times, simply because the growing complexity of the world has made suboptimization increasingly more dangerous and optimization less plausible. One has a constant nightmare in which the next generation of Sporns succeeds in destroying us, while the next generation of Novicks prophesies doom into the careless wind. It is not criticism of these authors that they have not solved this problem; it is a problem, however, which the human race must keep on its agenda, or it may perish.

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Inside the Human Brain

Subcortical Correlates of Human Behavior. A Psychological Study of Thalamic and Basal Ganglia Surgery. MANUEL RIKLAN and ERIC LEVITA. Williams and Wilkins, Baltimore, 1969. xii + 340 pp., illus. $17.

The acceptance of neurosurgical methods of treating parkinsonism is due in no small measure to Irving Cooper at New York's St. Barnabas Hospital; he has performed several thousand of the subcortical operations that can relieve patients of the abnormal movement symptomatic of that progressive disease. As a result, an elderly human population has been available for behaviorial studies of subcortical function, the study of which has otherwise been confined largely to work on monkeys, cats, and rats. During the last decade the two senior psychologists at St. Barnabas have published useful statistics on IQ, inkblot, and other clinical results. In this book they survey their research and provide a "unified bidimensional rationale" to explain psychological defects that are at least temporarily accentuated by the surgery.

The introductory chapters cover the mind-brain issue, methodology, and the relevant subcortical physiology and anatomy. The next four chapters—on cognition, language, perception, and personality—contain critical comment on contemporary psychology and cover Riklan and Levita's own varied research (often on groups containing more than 50 cases and in one instance 256 cases). Their selected research patients were not very alert after their operations, but the impairment was minimal months later, provided the surgery had to be done on only one side of the brain. The changes after the surgery were therefore rather general, and in another chapter the authors compare them with the known changes following (larger) lesions at the surface of the brain. The latter effects are usually found in younger patients and are more specific in that they often can be related diversely to size, side, and locus of surgery or neuropathology.

Riklan and Levita's research enables them to emphasize that subcortical physiology is a persuasive factor affecting all that the human brain does, and before neatly summarizing the book they offer a theoretical chapter based on a concept of "directed-activation" or "activated-direction," about which the reader has been amply forewarned. Several other general theoretical positions are given short shrift even when allowed to contribute to the grand formulation. The new concept is intended to be both a physiological and a behavioral one and is as acceptable as any designed to comprehend so much. A part of one sentence probably does as well as any other short passage to indicate the character of the theory: ". . . the matrix of directed-activation can range from a preponderance of quasiautomatic organizational responses to arduous directive reactions requiring much greater catalysis from activation associated with physiological arousal" (p. 306). The authors have worked hard to synthesize ideas of activation and direction in behavior, to get at the complexities of clinical reality, and to avoid the simplifications which biologists commonly use. Their concern for highest integrative functions, interaction, patterning, interweaving relationships, and so on seems to go along with the selection of the word "correlates" for the title rather than some stronger term like "mechanisms" or "functions." Early in the book they request that they not be interpreted as assuming that "the human brain could think without man."

The conventional jargon of clinical psychology is used sparingly, but the writing style is often cumbersome and the variety of terms needed to cover such diverse fields as neuropathology, factor analysis, and existentialism slows the reader. Every chapter but the last ends with a comprehensive list of references, but the text has its share of excess and missing citations, as well as of typographical errors. Most of the schematic drawings that are meant to illuminate theoretical issues get an isolated "see figure" at the end of their corresponding sections, and the reader is invited to go back again to review the problem visually. Many section headings promise more organization than is actually found.

Two reports on the variation in site and size of the lesions (in 20 and 22 cases) indicate that the consistency of the surgery, and some of the nonspecificity in the results, is more debatable than is implied elsewhere in the book. Physicians will also wonder if some general psychological benefit from the therapeutic surgery could be quantified as well as the deficit. The next 1000 patients will yield more explicit information with the new methods Riklan and Levita are using, and their future work will serve to test their approach to the most complicated organism and its most complicated organ.

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Guidelines to Invention

The Design of Design. GORDON L. GLEGG. Cambridge University Press, New York, 1969. viii + 96 pp., illus. $4.95. Cambridge Engineering Series.

Gordon Glegg is obviously an engineer of wide experience and great originality, and his purpose in this small and very charming book is "to suggest some guiding principles that are behind most designs and so help the young engineer on his way." The book outlines three basic elements in design—the invention, the art, and the final, cold-blooded analysis. The many examples offered in it of conventional and unconventional thinking in the solution of engineering problems are beautifully described.

With most of Glegg's presentation this reviewer agrees wholeheartedly. There is no doubt that almost always the basic ideas come first and not too rationally, and that cold, incisive logic, which separates the wheat from the chaff, has to follow. Perhaps this is just as well. If the reverse were true, computers could replace us who make a living by producing original designs.

The question in my mind is whether any small book, or any large one for that matter, can really help an engineer or inventor to develop his designing skill. How can one learn even to appreciate the art of design—that is, the concept of overall beauty or elegance in a mechanism or a system? It can only be learned as one learns to appreciate good painting, good music—