(Pl. XVI. figs. 2, 3; Pl. XVII. fig. 1), with its extraordinarily narrow arm-groove, the ambulacral plating of the pinnule always arises from a similar but less defined skeleton on the brachial ambulacrum (Pl. XVII. figs. 7–9; Pl. XXXIII. figs. 3, 4; Pl. XLI. figs. 4, 13; Pl. LIV. fig. 7). This is itself directly continuous with the ambulacral plates of the disk; while the perisomic plates, which may appear at its sides (Pl. XXVII. figs. 6, 13; Pl. XLI. figs. 4, 13), are in like manner connected with the anambulacral system over the arm-bases (Pl. XXVI. figs. 1, 2; Pl. L. fig. 2). Wachsmuth's own beautiful observations have demonstrated the existence both of anambulacral and of ambulacral covering plates on the upper surface of the body, beneath the vault of *Actinocrinus;* and since the latter also appear on the pinnules, it seems unreasonable to doubt their presence on the arms.

But if, as I firmly believe, brachial covering plates occurred in *Actinocrinus* as in *Cyathocrinus*, what becomes of the supposed homology between these covering plates in the latter genus and the pinnules of the former type?

Mr. Wachsmuth appears to me to have been much nearer the truth when he suggested that the many little branches of the bifurcating arms in *Cyathocrinus* performed the functions of pinnules,[1] though he gave no explanation as to what these functions were. In recent Crinoids, and most probably therefore in the fossil ones also, the functions of the pinnules are threefold, viz., (1) the protection of the fertile portions of the genital glands, which are all connected together by the sterile rachis in the arm; (2) respiration; (3) alimentation.

Dr. Carpenter[2] has pointed out that the Crinoids are very closely dependent for the maintenance of their life upon pure, well aerated water. He alludes to the importance of the pinnated arms in bearing a vast aggregate of tubular tentacles by which respiration is effected; and regards it as probable "that the ordinary pinnules are specially related to the function of *respiration*, in virtue alike of their proper branchial canals, and of the ambulacral canals and the tubular tentacula with which they are furnished."

This process of respiration was doubtless effected just as well by the tentacles connected with the water-vessels in the many-branched arms of *Cyathocrinus*, as by those on the pinnules of *Actinocrinus* or *Comatula;* and there is no reason why the genital glands should not have been contained in these pinnule-less arms, for they frequently extend from the pinnules down into the arms both in *Holopus* (Pl. Vc. figs. 1, 2, *ov.*), in many Comatulæ (Pl. LXI. fig. 3), and even in Pentacrinidæ; so that they often appear in section as taking the place of the sterile genital cord, which unites the more fertile portions of the gland that are contained in the successive pinnules.

The third great function of the pinnules of a Crinoid arm is to present as large an

[1] Notes on the Internal and External Structure of Palæozoic Crinoids, *Amer. Journ. Sci. and Arts*, vol. xiv. p. 120.

[2] *Phil. Trans.*, 1866, pp. 701, 702.