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with each other, is simply a fact which admits of no controversy. We have then at least seventeen\* independent variable quantities which harmonize together in a complicated formula. In regard to each of these there are many chances to one against its value being such as to produce the existing harmony; hence the probability is almost infinity to unity against the accidental coincidence of the whole. The conclusion seems irresistible that my formula is the expression of a law of nature.

Pottsville, Pa., March, 1851.

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ART. XLV.—*New Genera of Fossil Corals from the Report by JAMES HALL, on the Palæontology of New York.*

THE researches of Mr. James Hall into the palæontology of New York have been carried forward with great labor and careful investigation, and are an honor to the state under whose liberal patronage and direction they are continued. The region included within the limits of the state, embraces the whole range of the Silurian and Devonian rocks, and in no part of the world is this series of strata more fully developed, or more abundant in organic remains. The completeness of the system here displayed will make it classic ground for the student of the ancient life on our globe, and Mr. Hall's work, in which these relics of antiquity are described, must become of standard importance the world over. The first volume, a thick quarto, with nearly a hundred plates, was published in 1847. A second volume of equal extent has been for some time ready to be issued excepting a few plates yet unfinished. This is hardly half the work before him—although 722 species have been thus far described; for the fossils are strewn through many of the rocks of the state with the most wonderful profusion, and the whole number of species they include cannot be less than 1800. We propose in this place to cite the descriptions of some of Mr. Hall's new genera from the second volume. We confine ourselves at present to the fossil corals. The strata whose fossils are described in this volume, are those of the Medina sandstone, and the following beds to the Onondaga Salt Group; over 200 pages of the volume are devoted to the Niagara Group.—Eds.

*New Genera of Fossil Corals.*—1. *Clinton Group.*

GENUS HELOPORA, *Hall*, p. 44.—[Bryozoöid?] Simple or branching cylindrical stems, often swelling at the upper extrem-

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\* Viz.: The distances and masses of Mercury, Venus, the Earth, Mars, Jupiter, Saturn and Uranus, and the periods of rotation of Venus, the Earth and Saturn.

ity, poriferous on all sides. Pores oval or subangular, arranged between longitudinal elevated lines.—Species *H. fragilis*.

GENUS PHÆNOPORA, *Hall*, p. 46.—[Bryozoöid.] Corallum consisting of a thin broad calcareous or semicalcareous expansion which is celluliferous on both sides; cellules oval, arranged between direct longitudinal and obliquely transverse lamellæ, and opening upward and outwards from the base. Near *Fenestella* in general aspect.—Sp., *P. explanata*, *P. constellata*, *P. ensiformis*.

GENUS RHINOPORA, *Hall*, p. 48.—[Bryozöoid?] Corallum consisting of an expanded calcareous crust, either subcylindrical and hollow or explanate, poriferous on the two sides; cells arranged somewhat in quincunx order, roundish or oval, and strongly raised in little papillæ or pustules above the surface.—Species *R. verrucosa*, *R. tubulosa*.

## 2. Niagara Group.

GENUS POLYDILASMA, *Hall*, p. 112.—Corallum turbinate [Cynthophylloid]; lamellæ numerous, thin, apparently rising in pairs and one often much stronger than the other; cell broad, margin thick and strong, with a deep central pit; half the lamellæ reaching to the centre of the cell, where they are complicated or contorted; transverse septa below the central part of the cup obsolete or irregular. Allied to *Calophyllum*, but does not show the transverse septa characteristic of that genus.—Sp., *P. turbinatum*.

GENUS CONOPHYLLUM, *Hall*, p. 114.—Corallum turbinate or subcylindrical, having transverse septa in the form of inverted cones set one within the other; rays or lamellæ very thin, numerous and denticulate. In weathered specimens the transverse septa often project beyond the sides the coral above, and the whole appears somewhat like a series of inverted cones. The weathered surfaces have sometimes the appearance of *Cystiphyllum*, from the irregular meeting of the upper and under surfaces of the successive transverse septa.—Sp., *C. Niagarensis*.

GENUS DIPLOPHYLLUM, *Hall*, p. 115.—Simple; ramose or aggregated cylindrical stems; corallum composed of two distinct portions, the inner transversely septate, the outer with fine transverse dissepiments uniting the lamellæ which are continuous to the centre; cell deeply concave in the centre and separated from the outer portion by a distinct rim, both the inner and outer portions stellate, with the same number of rays. Near the *Diphyphyllum* of Lonsdale.—Sp., *D. cæspitosum*.

GENUS ASTROCERIUM, *Hall*, p. 120.—Coral massive (or ramose?); interior prismatic or basaltiform; cells contiguous, openings upon the surface more or less angular, and often very variable in size; rays twelve or more, consisting of slender elongated and ascending points; transverse septa direct. Near *Favosites*, and more especially, *Favistella*, but with spiniform rays instead

of lamellar.—Sp., *A. venustum*, *A. parasiticum*, *A. pyriforme*, *A. constrictum*.

GENUS CLADOPORA, *Hall*, p. 137.—Ramosse or reticulate, branches cylindrical or slightly compressed, terminations terete; coral composed of a series of tubes or cells radiating equally on all sides from the axis, and opening upon the surface in rounded or subangular expanded mouths; cells more or less closely arranged, but not always contiguous and apparently destitute of septa or rays. The cells when filled with calcareous matter frequently separate in prismatic forms like Favosites, but there is no evidence of transverse septa. The cells are not always contiguous, and there is often a space between the cells which appears to be solid in one or more species.—Sp., *C. seriata*, *C. cespitosa*, *C. cervicornis*, *C. fibrosa*, *C. multipora*, *C. macrophora*, *C. reticulata*.

GENUS CALOPORA, *Hall*, p. 144.—Ramosse or incrusting with a columnar structure; cells tubular with the apertures circular or petaloid, not contiguous, and having the intermediate spaces occupied by angular cell-like openings which are transversely septate; tubular cells rarely septate.—Sp., *C. elegantula*, *C. florida*, *C. laminata*, *C. aspera*, *C. nummiformis*. The *Hetiopora crassa* of Lonsdale is probably of this genus.

GENUS TREMATOPORA, *Hall*, p. 149.—Ramosse or incrusting, composed of tubular cells more or less closely arranged; intermediate spaces solid on the surface, but in the interior transversely septate; cells not septate; apertures oval or circular, often contiguous, margined by a thin elevated border or calicle, which on the lower side is often prominent or labellate. Near *Calopora*, but calicle or elevated rim more conspicuous, and intervals between cells solid instead of cellular.—Sp., *T. tuberculosa*, *T. coalescens*, *T. tubulosa*, *T. punctata*, *T. ostiolata*, *T. solida*, *T. striata*, *T. granulifera*, *T. aspera*, *T. spinulosa*, *T. sparsa*.

GENUS STRIATOPORA, *Hall*, p. 156.—Ramosse; corallum solid; stems composed of angular cells; apertures of the cells opening upon the surface into expanded angular cup-like depressions; interior of the cell rayed or striated, striæ extending beyond the aperture of the cell.—Sp., *S. flexuosa*.

GENUS CLATHROPORA, *Hall*, p. 159.—Bryozoöid. Ramosse or reticulate; uniformly poriferous on both sides of the reticulate fronds, and on all sides of the stems and branches of ramosse forms; apertures of cells more or less quadrangular, regularly arranged in series parallel to the direction of stems, or obliquely in quincunx order. Near *Retepora* in habit.—Sp., *C. alcicornis*, *C. frondosa*.

GENUS CERAMOPORA, *Hall*, p. 168.—Bryozoöid. Incrusting or in flattened hemispherical forms; cells arranged in alternating or imbricate series; apertures arching or triangular, with the apex

above.—Sp., *C. imbricata*, *C. incrustans*, *C. foliacea*. The *Berenicea irregularis* of Lonsdale, and *B. megastoma* of M'Coy, are here related.

GENUS LICHENALIA, *Hall*, p. 171.—Bryozoöid. Membranous or subcalcareous, growing in circular or flabellate forms, concentrically or radiately striate, celluliferous on one surface only; frond usually a thin membrane, though often unequally thickened and contorted or wrinkled. It is only in rare instances that distinct cells are visible, though in most cases the surface appears marked as if by stigmata or the commencement of cells, which sometimes rise in low nodes without presenting any defined apertures.—Sp., *L. concentrica*.

GENUS SAGENELLA, *Hall*, p. 172.—Bryozoöid. Thin membranous, net or web-like, incrusting; cells arranged in regular parallel or diverging series more or less oblong quadrangular when in juxtaposition, and separated from each other by a thin lamina of calcareous matter.—Sp., *S. membranacea*.

GENUS DICTYONEMA, *Hall*, p. 174.—Bryozoöid, and near Fenestella. Frond circular or flabelliform, composed of slender radiating branches which frequently bifurcate as they extend towards the margin; branches and subdivisions united laterally by fine transverse branchlets; branches impressed with deep striæ or grooves, producing indentations that sometimes have an elongated rhomboidal form; axis subcalcareous with a corneous exterior. Branches sometimes like a graptolite in appearance.—Sp., *D. retiformis*, *D. gracilis*.

GENUS INOCAULIS, *Hall*, p. 176.—A plant-like corneous coral with numerous bifurcating branches; structure fibrous or plumose. The texture is like that of Graptolites, a black scaly crust or film being all that remains of the substance. Probably grew in groups of rounded or flattened stems dichotomous above.—Sp., *I. plumulosa*.

ART. XLVI.—*Analyses of Pitchstone Porphyry from Isle Royale, and of a Crystal of Phosphate of Lime from Hurdstown, New Jersey*; by C. T. JACKSON, M.D., Assayer to the State of Massachusetts. (Read before the Boston Society of Natural History, March 19, and communicated to this Journal by the author.)

1. *Pitchstone Porphyry from Isle Royale, Lake Superior.*

*Description.*—It occurs in rounded pebbles, on the shores of Isle Royale, near Scovill's Point. Color of the pitchstone, jet black, lustre more vitreous than obsidian. Fracture conchoidal. Sp. gr. = 2.375. Hardness 5½. B. B. swells very much, exfoli-