BOOK REVIEWS

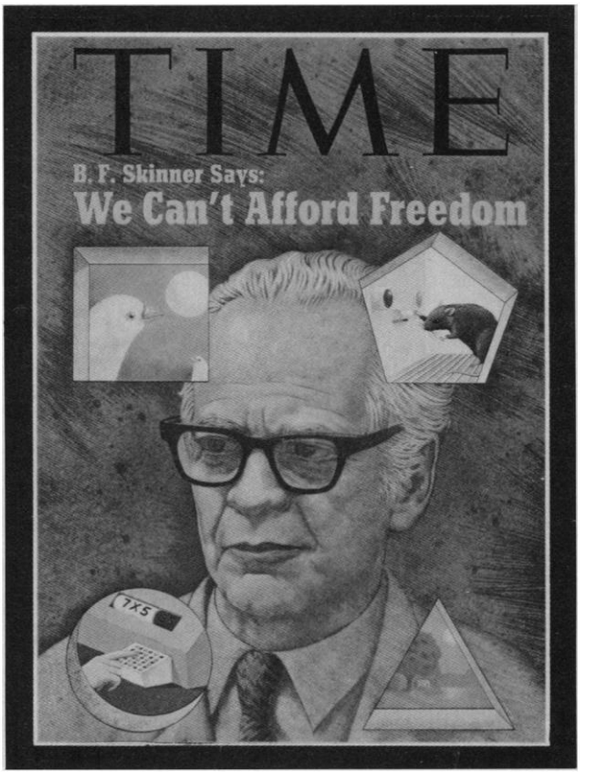
Bold Claimant

B. F. Skinner. A Life. DANIEL W. BJORK. Basic Books, New York, 1993. xvi, 298 pp. + plates. $25.

In 1970 *American Psychologist* rated B. F. Skinner second, after Freud, in influence on 20th-century psychology, and Skinner later boasted to a friend that he surpassed Freud in psychological citations. As an undergraduate at Hamilton College in the 1920s, Skinner made plans to be a creative writer and won praise for his work from Robert Frost, but a post-graduation "Dark Year" of solitary labor in his parents' attic revealed to him that he had nothing to say as an artist, and he self-consciously chose the science of behaviorism as the alternative means by which he would make his place in the world. Once he had found the appropriate outlet for his immense talent and ambition, Skinner enjoyed fabulous success—as a graduate student who developed the most powerful technology for predicting behavior, as a postdoctoral fellow at Harvard supported by the National Research Council and the Harvard Society of Fellows, as a faculty member at the University of Minnesota, as departmental chair at Indiana University, and finally as a Harvard don whose popular writing won a *Time* cover and a vast audience for his provocative thesis that traditional American values of individual freedom were archaic and had to be supplanted by a culture to be designed by behavioral scientists. Despite immense personal success, when Skinner died in 1990 at the age of 86, he thought the prospects for human survival grim and was deeply concerned because students who enlisted in his academic school of operant conditioners were losing the competition for good university jobs to cognitive scientists and other "mentalists" for whom Skinner had complete contempt. Skinner's career offers a case study of scientific creativity, academic politics, and the relationship between intellectuals and American culture.

Thanks to Daniel W. Bjork, a historian best known for works on William James, *the* philosopher of indeterminacy and personal freedom, we now have an accurate and sympathetic biography of our most salient determinist. Bjork had the cooperation of Skinner as well as his family and colleagues. Skinner published a multivolume autobiography and kept detailed notes on his perceptive self-analysis in addition to professional and personal correspondence. Bjork mastered these uniquely rich sources and provides a candid and satisfying biography of Skinner that includes discussion of his sexual conduct, character defects, business failures, and humiliations at the hands of critics. Those who admit to an interest in academic careers will find an irresistible account of a precocious small-town boy's pursuit of fame that would satisfy the expectations of his social-climbing parents as well as his own immense ambition. For historians of psychology, Bjork provides a wonderful account of Skinner, the protégé of the academic maverick William Crozier, challenging and defying E. G. Boring, the chairman of the Harvard psychology department and a figure of international stature, who had good reason to be offended by Skinner's contempt for history and utter lack of deference toward disciplinary canons. When Boring asserted in a five-page critique that Skinner's bold claims for radical determinism would require "more than a paper" but "propaganda and a school" as well, Skinner did not flinch before the ire of the great man but underlined "You need propaganda and a school" and wrote in the margin, "I accept the challenge" (p. 97). To his credit, Boring removed himself from Skinner's dissertation committee, recommended him for jobs, and in 1948 lured Skinner back to Harvard when it became clear that despite "certain inflexibilities and certain immaturities" (p. 167) he was an emerging star whom one had to recognize.

Skinner returned to Harvard in part because the university provided a bully pulpit for his increasingly controversial ideas about social transformation through applied behavioral science. Skinner's early academic success depended on a genius for mechanical invention. As a graduate student he was happiest in the well-stocked departmental workshop, where he was free to "make do" with "shelves of brass and iron wood screws and machine screws and nuts. . . . There were boxes of piano wire with which you could wind springs on the lathe, and shelves of strap and plate brass steel" (p. 80). He constructed an alternative intellectual world out of these materials, first by devising the experimental space that became known as the Skinner box and then by tireless claims that his success in predicting the behavior of white rats revealed the utter poverty of other research strategies. The disillusioned intellectual had found something in which he could believe, operant conditioning, and he promptly insisted that everyone else worship in the same pew. As both friends and enemies observed, Skinner had a habit of claiming universal validity for local successes. His own brilliant experimental work demonstrated that some problems could be attacked most profitably by a strategy of radical behaviorism, but Skinner persistently pushed claims for the applicability of his discoveries to the limits of credibility. Operant conditioning yielded diminishing returns in the laboratory, but Skinner's attention was mainly elsewhere as he informed the *Ladies' Home Journal* (1945)



The cover of *Time*, 20 September 1971. [From *B. F. Skinner*; copyright 1971, Time Inc.; reprinted by permission]

that he had invented a climate-controlled baby tender that would revolutionize child-rearing, published *Walden Two* (1948), a utopian novel describing the better world to come through proper community design, confronted the educational establishment with claims for the efficacy of programmed learning, and challenged all Americans in *Beyond Freedom and Dignity* (1971), which seemed to dismiss the intellectual legacy of William James and John Dewey.

While Bjork provides a fascinating description of the career of this controversial "social inventor," he does not have a strong interest in the sociology of knowledge, and he tends to accept without challenge Skinner's perception of himself as a pure scientist who gazed at nature without flinching. Those who want guidebooks to the critical analysis of the academic culture in which Skinner flourished may turn to the different history of psychology provided in Kurt Danziger's *Constructing the Subject: Historical Origins of Psychological Research* (1990), John M. O'Donnell's *The Origins of Behaviorism: American Psychology, 1870–1920* (1985), *The Rise of Experimentation in American Psychology* (1988), edited by Jill G. Morawski, or *Metaphors in the History of Psychology* (1990), edited by David E. Leary. Bjork's traditional biography is a welcome introduction to B. F. Skinner, the man and the scientist.

James W. Reed
Department of History,
Rutgers University,
New Brunswick, NJ 08903

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Scanning electron micrograph of the nacreous surface of the mollusk *Atrina*. Magnification, ×2000. [Courtesy of Jon Didymus, University of Bath, United Kingdom]

Molecular Materials

Inorganic Materials. DUNCAN W. BRUCE and DERMOT O'HARE, Eds. Wiley, New York, 1992. xiv, 543 pp., illus. $99 or £58.

To many scientists the term "inorganic materials" refers to solids such as ceramics and metals that typically are prepared at high temperatures and exhibit low solubility in conventional solvents. The increasing interest in molecule-based chemistry has led to the development of a plethora of new materials, many of which are described in depth in *Inorganic Materials*. The volume covers the technologically important class of materials with "cooperative" properties, that is, properties that are consequences of the entire solid, not of its individual components. Such materials are extremely rare in molecule-based systems, but some organometallic and metal-coordination complexes as well as organic materials prepared by the methodologies of organic chemistry do exist. The book includes substantial chapters on superconductivity (Cassoux and Valade), ferromagnetism (Kahn, Pei, and Journaux), and nonlinear optics (Marder) that offer the reader a state-of-the-art view of these areas of research.

The marriage of molecular organic chemistry and classical inorganic materials has produced the hybrid area of intercalation compounds. O'Hare's chapter on the intercalation of layered materials ranging from metal dichalcogenides to clays provides a fine overview of this fascinating chemistry. Intercalation involves the interleaving of molecular species with layered solids or the filling of voids in framework structures. Intercalation materials can exhibit a wide array of properties including superconductivity, metallic conductivity, semiconductivity, ion exchange, and catalytic behavior. Catalytic behavior is emphasized in McCabe's chapter on clay chemistry, which includes a survey of clay-mediated organic reactions.

Electroactive metal-containing polymers, including metal-like conducting polymers with and without metal ions, are covered by Kellogg and Gaudiello, who provide a succinct discussion of characterization methods for their physical (but not mechanical) properties that complements the chapters on intercalation and superconducting materials. The only polymer characterized by molecular weights is covered in Bruce's comprehensive chapter on liquid crystals that contain metal ions, which includes an informative survey of organic liquid crystals and methods of characterization.

An especially thought-provoking chapter on biomaterials, emphasizing their low-temperature crystal growth (biomineralization), has been contributed by Mann. Here a myriad of biominerals that contain calcium or iron are profiled, leading one to envision many possible new materials. Success in mimicking the in vivo crystal growth of these minerals undoubtedly will lead to new generations of materials with specifically engineered properties.

The use of metal-containing volatile compounds as precursors to elemental and binary, and to some extent ternary, semiconductors as well as oxides such as superconductors is the basis of O'Brien's contribution, which clarifies the requirements for precursors, especially single-molecule precursors. Many illustrative examples are provided.

This collection unfortunately lacks cohesiveness and could have benefited from an epilogue tying the subject matter together and placing inorganic materials in the context of materials in general. Nonetheless, the individual reviews are timely, self-contained, and up-to-date and will be of value to researchers in chemistry, physics, and materials science.

Joel S. Miller
Department of Chemistry,
University of Utah,
Salt Lake City, UT 84112