

Scholar's Progress

Particulars of My Life. B. F. SKINNER. Knopf, New York, 1976. x, 324 pp. + plates. \$10.

The Shaping of a Behaviorist. Part Two of an Autobiography. B. F. SKINNER. Knopf, New York, 1979. x, 374 pp. + plates. \$12.95.

The author is perhaps America's most distinguished and most widely known psychologist; he is surely the most outspoken proponent of his own variety of behaviorism. He has undertaken an expansive autobiography. The first volume gets him at 24 off to graduate school at Harvard (in 1928), and the second ends with him at 44 back to Harvard as a professor. Extrapolating, we may expect another volume covering his professorial years and yet another covering his years of active retirement.

There are several kinds of readers who might be tempted to go through these volumes. Those who are devout "Skinnerian" psychologists may read them just because they always read the word of the prophet. Others, less committed, may read them because Skinner's views have been important and they are curious to see how these ideas evolved. Still others, motivated by idle curiosity, may want to understand how so eminent a scholar became so eminent. Historians of psychology, and of science in general, may hope to find some chronicle of the times or to gain some insight into the conflict of paradigms in which Skinner participated. However, all these readers are likely to be disappointed. The first volume does *not* show a young man becoming a psychologist. That metamorphosis is inexplicable; it happens all at once near the end of the book when the young man happens upon works of Bertrand Russell and John Watson. What the first volume portrays is a very bright and very energetic young man caught in the intellectual confines of a small town (Susquehanna, Pennsylvania). There is a younger brother he loves and an English teacher he bedevils but is fond of. Both die quite young, and for a moment we feel that the author is moved by these losses. But this feeling is soon replaced by the kaleidoscopic impressions of the varied activities of a small-town boy who is into music, literature, and girls. Readers who like small towns, or small-town

boys, will be delighted. They will recognize neighbors and relatives, and old cars and swimming holes, and much of the good old days. They will see the boy grow up in this milieu.

The first volume is well written. Skinner is a surprisingly good writer for an academic—but the style is something unique in biography, I think. Skinnerian behaviorism is objective (nothing but the behavior, please), and so is his story. Skinner's approach to science is inductive (let us gather facts now and theorize later), and his story is like that too. Things happen, people do this and that, they are seen to be happy and angry and so on, but they lack motives. There is no psychological causation. People do not want this or plan that; this and that just happen. We do not see any parental influence; we see only the parent doing this and the son doing that. So the facts are there, the particulars of his life are all described, but there is little sense of drama or narrative. There is no becoming. The reader will not see the boy become a man, or understand why he turned to psychology. It is an interesting literary style.

Part two finds the author at Harvard busily reading Pavlov, Sherrington, Magnus—the classic works on the reflex. Any mentalistic concept was anathema, of course, in this framework. So right from the beginning Skinnerian behaviorism was mindless. Skinner worked with Crozier, of "general physiology" fame, who sought reflexive lawfulness in the behavior of the whole organism rather than in isolated nerve-muscle preparations. Skinner accepted this approach and quickly saw one important implication: Behaviorism should be bodyless as well as mindless. The correlation of stimulus and response was all that mattered. The bodily manifestation of the correlation, that is, the reflex arc, and the mental concomitant of the behavior were both hypothetical and irrelevant to the empirical correlation. It was the lawfulness of behavior itself that provided, or should provide, the data and the substance of psychology. The path that Skinner subsequently cut through the mentalism-mechanism jungle really has been a great contribution, no doubt his greatest.

Skinner's behaviorism was born in 1930, and the birth is well described. But the reader will find relatively little insight here into the later development of his position. The knowledgeable reader will find here very little that he or she does not already know from Skinner's papers published between 1931 and 1937, or even from the sampling of them contained in his book *Cumulative Record*. The second volume is, disappointingly, *not* a history of Skinnerian behaviorism. Rather, it is the story of a bright, energetic, and very ambitious academic on the way up.

Skinner describes in detail the various recognitions he received in those early years from more established workers in his area. But their work and their ideas are not described, nor are they related to his own efforts. Students of Skinner's 1938 book are aware that he was at that time on top of all the relevant literature, but here, it appears, nothing that anyone else was doing was relevant. Younger men and women do not figure in the story at all. Only a handful of Skinner's students are mentioned, and of these only William Estes receives any praise.

Most scholars delight in a meeting of minds, but not Skinner. The historically inclined reader is going to be distressed that Skinner is so reluctant to acknowledge the existence of kindred souls. Indeed, he goes to some pains to prove the insularity of his work and his ideas. There was Tolman, who once taught at Harvard when Skinner was there and who had already arrived at a nonphysiological behaviorism. All we learn about Tolman was that he stole an idea (a trivial notation, actually) without acknowledgment. The really important ideas that Tolman and Skinner shared are lost in the petulant account of the theft. Then there was Skinner's colleague at Indiana, J. R. Kantor, who is treated cordially enough but very briefly. Are we really supposed to believe that Skinner learned nothing or gained nothing from this man who shared so many of his views about a purely behavioral behaviorism?

The depth of Skinner's "I did it all by myself" attitude is revealed in his account of E. G. Boring, who was the head of experimental psychology at Harvard when Skinner was a young man there. It was no doubt Boring's word that got Skinner into graduate school. We are told that it was Boring who later invited him to join the faculty. We also know that it was in part Boring's letters of recommendation that obtained for him various positions, honors, and recognitions—all this in spite of the fact that the older man was deeply committed to an

ideological position quite opposed to Skinner's behaviorism. How does Skinner now regard Boring? He does not tell us explicitly, but he does let slip at one point that Boring's lecture notes were 25 years old; at another point he quotes an early letter in which he had described Boring as a stupid son of a bitch.

There is, indeed, room at the top. In the second volume Skinner, who is a skillful writer, evidently wants us to see how he got there.

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Solid State Systems

Highly Conducting One-Dimensional Solids. JOZEF T. DEVREESE, ROGER P. EVRARD, and VICTOR E. VAN DOREN, Eds. Plenum, New York, 1979. xiv, 422 pp., illus. \$42.50. Physics of Solids and Liquids.

Solid state physics in one dimension has received an enormous amount of experimental and theoretical attention since the synthesis, in the early 1960's, of highly conducting complexes of the organic acceptor molecule TCNQ (tetracyanoquinodimethane) and since the rediscovery, at roughly the same time, of "platinum-chain salts" exemplified by KCP (potassium tetracyanoplatinate). This volume, a compendium of eight chapters by 11 authors, serves as a comprehensive review of the field up to the early part of 1978. Unlike several previously published conference proceedings that it will undoubtedly replace as a convenient reference, *Highly Conducting One-Dimensional Solids* has been planned and prepared in such a way as to give the reader a relatively concise yet comprehensive and balanced perspective of the successes and remaining controversies in the field. The authors, all of whom have worked extensively in one dimension, review in particular detail the experimental work that was performed after 1973 on the organic charge transfer conductor TTF-TCNQ (tetrathiofulvalene-tetracyanoquinodimethane) and its alloys and summarize the concurrent theory that was engendered. The coverage therefore includes the enormous bulge in publication of papers between 1973 and 1976, and the book should prove useful as a reference for workers already in the field, as an introduction for newcomers, and as an informative browse for the casually curious.

TTF-TCNQ first hit the headlines in 1973 when A. J. Heeger and A. F. Garito announced during a meeting of the American Physical Society the discovery, at the University of Pennsylvania, of a huge increase in its conductivity near 60 K. This observation, coupled with the high degree of electrical anisotropy in the material, stimulated feverish activity around the world from California east to Japan and spawned many controversies, some of which are not yet settled. Considerable advances in our understanding of the effects of electron-electron and electron-phonon interactions have been made as a result of the opportunity to apply mathematically tractable one-dimensional models to real materials. Much of this theoretical work on the one-dimensional electron gas is covered in the chapter by Emery, which will serve as an excellent survey for the many-body theorist. Emery also points out the connection between the various exact and approximate solutions and problems in other fields of physics, such as the two-dimensional Coulomb gas and the roughening transition of solid surfaces.

The juxtaposition of the chapters by Heeger and by Schultz and Craven emphasizes a major remaining subject of controversy, namely the role of a collective mode in the electrical conductivity. Heeger lays out the growing body of evidence in favor of such a mechanism, describing the results of many experiments on the electrical, optical, magnetic, and structural properties of TTF-TCNQ. Schultz and Craven take the view that no single model adequately explains the accumulated data. Another controversy, touched on only briefly in the book, concerns the magnitude and importance of the electron-electron interaction compared to the electron-phonon interaction. I would have preferred to see a more extensive discussion of this problem.

The holy grail of this field of study remains the synthesis of a high-temperature superconductor, perhaps employing the excitonic coupling mechanism proposed by Little in 1964 and reviewed in the present volume by Gutfreund and Little. The quest goes on, perhaps in vain, but like the knights of the Arthurian legend (the comparison should not, however, be pushed too far) the scientists involved have achieved much along the way. *Highly Conducting One-Dimensional Solids* is not the final word on the subject by any means, but rather appears as a timely guide to a field of research that is rapidly becoming more diversified. Many important one-dimensional materials, such as the incom-

mensurate-chain compound mercury arsenic hexafluoride and the highly conducting derivatives of polyacetylene, are too recently investigated to be included. Omitted also is a great deal of important work on other charge-transfer organic complexes and the recent and continuing studies of TTF-TCNQ, notably the high-pressure investigations of Jerome and co-workers, which may furnish the conclusive evidence in favor of collective conductivity.

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Earth Tides and Ocean Tides

Tidal Friction and the Earth's Rotation. Proceedings of a workshop, Bielefeld, Germany, Sept. 1977. P. BROSCHE and J. SÜNDERMANN, Eds. Springer-Verlag, New York, 1978. viii, 242 pp., illus. Paper, \$24.

This is an attractive, concise, and remarkably comprehensive treatment of one of the most fascinating and interdisciplinary fields of earth science. To understand the rotation of the earth and the history of the lunar orbit we must delve into history, astronomy, geophysics, geology, paleontology, hydrodynamics, and meteorology. In perhaps no other field is input required from such a variety of disciplines. Relevant subjects include laser techniques for measuring the earth-moon distance, radio astronomy techniques for measuring current changes in rotation rate, ancient solar eclipses, Mercury transits, lunar occultations, and growth periodicities in fossils. The timing and location of ancient eclipses require training quite different from that of the modern astronomer. It is remarkable that in such a small volume most significant aspects of the subject have been dealt with in adequate detail to satisfy both the beginner and the specialist.

The book covers astronomical observations from pretelescopic times to the present. Solid-earth and ocean tides are discussed from several points of view, including their interactions. One of the more intriguing chapters is an attempt by Sündermann and Brosche to calculate tidal friction for ancient oceans. Most of the present tidal dissipation occurs in shallow seas, and changes in the configuration of the continents and in sea level can be expected to change the tidal friction and hence to change the lunar orbit. If such changes did not occur, the moon