THE AFFINITIES OF RICHTHOFENIA.

DR. W. WAAGEN considers the results of his recent study of the new genus Richthofenia Kays. (Anomia Lawrenciana Koninck) so remarkable as to deserve a preliminary notice (*Rec. geol. surv. India*, xvi. 1). Mr. Barrande and Professors Valérin and Möller were of opinion that this fossil was more nearly related to the corals than to any other class of animals, while Professors Zittel and Lindström seemed to be in favor of the view that it was a brachiopod. In favor of the latter view, the microscopic structure of the shell is the most important point. Its silky lustre is identical with that of Productus, though this seems to be effected by different means. In the shell of Productus it is caused by obliquely ascending prisms, whilst in Richthofenia it depends apparently on the fine lamination of the shell, as in Placuna or similar genera. Of great importance is the prismatic structure of the single laminae of which the shell of Richthofenia is composed. Such a prismatic structure is chiefly characteristic of mollusks and molluscoids. Dr. Waagen has never yet observed this structure in corals. In Calceola sandalina, which seems the most kindred form among corals, a microscopic section through the larger valve showed well its radial septa ; but all these septa exhibited a granular, not a prismatic structure. The punctation of the shell is very similar to that of Productus, and so are the hollow root-like tubes which penetrate the shell-substance of the larger valve, and adhere to other bodies. The smaller valve can also be very well compared to the same valve of Productus, although it is doubtful whether the thick parallel ridges on the hinge-line of this valve of Richthofenia can at all be compared to a cardinal process, and whether the impressions on the valve can be taken as muscular impressions. Reniform bodies are most certainly absent. Nevertheless, among the brachiopods, the Productides are the only ones to which the genus Richthofenia might stand in any relation.

Richthofenia possesses certain points of resemblance with rugose corals, — the irregular partitions in the lower part of the larger valve ; the columella-like portion, which is divided off by three vertical septa ; these septa themselves, which can well be compared to the primary and the two lateral septa of a rugose coral ; the cellular structure of the shell ; the septa-like ridges on the outer wall of the animal chambers, which are in connection with the hollow canals which pierce the substance of the shell ; and the tortuous tubes themselves, into which the canals are prolonged on the outer side of the larger valve. There can be no doubt, that on first inspection, ignoring the silky lustre of the shell, one would be far more likely to regard this fossil as a coral than as a brachiopod.

The points of similarity between Richthofenia and the Rudista, chiefly Hippurites, are not very numerous. If we make a section of Richthofenia from the hinge-line to the opposite wall, so as just to touch the median vertical septum, we obtain a figure very similar to what a Hippurites shows when cut so as to touch the first columellar fold. Another point of similarity consists in the direction of the prisms, of which the substance of the shell is composed. The Rudista differ from all the other groups of Pelecypoda in having the prisms of the outer shell arranged vertically ; i.e., longitudinally to the whole extension of the shell. The same is the case in the median shell-layer of Richthofenia. A third point of great importance exists in the pallial impression which is common to Richthofenia and the Rudista ; and, finally, it is not quite certain that the sinuations of the large valve of Richthofenia on both sides of the hinge-line, which stand in so close a connection to the lateral vertical septa, may not be regarded as the beginning of the infoldings of the shell, so characteristic of the Rudista. The distance in time between Richthofenia, which comes probably from the limits between the carboniferous and Permian formations, and the Rudista, which are for the most part upper cretaceous, is so enormous, and the absence of every connecting-link so complete, that a close affinity between the paleozoic and the cretaceous forms should not be expected. It will therefore only be possible to prove the connection between the present fossil and the Rudista, when further members of such a developmental series are discovered.

As the case now stands, it will be most prudent, in accordance with the microscopic structure of the shell, to consider the fossil as something like a brachiopod. As far as Dr. Waagen's opinion goes, he is convinced that Richthofenia is a member of a series, which, branching off somewhere from the rugose corals, has reached in Richthofenia a brachiopod-like stage, and is going to terminate its career as a Pelecypod, as one of the Rudista. But opinion is nothing in science, and proofs are every thing. As yet, it cannot be positively denied that Richthofenia may be a predecessor of the Rudista.

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THE GREENWICH OBSERVATORY.

AMONG the leading points referred to in the report of the astronomer royal, W. H. M. Christie, F.R.S., to the board of visitors of the Royal observatory, Greenwich, read at the annual visitation on June 2, are the following: —

Besides the regular subjects of observation with the transit-circle, — the sun, moon, planets, and fundamental stars, — a new working-list of 2,600 stars, comprising all those down to the sixth magnitude inclusive, and not observed since 1860, has been prepared, and was brought into use at the beginning of March. The entire number of transits observed with this instrument during the year was 4,488; determinations of collimation-error, 354; determinations of level-error, 323; number of circle-observations, 4,485; determinations of nadir-point, 298; reflection-observations of stars, 484. Comet *a* 1882 was observed seven times on the meridian, and comet *b* 1882, three. The routine reductions of all the observations with this instrument are reported in an extraordinary state of forwardness. From the beginning of this year, a correction of $-0''.39$ has been applied to the