secondary biological effects on molecules and cells are described, and the coverage is broad. The book begins with a description of ionization, activation spectra, and other events at the atomic and molecular levels and then goes on to discuss the hydrated electron and radical production in water and in organic and inorganic materials; effects on artificial polymers and macromolecules of biological significance, especially proteins and nucleic acids; and effects on cell populations in vivo. The biological effects observed in viruses, bacteria, and plant and mammalian cells are described in terms of effects on DNA; transcription or production of messenger RNA; mutations, including genes controlling radiosensitivity; chromosome aberrations; and cell killing. Recovery or repair of radiation damage is given considerable attention both at the molecular level, where it is observed as excision and patching in DNA, and at the cellular level, where it is observed as restitution of chromosomal lesions and an increase in survival following fractionated doses.

Effects on the whole animal are discussed briefly, but only in terms of cellular kinetics, as they relate to the radiation syndrome and recovery from radiation injury. The main concern of the book is to gain an understanding of radiation lethality, but inclusion of material on radiation and the origin of life presents a counterbalance in that radiation may have been instrumental in the synthesis of life.

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A Panorama of Genetic Studies

Proceedings of the Third International Congress of Human Genetics. Chicago, Sept. 1966. JAMES F. CROW and JAMES V. NEEL, Eds. Johns Hopkins Press, Baltimore, 1967. xviii + 578 pp., illus. $14.50.

The topics of the symposia held at the Third International Congress of Human Genetics were chosen to represent the major areas of modern human genetics, and the resulting book presents a patchy but impressive panorama of the field.

The two sessions on Clinical Genetics contain a mixture of review articles on general topics and reports on specific research programs. W. Lenz (Germany) illustrates the problems of "Diagnosis in medical genetics" by a number of examples of skeletal anomalies. J. Mohr (Denmark) reviews the legal framework, scope, effects, underlying attitudes, and methodological possibilities of "Genetic counseling," basing his remarks largely on efforts in his country, the farthest advanced in this field. C. Scriver (Canada) presents a refreshingly imaginative review of "Treatment in medical genetics." The neurolipidoses (D. Klein, Switzerland) and the ichthyosis and epidermolysis groups (U. W. Schnyder, West Germany) are discussed from the diagnostic and nosological point of view, and M. Lamy and P. Maroteaux (France) describe a new skeletal disorder, pycnodysostosis. H. Falls (U.S.) presents an illustrated review of 81 hereditary conditions in which features of the eye and hand aid the diagnosis, and J. François (France) discusses the Lyon hypothesis of differential X-chromosome inactivation in relation to certain, mostly ophthalmological, human diseases. Finally, F. Vogel and J. Krüger (West Germany) present several models for the multifactorial determination of "familial" diseases, using strabismus as an interesting example. Under the guise of discussants, Mary Efron (U.S.) presents some practical experiences in screening for inborn errors of metabolism; D. Danks (Australia) reviews the philosophy and practice of heterozygote detection; M. A. Ferguson-Smith (Scotland) discusses the applications of clinical cytogenetics; I. Uchida (Canada) shows that the near relatives of patients with trisomy 21 mongolism do not share, even in minor degree, their dermatoglyphic peculiarities; C. A. Clarke (England) reviews the exciting new work on prevention of Rh-immunization; R. W. Day (U.S.) discusses the role of public health agencies in clinical genetics; and C. O. Carter (England) evaluates the impact of counseling on the subsequent reproductive behavior of the couples counseled. It appears that counseling does make a difference.

The session on Cytogenetics begins with a useful review by Pfeiffer (West Germany) of the less well-known autosomal variants and their phenotypic manifestations, or lack of them. This is followed by German's (U.S.) description of DNA replication patterns, determined by autoradiography, and their use in the analysis of human chromosome identity and structure, and J. de Grouchy's (France) review of chromosomes in neoplasms. C. E. Ford's (England) paper on sex chromosome anomalies was not available for inclusion.

J. Frézal and J. Rey (France) introduce the session on Biochemical Genetics with a paper on a group of diseases characterized by chronic diarrhea and stunted growth, only recently recognized as "inborn errors of digestive enzymes." The confusing interactions of the ABO, H, Secretor, and Lewis blood-group genes are beautifully accounted for by W. M. Watkins (England). She presents evidence that these genes control the serological specificity of the blood-group substances by producing enzymes that add specific sugars to a basic glycoprotein in a defined sequence. The current status of the interesting group of catalase deficiencies is reviewed by H. Aebi (Switzerland). In a thoughtful summarizing address, H. Harris (England) points out the unexpected amount of enzyme variation in human populations, the considerable degree of individual diversity in enzymic makeup this implies, and how a relatively small number of genetically determined differences in activity of an enzyme can account for the continuous unimodal distribution of activity found in a randomly selected population. ". . . One can argue that the detailed study of these enzyme polymorphisms . . . provides at the present time the most direct approach to the understanding of the genetical structure of human populations."

Immunogenetics is represented by a paper on "Genetic control of cellular antigens" (Shreffler, U.S.) which discusses the elegant genetic analysis of the complex locus controlling the H-2 antigen in the mouse, and by H. H. Fudenberg's (U.S.) capable discussion of immunological deficiencies and autoimmune disease. The paper of B. Pernis (Italy) on the genetics of antibody formation was not available for inclusion.

In the session on Population Genetics, N. Yasuda and N. E. Morton (U.S.) present a sophisticated discussion of four models of population structure (deviations from panmixia) and their value in estimating the genetic load, effects of drift, selection, and so on in human populations. A description of genetic studies on a religious isolate by A. G. Steinberg (U.S.) shows extraordinary differences in gene fre-

quencies between colonies, indicating the effects of genetic drift. Finally, H. B. Newcombe (Canada) describes the use of record linkage by computer to compile pedigrees for a large population, and its great value in assembling and analyzing genetic and demographic data.

A session on Human Evolution begins with a review by C. Baglioni (Italy) on the phylogenetic similarities in amino acid sequences of certain proteins—the hemoglobins, myoglobin, the haptoglobins, cytochrome *c*, and the immunoglobulins—and the evolutionary implications. J. M. Thoday (England) points out that the really interesting variables are the continuous ones and that little progress is being made in understanding these in man. He gives some illuminating examples in lower animals to show how progress can be made. Again the thought appears that continuous variations can be broken down into specific polymorphisms if looked at in a suitable way. A. Harrison (England) discusses human ecology in relation to demography, selection, and adaptability, and T. Dobzhansky (U.S.) presents a thought-provoking discussion of human evolution, past, present, and future.

The book also includes the papers presented at a Workshop on Computer Methods. Among these are an evaluation of census data as a resource for studies of genetic demography (W. Bodmer and J. Lederberg, U.S.), a report on "Experiments with an artificial population" by L. L. Cavalli-Sforza and G. Zei (Italy), a paper on the estimation of the genetic components of disease by record linkage (J. H. Edwards, England), a discussion of genealogic and bibliographic uses of computers by V. McKusick (U.S.), a report on record linkage and other genetic studies by M. P. Mi (U.S.), and a program for encoding, analyzing, and storing human linkage data (J. H. Renwick and D. Bolling, U.S. and England). The proceedings of a workshop on "Teaching Medical and Human Genetics" were not available for publication, and the symposium on Molecular Genetics was not included because much of it has already appeared elsewhere.

A public lecture on "Genes and people," a delightful testimony to C. Stern's (U.S.) ability to illuminate genetics for the layman, ranges from genetic counseling, through gene-environment interactions in determining mental traits, to questions of race and eugenics.

The opening plenary session is devoted mainly to the presidential address by the distinguished English geneticist L. S. Penrose, on the extensive and fundamental contributions to human genetics made by the English school. One tradition of the English school which Penrose himself "steadfastly refused to follow, or to endorse," is the "cult" of eugenics, which ". . . was based upon arbitrary valuations of individuals and social groups, supported by unjustified and premature assumptions about the nature of hereditary influences." By contrast the last chapter of the book, by the late H. J. Muller, urges action now to ensure genetic progress toward the improvement of our mental and moral natures. Though controversial, this essay is recommended to those interested in the future of the human species.

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A Plasma Protein

Fibrinogen. KOLOMAN LAKI, Ed. Dekker, New York, 1968. xiv + 398 pp., illus. $19.50.

Fibrinogen and fibrin, besides being proteins of intrinsic biochemical interest, are the major substrates for two critical enzyme systems in vivo—the blood coagulation system and the plasminogen-plasmin (fibrinolytic) enzyme system. The properties and functions of fibrinogen are of importance in many scientific disciplines ranging from biochemistry to clinical medicine, and a comprehensive monograph has long been a need. Thus the present monograph, though of somewhat uneven quality and interest, is to be welcomed.

The editor's introductory chapter, which serves also as a practical summary of the book, is a highly personal account of his and his colleagues' many valuable contributions to the biochemistry of fibrinogen. This chapter updates Laki's last major review on the biochemistry of fibrinogen and fibrinogen-fibrin conversion; it also summarizes recent data on the fibrin stabilization reaction, on the role of the carbohydrate moiety in fibrinogen, and on the vasoactive properties of peptides released from the molecule, and evolutionary data on thrombin and fibrinogen. These last subjects are treated individually and at greater length in chapters by the 15 contributors. Some of these chapters serve to chart directions for further research effort, whereas others describe fields in which data are reasonably complete; for example, the action of thrombin on fibrinogen (Gladner) and the fibrin stabilization reaction (Loewy). Loewy's chapter is particularly valuable since data widely scattered in the literature are reviewed.

The structure of fibrinogen is discussed in terms of the information obtained by rupture of S-S linkages and trypsin degradation (Mihalyi) and the immunologic structure in terms of antigenic determinants isolated after plasmin degradation (Marder). Electron microscopic studies of the fibrin networks and of fibrinogen itself are reviewed (Szalontai), and there are chapters on the early history of the study of blood coagulation (Beck), the purification and chromatography of fibrinogen (Finlayson), protein biosynthesis (Mora), and the hydrogen bond (Ladik).

Coverage of the clinical aspects is notably less complete. Clinical or clinically related subjects reviewed are fibrinogen metabolism (Adelson), in a chapter devoted mainly to clearance studies of isotopically labeled fibrinogen; in two brief chapters, congenital abnormalities of the fibrinogen molecule (Beck) and the role of fibrin in the growth and metastasis of tumors (Laki and Yancey); and in a longer chapter, the use of fibrin products in hemostasis and wound healing (Gerendas). This last chapter describes the use of bioplasts (molds made of fibrin powder and plasticizer) in surgery, but insufficient data are provided to permit evaluation of the utility of these novel materials. Substantial progress has recently been made in the delineation of the clinically significant syndromes of intravascular coagulation and the hemorrhagic diathesis resulting from defective fibrin polymerization (arising either as a result of abnormality of the fibrinogen molecule itself or of interference by specific fibrinogen proteolysis products). Except in passing, neither of these syndromes is described.

The main strength of this book lies in useful review of the biochemical aspects of fibrinogen; the clinical sections, though less satisfactory, do contain interesting material. Reference citation is selective but reasonably complete, extending in some cases to early 1967, though some chapters appear to have been written well prior to this date.

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