Meetings

Molecular Biophysics: International Summer School

The main impetus for biophysics comes from biology, and particularly from that part of biology which has been steadily progressing toward the molecular level—a level which is describable only in physicochemical terms. Biology, molecular biology, biochemistry, and molecular biophysics form a logical sequence between the description of living systems and the physical characterization of the molecular entities responsible for them. Molecular biophysics interacts most strongly with its "nearest neighbor" biochemistry, and the relation between the two is analogous to that between chemical physics and chemistry.

These relationships were reflected by the program of the International Summer School on Molecular Biophysics held at Squaw Valley, California, 17-28 August 1964, in which studies ranged from the biological level to detailed molecular properties. A review of protein biosynthesis and the cell machinery responsible for it was given by Gros (Centre National de la Recherche Scientifique, Paris). Rich (M.I.T.) elaborated on certain details, particularly in regard to the role of the ribosomal particles, and continued with a discussion of structural features of nucleic acids and proteins as revealed by analysis of x-ray diffraction patterns. Schachman (University of California) and Katchalski (Weizmann Institute, Rehovoth) concentrated on proteins and model compounds—conformational stability, thermodynamics of solution, electrochemical properties, and the basis for higher order structure (secondary, tertiary, and so forth). Electronic properties of biomolecules were discussed by B. Pullman (Sorbonne) on the basis of indices arising from molecular orbital theory. A large number of physicochemical properties, including radiosensitivity, photochemical effects, reactive sites, and the mutagenic and carcinogenic effects of hydrocarbons, may be described from this standpoint.

Weber (University of Illinois) and Tinoco (University of California) discussed absorption and fluorescence spectra of proteins in solutions, polarization, rotatory dispersion, and the relationship of optical properties to conformation. A. Pullman (CNRS) summarized molecular orbital methods in conjugated systems. Hirschfelder (University of Wisconsin) concentrated on intermolecular forces, and McConnell (Stanford) described various types of collective excitations in ordered molecular aggregates. Certain photochromic effects resulting from configurational transitions were discussed by Douzou (Laboratoire de Biophysique, Paris). Scrocco (Instituto di Chimica Fisica, Pisa) discussed electronic properties derivable from nuclear quadrupole resonance spectroscopy, while Weissbluth (Stanford University) gave analogous discussions for Mössbauer spectroscopy in proteins containing iron and for spin-resonance spectroscopy of the triplet state in amino acids. Griffith (University of Manchester, England) continued with spin-resonance spectroscopy of iron compounds. The program also included a number of seminars, including one on information theory and memory, led by Griffith, and one on the molecular basis for radiation damage, led by Kaplan (Stanford). Jehle (George Washington University) conducted a seminar on the relation between specificity and London forces, and a seminar on the molecular aspects of muscle contraction was conducted by Morales (University of California).

From the discussions at this meeting it was apparent that there still exists a wide gap between molecular biology and biochemistry and, of course, an even wider gap with respect to molecular biophysics; physicochemical explanations of biological phenomena have barely begun. Another difficulty is that there is no physical theory of macromolecules, which are now treated either as crystals or as collections of semi-independent small molecules; both approximations are useful, but both have shortcomings. Also, physical methods used in molecular biophysics are based on concepts drawn largely from thermodynamics and quantum mechanics. These problems make this an immensely exciting field, particularly to those who have a physical orientation.

B. Pullman was the director of the Summer School which was sponsored jointly by NATO and the U.S. Office of Naval Research. Approximately 150 conferees attended, of whom more than one-fourth came from outside the United States. The proceedings will be published.

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DNA Replication and Recombination

A symposium on the mechanisms of DNA replication and recombination was held during the annual meeting of the American Society for Microbiology in Washington, D.C., in May 1964. The four participants—Sidney Brenner (Cambridge, England), Karl Lark (Kansas State University), Frederick Forro (Yale University), and Matthew Meselson (Harvard University)—all presented work done with the enteric bacterium *Escherichia coli* and its viruses.

Meselson's contribution to the symposium was presented as his acceptance speech for the Eli Lilly Award in Microbiology. He discussed his experiments, begun with Jean Weigle (California Institute of Technology), with the bacteriophage λ which infects *E. coli*; in these experiments the bacterial cells were mixedly infected with two strains of λ which differed in a number of genetic markers. The phages had previously been grown in a medium containing heavy isotopes of carbon and nitrogen and then used to infect bacteria in light medium. When the infected cells lysed they liberated progeny phage particles of several sharply defined densities: a few in which both DNA strands of the phage chromosome had been conserved (heavy-heavy), a very large number