

an emphasis that presumably reflects the origin of the book. The balance among kinds of phenomena dealt with, however, reflects the trend in modern animal physiology toward the study of mechanisms at the biochemical and molecular levels or the study of adaptations of animals to their environments, especially to extreme ones.

This trend is even more clearly demonstrated in *Comparative Physiology*, which contains 23 papers presented at the International Conference on Comparative Physiology. Two of its three sections are devoted to mechanisms of transport of water and to osmotic and ionic regulation in animals living in unbalanced environments.

The third section deals with fluid mechanics in biology. The papers in this third section may have been stimulating for the participants at the conference and may have led to fruitful discussions. The discussions are, however, not included in the book, and most readers will probably find the contributions unrelated, despite their inherent interest.

Among investigators of the transport of ions and water there has been a special interest in whether water is always transported passively, secondarily to solute transport, or whether water molecules may in some cases be actively transported. Great excitement was therefore aroused when it was realized that certain insects are able to take up water from air unsaturated with water vapor. Both books attest to the interest in the mechanisms by which water molecules are taken up under such conditions. The uptake has been described in several insects, mites, and ticks, which use different mechanisms. The ability to hydrate in the atmosphere, at relative humidities varying between species from about 90 percent down to about 65 percent, thus seems to represent adaptations that have evolved independently several times in terrestrial arthropods.

The use of animals and their organs as models for more general studies of functions is as old as experimental physiology itself, and the elucidation of basic functions has often depended upon finding the animal that possesses organs or structures especially suited to the study of the functions in question. The importance of finding the right kind of animal was clearly formulated by Claude Bernard and later by Krogh. It is also a recurring theme in the books under review, most explicitly in *Transport of Ions and Water in Animals*. Both books call themselves comparative physiologies, but the use of animals and their organs as physiological models is not by itself com-

parative physiology. Physiology first becomes comparative at more integrated levels in the hierarchy of physiological disciplines, such as those dealing with how animals adapt functionally to their environments. In *Transport of Ions and Water in Animals* this type of physiological analysis is often referred to as ecological physiology, which may again confuse concepts. Investigations at the level of ecological physiology imply studies of the integrated function of animals as components of their ecological niche. Comparative physiology is a basic discipline within the ecological physiology of animals.

This loose use of the term "comparative physiology" is, however, widespread among physiologists, and it does not affect the value of the books as means to improve mutual understanding among specialized research workers and as source books for broader groups of biologists.

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Cell Development

Stem Cells and Tissue Homeostasis. Papers from a symposium, Manchester, England, Apr. 1977. B. I. LORD, C. S. POTTEN, and R. J. COLE, Eds. Cambridge University Press, New York, 1978. viii, 368 pp., illus. \$45. British Society for Cell Biology Symposium 2.

Stem Cells and Tissue Homeostasis contains 15 papers spanning a range of studies from stem cells involved in plant development to clonal hemopathies in humans. It presents a broad overview of stem cells and cell renewal systems and brings together in one volume diverse viewpoints and varied approaches to what clearly is a central subject in cellular and developmental biology.

It is interesting that many of the contributors find it necessary to redefine "stem cell." Holtzer, for example, re-considers the traditional concepts of "undifferentiated," "totipotent," and "multipotent" in the light of his view that at any given time a cell can have only a binary (quantal?) choice. His discussion of stem cells in relation to neoplasms and virus-transformed cells is thoughtful. Wolpert's criticisms of Holtzer's views, presented in the next paper, provide an immediate, welcome alternative. Papaioannou, Rossant, and Gardner also question the concept of the true stem cell, directing attention to the work on teratocarcinoma cells and their

frequent origination from germ cell precursors. The view that germ plasma rather than germ cells may play a universal role in these tumors is worthy of more detailed experimental attention.

Nöthinger, Schubach, Szabad, and Wieschaus present two systems in *Drosophila* representing different aspects of developmental stability and the concept of stem lines: imaginal disk development and female germ cell development. By taking advantage of the many known genetic variants and generating various genetic mosaics it is possible to obtain unique information concerning both cell lineages and cell potentials. The authors' discussion of developmental homeostasis emphasizes that there is positional regulation rather than purely clonal regulation of differentiative patterns in imaginal disks.

In his discussion of stem cells in plant growth and development, Barlow concludes that although plants do have meristematic zones (permanent meristems) the concept of the stem cell cannot by any means be applied to all aspects of meristem biology. He presents a balanced analysis of cell divisions in various regions of the meristem, of the concept of pluripotency in its application to regenerating tissues, and of the developmental changes and aging of stem cells in plant systems.

One of the most interesting papers, Clayton's review of the events leading to lens cell differentiation, is at first glance the least relevant to our notions of stem cells. In the paper, Clayton outlines the many different developmental events that must determine the direction that lens "stem cells" must take to give rise to the specific definitive cell products. At the same time precursors to those lens cells may, during regeneration or development, arise from dorsal and ventral iris, from neural retina, from pigmented epithelium, from cornea, or from the diencephalon, depending on the species studied and the conditions of the analysis employed. Clayton's paper serves as an excellent reminder of the complexity of cellular differentiation and of the regulatory mechanisms that must be operative during development.

Functional stem cell renewal systems in the intestine are discussed both by Wright, who distinguishes between "functional" and "potential" stem cells, and by Potten, who discusses the positional relations between generative and differentiative cells. Potten's view of positional controls is extended to other epithelial cell populations, and the discussion of position, asymmetry, and stem cell properties is highly original.

The remaining papers are concerned with hematopoietic stem cells. Although the subject has received much attention in several recent symposiums, the choice of papers here offers an unusually broad and quite original perspective. Micklem's review of lymphoid stem cells is self-contained, free of the frequently unintelligible language of the specialist, and thoughtful. Moore's paper emphasizes the role of macrophages as regulatory cells that control stem cell proliferation. Allen's scanning electron micrographs are informative as well as esthetically exciting. And the discussions of inhibitors of proliferation by Lord *et al.*, of molecular aspects of erythroid cell regulation by Harrison *et al.*, and of viral factors regulating erythropoiesis by Tambourin together give one an excellent sense of the wide span of studies directed at understanding the nature of stem cells and tissue homeostasis.

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Advances in Carbohydrate Chemistry and Biochemistry. Vol. 35. R. Stuart Tipson and Derek Horton, Eds. Academic Press, New York, 1978 xii, 434 pp., illus. \$41.

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Behavioural Techniques. A Therapist's Manual. Richard Stern. Academic Press, New York, 1978. xii, 82 pp. Paper, \$6.75.

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