phragm muscle, and some provocative thoughts concerning the action of hormones on the cell as a whole. Other subjects covered are the action of parathyroid hormone on mitochondrial metabolism, melanotrophic and lipolytic activities of various synthetic peptides, the action of thyroid hormones in vitro, the cellular location of adenyl cyclase, the mechanism of action of steroid hormones, and the regulation of biological function mediated by changes in protein structure.

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Botany

Pollen Physiology and Fertilization. A symposium held at the University of Nijmegen, Netherlands, in August 1963. H. F. Linskens, Ed. North-Holland, Amsterdam, 1964. xii + 257 pp. Illus. $11.20.

In this volume papers contributed by 37 authors are arranged in seven sections: Physiology of the Embryo Sac; Biochemistry of Pollen Wall Formation; Metabolism of Pollen Tubes; Boron and Pollen Tube Growth; Chemotropism of Pollen Tubes; Controlled Fertilization; and The Incompatibility Barrier. Within so wide a range of topics, the individual papers vary in their valid contribution to the expressed purpose of the symposium —to focus attention on "those fundamental processes in higher plants leading to formation of the zygote."

The following papers are representative of the collection. J. Heslop-Harrison has provided a provocative account of detailed observations on pollen development in *Cannabis* and *Silene*. The synthesis of callose in pollen mother cells of *Cucurbita* is briefly described, primarily in the form of a model based on electron microscopy by W. Eschrich. L. Waterkeyn's detailed report on the incidence of callose in the microsporocyte, microspore, and pollen grain of *Pinus* represents a continuation of long-term studies carried on at the Institut J. B. Carnoy. In describing pore formation in pollen of *Poa*, J. R. Rowley includes a thought-provoking discussion of the still-controversial matters of exine formation and function. E. A. Britikov, N. A. Musatova, S. V. Vladimirtseva, and M. A. Protsenko suggest, on the basis of an extensive exploration of approximately 200 species of seed plants, that the unusually high proline content of pollen relates, in part, to active protein synthesis after pollination. According to J. Tupý, exogenous proline does not stimulate the growth of pollen tubes in short-term cultures. E. Hrabetová and J. Tupý found that raffinose is the best substrate for pollen tube cultures of long duration. The relation of boron to pollen tube growth continues to be a topic of research interest. I. K. Vasil points out that the general deficiency of boron in pollen is counterbalanced by comparatively high levels of boron in stigmatic and stylar tissues. P. Fähnrich found that five different homologues of boron were ineffective stimulants for germinating pollen. R. G. Stanley and F. A. Loewus concluded, on the basis of their observations on germinating pollen of *Pyrus*, that boron plays a definite role in pectin synthesis.

Small populations of pollen grains rarely germinate well in vitro, but J. L. Brewbaker and B. H. Kwack provide evidence which indicates that calcium overcomes this population effect. Their use of the expressions "pollen elongation" and "pollen growth," with reference to growth of pollen *tubes*, seems inappropriate in terms of ontogeny of the pollen grain. W. G. Rosen calls attention to the contradictory nature of much of the literature on chemotropism in pollen tubes. M. M. A. Sassens presents a photographic record of the generative *cell* of *Petunia* pollen.

P. Maheshwari and K. Kanta describe the control of fertilization in four species in the *Papaveraceae*, and in two Solanaceous species, through use of intraovarian pollination as well as test-tube fertilization. I. M. Polyakov stresses the multistage nature of the fertilization process. In analyzing the successive steps involved in fertilization, the designation of one step as *gamogenesis* appears unfortunate because the term is applied to the phase that is typified by fusion, rather than by generation, of gametic elements. According to M. Kroh, two enzyme systems, cutinase and pectinase, are operative in the initial penetration of pollen tubes into the walls of stigmatic papillae in the *Cruciferae*. It is suggested that, in self-incompatible crucifers, formation of activator-enzyme complex is inhibited by the stigma. By removing anthers in *Petunia*, H. F. Linskens uncovered evidence of a growth principle responsible for normal maturation of the female organs. Figures 5 through 8 in this paper are somewhat difficult to interpret owing to their skimpy explanatory legends. According to A. Hecht, inactivation of incompatibility substance in stigmas and styles of *Oenothera* is a temperature-dependent chemical process. M. Hagman applied disc electrophoresis and serological reactions in a pilot observation of pollen and style relationships in three species of *Betula*.

There is no summarizing chapter, although helpful portions of the recorded discussions are included. Many of the papers provide up-to-date, critical citations to the literature. There are occasional typographical errors, and "species" is applied (p. 194) where agronomic variety is obviously involved. The expression "tubes of immature pollen" (p. 236), without further description, appears to be a non sequitur. Use of the term *microspore* (p. 121) as a synonym for pollen grain is unfortunate. The pollen grain released from the mature anther is, of course, the two- or three-celled gametophyte.

The volume has been attractively produced with admirable promptness.

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New Books

General

Alluvial and Palynological Reconstruction of Environments, Navajo Reservoir District (Anthropology Paper No. 13). James Schoenwetter and Frank W. Eddy, with a section by Eleanor Jane Nettle. Museum of New Mexico Press, Santa Fe, 1964. 155 pp. Illus. Paper, $3. A report on field studies performed during parts of 1958, 1961, 1962, and 1963 as part of a program to investigate and study materials relative to the prehistoric occupation of the area that is now being flooded by Lake Navajo.

American Aspects. D. W. Brogan. Harper and Row, New York, 1964. 207 pp. $4.

Animal Communication. Hubert Frings and Mable Frings. Blaisdell (Ginn), New York, 1964. 216 pp. Illus. Paper, $2.50.

Anthropological Papers. Nos. 68–74 (*Bull. Bur. Amer. Ethnol. No. 191*). Frank H. H. Roberts, Jr., Ed. Smithsonian Institution, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 431 pp.

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