EDMOND HALLEY (1656–1742)

TO mark the tercentenary of the birth of Halley in 1656, the British Astronomical Association has published a "Memoir"*, prepared by Mr. C. A. Ronan, who is director of the Historical Section of the Association. The "Memoir" includes a reproduction of a portrait of Halley by Thomas Murray, in the possession of the Royal Society, a photograph of Halley's transit instrument, supplied by the Royal Greenwich Observatory, and a drawing of the 8-ft. mural quadrant made for Halley by George Graham. Dr. Angus Armitage, lecturer in the Department of the History and Philosophy of Science at University College, London, contributes an introductory paper on "Halley's Astronomical Heritage".

Dr. Armitage provides an outline of the position which astronomical knowledge and speculation had reached about the time when Halley was entering upon his labours. It is remarkable that, in spite of the fact that seventeenth-century Christendom was racked by strife and dissension, nevertheless western Europe then saw the rise of scientific societies "pledged to promote natural knowledge by concerted investigation and free discussion". Among the developments in astronomical thought, the most momentous for the future was the conception of the universe extending indefinitely in all directions, populated with suns and possibly planetary systems which were, perhaps, inhabited. In his later years Halley supported this view and opposed the view that, if the entire universe was so constituted, the whole surface of the celestial sphere would appear luminous. While Halley thus showed his interest in ultimate cosmological speculations, he was largely concerned with problems of practical and geometrical astronomy.

This subject is well developed by Dr. Armitage and provides an excellent introduction to the two succeeding chapters; in Dr. Armitage's own words: "He (Halley) lived at a crucial and formative period in the growth of the science when energies that had been slowly building themselves up for centuries were almost simultaneously released, enhancing and intensifying one another's effects".

Mr. Ronan's first paper, "Edmond Halley—the Man and his Work", gives a short account of Halley's earlier years, and his versatility is shown from the fact that after leaving Oxford in 1676 he communicated a learned paper to the Royal Society when he was only twenty, in which he discussed the problem of finding the eccentricities and aphelia of the planets, finally abolishing the notion of a fixed centre about which uniform motion was supposed to take place. While much of this chapter is 'ancient history' to many, nevertheless there is a very great advantage in having it presented in such an interesting form. Perhaps more interesting still is the last chapter, "The Effect of Halley's Astronomical Work on Later Astronomy", which points out that many histories of astronomy are content to mention Halley's work on comets and his efforts which resulted in the publication of Newton's "Principia". Mr. Ronan directs attention to various other sides of Halley's work, such as the discovery that stars shift their position in space, a phenomenon later known as 'proper motion'; his pioneer work on geomagnetism and geophysics and also in meteorology; the stimulus that he gave by his early efforts to determine the solar parallax; his work in cataloguing southern stars, laying the foundations for his successors in this field; and his interest in novæ and variable stars. As the author comments (p. 33): "If he himself had made no discoveries and had not persuaded Newton to pursue his work on universal gravitation, Halley would still be remembered for the effect he had on subsequent research. Adding then his own discoveries and his efforts on the 'Principia' we can see clearly that this great astronomer played a vital part in furthering astronomical science not only in his own day but also in the years that followed".

* Memoirs of the British Astronomical Association. Vol. 37, No. 3: Edmond Halley, 1656–1742—Papers to Commemorate the Tercentenary of his Birth. Pp. 39+2 plates. (Hounslow West, Mddx.: British Astronomical Association, 1956.) 5*s*.

HYDROMEDUSAE OF THE SOUTHERN HEMISPHERE

IN a recently published report*, Dr. Kramp deals with the systematics and zoogeography of eighty-five species of Hydromedusae chiefly from the earlier voyages of the "Discovery" Investigations, and although the material is mainly from the Southern Ocean, it also includes medusae collected in the North and Central Atlantic and in the Indian Ocean. Let it be said immediately that this is the most important contribution that has ever appeared on the hydromedusan fauna of the southern hemisphere.

This report fills many gaps in our knowledge of the distribution of medusae, and suspicions (which have been growing for some time) are confirmed that many species, which were once thought to be restricted to the North Atlantic, are now shown to have an extensive distribution. Many, with names made familiar to us through F. S. Russell's "Medusae of the British Isles", are now recorded from the South Atlantic and elsewhere. The great contribution which this report makes to the zoogeography of medusae can best be appreciated by consulting the sixteen excellent distribution maps.

Seven new species are described, one, *Russellia mirabilis*, being so remarkable as to require a new family, the Russellidae, to take it. It is suggested that the genus has affinities with the Calycopsidae and the Pandeidae rather than with the Bougainvillidae to which it has a superficial resemblance.

Dr. Kramp has made the interesting discovery of stolons and stalked hydranths carrying medusa buds on the stomach of the medusa *Bougainvillia platy-*

* "Hydromedusae from the Discovery Collections". By P. L. Kramp. (Discovery Rep., Vol. 29.) Pp. 128+7 plates+19 text figs. (Cambridge: At the University Press, 1957.) 63*s*. net.

gaster Haeckel. These stolons and polyps issue from the corners of the stomach and are regarded by him as a means of asexual propagation. This implies that the medusa is no longer restricted to coastal waters by the need for a benthic hydroid phase and can range farther afield ; in fact, as the distribution map shows, it is in process of becoming an oceanic species.

The fragile Narcomedusae are not easy to investigate in expedition material because of the difficulty of obtaining satisfactorily preserved specimens. Nevertheless, much progress has been made by concentrating on hitherto little-used characters, and by careful work Dr. Kramp has gone a long way towards a revision of the genera *Pegantha*, *Solmissus* and *Cunina* ; his own comment is that a reliable revision requires the study of living specimens.

The life-histories of most Narcomedusae still await elucidation, but their larvæ are known to develop attached to other medusae. Here four kinds, two of them tentatively assigned to *Pegantha triloba* and to *Cunina peregrina*, are recognized.

In all narcomedusan larvæ hitherto studied "the larvæ propagate by budding, but the primary individual, as well as all the others, develops into a medusa, so that (as emphasized by Brooks) there is no true alternation of generations". In the examples studied by Dr. Kramp, however, the tentacles of the primary polyp are dimorphic and different from those of the medusa buds which are "of equal size and structure, and the primary individual remains in a polypoid stage". If the latter statement is true—and we have no reason for doubting it from the evidence—then the text-book concept, that all the Narcomedusae have a direct development, will have to be considerably amended.

In the zoogeographical remarks the author indicates that "the dominant factor in the distribution of medusae is the temperature of the water, and for holopelagic species it is often the only factor of importance, although indeed some of these medusae can tolerate a wide range of temperature". He groups the species into very useful distributional tables according to whether they are neritic, epipelagic or bathypelagic, and it is possible to tell at a glance whether a species has been found in a particular area. These distributional regions are based mainly on Ekman's divisions and have been modified to take account of oceanic areas. This is followed by a detailed discussion of the different species in the ecological groups noted above and it is stated that "very few epipelagic species of medusae are common to antarctic and antiboreal waters, the Antarctic convergence evidently constituting an effective barrier to the distribution of these animals". Only one neritic leptoline medusa (*Staurophora mertensi*) is bipolar. North of the Antarctic convergence is the area embracing the Falkland Islands, which has a number of characteristic neritic Leptolina such as *Proboscidactyla mutabilis*, *Laodicea pulchra* and *Phialella falklandica*. Species like *Zanclonia weldoni*, *Calycopsis borchgrevinki* and *Ptychogena antarctica*, which are well-known Antarctic species, are shown to have a circumpolar distribution.

These brief comments cannot do more than indicate that this authoritative report is a very interesting one containing a wealth of information for the planktologist. Its publication in February 1957 coincided with Dr. Kramp's retirement from his post as keeper of invertebrates at the Zoological Museum, Copenhagen. It is hoped that he will continue the fruitful researches that he has carried out in this field for nearly fifty years. He has done more than anyone else, since Haeckel and Mayer, to place the identification of medusae on a sound basis, and, to use his concluding remark in this report, "this is a necessary condition to every discussion of distributional questions".

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PHYSIOLOGY OF EXSHEATHMENT IN NEMATODES AND ITS RELATION TO PARASITISM

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In the life-cycle of many nematodes the egg hatches to produce the first 'larval' stage, which then moults to give the second stage. Moulting is repeated at the end of the third and fourth stage to give the adult. However, in some nematodes, such as *Trichostrongylus axei* and related species which are discussed here, the complete moulting of the second stage is delayed so that the third stage is enclosed in two cuticles, the outer usually called the sheath. After the sheathed form is eaten by a sheep, the sheath fractures[1] about 20μ from the anterior end. This exsheathment is the first obvious change which takes place when the nematode enters the parasitic phase of the life-cycle.

We wish to advance the hypothesis that moulting in nematodes is controlled by endocrine systems and that, in parasitic species, the delayed exsheathment of the second stage is due to the suspension of the normal endocrine mechanism. We suggest that factors from the host are necessary to stimulate the processes which complete moulting.

Preliminary work was concerned with the change which occurs when larvæ of *T. axei* become parasitic. Results suggested that factors in rumen fluid stimulated the process which caused exsheathment. It seemed that two separate mechanisms may have been involved : (1) the stimulation by the host ; and