IDENTITY OF AN IODINE-STORING TISSUE IN AN ASCIDIAN

THE thyroid gland, engaged in the fabrication of its hormone, is the only organ in vertebrates capable of withdrawing considerable amounts of iodine from the blood stream and storing it within itself in relatively high concentration. Recently, by the use of iodine which has been made radioactive, and which will therefore affect a photographic plate, it has become possible to provide a graphic demonstration of this property of iodine-accumulation of thyroid tissue.

With this simple test available, it was of interest to determine whether a protochordate, lacking a thyroid gland, but possessing an organ which is considered its morphological homologue, the endostyle, is capable of storage of iodine. For this purpose about 100 of the small littoral tunicate *Perophora annectens* Ritter were kept for two days at 10° C. in 800 cc of sea-water to which had been added an amount of radio-iodine[1] having a total activity of 150 μ-curies. The mass of iodine involved, as the sodium salt, was less than 0.1 mg. The half life of this preparation is eight days.

After exposure to the radio-iodine some of the animals were dried on glass slides, and some were fixed in formalin and sectioned serially. The slides, bearing either the whole-mounts or serial sections, were placed in close contact with a sensitive "no-screen" x-ray film. After having obtained a satisfactory radio-autograph of the serial sections, they were stained in haematoxylin-eosin.

Contrary to expectation, the radio-autographs of the whole mounts showed that no tissue within the body proper of the tunicates stored iodine. It was clear, however, that the stolon was capable of iodine accumulation to a degree fully as great as the vertebrate thyroid. Matching of the serial-sections with their radio-autographs demonstrated that the endostyle stored no iodine whatsoever and that the tissue within the stolon responsible for the remarkably strong iodine storage was the stolonic septum.

The stolonic septum, in most of those ascidians possessing this structure, is a reproductive organ, contributing to the formation of buds. The usual source of the stolonic septum is the pharynx in the region of the endostyle (see discussion by Garstang[2]). In *Perophora,* however, the endodermal origin of the septum is not clear, although it is well established that it is the direct source of all endodermal tissue of the bud.[3,4]

It must be remembered that the iodine which produced the radio-autographs of the serially sectioned animals had remained in the 8 μ sections after passing through aqueous and alcoholic solutions, alcohol-ether and xylene, and was, therefore, probably organically bound. This activity by the stolonic septum of *Perophora,* resembling that of the thyroid in its ability to remove iodine from the blood stream, bind it organically, and store it in high concentration, would seem to indicate that the endostyle in this animal may not be the homologue of the thyroid, especially when it is noted that the endostyle displayed no such properties. Indeed, Marine[5] has shown that only a small part of the rather complex endostyle in the ammocoetes of cyclostomes is involved in the formation of the thyroid tissue of the adult. The pharyngeal derivation of the stolonic septum in tunicates as well as its demonstrated iodine-storing activity invite the re-examination by modern workers, with improved techniques, of the protochordate homologue of the vertebrate thyroid gland.

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THE POLARIZATION OF ATMOSPHERIC HAZE[1]

THE partial plane polarization of skylight was discovered by Arago in 1811. The theory of this phenomenon was later developed by Lord Rayleigh and is described in his papers on the more general subject of the scattering of light by small particles. An equally interesting and more important phenomenon is the polarization of atmospheric haze or air-light, the luminous veil which obscures distant landscape objects. Like skylight, the air-light is most strongly polarized in a direction at right angles to the sun, and if $F_{max.}$ is the fraction of light polarized in this direction, the fraction F_θ polarized in a direction making an angle θ with the direction of the sun is given approximately by the equation

$$F_\theta = F_{max.} \frac{\sin^2 \theta}{1 + \cos^2 \theta}$$

provided that θ does not depart greatly from 90°. On clear days when the scattering particles are very small, $F_{max.}$ usually has values between 0.5 and 0.7

[1] The writer is indebted to the Radiation Laboratory of the University of California, and especially to Dr. J. G. Hamilton, for the radioactive iodine used in this work.

[2] W. Garstang, *Quart. Jour. Micr. Sci.,* 72: 51, 1928.

[3] A. Kowalevsky, *Rev. Sci. Nat. Montpell.,* 1874.

[4] W. E. Ritter, *Jour. Morph.,* 12: 149, 1896.

[5] D. Marine, *Jour. Exper. Med.,* 17: 379, 1913.

[1] Haze is sometimes defined as particles suspended in the atmosphere, but a definition which is more compatible with the usual meaning of the word and describes observed facts in a more satisfactory manner defines haze as a luminous condition of the atmosphere, which makes haze synonymous with air-light.