of teratoma cells that suggest that such cells might be useful models for analyzing tissue interactions, Nicholson *et al.* discuss adhesive interactions in tumor development, and De Petrocellis *et al.* report on the control of DNA replication via cell interactions in early development in sea urchins. The normal (Frank and Fischbach) and abnormal (Macagno) development of a functionally significant adhesive interaction, the synapse, is also discussed.

The book provides a valuable collection of papers that offer insight into the development of a number of systems. I recommend it for both students and investigators with interests in developmental biology.

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## Plant Hormones

**Hormone Action in the Whole Life of Plants.** KENNETH V. THIMANN. University of Massachusetts Press, Amherst, 1977. xii, 448 pp., illus. $35.

The scientific career of Kenneth Thimann has coincided almost exactly with the vigorous development of the study of plant hormones, and, indeed, he and his students have contributed substantially to many aspects of that development. Like Dean Acheson at the United Nations, Thimann was "present at the creation"; as a young biochemist, he came into early and close contact with Frits Went, whose 1928 Ph.D. thesis conclusively established the existence in plants of the diffusible growth hormone, auxin. With Went, he wrote, in the late 1930's, a definitive monograph on the history, methodology, and state of our understanding of the physiology and biochemistry of plant hormones. First at Caltech, later at Harvard, now at Santa Cruz, he has continued his incisive exploration of auxin and other regulators of plant growth and development. In 1974, he accepted the invitation of the University of Massachusetts to collect many of his ideas, insights, and interpretations into a series of lectures surveying anew this entire enlarged field. This book, which is based on the lectures, is a valuable and highly personal narrative, in which historical, anecdotal, and experimental information are skillfully blended with literary grace and skill.

Reading the book will give the advanced student and professional worker an appreciation not only of our present understanding of hormonal regulation in the higher plant, but also of stages in the evolution of our ideas. Thimann follows the plant from birth to death, starting with seed germination and proceeding chronologically through all developmental stages to maturity and the production of new seed. In the course of this intellectual journey, he gives detailed treatment to hormonal aspects of seed germination, cell enlargement, polarity, tropisms, differentiation, organogenesis, leaf and root growth, apical dominance, flowering, fruiting, senescence, and abscission. In addition, special chapters deal with the chemistry of plant hormones and concepts of their mode of action.

Thimann admits that "truly encyclopedic coverage was the last thing at which the lectures aimed"; accordingly he uses data from his own laboratory or the laboratories of his students wherever possible. He explains that "in many cases the data obtained by others could have about equally well been used, but our own materials were at hand." The result is that one does not expect or get a balanced coverage of the literature from the book; Thimann refers the reader instead to his extensively documented chapters in volume 6B of the treatise *Plant Physiology*, edited by F. C. Steward.

Into each personal synthesis, some error of fact, emphasis, or interpretation must inevitably creep, and this book is no exception. To take some trivial examples, Sievers, whose work on statoliths in *Chara* is discussed by Thimann, is not from Halle, East Germany, but rather from Bonn, West Germany; Kerns, not Carns, worked with Clark on auxin-induced flowering in pineapple; and my 1949 work on riboflavin-sensitized photoreactions was done not at Yale but at Caltech. Dealing with matters of scientific fact, Thimann states flatly on p. 33, as he has done elsewhere on the basis of experiments in his laboratory, that sucrose produces only very slight effects on the growth of excised etiolated pea epicotyl sections. But, as has been pointed out before, this ignores contrary work done elsewhere; Purves has clearly shown marked effects of sucrose on truly dark-grown pea tissue, and this has been independently confirmed elsewhere. Further, Bertsch and Hillman have shown that red light perceived by phytochrome specifically inhibits this extra growth induced by sucrose. Since the last finding might well explain the difference between Thimann's findings and those of others, one might have expected less dogmatic treatment of the issue. In view of what we now know about auxin-mediated proton extrusion, sucrose-proton cotransport into plant cells, and the effects of phytochrome on the latter process, this matter is not trivial. Similarly, not all will agree with Thimann's interpretation of his experiments on the role of starch statoliths in the geotropism of gibberellin-treated *Avena* coleoptiles and of the significance of "crystal bodies" in *Avena* and *Phycomyces* or with his treatment of the thorny issue of carotenoid as opposed to riboflavin as a photoreceptor in phototropism. Regarding the last issue, it would have been helpful to disentangle the question of the nature of the photoreceptor from the question of subsequent physiology; specifically, the possible role of riboflavin as a photoreceptor in phototropism is made neither less nor more probable by the fact that lateral auxin transport, rather than auxin photooxidation, occurs following light absorption, since either pigment could produce either effect. It would also have been helpful to cite at least one literature reference providing data on flavin photoreception.

No book produced in the last ten years has so successfully integrated the vast and complex literature of this field. The author and the University of Massachusetts deserve congratulations for the excellence of the product of their collaboration.

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## Books Received

**Aerial Remote Sensing Techniques in Archeology**. Papers from a symposium, Bal Harbour, Fla., May 1972. Thomas R. Lyons and Robert K. Hitchcock, Eds. Chaco Center (National Park Service and University of New Mexico), Albuquerque, 1977 (available from the Superintendent of Documents, Washington, D.C.). xiv, 202 pp., illus. Paper.

**Annual Review of Astronomy and Astrophysics**. Vol. 15. Geoffrey Burbidge, David Layzer, and John G. Phillips, Eds. Annual Reviews, Palo Alto, Calif., 1977. xii, 602 pp., illus. $17.

**The Anthropological Imagination**. Muriel Dimen-Schein. McGraw-Hill, New York, 1977. xviii, 294 pp. Cloth, $7.95; paper, $4.95.

**Antibodies in Human Diagnosis and Therapy**. Papers from a symposium. Edgar Haber and Richard M. Krause, Eds. Raven, New York, 1977. xviii, 414 pp., illus. $27.50.

**The Application of Technology in Developing Countries**. Papers from a seminar series, Aug.–Dec. 1976. Robert L. Bulfin, Jr., and J. Richard Greenwell, Eds. University of Ari-

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