

nature) 5 cubic feet of air would be displaced. The grains of sand are very rounded. The proportion of a sphere to its circumscribing cube is .5236, so the interstitial space is rather less in this sand than it would be with an equal mass of small shot of uniform size. The cementing power of moisture in sand is very remarkable, for moist sand will stand nearly vertical for a considerable height, the same material when dry flowing like water. The sand dunes when moist being denuded into cliffs by the sea, but not at other times, show this.¹

Probably I may be asked what is the geological application of the foregoing. Well, I did not write with any special application in view.—but simply to record a curious fact. If, however, we substitute beds of rock on a large scale for the sandy laminae, and molten rock injected from below, for the air, we shall have a pretty good model of the *modus operandi* of the formation of the laccolites or stone cisterns so well expounded by Mr. Gilbert in his *Geology of the Henry Mountains*.

VII.—NOTE ON THE SYNONYMY OF *PHILLIPSIA GEMMULIFERA*, Phillips sp. 1836, A CARBONIFEROUS TRILOBITE.

By HENRY WOODWARD, LL.D., F.R.S.

ALTHOUGH the Carboniferous Trilobites are but few in number, and are all included in four genera, they have not escaped the usual trouble arising from incorrect determinations.

One of these occurred in reference to *Phillipsia gemmulifera*, Phillips, sp., better known by the name of "*Phillipsia pustulata*," Schlotheim species, a name first applied to this form by Professor de Koninck in 1842-44 (see *Descr. Anim. Foss. Terr. Carbonif. de Belgique*, p. 603, tab. liii. fig. 5).

This Trilobite, first known by a pygidium only, was very carefully figured in "Brongniart's and Desmarest's *Histoire Naturelle des Crust. Foss.* 1823, p. 145, pl. iv. fig. 12, 1822," where it is called "*Asaphus*" from the black limestone in the environs of Dublin.

It was next figured by Phillips in his *Geology of Yorkshire*, 1836, vol. ii. pl. xxii. fig. 11, p. 240, who named it *Asaphus gemmuliferus*.

Buckland again repeats the figure later in the same year, and follows Phillips's name of *A. gemmuliferus*.

Prof. de Koninck, in 1842-44, changed the name to *Phillipsia pustulata*, quoting Schlotheim's "Nachtrage zur Petrefactenkunde" (ii. Abth. pp. 42-3, Gotha, 1823, and Atlas, p. 22, and plate xxii. fig. 6) as his authority. Now as Schlotheim's Trilobite differs very greatly from Phillips's figure, and also from those given by Brongniart, and by Buckland, and as moreover Schlotheim's specimen was said to have been derived from the youngest Upper Transitional Limestone (Devonian) of the Eifel, I felt great doubt in accepting Prof. de Koninck's correlation of *Phillipsia gemmulifera* with the *Trilobites pustulatus* of Schlotheim.

¹ See *Æolian Sandstone*, *Geol. Mag.* 1881, p. 197.

These doubts I expressed in my Monograph,¹ and acting on the evidence of the age (Devonian), and the published figure of Schlotheim's specimen, I restored Phillips' specific name of *gemmulifera* for this Carboniferous Limestone form, and discarded that of Schlotheim (*T. pustulatus*) as untenable. Having lately seen and consulted my friend Prof. Dr. Ferdinand Roemer, of the Mineralogisches Museum, Breslau, our highest authority on the fossils of the Eifel, he very kindly promised me, on his return journey, in passing through Berlin to Breslau, to compare my figures of *Phillipsia gemmulifera* with Schlotheim's specimen of *Trilob. pustulatus* in the Berlin Museum. I now have the pleasure to append his letter, which entirely sets the matter at rest.

“Mineralogical Museum of the Royal University of Breslau. Dear Dr. Woodward,—Schlotheim's *Trilobites pustulatus* is nothing else than a pygidium of *Phacops latifrons* from the Eifel. This is proved beyond any doubt by Schlotheim's original specimen in the Berlin Museum.—Yours very truly,

“(17th October, 1883.)

FERD. ROEMER.”

NOTICES OF MEMOIRS.

SOME GEOLOGICAL CONDITIONS AFFECTING THE QUESTION OF WATER SUPPLY FROM THE CHALK.

[Part of the Presidential Address to the Norwich Geological Society, 6 Nov. 1883.]

By W. WHITAKER, B.A., F.G.S., of the Geological Survey.

IT has occurred to me that I might profitably take as the chief subject of my address one of practical importance, and one showing that the detailed mapping of our county by the Geological Survey, which is now all but finished, is not a matter of mere theoretical interest.

As our Survey will be finished this year, except for some questions of revision in the western part of the county, and as some time next year the officers of that Survey will be denuded from Norfolk, the present seems a fit time for bringing forward such a subject. Were the question put off for the publication of the whole of the Survey Maps, it would be at least two years before it could be brought before you, and though I suffer therefore from the want of great part of the material needful for a full consideration of the question as regards Norfolk, yet I think that we have enough to warrant its discussion, especially as it can be illustrated by reference to other districts of a like character. Indeed the amount of material in my hands is so large that I have been unable to work it all up in time, and therefore have had to neglect some parts of the bordering counties of Cambridge and Suffolk which I had hoped to have illustrated amongst the maps before you.

During the course of my work on the Geological Survey I have paid some attention to the question of water-supply, and a few years ago I had to make a set of maps for the purpose of showing the

¹ See Mon. Carb. Limestone Trilobites, 1883, part i. pp. 17–19, plate iii, figs. 1–8. See also GEOL. MAG. 1883, Decade II. Vol. X. Fig. 3, p. 450.