

nucleotides to proteins. Some antisera can distinguish single-, double-, or triple-stranded helical polyribonucleotides. Some differentiate between native and denatured DNA and are useful in elucidating structural changes in DNA. Antisera to oligo- and polynucleotides have been used to examine the mechanism of bacterial transformation.

Antibodies to nucleic acids are also produced in some human diseases. Serums from patients with systemic lupus erythematosus may combine only with denatured DNA, only with native DNA, with both forms of DNA, or with nucleoprotein. Antibodies from patients with collagen diseases, labeled with fluorescein, react with various nuclear components of human white cells.

Antisera to bacterial ribosomes are specific for the polyphosphate backbone, not for the bases. They have been used to study the number of strands in synthetic polynucleotides and to measure the proportion of the RNA that lies on the surface of each ribosomal subunit.

A session on nucleic acids as non-specific stimulators of immune responses precedes the discussion of the role of nucleic acids in specific antibody formation. This fascinating problem, the genetic control of the means by which an animal can synthesize antibodies to an almost infinite variety of antigens, has not yet been solved, but the numerous skillful approaches described at this symposium give the impression that, as of 1967, the answer lurked just around some corner. The topics include the roles of macrophages and lymphocytes, transfer of information by isolated RNA's or RNA-peptide complexes, immunoglobulin synthesis and assembly, and theories, deduced from amino acid sequences, of the genetic control and evolution of antibody polypeptide chains.

Each group of papers is followed by a general discussion of experimental techniques and interpretation of results; these discussions are one of the most valuable parts of the book.

The final chapter is an address by Melvin Cohn entitled "The molecular biology of expectation," in which he discusses "the mechanism by which an individual can react in an adaptive way to an unexpected stimulus." Theories of somatic versus germline mutation are discussed at length for the immune system and considered briefly in regard to control of the detoxifying and learning mechanisms.

The book is highly recommended to all those who are interested in either nucleic acid structure or immunoglobulin synthesis.

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Flagellates

The Biology of *Euglena*. DENNIS E. BUETOW, Ed. Vol. 1, General Biology and Ultrastructure. Academic Press, New York, 1968. xii + 364 pp., illus. \$19.

This volume on *Euglena* and the forthcoming second volume summarize what is known about the genus. Volume 1 ranges from taxonomy, ecology, and locomotion through morphology and cytology to growth in axenic cultures and some general aspects of biosynthesis. The chapter on cultivation and growth (J. R. Cook) is a comprehensive survey of methods for maintaining cultures (small to large volumes, conventional methods to continuous-culture techniques). Recent work on specific nutritional requirements is covered thoroughly. Following a summary of changes which *Euglena* undergoes as the culture grows older, the chapter concludes with a section on environmental influences on growth of *Euglena* in cultures, stressing effects of such factors on morphological features as well as biochemical activities. The chapter on morphology and ultrastructure (D. R. Buetow) begins with a brief description of active and flagellated stages, continues with a compact review of the pellicular complex in *Euglena*, and then proceeds to flagella, cytoplasmic inclusions, and various internal organelles. The chapter contains more than 40 excellent micrographs and several good diagrams. The nucleus is covered in a chapter which correlates revelations of electron microscopy with observations made with light and phase-contrast microscopes (G. L. Leedale). This treatment, highlighted with a beautiful series of anoptral contrast photomicrographs of living *E. gracilis* undergoing fission, yields a very informative account of mitosis. Correlated photomicrographs of stained preparations are exceptionally clear, as are a number of electron micrographs showing particularly the microtubules ("spindle elements") in dividing nuclei. Locomotion and other movements (T. L. Jahn and E. C. Bovee) are related, as far as possible, to the structure of *Euglena*

(and closely related flagellates). Responses to physicochemical stimuli are critically reviewed, and phototaxis is related to structural features of the stigma and the light-sensitive paraflagellar swelling (specific function still uncertain). Swimming is discussed in detail, metaboly is considered in relation to structure of the pellicular complex, and mechanisms for gliding (still considered a mystery) are discussed. Rates of biosynthesis (carbohydrate, protein, DNA and RNA, cell number, dry weight) are compared for *E. gracilis* (supplied with different substrates) and with cultures of mammalian tissue cells (B. W. Wilson and B. H. Levedahl). For those who sometimes meet their flagellates outside labeled culture tubes, there is an excellent chapter on ecology (J. B. Lackey) and also a well-illustrated section on taxonomy of *Euglena* (L. P. Johnson). A potentially valuable feature of this volume is the consistent emphasis on major and minor gaps in the available information on *Euglena*. If these signposts awaken the curiosity of at least a few industrious investigators, *The Biology of Euglena* will be more than worthwhile on this basis alone.

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Responses to Environment

The Climatic Physiology of the Pig. L. E. MOUNT. Williams and Wilkins, Baltimore, 1968. x + 274 pp., illus. \$14.50. Monographs of the Physiological Society, No. 18.

The pig is being used increasingly in biomedical research. The author here indicates that the physiological analogies between pig and man are more apparent than real. Especially is this true in regard to the skin of the animal, the subject of research carried out in the belief that it is similar to that of man. Mount points out the patent fallacies of such an approach, and does it well. There are purposes for which the pig can be the animal of choice, such as in artificial heart studies, where both anatomical and physiological similarities to man are observable. This book, however, does not treat aspects of the pig which would make it a useful work of reference for such purposes, dealing rather with the physiological responses of pigs to climatic variables with a comprehen-