Book Reviews

Lockyer

Science and Controversy. A Biography of Sir Norman Lockyer. A. J. MEADOWS. M.I.T. Press, Cambridge, Mass., 1972. x, 322 pp. + plates. $16.95.

Mention the name of some celebrity and up from memory comes an ill-assorted collection of facts and impressions, some true and some false. Lockyer! British astronomer, discoverer of helium by solar spectroscopy, editor of *Nature*, with a reputation for controversy, somehow associated with the Solar Physics Observatory at South Kensington. (What then was it doing at Cambridge when this reviewer was a student, and where did the Norman Lockyer Observatory at Sidmouth, South Devon, fit in?) One somehow assumes that Lockyer's was a conventional career complete with university education, a doctorate and all that, and that *Nature* was a large-staffed, profitable enterprise. Certainly *Nature* had and has a great influence, and Lockyer was sufficiently overpositive in its direction to prompt the wisecrack that he did not distinguish very readily between the Author of Nature and the editor of *Nature*.

Lockyer, born in 1836, was in fact a clerk in the British War Office when he founded *Nature* in 1869, and ran the journal in his spare time, which was considerable, though much reduced by his secondment to various committees and commissions. It never made a profit for Macmillan's during the 19th century. Lockyer's discovery of helium was long in being confirmed. He never had any formal scientific training and did not obtain an academic appointment as an astronomer until he was 45, nor a degree before he received an honorary Sc.D. from Cambridge in 1904 after he had retired.

Meadows tells us how all this happened and brings before us the picture of a most remarkable and influential man. One could wish that the book were better written—it takes the author a chapter or two to strike a good relaxed style, and there are a number of minor errors (Angström was Swedish, not Norwegian, the Cambridge higher doctorate is not a D.Sc.), and so on. The general development is not strictly chronological, which makes reference a little difficult, especially as the index heads are rather general, but Meadows has whole armies of eminent Victorians to marshal and his is probably the best choice of expository technique. The production of the book strikes this reviewer as less than happy—the letterpress seems crowded at over 1000 words a page and the extensive quotations are set in uncomfortably small type.

What makes the book absorbing is the character of its subject. To summarize: Lockyer began as a student-teacher with an interest in languages and obtained a post as a clerk at the War Office in 1857. This left him a great deal of leisure, much of which he spent reading science in the British Museum. His first wife was also a linguist and translated a number of French scientific books. At Wimbledon, where they lived, he met an amateur astronomer at the village club and obtained a telescope. A move to Hampstead in 1865 brought him in contact with several eminent figures in the scientific and literary worlds and in particular with Alexander Macmillan, the publisher. Lockyer became involved in the production of a journal called *The Reader*, which emphasized science, and which subsequently failed, and briefly with other publications. At the overstaffed War Office in 1865, he was put in charge of the codification of regulations, but never made a successful Civil Service career. His early astronomical observations were of the moon and of Mars, but by 1865 he had begun to specialize in solar studies including spectroscopy, starting with sunspot spectra. The discovery of the D_3 emission line of helium was announced independently by Lockyer and by Janssen at the same meeting of the French Académie des Sciences in 1868 on the basis of observations of solar prominences in England and at an eclipse in India. Helium was not identified terrestrially until 1895. Lockyer discovered the solar chromosphere and introduced the wide-slit technique for observing prominences, over which there was a row with Huggins. He published the first of many books in 1868 and started *Nature* the next year. That he could do this while holding down a Civil Service job, and even more that he could continue when co-opted to the Royal Commission on Scientific Instruction and the Advancement of Science under the chairmanship of the Duke of Devonshire, to which he was seconded from his War Office post, seems incredible. The Commission issued seven lengthy reports, the last in 1875, which covered all manner of topics from education and state subsidies for research to the organization of what became Imperial College, support for museums, and solar research, plugged because of its practical connection with meteorology and the terrestrial effects produced by the sun. Lockyer combined a leading share of this work with the running of *Nature* and with participation in several eclipse expeditions. Meadows deals with his stormy relations with the Royal Astronomical Society, which sometimes regarded *Nature* editorials as the exercise of undue influence. Lockyer landed up at South Kensington in 1874, at first still a War Office clerk seconded to organize an exhibition of laboratory and teaching apparatus, which developed into the present Science Museum. Finally in 1881 a separate College of Science was organized with a solar physics observatory and Lockyer was at last a respectable academic.

Lockyer was something of an autocrat, often mistaken, as in his meteoritic hypothesis, which was supposed to account for everything from comets to novae, sometimes in advance of his time, as in his ideas of atomic dissociation, which presaged the theory of ionization. Undoubtedly, he laid very sound foundations in spectroscopy which strongly influenced G. E. Hale and provided the climate for the work of Alfred Fowler, M. N. Saha, and their successors at Imperial College.

In the end, the Solar Physics Observatory had to be moved from London and was snapped up by Cambridge and away from Lockyer just before the outbreak of World War I. Lockyer then got up a subscription to establish the

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,