A Celebration and Review

British Biochemistry. Past and Present. Biochemical Society Symposium No. 30, London, Dec. 1969. T. W. GOODWIN, Ed. Academic Press, New York, 1970. x, 228 pp., illus. $9.

The 13 articles in this volume were prepared in connection with the 500th meeting of the Biochemical Society, the first meeting having been held on 14 March 1911. The stated purpose of the symposium was to "survey the achievements" of British biochemistry during the intervening 58 years.

The first section, entitled Molecular Biology, includes articles by J. C. Kendrew, who recounts briefly the beginnings of the application of x-ray methods to the study of biological materials, and by D. C. Phillips, who carries the story to the recent work in England (and elsewhere) on the three-dimensional structure of enzyme proteins. There follows an essay by B. S. Hartley on recent studies concerning the amino acid sequences of proteins. From the point of view of the historian of science, the succeeding article by N. W. Pirie is of special value, as it provides an incisive retrospect on the work he and F. C. Bawden did during the 1930's on plant viruses.

The second section, entitled Immunology, begins with J. H. Humphrey's excellent review of recent work on the role of lymphocytes in the immune response. This is followed by articles by R. R. Porter on the structure and combining sites of antibodies and by W. T. J. Morgan on the chemistry of the immunologically active carbohydrates.

The third section, entitled Intermediary Metabolism, includes a brief survey by H. A. Krebs of the highlights in the development of this subject since 1911, and G. Popják's valuable account of the beginnings of British studies on metabolism with the aid of ^{14}C-labeled compounds. The section concludes with H. L. Kornberg's article on the control of the tricarboxylic acid cycle in *Escherichia coli.*

The final section, Separation Methods, offers R. L. M. Synge's recollections of the beginnings of liquid chromatography, an article by F. Sanger and G. G. Brownlee on their new method for determining nucleotide sequences in RNA, and an account by A. T. James of the initial development of gas-liquid chromatography.

The achievements surveyed in this small volume amply attest to the importance of the contributions made by British scientists to the development of modern biochemistry. Although there is repeated emphasis, throughout the book, on the international character of science, and the authors have been careful to indicate relevant advances made outside Britain, the topics selected for discussion understandably tend to stress those areas in which the British effort has been particularly significant.

In appreciating the value of this book to students of the historical background of present-day biochemistry, this reviewer regretted that the 58-year time span had not been divided somewhat more evenly. The survey could have done more in recalling the special contributions of British biochemistry during the first half of this period, when the center of gravity still appeared to be in Germany, and before the United States had assumed a dominant role. For example, it would have been more than sentimental pride to include an account of British work on intracellular respiration, with special reference to the work of Keilin and the Hopkins school. Also, more attention might have been given to the role played by British scientists in the elucidation of the biochemical basis of nutrition, or in the development of protein chemistry, before 1939. Finally, except in the article by Popják, the reader does not glimpse the remarkable achievements of British organic chemists in helping to lay the groundwork of modern biochemistry through their studies on the chemistry of amino acids, carbohydrates, nucleotides, and isoprenoid compounds. The volume would have been enriched as a contribution to the history of science if these neglected topics had been treated more fully, even at the cost of the omission of several of the more topical essays, some of which repeat recent research reports readily available in other publications.

This expression of regret on the part of one reader should be weighed, however, against the undoubted value of this book to all students of biochemistry. In recalling some of the earlier steps in the development of our subject, the Biochemical Society has reminded us of our debt to many scientists, among whom British biochemists will always occupy a distinguished place.

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On the Primate Biogram

Social Groups of Monkeys, Apes and Men. MICHAEL R. A. CHANCE and CLIFFORD J. JOLLY. Dutton, New York, 1970. 224 pp. + plates. $11.50.

Almost too late man has realized that his own behavior and social structure are understandable only as a variant of a basic "primate biogram" or way of life. This revelation, coupled with the rapidity with which many species of primates are nearing extinction, has recently led to a tremendous increase in studies of subhuman primates in the laboratory, in captive colonies, and in the wild. Chance and Jolly have attempted a synthesis of the data regarding one major subdivision of the primate biogram: social structure.

Cognizant of the incommensurability of many of the available data on subhuman primates, the authors have set out not only to present their conclusions concerning the structure of primate societies, but also to provide a standard theoretical model for future work and thus make possible a science of comparative social behavior. Their approach to the study of behavior is based upon the rejection of functional explanations (both biological and social) for behavioral phenomena in favor of discerning "the underlying patterns by discovering the *order* which holds together the separate parts of the behaviour" (p. 16; my italics).

Chance and Jolly propose that the order binding together the behavior and molding the social groups of most Old World monkeys and apes (these being chosen for examination because of their phylogenetic proximity to man and the availability of data on wild populations) is the attention orientation of the individual group member. Differing patterns of attention orientation, and of the social bonds which are the result of predominant attention, have produced two major types

of primate society: centripetal and acentric. These societies are at least partially shaped by and are most easily recognized during predator attack.

A typical centripetal society as seen by Chance and Jolly is organized around the central "male cohort" which directs group activities and movements. Males of the cohort are rank-ordered and very aggressive. The predominant attention orientation of all group members is toward the male cohort, and especially toward the most dominant male. The more aggressive the dominant males, the tighter is the attention of the group bound to them. Intraspecific escape, the pattern of which is hypothesized to be a product of the reaction to predator attacks, is reflected back into the social group, with a threatened animal fleeing toward a dominant male (sometimes toward the threatening animal itself). During predator attack, the females and immatures of the group orient on the massed adult males, and the group maintains its integrity rather than dissolving into independently fleeing animals. Thus, even during times of maximum excitement, the attention orientation of the individual remains constant and the society stable.

Subhuman primates classed as centripetal include savannah and gelada baboons, Japanese, rhesus, and bonnet macaques, chimpanzees, and gorillas. The authors also suggest a centripetal organization for many segments of human societies, both modern and prehistoric.

In contrast, an acentric society is one in which the attention orientation undergoes a switch during periods of high excitement and the society fragments into dispersed components. For example, patas monkeys live in small groups containing one adult male. The adult male remains peripheral to the main body of the group and functions essentially as the group watchdog. Adult females typically initiate and determine the direction of group movements. During predator attack the attention orientation of the individual monkey switches from the adult male, who bounds away from the group in a diversionary display, to the physical environment. This is due to the fact that the animal will be dependent upon the environment for escape if the male's diversion fails.

The authors recognize three common subgroupings within the two types of society: female assemblies, juvenile clusters, and male cohorts. Taken together, these constitute the "stem structure" of subhuman primate society, "encompassing the social relations of the adults of both sexes, with the juvenile clusters forming a transitional stage in the growth from infancy to adulthood" (p. 160).

The use of theory and field data in support of the authors' arguments is generally logical and persuasive. Reflected escape within centripetal societies is accounted for in terms of arousal variation. A threatening animal initially produces a high level of arousal and withdrawal. After the arousal level has dropped, the same stimulus animal (no longer threatening) elicits approach. Attention orientation among the infrequently aggressive chimpanzees is explained as being organized in the *hedonic* mode, that is, based on attention-demanding displays.

At times, however, Chance and Jolly do seem to stretch a point. For example, it is obvious that savannah baboons (*Papio cynocephalus*) fit their definition of a centripetal society to perfection. Adult males of this species may indeed be the objects of predominant attention and the focus of the society. It is a bit more difficult, however, to classify the loosely organized chimpanzee as centripetal. Chimps occur in various types of social groups including heterosexual bands minus mothers with dependent young, bands of adult males, bands of mothers and young, and bands containing every possible age-sex combination. The authors' contention that the adult male bands are the core of the chimp population is unconvincing.

The book's main theme, that most catarrhine species are male-focal in their social structure, is not uncommon among students of the primates and probably stems from the fact that males of these species are typically much larger and more conspicuous than the females. Any action by an adult male immediately catches the eye of the observer. The question at hand, however, is whether or not the other group members as well as the observer orient to the males' behavior. Recent long-term studies of free-ranging rhesus macaques (one of Chance and Jolly's centripetal species) on Cayo Santiago, Puerto Rico, have revealed that, rather than being a male-focal society, rhesus monkeys are basically female-focal, being organized around the matriline. These studies (primarily by D. S. Sade) show that adult male rhesus monkeys play a minor role in dictating group activities. Chance and Jolly make no mention of these data that contradict their theories.

Only further study will determine whether male-focal societies or female-focal societies are more prevalent among Old World primates. In all probability, the situation will turn out to be much more complex than having a single form of social organization characteristic of all Catarrhini. It is disappointing, however, that the authors did not make this controversy known to the reader.

In a few places the book presents data which are simply not true. Contrary to statements by the authors, rhesus macaque adults occasionally engage in play behavior and rhesus infants begin grooming other monkeys when less than one year old. More important, it is incorrect that the rank order among females is unstable in all macaque species. The basis of rhesus monkey social organization is the remarkably stable rank order among the old females who head the matrilines.

Barring the criticisms given above, the book must be rated as a scholarly attempt at the analysis of primate social organization. Although I would argue with many of the authors' conclusions, their models of social structure are lucidly described and logically developed. Students of the primates will find this book extremely thought-provoking, and I recommend it to them with the reminder that, as the authors state in their introduction, at the present stage in the study of primates few if any generalizations can be taken as established.

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The Structuralist Position

Claude Lévi-Strauss. EDMUND LEACH. Viking, New York, 1970. xiv, 142 pp., illus. Cloth, $4.95; paper, $1.65. Modern Masters series.

Lévi-Strauss, perhaps more than any other contemporary thinker, resists summary treatment within the format of the short volume for the general reader. Not only has he made important contributions on a number of disparate topics ranging from kinship