

Book Reviews

Large Projects and Larger Questions

Technology, Engineering, and Economics. PHILIP SPORN. M.I.T. Press, Cambridge, Mass., 1969. xii + 148 pp., illus. \$5.95.

The Careless Atom. SHELDON NOVICK. Houghton Mifflin, Boston, 1969. xiv + 226 pp. \$5.95.

These two books, remarkably different in character and point of view, are nevertheless both related to the theme of technological dynamics, that is, how new things get done. Philip Sporn's book is written from the point of view of a practicing engineer and entrepreneur who has been associated for many years with the American Electric Power System in the valley of the Ohio River. The book is an intriguing account of the response of a dynamic private power corporation, not only to the normal growth of a large semirural region, but also to the extraordinary demands made upon it by the United States government, in the shape of the Atomic Energy Commission, for a large diffusion plant for the production of nuclear explosives and fuel. Sporn manages to make this operation sound somewhat more dramatic than one would think it would be at first sight, especially in the light of the fact that there is practically no peak-load problem because the plant operates at peak load all the time. However, there is a long-run problem that plants of this kind might be shut down when the stockpiles of their grim product become excessive. In a way, a more interesting, if less dramatic, story is the account of the steady reduction of the real costs of ordinary electricity over the years through rather slow technological change, brought about by means of a systems approach which includes more variables than the average engineer probably considers. It is evident, however, between the lines, that Sporn, although he is clearly a first-rate engineer and organizer, is not very much concerned about the larger implications of his activities, and his systems

approach leaves out a good many variables of the real world. He thinks, for instance, that nuclear reactors eliminate the fear of possible exhaustion of what he calls our "inanimate energy resources." He thinks that science is mainly concerned with the physical world, and his economics does not go very much beyond cost reduction in real terms. Nevertheless, the book is interesting as a case study in what it is like to solve a limited range of problems extremely well.

Novick's book cuts a much wider swathe and is a first-rate piece of scientific journalism, written in a fresh, lively, and yet moderate style and raising a great many important questions which, one feels, probably never crossed Sporn's mind. The principal theses of the work are, first, that nuclear power plants are potentially very dangerous and the larger they are the more danger there is likely to be, so that the probability of a massive disaster within the next generation is at least high enough to be very uncomfortable, and, second, that the nuclear plants at present being designed will have a cumulative radiological pollution effect, especially on the atmosphere, which, in a hundred years, say, could lead to marked worsening of the human environment.

The book is designed for the lay reader and explains just about what he needs to know, and no more, in order to form some sort of judgment about the matter in hand. It begins with some grisly stories of some actual accidents at nuclear reactors and it raises important questions about the current fashion, in proposals at any rate, for nuclear power plants. The author is particularly skeptical about the value, and alarmed about the potential dangers, of the fast-breeder reactors, and his account of the goings on at the Fermi plant outside Detroit is certainly a little chilling. He points out, also,

that the current rush into nuclear reactors is heavily subsidized by the United States government, not only of course in the provision of fuel, but also through the provisions of the Price-Anderson Act of 1957, which in effect makes the government the ultimate underwriter for the liability insurance of nuclear power plants. The reluctance of private insurance companies to take on the risk is again sobering, though not surprising.

Perhaps the most fundamental issue Novick raises is whether, in the light of the very large reserves of conventional fuels which exist even in the United States, the move into nuclear power does not represent a serious misallocation of research and even of investment. He suggests that perhaps the reason for this is a guilty conscience, as it may be. We are perhaps trying to punish ourselves for having dropped the first nuclear bombs. Propositions of this kind are inevitably highly speculative, but to this reader Novick makes an extremely convincing case. Not being an expert in these matters myself, I cannot check the accuracy of all his details, but if Novick can do for the nuclear industry what Nader has done for the automobile industry, the public good may well have been served. Novick, furthermore, is very moderate in his language and even in his criticisms. He does not rule out the possibility that further research and development may produce nuclear plants that are both safe and nonpolluting, but he makes a very strong case that this happy day is not yet here.

The juxtaposition of these two books raises a question of the utmost importance for the future of mankind. What is it in the training and the life experience of obviously worthy, intelligent, and able men, like Philip Sporn, which makes them so extraordinarily insensitive to the kind of large questions which Novick is raising? Sporn is a suboptimizer; that is, he has spent his life finding the best way of doing certain things. It is clear that a question as to whether these are things that ought to be done has never clouded his judgment. Novick, on the other hand, is an optimizer; that is, he wants the best of all possible worlds in its magnificent totality. If one wants to get any particular thing done, it is obviously the Sporns that we turn to, not to the Novicks. Nevertheless, the conflict between the suboptimizers and the optimizers is perhaps the most fundamental and acute conflict of our own

times, simply because the growing complexity of the world has made sub-optimization 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.

KENNETH E. BOULDING
*Institute of Behavioral Science,
University of Colorado, Boulder*

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 behavioral 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, ink-blot, 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 visual-

ly. 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.

HERBERT LANSDALL
*National Institute of Neurological
Diseases and Stroke,
Bethesda, Maryland*

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—