Book Reviews

The Chemistry and Physiology of the Nucleus. *Experimental Cell Research,* Suppl. 2, 1952. Proceedings of the Symposium held August, 1951 by the Biology Department, Brookhaven National Laboratory. V. T. Bowen, Ed. New York: Academic Press, 1952. 402 pp. Illus. $7.00.

In this volume are presented the proceedings of a symposium on nuclear chemistry and biology held at the Brookhaven National Laboratory. A list of the contents emphasizes the wide range of interests covered by the symposium:

"Problems in Nuclear Chemistry and Biology" (K. G. Stern); "Interrelations between Nucleus and Cytoplasm" (J. Schultz); "The Role of the Nucleus in Protein Synthesis" (F. Haurowitz and C. F. Crampton); "Nucleoproteins of the Nucleus" (A. W. Pollister); "Quantitative Optical Techniques in the Study of Nuclear Chemistry" (M. J. Moses); "The Lampbrush Chromosomes of *Triturus viridescens*" (J. G. Gall); "The Enzymes of Isolated Nuclei" (A. L. Dounce); "Histochemical Demonstration of Nuclear Enzymes" (A. B. Novikoff); "Evidence for the Polynucleotide Nature of Cysteinylglycinase" (F. Binkley); "Organization and Function of the Inorganic Constituents of Nuclei (of Drosophila larvae)" (D. F. Poulson and V. T. Bowen); "Studies on the Metabolism of the Nucleic Acids" (A. Bendich); "Specificity in the Composition of Nucleic Acids" (G. R. Wyatt); "Chemical Action of X-Rays on Nucleic Acids and Related Substances in Aqueous Systems" (G. Scholes and J. Weiss); "Relationships between Ionizing Radiation, Chromosome Breakage and Certain Other Nuclear Disturbances" (A. H. Sparrow, M. J. Moses, and R. J. Dubow); "Chromosome Metabolism as Shown by Autoradiographs" (S. R. Pelc and Alma Howard); "Effects of Purines and Other Chemotherapeutic Agents on Nuclear Structure and Function" (J. J. Biesele, Ruth E. Berger, Marilyn Clarke, and L. Weiss); "The Effect of Colchicine on the Microscopic and Submicroscopic Structure of the (first maturation division) Spindle (of the oöcyte of *Chaetopterus pergamentaceous*)" (S. Inoué); "Current Status of the Bacterial Nucleus" (E. D. DeLamater, M. E. Hunter, and S. Mudd); "The Origin of Bacteriophage Nitrogen, Carbon, and Phosphorus" (F. W. Putnam); "The Fate of the Infecting Virus Particle (L. M. Kozloff); and "The Biological Nature of the Bacterial Transforming Factors" (R. D. Hotchkiss).

In addition, the value of many of these contributions is enhanced by the inclusion of a report of the subsequent discussion.

Certain of the initial papers, which attempt to reconcile current ill-defined ideas of desoxypentosenucleoprotein structure with biological function, suffer from a surfeit of hypotheses, whereas others merely reiterate the results of work already published. Prominent among the contributions which record new observations are those of Gall and Binkley. The latter describes the isolation from frozen pig kidney of a protein-free polypentosenucleotide fraction that exhibits high hydrolytic enzyme activity against cysteinylglycine and glycylcysteine. The work, which possibly points to a definite function of the pentosenucleic acids, is presented with caution in the form of a progress report, and it is emphasized that it would be premature to ascribe the enzyme activity to the polynucleotide alone.

Novikoff's paper on the histochemical demonstration of nuclear enzymes—largely confined to an extensive consideration of the limitations and sources of error inherent in the Gomori and other techniques for the location of alkaline phosphatase—includes a limited survey of the distribution of 5-adenylic acid (adenosine-5-phosphate) phosphatase, adenosine triphosphatase, "DNA-phosphatase," and succinic dehydrogenase.

Pelc and Howard discuss the synthesis of desoxypentosenucleic acid and sulfur-containing protein in the chromosomes of cells from the meristematic tissue of the main root of *Vicia faba* seedlings and show, by experiments in which the growing roots are subjected to irradiation with x-rays, that the synthesis of protein in the chromosomes can occur without a corresponding synthesis of desoxypentosenucleic acid.

The current concept of DeLamater, Hunter, and Mudd that the bacterial nucleus is essentially similar to the nuclei of higher organisms, and contains discrete, countable chromosomes, which undergo a typical mitotic process prior to the division of the cell, is derived solely from the recent extensive investigations of DeLamater and his colleagues, and excludes the equally current concepts held by other bacterial cytologists.

Among the papers of predominant chemical interest, that presented by Scholes and Weiss gives a comprehensive account of the nature of the degradative changes induced in aqueous solutions of nucleic acids by irradiation with x-rays, which lead to an initial depolymerization of the substrates, followed by fragmentation of the polynucleotides and the liberation of inorganic phosphate, ammonia, and small amounts of free purine bases.

Bendich's paper, which gives detailed and critical consideration to the nature of the biosynthesis of the nucleic acids, also points to heterogeneity in constitution, and possibly function, of the desoxypentosenucleic acid of rat tissues. Thus, it is now possible to separate the desoxypentosenucleic acids of the pooled internal organs of adult rats, or regenerating rat liver, into two distinct fractions, which differ not only in their solubilities in 0.87% sodium chloride solution, but also in metabolism and rates of turnover.

Wyatt deals thoroughly with the differentiation of nucleic acids, particularly desoxypentosenucleic acids, by the determination of the relative amounts of the purine and pyrimidine bases. Differences in the proportions of the major bases between one nucleic acid and another, as revealed by analyses carried out in

various laboratories, are considered significant in some cases, but in others no greater than the experimental error. The 5-methylcytosine content, which, when high, tends to be balanced by a reduced amount of cytosine, is significantly different for the desoxypentosenucleic acids of every animal species, and is the same only in desoxypentosenucleic acids derived from different tissues of the same species. The greater constancy of the composition of the desoxypentosenucleic acids isolated from higher organisms, than that from lower ones, apparent from the results thus far available, is considered to be consistent with the concept that the analyses determine the mean composition of a number of gene-specific nucleic acids.

In a critical review of the chemical and photometric evidence leading to the concept of a constant amount of desoxypentosenucleic acid in the interphase nuclei of different somatic tissues of the same species, Pollister justly emphasizes that the apparently constant values obtained are statistical means, and neither procedure excludes the possibility that the nuclear desoxypentosenucleic acid content varies during intracellular metabolism. In this paper attention is also drawn to the high content of nonhistone protein in cell nuclei (provisionally estimated, for example, as 65% of the dry weight of the interphase nucleus of the mammalian liver cell), which differs from cell to cell, and which merits more detailed chemical investigation than it has hitherto received.

Putnam produces evidence to show that most of, if not all the phosphorus of the T7 bacteriophage nucleoprotein is derived from the desoxypentosenucleic acid of the *Escherichia coli* host cell. Synthesis of the phage desoxypentosenucleic acid is preceded by the degradation of the host nucleic acid to oligo- or mononucleotides.

Kozloff presents an interesting summary of evidence to show: (1) an extensive breakdown of the *E. coli* T6r+ and T7 bacteriophages occurs during the reproductive process; (2) the contribution of parent material to the virus progeny is not a specific and obligate part of the reproductive process; (3) the transfer of nitrogen and phosphorus from the parent virus to the progeny involves excessive rearrangements and is largely independent of genetic units. In the subsequent discussion certain of the results and hypotheses presented in the paper are debated with exuberance.

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Sir James Jeans: A Biography. E. A. Milne. New York: Cambridge Univ. Press, 1952. 176 pp. Illus. $4.00.

Just before his death in 1950 Milne completed this biography of Sir James Jeans. The biography consists of three parts, the first part being a memoir by S. C. Roberts, of the Cambridge University Press. In this memoir, Roberts describes how he induced Jeans to write *The Universe Around Us,* the first of the series of books meant for the general public in which Jeans so successfully popularized the theories and discoveries of astronomy and physics. Roberts also describes how Jeans met his second wife in the Swiss and Italian mountains, while on holiday.

The main part of the book is Milne's biography. In the first six chapters Milne describes in detail Jeans' life, his academic career, and his career as a writer of popular books. The last six chapters are devoted to a critical account and assessment of Jeans' contributions to science. The bibliography of all Jeans' works is given at the end of the book. In it one finds a list of eight technical books, ten popular books, and 76 research papers, as well as of ten references to abstracts of lectures. From this biography there emerges a picture of Jeans, the man and the scientist, but also a picture of Milne, and finally a picture—and not always a pleasant one—of the atmosphere of British astronomy.

The biographical part falls naturally into six chapters. The first deals with Jeans' boyhood and years in Cambridge, the second with his stay in Princeton, where he was invited as professor of applied mathematics by Woodrow Wilson at the same time as O. W. Richardson, G. Birkhoff, O. Veblen, and Henry Norris Russell. The third chapter deals with the period from 1909–19, during which Jeans probably made his most important contributions to science. The fourth chapter is devoted to the ten years that Jeans was secretary of the Royal Society, and the fifth and sixth chapters deal with Jeans' popular works and the last years of his life. Milne stresses the fact that as a stylist, both in his scientific writings and his popular books, Jeans was outstanding. Before he started writing for the general public, Jeans had gained a place in *The Oxford Book of English Prose.*

In the last part of the biography, Milne discusses critically, sometimes perhaps too critically, Jeans' contributions to science. Again the division in chapters comes naturally, and they deal successively with kinetic problems, rotating masses, star clusters, stellar equilibrium, and Jeans and philosophy.

Jeans' popular books are still fascinating to read, whether or not one agrees with him in all detail, and it is extremely fortunate that we now possess in Milne's biography a fascinating account of this outstanding British scientist. As one can expect from the Cambridge University Press the book is beautifully produced and at a reasonable price.

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