observatory at Sidmouth, but he was too old for much active participation. He died in 1920.

This brief account in no way exhausts the catalog of Lockyer's diverse interests. He anticipated recent developments in his interest in the astronomical orientation of ancient temples. He was mightily concerned with the public impact of science and was active both in the British Association for the Advancement of Science and the British Science Guild. Such problems as scientific military preparedness, education in the Navy, grants for the National Physical Laboratory, the pollution of rivers, postage on learned journals, standardization of time, agricultural research, research fellowships, and the election of women to membership of learned societies were all urged, mainly at his instance, upon official quarters.

All this made him friends and enemies, both warm and numerous, and Meadows does Lockyer and us a great service in describing the vivid personality of his subject and the immense variety of his concerns in science and public life. As a vignette of intellectual and political life in Victorian London, the book is outstanding.

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Human Data for Brain Models

Aphasia, Apraxia and Agnosia. Clinical and Theoretical Aspects. JASON W. BROWN. Thomas, Springfield, Ill., 1972. x, 310 pp., illus. $14.50.

Patients who have incurred focal damage to the phylogenetically newest portion of the brain, the cerebrum, experience apparently isolated difficulties in certain aspects of thinking, perceiving, verbalizing, or performing skilled acts. Impairment of the control systems responsible for our characteristically human behavior may result in these deficits. They are among the most studied but least understood of natural phenomena. They are much studied in the hope that to understand them will be to comprehend the principles according to which the human cerebrum is organized. These diverse phenomena are not intrinsically unintelligible. However, when investigators have formulated questions to ask their subjects, they have used restrictive models of brain organization, which either admit only the simplest of organizing principles (information flow from point to point) or overreact to this simplicity by asserting such invincible complexity that analysis seems virtually impossible.

These reservations naturally apply to much of the material that Jason Brown reviews in his lucid and tightly organized book, and he is well aware of this. The many reported cases that he quotes were studied from quite different perspectives and one suspects that information inimical to each case reporter's theoretical orientation may be skated over. This is especially likely because such cases are rarely available for study by more than one group, and replication is a dubious concept when no two brain-damaged patients are identical. Most of these studies were inspired by a simple "switchboard" model of information flow, which has proved remarkably hardy in the face of a century of justifiable castigation. But the switchboard model bypasses analysis at the level of function and glibly equates each overt behavioral deficit with a presumed brain operation, each with its supposedly definite locus and with discrete communication pathways to other loci.

Brown fundamentally departs from this model in the direction of a less restrictive approach which makes it possible to apply to neuropsychological problems the methodology and insights of contemporary cognitive psychology, from which it has formerly been well insulated. He does not think in terms of a sequential progression from input to output, with different deficits depending on where the sequence is blocked. Instead, he thinks in terms of a dimension of "depth," ranging from the superficial-specific input and output functions to the deepest and more general semantic processes. At each level both input and output functions will be impaired. Thus at the superficial level of a language disorder, the impairment is phonological for input, articulatory for output. At a deeper level it compromises the word as a lexical unit, so that words are wrongly interpreted and wrong words are evoked in speech. He uses his "microgenetic" organizing principle to make some strikingly successful explanations of the various components of symptom complexes. He does not believe the symptoms are additive but rather that they are various aspects of one deranged process at a particular stage of its realization; transitions from "syndrome" to "syndrome" in recovery (lessening "severity") are changes in the microgenetic stage of the damaged process. The approach, applied clearly and without the vague jargon that encumbers some of its previous proponents, helps the student of cerebral symptomatology and has heuristic value to the investigator in organizing his thoughts: the predictions are many and testable.

Models of the brain are not mutually exclusive. The switchboard model and the microgenetic one can each contribute understanding of those aspects of brain function that utilize their principles. In addition to those Brown discusses, Jackson's principle of hierarchically superimposed cortical systems certainly elucidates a further set of phenomena. The Sherringtonian approach that deals in inhibitory interactions between competing responses is particularly well adapted to serve as a neural model for the behavioral interactions subsumed under the term "selective attention," in which a limited amount of overall "capacity" is variously distributed between concurrent activities.

All these are, and more will be, grist to the mill of the opportunistic investigator, and the brain is complex enough to accommodate the ambitions of all model makers. As for the data needed for the making of this model, there exists no single source as accurate, concise, detached, and intelligently put together as that now presented by Brown.

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Reproductive Endocrinology

Gonadotropins. A symposium, New York, June 1971. BRIJ B. SAXENA, CARL G. BELING, and HORTENSE M. GANDY, Eds. Wiley-Interscience, New York, 1972. xxxii, 800 pp., illus. $32.50.

A symposium with the objective of integrating recent research on gonadotropins as they affect human reproduction was organized to commemorate the 200th anniversary of the Society of the New York Hospital in June 1971. The resulting symposium volume consists of 58 separate research reports organized into nine sections spanning broad areas such as biochemistry,

regulation of secretion, and modes and types of action of the pituitary and placental gonadotropins. Because direct research on human gonadotropins is still rather limited, much of the book deals with reproductive studies of other mammals, and these provide a valuable framework for the more recent research on human hormones. Despite the broad title of the symposium, there is no comparative information for any nonmammalian species. Also surprising, in view of the special interest in fertility control expressed in the preface, is the dearth of information on current contraceptive research in relation to gonadotropins.

Within these limitations, the breadth of topics covered is still impressive. Both theoretical and applied approaches are represented. For example, a large section is devoted to the practical problems of measuring hormone levels. Emphasis is given to discrepancies obtained when different types of techniques or standards are used, and especially when attempts are made to compare classical bioassay data with results obtained from radioimmunoassay. The detailed presentation of methodology for the radioimmunoassay of gonadotropins and gonadal steroids should prove valuable to anyone wishing to undertake the use of this new and sensitive technique. After examining this section, however, one may wonder whether radioimmunoassay is indeed the panacea it is sometimes claimed to be.

The consideration of the physiological relationships between gonadotropins and the gonads tends to be largely clinical but illustrates how human studies can benefit from general physiological studies and vice versa. Details of the effects of the two pituitary gonadotropins on various testicular and ovarian functions in humans may cast some doubt on the classical dogmas regarding the specific actions of follicle-stimulating hormone (FSH) and luteinizing hormone (LH).

The interdisciplinary approach of the symposium provides interesting insights into some of the broader problems in reproductive physiology. For example, the question of how pituitary gonadotropins are regulated is highlighted by recent chemical findings of a single hypothalamic releasing factor that appears to be nonspecific for FSH and LH, and by the indication from immunostaining techniques that both gonadotropins may also be produced in a single cell type within the gland. These phenomena appear to be general for all mammals studied. In other sections, it is emphasized that estrogens and other sex steroids may have positive, as well as the classical negative-feedback, control on gonadotropin secretion. How the secretion of two gonadotropins is independently regulated, if in fact it is, remains unresolved.

Unfortunately, the potential value of the interdisciplinary approach is limited by several shortcomings in the organization of the volume. Contrary to the publisher's assertion on the dust jacket, each section is not introduced by a critical review of current knowledge in the area. Rather, all the reports tend to be highly technical and relatively narrow in scope. Furthermore, there is no real attempt to integrate or synthesize the diverse material presented within or between sections. In several cases, papers covering virtually identical subjects reveal marked discrepancies in results. But aside from brief comments by participants in the discussions following each section, there is little effort to clarify or resolve these differences or to evaluate their importance. The lack of summaries in most papers and a poor indexing system make it difficult for the reader to glean the details necessary to derive any generalizations, and this compilation of papers may thus prove most useful to specialists already working in the field of reproductive physiology.

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Ecology of Nutrition

Malnutrition. Its Causation and Control. (With Special Reference to Protein Calorie Malnutrition.) JOHN R. K. ROBSON in collaboration with Frances A. Larkin, Anita M. Sandretto, and Bahram Tadayyon. Gordon and Breach, New York, 1972. Two vols. Vol. 1, xii pp. + pp. 1–312, illus. Vol. 2, x pp. + pp. 313–612, illus. Each vol., $14.95; the set, $24.50.

This two-volume work grows out of the authors' 18 years of experience "in every continent of the world. . . . [which has included] the planning of nutrition programs at national and local levels and the delivery of nutrition services in the richest and the poorest countries of the world. . . . laboratory and field research, and teaching nutrition in a variety of settings from graduate and undergraduate programs in nutrition in the United States and elsewhere, to the training of local auxiliaries in the field." They present an environmental approach to the study and practice of nutrition. "Malnutrition is an ecological problem; . . . nutritional science cannot be effectively applied unless it is related to physiology, pathology, human behavior, and the many factors that constitute the ecology of food and nutrition." The "many factors" delineated as a part of the ecology of food and nutrition include concepts from the pure, the applied, and the social sciences—chemistry, biology, physiology, medicine, agriculture, education, sociology, economics, anthropology, and politics.

Ecology is defined as concern with relationships between the environment and the organism (in this case, the community). From this point of view discussions of both malnutrition and normal nutrition are presented for students and professionals in nutrition, medicine, nursing, public health, and related sciences. A major goal in these volumes is providing definitions of terms used in public health nutrition.

The first volume offers a fairly comprehensive overview of contemporary public health nutrition problems on a global scale, grouped for discussion purposes into the clinical states of overnutrition, undernutrition, and malnutrition. Malnutrition is defined as the result of an imbalance of nutrient intake. Some of its etiology is hinged to such identifiable (but difficult-to-measure) factors as food availability, cultural influences, effects of food processing and storage, and nutrient utilization, as well as some of the more immediate and measurable causes such as infant feeding practices, infections, and the sources of nutrients available within the community. The focus on ecological considerations in relation to malnutrition is enhanced by descriptions of real-life situations which provide insight into the causal relationships of worldwide community nutrition problems.

Normal nutrition is the theme of the last half of volume 1, in which concise but quite basic explanations of nutrient physiology, chemistry, absorption and metabolism, functions, deficiency states, sources, and recommended intakes of all the known factors essential to normal nutrition are discussed. Normal nutrition per se is not defined, but there is reiteration of disturbances in function which occur when nutrient intake is inadequate, in excess, or imbalanced.

The second volume takes up what can possibly be dubbed the "control"