,* the septal plan of one of which is figured in *Biol. Bull.,* June, 1905, p. 39. Some of these are beautifully perfect, and present all the appearances described by Gordon, but one would scarcely think of using mere surface views for the determination of a question of such fundamental importance, especially when more reliable means are available. Since the publication of my paper in 1902 I have made special efforts, with the assistance of grants from the Carnegie Institution, to secure from all parts typical species of the Rugosa with perfect tips suitable for the investigation of this particular problem. Any one familiar with the subject knows how very rare such specimens are and the difficulties which surround their examination. From my study of these, by the method of grinding, I can now state that *in five different species I have definitely determined the presence of six primary septa,* all equal, and situated at equal distances apart. These species are *Streptelasma rectum* Hall, already figured in *Biol. Bull.,* June, 1905, *Cyathaxonia cynodon* E. & H., *Hadrophyllum glans* (White), *Hadrophyllum pauciradiatum* E. & H., and *Microcyclus discus* Meek & Worthen. Many other species have been investigated, but for one reason or another their tips were unfavorable for showing the primary septa, yet in tracing the development of the later septa this so closely agreed with the species mentioned that there can be no reasonable hesitation in assuming that their primary septa were hexameral. In no instance were there only four protosepta.

Thus, with the addition of *Lophophyllum proliferum,* the hexamerism of which Gordon does not dispute, there are now six known species of Rugosa each having six primary septa, while not a single undoubted instance of only four primary septa has been brought forward. Moreover, the geological distribution of the species mentioned is so wide, from the earliest to the latest appearance of the Rugosa, that Gordon's main argument in favor of acceleration fails in its application. Unless, therefore, fresh and weighty evidence to the contrary should be forthcoming we are reasonably justified in considering the primary hexamerism of the Rugosa as established.

The underlying significance of the primary hexamerism of the Rugosa is that it admits of the relationship of the group with other Anthozoa being established. In the past the assumed tetramerism has led to many fanciful suggestions. In my original paper I showed conclusively that the Rugosa find their nearest modern relatives among the zoanthid actinians, and subsequent work, especially on the fossula, has but served to confirm this. Unless Gordon can produce more acceptable evidence than is contained in his paper under review his contribution must be regarded as a retrograde step in our efforts to determine the phylogenetic relationships of the Rugosa.

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THE SOURCE OF THE ENERGY OF CYCLONES.

TO THE EDITOR OF SCIENCE: In the issue of SCIENCE of May 5 last you were good enough to publish a communication of mine suggesting the source of origin of cyclones, cold waves, and tornadoes. Since the appearance of that article there has occurred to me the suggestion of the derivation of the energy involved in the movement of these bodies, or I might better say, a mechanism of the action of the prevailing westerly winds in accomplishing their movement, that has not hitherto been suggested by any one, as far as I know.

When a cyclone has once been inaugurated, in whatever way this may be effected, it presents itself as a mountain of air with a tendency to rise to a great height into the prevailing over-current. If established before starting on its journey, there was an inrush of air from every direction, and to the extent of the momentum of this inrush the mountain was a hollow one and its area a 'low.' At a variable distance above the earth's surface the crest of the cyclone is struck and carried away forward by the prevailing over-current, which in the tropics is the returning loop of the uplifted trades as they journey west, after that this same loop becoming the antitrade as it takes a brief turn poleward, and finally the prevailing westerlies in the temperate regions.

Now it is well known that the prevailing westerlies, or any other steady winds blowing across a mountain chain, draw up the air on the leeward side of the mountain, condensing its moisture into a constant cloud. There is also a well-known instrument now widely used by surgeons and painters, which consists of a tube opening at right angles to the mouth of another tube which dips into the fluid to be sprayed. By blowing through the first tube a liquid is made to rise up through the second or perpendicular one. In both these instances the horizontal current, by the momentum of its trajectory, has to a greater or less extent removed the pressure of the superincumbent atmosphere and permitted the surrounding pressure to force the air or the liquid upward.

Now in the case of the beheading of our cyclonic mountain, the available energy is the momentum of the horizontal trajectory of the upper prevailing winds. Twenty-seven inches of mercury is probably the extreme of 'low' for any cyclone, and this shading off to zero at the edges, so that an average fall of one inch over the entire area of a cyclone is the highest probably ever attained if, indeed, it goes nearly so high. This prevailing wind is operative at from 2,000 feet to ten or more miles high, while moving at a speed of from, say, 50 to 250 miles an hour. But, whether it embraces the entire operative force or not, this prevailing overcurrent supplies a vast amount of the energy of motion to cyclones and is to that extent a *vera causa*. Again, the translatory energy, as well as the gyratory, may be derived from the same source. While the crest of the cyclonic mountain is being dragged away forward, the body of the cyclone itself is made to lean in the same direction. In this case air, drawn into the cyclone from in front, reaches its body at a given height in less time than a like mass drawn in from the rear, and this still more when the cyclone is in motion. The result altogether will be that the diameter of the base of the cyclone is added to more rapidly in front than in the rear. This of necessity results in a forward movement of the center of gravity; and, since the cyclone is rotating, it must continuously advance in order to make its axis correspond with its center of gravity. Indeed, so much is this the case that the axis of a cyclone is probably curved—advanced at the base and at the top while lagging in the middle.

D. T. Smith.

SPECIAL ARTICLES.

RECENT DISCOVERIES OF QUATERNARY MAMMALS IN SOUTHERN CALIFORNIA.

Several months ago Mr. F. M. Anderson called my attention to a deposit of bones occurring in asphalt beds near Rosemary Station about nine miles west of Los Angeles. In a small collection of specimens kindly presented to me by Mr. Anderson there were represented a number of Quaternary mammalian species which are either new to the fauna of the Californian region or have been very imperfectly known.

Recently Mrs. Ida Hancock, the owner of the property on which the asphalt deposits are located, has very kindly given to the University of California permission to carry on excavation work in these beds, and a considerable collection of valuable material has been obtained.

The beds in which the bones occur extend over many acres. So far as I am aware the bottom has not been reached in excavations carried to the depth of at least fifteen feet in quarrying the asphalt. Bones are scattered