

characters, from the other three, and the authors make the significant deduction that acute lymphoblastic leukaemia is a disease separate from the other types, but that the latter form a related group. They suppose that in the normal person there is one stem cell which can produce lymphocytes only, and another which produces myelocytes, monocytes, or erythrocytes, in response to appropriate stimuli.

Several other observations of interest are discussed. In Romanowsky preparations a few, apparently normal, mature cells are commonly seen in acute leukaemic blood, which are useful in distinguishing the types of the disease. Further, in these preparations, primitive cells often appear similar to corresponding precursor cells in the normal bone marrow. The authors have been able to show that both these appearances are misleading. Cytochemical methods (notably the sudan-black, peroxidase, and periodic acid-Schiff stains) show that both the apparently mature cells and the apparently primitive cells in leukaemic blood differ from their presumptive counterparts in normal blood or bone marrow.

Finally, a hypothesis about the nature of the essential cellular lesion in acute leukaemia is put forward, namely, that there is failure of the proliferative capacity of cells at an early stage of differentiation, with the result that cytoplasmic materials (sudanophilic and periodic acid-Schiff positive), which are present in mature normal cells, accumulate in leukaemic cells without corresponding nuclear development. By analogy with what is known of the megaloblasts of Addisonian anaemia, it is postulated that this failure is due to a prolongation of interphase at the second resting period ("G<sub>2</sub>" of Lajtha and Oliver<sup>1</sup>) with consequent asynchrony of nuclear and cytoplasmic developments.

As a student of viral-induced leukaemia in animals (which may or may not be analogous to the human disease) I value this survey of modern haematological methods highly. Several murine leukaemogenic viruses induce either lymphoid or myeloid leukaemia under different conditions, while others induce a blood disease in which abnormal cells of all the haemopoietic series may appear. Clearly, the methods so carefully tested by the authors may help in the analysis of this complex situation, and perhaps give an indication of the point of attack of these viruses. To clinical haematologists the book will be stimulating, and valuable as a book of reference for some years to come. They will be grateful to the authors for what must have been a laborious task, and for the factual and restrained manner in which the results have been presented.

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<sup>1</sup> Lajtha, L. G., and Oliver R., in *Ciba Symp. Haemopoiesis*, edit. by Wolstenholme, G. E. W., and O'Connor, M. (J. and A. Churchill, Ltd., London, 1960).

## THE LOWER ORDERS

### The Lower Metazoa

Comparative Biology and Phylogeny. Edited by Ellsworth C. Dougherty. Pp. xi+478. (Berkeley and Los Angeles: University of California Press; London: Cambridge University Press, 1963.) 140s.

CIRCUMSTANCES prevented the prompt publication by the Kaiser Foundation of the *Proceedings* of their second annual symposium on "Comparative Biology" (1960). Most of the papers, along with some new matter, have now been independently published in *The Lower Metazoa*. The papers collected are inevitably heterogeneous, but the volume is mainly concerned with views about the relationships of the lower animal phyla with each other and with the Protozoa. Only one paper (by D. D. Jensen) looks upward to the vertebrates and derives them, via myxinoidea, from the hoplonemertines.

For many lower Metazoa (here taken as extending up to and including the Aschelminthes) there is little or no

fossil record. Phylogeny therefore relies heavily on the notions of homology and convergence. There is much room for speculation and speculation readily expands to fill the room available. Remane's criteria of homology are discussed in some detail by Hanson, and Remane himself claims that "morphology can be defined as the search for homologies". The open-minded reader of this book will find that one man's homology is another man's convergence and that there is much dispute over what is primitive and what degenerate. Nevertheless, the book is stimulating, provocative and in places exciting, except perhaps to the purist rigorously analysing his authenticated data. An index would have been useful.

The book opens with 21 papers on comparative morphology and phylogeny, and although it is impracticable to summarize them adequately, some idea of the main positions taken may be given. The earliest metazoan was probably an acoele (Hanson, Steinböck) deriving from some gymnostomatous ciliate (Hanson); or was a planuloid deriving from flagellates (Remane, Hand); or was a sponge deriving from the higher volvocines (Tuzet). As to the coelom, the enterocoelic origin is best founded (Remane), or the mode of formation cannot yet be decided (Hartman), or it may have been differently evolved in different phyla with much convergence (Clark).

In the coelenterates are two main branches showing radial symmetry: Hydrozoa and Scyphozoa; the bilateral Anthozoa are an offshoot from the latter (Uchida) and the sub-phylum Ctenophora from the former (Komai). The Turbellaria show trends in their organ systems (Karling) enabling the hypothetical archetype to be both described and illustrated: compared with it, the Acoela are not so primitive! (Ax). Turbellaria arose by progressive neoteny from a parenchymula-like larva of the Cnidaria, and the latter from flagellates (Beklemishev).

Rotifers are closely linked with gastrotrichs (Lang; Ruttner-Kolisko) or are not (Remane): they may have as ancestor a primitive annelid like the Dinophilidae (Ruttner-Kolisko). The ancestral nematode can be described in some detail (Maggenti); free-living Phasmodia living in terrestrial saprobic substrates are pre-adapted to parasitism, which is polyphyletic in nematodes (Osche).

There are six papers under comparative physiology. Baldwin postulates that, given the common metabolic ground-plan essential to the survival of animals, possible adaptations are severely restricted and evolution is slow. Dougherty outlines the present position of nutrient media for axenic organisms. G. O. Mackie discusses the nature of individuality in the Siphonophoran bud-colonies, which have reached the organ grade of construction by converting whole individuals into organs. E. J. Martin describes a toxin in the coelenterate *Rhodactis howesii*. Jennings discusses nutrition in the carnivorous Turbellaria and Rhynchocoela and in the parasitic Trematoda, in which nutritional adaptations are physiological. D. Schneider has investigated phototropism in the bryozoan *Bugula* in which growth is purely apical.

Under other disciplines are seven papers, including C. Lévi on gastrulation in sponges, and Nicholas and Hynes on the embryology and development of *Polymorphus minutus*. Embryology shows a distorted form of spiral cleavage with no clear homologue of the 4D cell and no clearly defined entoderm or mesoderm. M. Benazzi describes the chromosome cycle in polyploid biotypes of triclads, and J. H. Phillips presents preliminary evidence for immune mechanisms in coelenterates. R. W. Pennak considers that the successful invasion of a freshwater habitat from the sea is an evolutionary rarity, more likely to occur via the sandy beach 'psammolittoral' and ground-water 'phreatic' than directly by the estuarine waters route. M. Vogt remarks on the profusion of (moist) habitats invaded by flatworms and on their symbiotic relationships. Finally, R. B. Brunson presents some anomalous results in culturing gastrotrichs.

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