analysis of civic science and scientists he even transforms social history of science into urban history. Despite occasional signs of hasty revision, this book is therefore essential reading for those interested in science in its urban locale while it also reveals how by 1906 Schuster could justly affirm to Rutherford that "Manchester is not at all a bad place."

J. B. MORRELL
Undergraduate School of Studies in Social Sciences, University of Bradford, Bradford, West Yorkshire BD9 4AE, England

Science für das Volk

Scientific Materialism in Nineteenth Century Germany. FREDERICK GREGORY. Reidel, Boston, 1977. xxiv, 280 pp., illus. Cloth, $28; paper, $13.50. Studies in the History of Science, vol. 1.

Historians of science normally take little interest in the German Revolution of 1848. It was a straightforward political episode in which middle-class liberals riding a wave of popular social discontent tried to wrest a share of power from Germany's entrenched aristocracy. The movement failed—some say it was talked to death by lawyers and professors—and authoritarian governments cracked down. For the next decade, politically minded liberals were left with little to do, but many of them apparently chose to spend their time reading about science. During the 1850's, a number of popular science journals were founded, and several writers made national reputations by expounding scientific ideas before a general audience. The tone of this literature, skeptical and irreverent toward established belief, was often materialistic in a philosophical sense. However, the authors were not philosophers, and they had little interest in philosophy for its own sake; they were scientists or scientifically trained men who hoped to forge their special knowledge into an ideological weapon against the status quo. Ludwig Büchner, the most popular of these writers, explained the matter simply: "The public is demoralized by the recent defeat of national and liberal aspirations and is turning its preference to the powerfully unfolding researches of natural science, in which it sees a new kind of opposition against the triumphant Reaction."

This scientific materialism of the 1850's, typically German in its origins and motivation, has attracted little attention from American scholars. Now, however, Frederick Gregory has produced a thorough study of the intellectual leaders of the movement, detailing their lives and careers and analyzing the significance of their ideas. His *Scientific Materialism in Nineteenth Century Germany* focuses first on Ludwig Feuerbach, the philosopher whose assault on Hegel's idealism set the stage for the materialists. Gregory then concentrates on three men, Karl Vogt, Jacob Moleschott, and Ludwig Büchner, the most prolific and most characteristic representatives of the materialist school. He indicates some of the variety possible in materialist thinking by describing the atypical views of Heinrich Czolbe. Finally, he discusses at length the implications of this German materialism for philosophy, biology, and social thought. Throughout the book, Gregory is sensitive to the political background of his subjects' thinking, and he offers a wealth of personal detail about each of them. The emphasis, though, is on polemical argument, the ideology that the German materialists fashioned out of the science of their day.

The doctrines worked out by Vogt, Büchner, and Moleschott assumed the form of a naive realism that regarded the things of this world to be very largely what they seem to be. The materialists bridled at Kant's notion that the ultimate constituents of the world might remain in principle unknowable; for them, there existed no *Ding an sich*, no category of being that was inaccessible to empirical investigation. One had only to experiment and observe, and all truth would eventually be perceived. Confident in this faith, the materialists brought the average German reader a world picture of mechanistic determinism in which rigorous laws of cause and effect governed all things from the motions of atoms to the thoughts of men. In doing so, they paid special attention to the biological sciences. All the materialists had studied medicine and were engaged in either medical practice or biological research. Those were years in which German physiologists were making rapid progress in relating life phenomena to physical and chemical processes. The materialists naturally made much of these developments. For them, physiological research proved that all human activities could ultimately be explained in terms of physical causation, a position summed up in Karl Vogt's blunt assertion that the brain produces thought much as the kidneys produce urine. Most practicing physiologists were far more cautious, preferring to restrict their comments to known mechanisms and declining to speculate about the ultimate basis of life and thought. Still, in spite of their crudity—or perhaps because of it—the materialists contributed much to the widespread enthusiasm for science that existed in mid-19th-century Germany.

When measured against their ideological goals, the accomplishments of the materialists seem more uncertain. Vogt, Büchner, and Moleschott were concerned not merely to popularize science but to harness it to an ideological purpose, the cause of radical liberalism and democracy in Germany. Here they faced the objections of philosophical critics who wondered how any moral purpose could truly be derived from the materialistic determinism they espoused. Even more concretely, they were challenged by the Prussian Army physician Heinrich Czolbe, who proceeded with a rigor that matched their own to derive a conservative, authoritarian message from his view of science. Gregory also observes that German socialists have paid more attention to scientific materialism than liberals have. He might further have noted the materialistic influence on technocratic *nur-Wissenschaftler*, who have indiscriminately served successive German regimes, unconcerned about the political uses made of their scientific work. In practice, then, scientific materialism has been turned to many ends that would have appalled Vogt, Büchner, and Moleschott. The ease with which science can be reconciled with diverse ideological positions suggests a notable weakness in the thought of the materialists and underlines the perennial value of alert philosophical criticism—precisely the kind of criticism Gregory offers in this book.

WILLIAM MONTGOMERY
American Philosophical Society, Philadelphia, Pennsylvania 19106

Miescher and Successors

A Century of DNA. A History of the Discovery of the Structure and Function of the Genetic Substance. FRANKLIN H. PORTUGAL and JACK S. COHEN. MIT Press, Cambridge, Mass., 1978. xiv, 384 pp., illus. $17.50.

The authors of *A Century of DNA* set themselves the ambitious task of tracing the long history of investigations surrounding "the greatest discovery in biology in this century." They have followed the development of knowledge of the chemistry of DNA from the initial discoveries by Friedrich Miescher in 1869 to Watson and Crick's famous achievement establishing a three-dimensional structure that provided also a compelling