

APPENDIX.

GANOID SCALES AND RAYS.

THE scales of the ganoid order consist of three plates,—an inner, an outer, and an intervening one. The outer is composed mainly of enamel, and retains, when entire, however long exposed, much of the original dinginess of hue which it bore in the quarry: the inner is a plane of porcelanic-looking bone: the intermediate plate is finely composed of concentric lines, crossed from the centre to the circumference by finely radiating ones; and when, as mostly happens, this middle plate is exposed, the appearance of a mass of scales through the glass is of great beauty. The rays of our soft-finned fish (*Malacopterygii*), such as the haddock, seem as if cut through at minute distances, and then re-united, though less firmly than where the bone is entire, with the design, it would seem, of giving to the organs of motion which they compose the necessary flexibility, somewhat on the principle that a carpenter cuts half-through with his saw the piece of moulding which he intends bending along some rounded corner, or forcing into some concave. But in the ancient ganoid fish, in which the rays are bare enamelled bones, and necessarily of great rigidity, the joints appear real, not fictitious. We see them cut across into short lengths, a single fin consisting of many hundred pieces; and the problem lay in conceiving how