

A New Scholarship

Psychology in Twentieth-Century Thought and Society. MITCHELL G. ASH and WILLIAM R. WOODWARD, Eds. Cambridge University Press, New York, 1988. x, 320 pp. \$42.50.

In 1966, Robert Young in a review essay in *History of Science* delivered some stinging criticisms of what he considered the well-intentioned but parochial and amateurish scholarship then characterizing writing in the history of psychology. A plea to catch up with the ideas and standards developed in the historiography of the natural sciences concluded this attempt at consciousness-raising. Some 20 years later, it appears that a "new" history of psychology has indeed emerged. Whatever else, the number of publications in the field has increased dramatically. The current spate of texts and quasi-texts may represent nothing more than publishers' competition for a market, perhaps stimulated by recent recommendations that a history course be included in graduate psychology programs, together with an outbreak of centennials celebrating forgotten events from the early days of the discipline. A bit more mystifying—given the abysmally low subscription count for the one journal focused on the field, the *Journal of the History of the Behavioral and Social Sciences*—is the existence of a market for the surprising number of new monographic treatments of narrower issues, biographies, and compilations.

Going beyond sheer numbers, the new history has heeded the call for more critical and sophisticated scholarship, even if the message has not yet penetrated to all practitioners, especially textbook writers. The main characteristics of this new scholarship appear to be: an awareness of the pitfalls of naively "presentist" approaches; a shift from uncritical reliance on secondary sources and their anecdotes not just to close scrutiny of published originals but to the often laborious sifting of archival source material that may greatly expand and deepen contemporary information; and the asking of new and more interesting questions, largely about the linkages between strictly scientific developments and their personal, institutional, and social-political contexts. This approach took shape in the work of two groups of researchers, one a band of mostly young historians (of science) choosing to apply their skills and methods to the offbeat and unplowed field of psychology, the other a

number of psychologists of various stripes disillusioned with the mainstream's rhetoric about positivist-empirical science and the whiggish tales of its emergence from subjectivity and speculation into the objectivity of experimental facts. One of the first, and controversial, projects tackled the traditional success story of early intelligence testing, which upon close inspection revealed some forgotten but troublesome ties to the ideology of eugenics, racism, and immigration-restriction legislation. Another revisionist effort led to the rediscovery of Wundt's voluntarist psychology behind its fragmented and distorted orthodox rendition shaped by Titchener's and Boring's agendas. Since then the scope of the field has expanded enormously, as the number of its practitioners and with them its research topics have multiplied.

The present volume is an excellent representative of these developments. Put together by two historians, it illustrates the variety of endeavors, in the range of authors, half of them historians, half psychologists, one-third women (though one of them was omitted from the set of capsule biographies on pp. vii–ix), and half born outside the United States; in the variety of methods, from insider accounts and textual exegesis to (mostly) archival research; and in the wide sweep of topics, just half of them having to do with American psychology, stretching all the way from an internalist analysis of a developing research program (Titchener's), through a discussion of the role of women psychologists (neglected), to a quick glimpse at the shifting fate of psychology in the People's Republic of China and a rather offbeat story about two British officers' psychoanalytic practice in colonial India. In the absence of any obvious common focus, the editors' skills and a bit of stretching are needed to pull out some common threads: the course of professionalization and the price the discipline had to pay for it, the question of rationality and scientific progress, and the role of political contexts in the growth or demise of certain orientations or schools.

I shall skip the standard comments about the problems of multi-authored volumes, as I will also omit a catalog of the book's contents and a quick assignment of grades to the various contributions. I should point out that the main arguments of a number of the chapters have already been presented in

other places, which however are less accessible to the non-specialist. And if perhaps not all the contributions provide exciting new ideas, the volume as a whole makes a handy and instructive sampler of contemporary historiography of 20th-century psychology. As such, it should be of interest to a wide audience wanting to update its conception of history beyond Boring's *Zeitgeist* and Kuhn's paradigms and of use as a source of readings in history classes. As for this reader, the volume left me with two troubling thoughts. One came from David Joravsky's fascinating chapter on Vigotskii and Soviet psychology, which raises some provocative issues too complex to restate here but ends in the question why scientific psychologists in the Soviet Union (and by extension in Nazi Germany and perhaps elsewhere) have failed to seriously challenge those in power while creative writers did engage political authority in the "struggle for our souls" (p. 207). The other, related thought involves the direction of the present boomlet in the historiography of psychology. The boomlet began, at least in part, as an attempt to gain some understanding of the discontinuities in the discipline's evolution and of their determinants, and with the hope of playing, by narrowing the gap between scientific rhetoric and human reality, an "emancipatory role," as William Woodward in his concluding chapter (p. 305) puts it. But are such lofty aspirations still relevant, or is instead the field in the process of reproducing its parent discipline psychology in its fragmentation into specialist groups with professional interests, but with little except competitive concerns about each other and the larger issues? In the diversity of its voices, this volume does not provide a clear and reassuring answer.

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The Science of Mind

The Making of Cognitive Science. Essays in Honor of George A. Miller. WILLIAM HIRST, Ed. Cambridge University Press, New York, 1988. x, 284 pp., illus. \$29.95.

The problems of language and cognition have been central to George Miller's research and theorizing throughout his exceptionally productive and creative career. *The Making of Cognitive Science*, edited with care and insight by William Hirst, presents essays by 18 distinguished cognitive scientists who have worked with Miller. The result is a fitting tribute to him and a fascinating col-

lection of empirical and theoretical papers in cognitive science. It provides rich insights into the history of cognitive science, because each contributor describes what the field was like when he or she was working with Miller. And since, as the editor argues, "much of what cognitive science is today could be gathered from an intellectual biography of George," this book illuminates its history in a unique way.

Miller's career can be viewed as a series of empirical and theoretical investigations each of which, as Ulric Neisser and others indicate, has been important to cognitive science. There was Miller's early work on psychoacoustics and mathematical psychology in the late 1940s and early 1950s, the introduction of information theory to psychology and the delineation of constraints on our information processing capacities in the '50s, his development with Eugene Galanter and Karl Pribram in 1960 of a "cognitive" model of human action, his introduction to psychology of Chomsky's transformational grammar, which helped to define the field of psycholinguistics in the '60s, and his work on semantics and "mental dictionaries" in the '70s and '80s. Throughout Miller's entire career there has been a guiding interest in developing a psychologically plausible account of language. He has also helped to make the study of mental life scientifically respectable. Although a few of his contributions are not discussed much in this book (for example, the early work on psychoacoustics and the recent work on mental dictionaries), most of the major periods in his career, the impact they had, and the research they led to are treated in consistently insightful ways and with reminiscences that are usually penetrating and often amusing.

The book is divided into six sections that deal with successive phases of Miller's career and of the development of cognitive science. Part 1 is concerned with mathematical psychology, information processing theory, and the beginnings of cognitive psychology. William McGill illustrates early work in mathematical psychology that he did with Miller and comments in an insightful way on how George collaborated with his students and opened up opportunities to them. The deep respect for Miller apparent in these comments is echoed in several subsequent chapters. Wendell Garner reviews the history of information theory, from its introduction to psychology by Miller and Frick and by Garner and Hake a little less than 40 years ago to the present, and argues (as does Neisser in a later chapter) that the concepts (as opposed to the statistics) that came from it (for example, uncertainty, redundancy, channel capacity, coding, and information

itself) are still central to cognitive psychology today. In a witty chapter Galanter recollects the writing, with Miller and Pribram, of *Plans and the Structure of Behavior*, in which the authors offered a cognitive alternative to the then dominant behavioristic account of human action by stressing the importance of plans, intentions, feedback, and the hierarchical structure of human behavior, and he reflects on how their theory looks today. Roger Shepard presents some elegant multidimensional scaling and hierarchical clustering analyses of two sets of Miller's psycholinguistic data, which contributed to the development of these widely used methods. George Sperling presents a beautiful summary of Miller's classic paper "The magic number seven," which distinguished a domain in which information theory proved helpful (absolute judgments) from one in which it did not (short-term memory). He casts this paper in a historical context—this is one of several chapters in which Wilhelm Wundt emerges as a major figure who anticipated much of what is important today in cognitive psychology and psycholinguistics—and predicts how future work will supplement the theory contained in it. In this section's final chapter Neisser, though critical of mathematical formalism and of the computer simulation of cognitive processes, shows how Miller's early work, as well as that of Bartlett, Broadbent, and Selfridge, provided key ingredients that led Neisser to write his classic book *Cognitive Psychology* (1967), in which he developed the idea that "one could follow the information inward from its first encounter with the sense organ all the way to its storage and eventual reconstruction in memory." He concludes by arguing that early work, including his own 1967 book, did not consider enough the ecological and adaptive factors that influence information processing in the real world, a deficit he has tried to remedy in his recent work.

Part 2 is about the Center for Cognitive Studies, founded in 1960 at Harvard University by Miller and Jerome Bruner. Bruner, a longtime colleague of Miller's and himself a major force in cognitive psychology and cognitive development, describes the conditions that led them to found the Center, where "a new generation of cognitive psychologists, psycholinguists, and cognitive developmentalists was spawned," some of whom wrote chapters for this book. Donald Norman and Willem Levelt describe their perception of what it was like to be young researchers at the Center.

Part 3 of the book concerns psycholinguistics. Thomas Bever and Eric Wanner in their excellent chapters put into historical perspective the attempt by Miller and others

to establish the psychological reality of Chomsky's transformational grammar. They both conclude, among other things, that while there is convincing evidence for the influence of phrase structure (the constituent clauses and phrases of sentences) on the memory and comprehension of sentences, transformational or derivational complexity does not always predict sentence processing difficulty, in spite of the early exciting work by Miller and his students that suggested it did. Jacques Mehler describes his work on comparative (cross-language) psycholinguistics, and Morris Halle presents a new model of phoneme production emphasizing the articulators of speech (the larynx, the soft palate, the tongue, the lips) more than previous models have.

The fourth section treats the mental lexicon. Philip Johnson-Laird describes how his attempt with Miller to write a short paper on the perceptual foundations of some linguistic concepts eventuated in the massive book *Language and Perception* (1976), which established the field of psycholexicology. He recounts how they were led (forced) to postulate a conceptual system between the perceptual and linguistic systems, and how they ultimately analyzed more than 2000 words from various semantic fields into conceptual components. Susan Carey briefly recounts her attempts with Miller and others to study word learning in children within Miller and Johnson-Laird's framework, then summarizes interesting work by herself and others investigating the (perhaps innately determined) constraints on children's derivation of new word meanings. Keith Stenning argues that the study of semantics might bridge the schism between philosophy and psychology.

Part 5 concerns cognitive neuroscience. Michael Gazzaniga tells amusingly of conversations and correspondence with Miller that led to the founding of the Cognitive Neuroscience Institute in New York. Hirst describes work with brain-damaged patients who show mnemonic dissociations that, he demonstrates, illuminate theories of memory. He also provides a brief history of cognitive neuroscience, which is now emerging as an important subfield of cognitive science.

In the last section of the book Gilbert Harman defines cognitive science and describes its recent institutionalization by Miller and himself at Princeton University. He also discusses the problems arising from the fact that scholars coming from different disciplines, and therefore operating within different paradigms, are all attempting to contribute to this field.

In summary, this is an important book about an exciting field. It presents informative histories of many, but not all, of the

subfields of cognitive science: mathematical psychology, information processing, cognitive psychology, psycholinguistics, psycholinguistics, and cognitive neuroscience. It offers insight into the development of the thinking, theorizing, and research of George Miller, who has contributed so much to the advancement of cognitive science, as well as illuminating the development of the chapter authors' work. All in all, it makes for fascinating reading.

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Surface Science

Physics at Surfaces. ANDREW ZANGWILL.
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xiv, 454 pp., illus. \$69.50; paper, \$27.95.

If a fresh surface exposed by cleaving a sheet of mica is sprayed immediately with distilled water, the water seems to disappear as it uniformly wets the surface. If several seconds are allowed to pass before the surface is sprayed, the water will generally bead up in distinctly visible droplets. In that brief interval, organic vapors from the laboratory air have contaminated the surface, profoundly altering its physical and chemical properties. Yet, before 1967, no general method existed by which the surface composition of a solid could be analyzed. The invention of Auger spectroscopy in that year seemed to release a creative force.

For two decades, new surface techniques have been spawned one after another. Driven by these inventions, surface physics has experienced phenomenal growth. Indeed, it is the techniques of surface physics, both experimental and theoretical, that define the field. Such disparate topics as heteroepitaxy of germanium on silicon and the reaction of cyclopentane on platinum, after all, have little in common aside from the fact that both systems have been studied by low-energy electron-loss spectroscopy. It is not, in my opinion, possible to understand surface physics without first understanding the methods of surface characterization.

Andrew Zangwill has taken up the challenge of writing a textbook for surface physics. He has attempted to synthesize this diverse field in just 450 pages, divided into two parts: Clean Surfaces and Adsorption. That is a lot of territory to cover. How did he manage to condense it into a book of such modest dimensions?

A little inaccuracy, it has been said, saves a world of explanation. Zangwill "covers" Au-

ger spectroscopy in a record-breaking three pages and x-ray photoelectron spectroscopy in one paragraph. Field emission is confined to a single sentence in a chapter on kinetics and dynamics. This sort of condensation is not achieved without cost. One winces at the oversimplifications and at the occasional misuse of terminology.

In spite of these flaws, the book does manage to relate an enormous body of knowledge and provide a remarkably current picture of the field. I particularly liked the liberal use of figures taken from the recent literature. The figures serve in many cases to fill in gaps in the text, and they have a way of making the literature more accessible to the student. In some cases the figure captions are too cryptic, but that adds a note of realism.

Zangwill insists in the preface that this is not a textbook in the traditional sense. The field, he says, is too "untidy" for that. Anyone who has attempted to teach a course in surface physics will sympathize with that assessment. But if this is not a textbook, what is it? The question is, would I use this for a course in surface physics? I think good use could be made of parts of it, but it would have to be supplemented heavily in such areas of traditional surface concern as secondary emission and scattering theory.

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Sedimentary Geology

New Perspectives in Basin Analysis. K. L. KLEINSPEHN and C. PAOLA, Eds. Springer-Verlag, New York, 1988. xx, 453 pp., illus. \$64. *Frontiers in Sedimentary Geology.* Based on a symposium, Minneapolis, MN, May 1986.

This significant addition to the literature of "soft-rock" geology derives from a conference of the same title held at the University of Minnesota to honor Francis J. Pettijohn (Ph.D. Minnesota 1930!). Pettijohn came to sedimentary geology with a lifelong passion for field observation (his presidential address before a learned society was "In Defense of Outdoor Geology") and after years devoted to integrating field observation with microscopic and laboratory analysis to unravel the mysteries of the very hard rocks of the Canadian Shield. He should be pleased to have a super-avuncular relationship to this collection of papers by a younger

generation that includes his students' students plus other representatives of a wide spectrum of supporters and admirers. As is pointed out by Harold Reading in his introduction to a group of the papers, the conference and its product represent a return to the Pettijohn-fostered first principles of basin analysis after two decades of fixation on the fluid-dynamic, chemical, and organic processes represented by sedimentary rocks.

Basin analysis concerns the geography that controlled the sources and distribution paths of sediment reaching ancient sedimentary basins and that determined the equilibria (or disequilibria) between the critical rates of sedimentation, sea-level change, and basin subsidence. All of these were governed directly or indirectly by tectonic factors and all were important determinants of the volume, character, and distribution of the basin fill and the fluids it contains.

The book before us contains 21 separate contributions plus brief introductions to four subsets among which the papers are apportioned. As might be expected, the titles of the subsets (Source-Area Characterization, Lithostratigraphy and Chronostratigraphy, Tectonics and Sedimentation, and Precambrian Basins) are not particularly apt descriptors, but the divisions are welcome because each is preceded by a few thoughtful words by its organizer and each organizer has something interesting to say about the evolution of basin analysis and about Pettijohn's role in maintaining a focus on synthesis of significant observations from both field and laboratory.

The individual contributions range in length from a few pages to more than 30; many readers with a driving concern for sedimentary basins will profit from reading almost all of them. Those who are not totally enslaved by the subject but who want a quick and painless short course on forefront thinking on basin analysis will do well to study some of the longer contributions, which are fine review papers to which are added the authors' current pet solutions to major problems.

Many of the mechanisms that drive sedimentary basins (for example the initiation and recurrence of subsidence, sea-level change, and shifts in basin geometry and in depocenters) are incompletely understood. In these circumstances there is an almost irresistible urge toward the development of unique models that satisfy isolated data sets but that lose credibility in application to a wider universe of observations. The editors of this collection are to be congratulated for treating this problem with balance.

Finally, it should be noted that the section on Precambrian basins, included in recognition of Pettijohn's long interest in ancient