paleontologist, small-plane transport may be commonplace for those who can afford it, and radio and even telephone may be within close reach of field sites—Mary could be rescued by son Jonathan when suddenly struck with illness at Olduvai, and Richard could be summoned within a few hours from Nairobi to Koobi Fora to share in the thrill of a new discovery or in the attempted rescue of a lost and dying co-worker. But roads are often still little more than tracks that become impassable for weeks or months at a time, and researchers are halted temporarily or even permanently by snakes, elephants, lions, malaria, or other illnesses; one can still experience with awe a blackened night sky studded with thousands of brilliant light points over a campsite, savor days at a time uninterrupted by a single jarring phone call, experience wonder-tinged annoyance at sleep interrupted by elephant stomach-rumbles or the thrill of sharing the daily, casual company of evolution's most improbable products. To those who have ever caught the African "bug," this book has a feel of timelessness as well as of history told.

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Vignette: Realism vs. Antirealism

What is the relation between our knowledge and the world? There is, of course, a well-developed debate on this topic in the philosophy of science that goes under the heading of "scientific realism," but this debate translates the question into a very limited and intransigent form. Traditional philosophy works within the representational idiom, and the space in which it can take on the realistic problematic is exhausted by knowledge (empirical and, especially, theoretical) on the one side, and the world itself on the other. And just about the only philosophical question that can be constructed in this space is, does scientific knowledge mirror, correspond to, represent truly, how the world really is? . . .

In these debates, the realists have on their side our routine tendency to see knowledge as transparent, and our tendency to respect the hard work of well-funded communities of clever people. . . . The antirealists, though, are in possession of a single, apparently unstoppable argument . . . . Barring mystical revelation or divine inspiration, science is generally regarded as being the best knowledge we can have of how the world really is, so that it is impossible to imagine going behind the scenes of science to check whether science has, in this instance or that, got it right.

—*Andrew Pickering*, in *The Mangle of Practice: Time, Agency, and Science* (University of Chicago Press)

Demythification

Nazi Science. Myth, Truth, and the German Atomic Bomb. MARK WALKER. Plenum, New York, 1995. viii, 325 pp., illus. $28.95.

Germany has never produced or possessed nuclear weapons, and if Germans ever eagerly wished to have them it was in the late 1950s, in the context of the Cold War, not in Nazi times. Why, then, does a book that devotes only a few of its pages to German research on nuclear fission during World War II bear a title such as this one does? The title, it seems, is for selling, not telling. Yet this title *is* telling: as symbol, the atomic bomb is one of the great fascinations of the second half of this century, and "Nazi" denotes another. Further, the title is itself a piece of symbolic politics, for the book appears to have been produced with some haste, quickly enough to come out somewhere near the 50th anniversary of the Hiroshima bomb. Meanwhile we are becoming aware that these words, these symbols, and these fascinations—especially those with horror as the associated affect—have their own life and history. Walker's book is, in part, a step toward the analysis of this history. But it is only a step, and only in part.

In 1989 Walker published the standard account of the German fission project, *German National Socialism and the Quest for Nuclear Power* (Cambridge University Press), and in 1993 he edited, with Monika Renneberg, the best collection to date of papers on "Nazi science," *Science, Technology, and National Socialism* (Cambridge University Press). Thus he knows what and how science was done in Nazi Germany. But his new book does not deal with Konrad Lorenz's ethology emerging in the framework of Nazi ideology, or with breeding research and race theory, or with experiments on humans in concentration camps the results of which were used in later physiological literature. Neither does it deal with calculation of orbits for the V-2 or—except for the few pages on Heisenberg's uranium pile—with other R&D for the German military. In this book, then, Walker is not telling us about Nazi science but is concerned with—and involved in—symbolic politics. The two names occurring most frequently in the book are those of Werner Heisenberg and Adolf Hitler. Here you have the clash of symbols: the genius of pure science and the genius of extreme political evil.

In his introduction Walker complains that the standard interpretations of this era in the history of science are cast in terms of black and white—approaching every actor with the question "Nazi or anti-Nazi?"—and he sets out to show how broad is the gray zone between these extremes. His objects of study are Johannes Stark, the Nobel laureate in physics notorious for his advocacy of a racially defined "German" physics; the Prussian Academy of Sciences and its progressive nazification; and, with the focus on Heisenberg, the German atomic physicists involved in fission research. Not surprisingly, practically every person and every institution is shown to be in an ambiguous position, neither purely good nor purely evil.

Regarded as an attack on the persistent myth of heroes and villains in the history of science, the book gains coherence. Stark, the Prussian Academy, and Heisenberg have been paradigmatic objects of such simplistic judgment. The great scientist—Heisenberg—is not (at least not in print, not in any medium accessible to "the children") to be associated with bad politics or doubtful moral conduct. And the renegade scientist—Stark—has to be nothing but bad so that the good guys can be made to look nothing but good. Finally, the institution of high reputation and long tradition—the Prussian Academy—is to be seen as merely a victim of political pressures from the outside intruding violently into the peaceful and unpolitical sphere of scholarship. Those are the ahistorical myths of science, concentrated in symbolic names and words that signify only purity and innocence and their opposites.

Walker's best demythification is the story he tells of Heisenberg's lectures in foreign countries. In 1936–37 Heisenberg was attacked by Stark as the "white Jew" of physics. Thus being politically suspect he was frequently denied permission to travel

abroad. During the war, however, he was able to rehabilitate himself politically, in part through his leading role in Germany's "uranium club" and in part through lending himself and his international renown to Germany's program of cultural domination of the countries it had conquered. By the later years of the war he had become a sought-after and politically well accepted "good-will ambassador" of the Reich. In this role Heisenberg sought good relations with his colleagues in occupied countries, to whom he was frequently of help because of his high standing with the German authorities. But those same colleagues deeply resented his easy acceptance of his role as official representative of the occupation authorities and their program of cultural imperialism, and "Heisenberg was either unable to understand or unwilling to confront the cause and effect of this alienation" (p. 179). Certainly not an ardent Nazi, Heisenberg had fought for recognition and gained his position by collaboration with the political authorities—a "fellow traveler" indeed.

Following his two chapters on Heisenberg the traveler, Walker sets out to attack the central myths: (i) the "polemic" legend, created primarily by the Dutch-American physicist Samuel Goudsmit, that only incompetence prevented Heisenberg and his colleagues from having built a bomb for Hitler; and (ii) the opposing "apologetic" legend, created by Heisenberg and his colleagues (preeminently, theoretical physicist Carl Friedrich von Weizsäcker), that it was their own morally inspired resistance that prevented Hitler from having the bomb. Walker carefully follows the creation and transformation of these myths and also shows the changing functions they served as historical circumstances changed.

Walker is attacking a mythology at the core of which lies the "purity" of science. In this mythology the name "Heisenberg" stands for great and true science, and the purity of science requires that this bright name not be tarnished: Heisenberg could not have served Hitler and must not be described as "fellow traveler." Yet this label does apply, and, Walker maintains, the "overwhelming majority of German scientists" were "fellow travelers" of the Nazi regime. In so contending, Walker sees himself as violating a "taboo." Is he really? Certainly for two generations, that of those who as adults lived through the Nazi era and that of their immediate students, any non-ideological, open-minded and critical consideration of the nature and extent of scientists' collaboration with that regime was indeed taboo. Some 25 years ago, when I began to do research on mathematics in Nazi Germany, I was warned: If you do not tell the story simply and clearly in the accepted terms—good versus evil—you will have no academic career. I have told another story, and still I have had a career. But others did not. Thus I very much like Walker's dedication of his book "to all those critical voices who have tried to illuminate this ambivalent chapter of history, but were unappreciated, ignored, and discouraged."

But today? Is hero-worship still so ascendant that younger physicists could not bear a historical narrative in which Hitler and Heisenberg play their actual historical roles, one that admits all the intermediate shades of gray, and not only black-and-white contrasts? Even if in the popular mind such polar idealizations still have a strong hold—as we have recently seen once again with the publication and reception of Thomas Powers's *Heisenberg's War*—has not the self-image of science changed significantly in the meanwhile, now being such that not-so-pure involvement with politics, salesmanship, and simple human weakness are allowed, even for the heroes?

There is another object of implicit attack in Walker's book: historiography of science that does not take notice of the vast and sophisticated literature on Nazism produced by general historians. This has indeed been a deficiency in historiography, but here too the case has altered in the last decade, as the contributions to the collection edited by Walker and Renneberg two years ago well illustrate. In this new book—which largely collects and reworks papers Walker has previously published—he also provides excellent historiography in this sense. Notwithstanding some questions that might be raised regarding particulars, these studies are carefully researched, well written, and give well-informed interpretations.

All this conceded, the book remains, in the view of this reviewer, misconceived. Walker's topics are dictated by the politics of symbols. But if we want to understand "Nazi science," or the relation of science with politics, and with destruction, in the 20th century, we must go beyond symbolic oppositions. It is, I think, of little interest to evaluate once again Heisenberg's conduct in the face of Hitler. We should rather be examining the actual integration of scientists, in their work and its results, with this political regime—as Walker himself did so effectively in his previous book. Walker's historical analysis now of the myths around the "German atomic bomb" is certainly an important achievement. But if the historian himself finds the siren of symbols irresistible, that very circumstance should remind him that merely to confront myths and symbols with historical reality is likely to avail little. Indeed, such a tactic can also contribute to the revitalization of the very myths he is targeting. Rather, we should approach such myths and symbols on a different level of analysis, posing the question why such legends are so persistent and why those words are still so fascinating. Tell, to be sure, revealing stories opposing the myths with reality, but at the same time explain how and why the myths and symbols work as they do.

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Books Received

Adhesion of Microbial Pathogens. Ron J. Doyle and Itzhak Ofek, Eds. Academic Press, San Diego, 1995. xxx, 600 pp., illus. $89. Methods in Enzymology, vol. 253.

Biochemistry of Cell Membranes. A Compendium of Selected Topics. S. Papa and J. M. Tager, Eds. Birkhäuser, Cambridge, MA, 1995. x, 365 pp., illus. $149. Molecular and Cell Biology Updates.

Calcium Regulation by Calcium-Binding Proteins in Neurodegenerative Disorders. Claus W. Heizmann and Katharina Braun. Springer-Verlag, New York, and Landes, Austin, TX, 1995 (distributor, CRC Press, Boca Raton, FL). xii, 133 pp., illus. $69. Neuroscience Intelligence Unit.

The Dying of the Trees. The Pandemic in America's Forests. Charles E. Little. Viking Penguin, New York, 1995. xii, 275 pp. $22.95.

Ecodemia. Campus Environmental Stewardship at the Turn of the 21st Century. Julian Keniry. National Wildlife Federation, Washington, DC, 1995. xvi, 224 pp., illus. Paper, $14.95.

Fungus Diseases of Tropical Crops. Paul Holliday. Dover, New York, 1995. xvi, 606 pp. $22.95. Reprint, 1980 ed.

Galileo and the Church. Political Inquisition or Critical Dialogue? Rivka Feldhay. Cambridge University Press, New York, 1995. viii, 303 pp., $54.95.

HIV Infection in Children. A Guide to Practical Management. Jacqueline Y. Q. Mok and Marie-Louise Newell, Eds. Cambridge University Press, New York, 1995. xiv, 313 pp., illus. $59.95.

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Local Order in Condensed Matter Physics. S. D. Mahanti and P. Jena, Eds. Nova, Commack, NY, 1995. xii, 264 pp., illus. $98. From a symposium, Jekyll Island, GA, June 1993.

The Making of Man-Midwifery. Childbirth in England, 1660–1770. Adrian Wilson. Harvard University Press, Cambridge, MA, 1995. xii, 239 pp., illus. $35.

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Of Bicycles, Bakelites, and Bulbs. Toward a Theory of Sociotechnical Change. Wiebe E. Bijker. MIT Press, Cambridge, MA, 1995. x, 380 pp., illus. $35. Inside Technology.

Publishers' Addresses

Below is information about how to direct orders for books reviewed in this issue. A fuller list of addresses of publishers represented in *Science* appears in the issue of 26 May 1995, page 1220.

Plenum Publishing Corp., 233 Spring St., New York, NY 10013–1578. Phone: 800-221-9369; 212-620-8000. Fax: 212-463-0742.

Simon and Schuster, 200 Old Tappen Rd., Old Tappen, NJ 07675. Phone: 800-223-2336; 201-767-5000. Fax: 800-445-6991.