

with rationality, but a scientific leader has to learn what limits the effectiveness of scientists when they venture outside their labs—irrationality, passions and the weight of history. (“My whole life since I left my parents’ nest has been an education in irrationality,” said Baltimore at his Caltech inauguration.)

This lesson is strikingly different from that which emerges from the lives of biologists such as Max Delbrück, Salvador Luria and François Jacob, who belonged to the generation that preceded David Baltimore. In their day, scientific rationality was intimately linked with political passions and the flux of history. But the times were different: Theirs was a period of what Thomas Kuhn called revolutionary science. When David Baltimore entered biology, the molecular revolution was over: Now the goal was to unravel molecular complexity, not to prove its existence. In this highly readable book, Crotty shows how efficiently Baltimore did precisely that. —*Michel Morange, Biology and Center for the Study of the History of Science, Ecole normale supérieure, Paris*

The rDNA Debate

The Recombinant DNA Controversy: A Memoir. Science, Politics, and the Public Interest 1974–1981. Donald S. Fredrickson. xx + 388 pp. ASM Press, 2001. \$39.95.

On a balmy summer evening 25 years ago, I wedged myself through the doors of the packed City Council Chambers in Cambridge, Massachusetts, to witness what I knew would be a historic event. Scientists were testifying before elected officials on the future of research using recombinant DNA (rDNA) technology. Specifically, they were considering whether a moratorium on rDNA experiments that were considered to pose moderate to high risks should be extended and should apply to newly redesigned biological containment facilities. Maxine Singer, who had cosigned the letter in *Science* that had first raised concerns about the research, was there to deliver newly released National Institutes of Health (NIH) guidelines for rDNA experiments and to quell the fears of city officials, socially concerned scientists and lay citizens who were skeptical about the protections the guidelines afforded.

The controversy in Cambridge was a microcosm of a debate that began in



Protesters at the National Academy of Sciences forum on recombinant DNA research, held March 7–9, 1977. From *The Recombinant DNA Controversy*.

1973 and continued for several years. At the center of the firestorm was NIH director Donald S. Fredrickson, who took up his post in July 1975 unprepared for the intense politics of the affair and the inordinate amount of time it would consume. *The Recombinant DNA Controversy*, Fredrickson’s remarkably detailed and frank memoir of the period, interweaves his personal diary notes with accounts in NIH documents and scholarly works. What we get is an insider’s view of the politics behind the issuance and revision of the first NIH guidelines for rDNA research.

The recombinant DNA wars, as they have been called, had an enormous impact on many sectors of society, including the courts, Congress, the executive branch, interagency committees, foreign governments, the National Academy of Sciences, professional societies, the new biotechnology industry, university scientists, local governments and the media. Twelve bills were introduced in Congress, guidelines went through endless drafts, and local and state laws were enacted.

Fredrickson helps us understand the internecine struggles that ensued within governmental agencies when the clash of principles sparked intense emotions. A main battleground was whether to have regulations or guidelines. The prospect of regulations was anathema to scientists, because regulations cannot be as easily modified and would shift authority from scientists to regulators and from the NIH director to the secretary of Health, Education and Welfare (HEW). Fredrickson was convinced that guidelines were preferable “if the process could be controlled by the scientific community.” Molecular biologists, who

were concerned about the risks of the research, fought to be the ones who defined “responsible behavior.”

Fredrickson describes the difficulty he had appeasing Secretary of HEW Joseph A. Califano, Jr., to whom he reported, while protecting the interests of the largely NIH-funded scientists he represented. When Califano declared that he wanted broader citizen participation on NIH’s Recombinant DNA Advisory Committee (RAC), many in Fredrickson’s scientific constituency were ready to stage a palace revolt. The RAC was expanded from 11 to 25 members, who were to include 7 to 9 nonscientists. In an editorial in *Science*, Singer questioned whether the new, expanded RAC would serve science and the public interest. In a response, which he decided not to send for publication, Fredrickson wrote: “When the non-expert is unable to comprehend so much of the details, his ‘public policy role’ must be performed in the midst of the experts. Here, at the least, the layman is in a position to see if the experts appear to be listening to each other and paying attention to the evidence.”

As a RAC member in the early years, I observed that the nonexpert lawyers, philosophers and public health specialists did significantly more than merely judge the scientists’ listening abilities. The presence of those who were not genetics experts infused the debates with a healthy skepticism, raising the level of discussion regarding weight of evidence, acceptable risk and accountability.

Fredrickson, who believes strongly in the meritocracy of science, had to find a way to reconcile that meritocracy with democratic traditions. In his re-

sponse to Singer's editorial he wrote that "it is disappointing that an elitist image of science, including a sacred right of self-determination in technical matters, should be cast as the ultimate argument against the new use of the guidelines. It seems to me that the survival of the elite in our time must depend more on the ability to accept popular challenge to self-determination and to win arguments in the open on the merits of the case."

Many poignant issues debated in science-policy circles take concrete form in Fredrickson's account. Setting up advisory committees is a political action. The framing of issues and screening of committee members are keys to maintaining control over the process. Fredrickson discusses the strategy he developed with the "Kitchen RAC" (a small group of loyal advisors) of keeping high-profile scientists on the committee with a goal of dismantling the guidelines and neutralizing the voices of the more cautious dissenters. He analyzes the debates within the executive branch over the environmental impact assessment of the NIH guidelines as a test case for the fledgling National Environmental Policy Act.

In 1978 Fredrickson prophesied that the NIH guidelines would one day be regarded "as an aberration of the late 20th century." His book illustrates the delicate nature of the relationship between science and society. He takes justifiable pride in the transparency of the policy-making process that he oversaw—meetings were open, a complete record of the proceedings was published in the *Federal Register*, and public letters and meeting minutes were compiled into telephone directory-size volumes. But there was one exception to this openness: The affiliations of RAC members with commercial biotechnology companies, known to NIH officials, were not made public until the companies issued publicly traded stock.

Looking back, Fredrickson sees the controversy surrounding rDNA research as a "dangerous overreaction" to theoretical risks raised by honorable scientists. Nonetheless, he stands apart from many of his colleagues in acknowledging the salutary effect of the strong public reaction. "When science makes moves that can be interpreted as threatening to the public welfare," he notes, "it is proper and necessary for other citizens to provide the 'turbulence' necessary to give them access

to the full intent and meaning of the science."

This book adds a unique interpretive voice and new information to the historical record of the rDNA controversy.—*Sheldon Krinsky, Urban and Environmental Policy and Planning, Tufts University, Medford, Massachusetts*

MEDICINE

Combating Fat

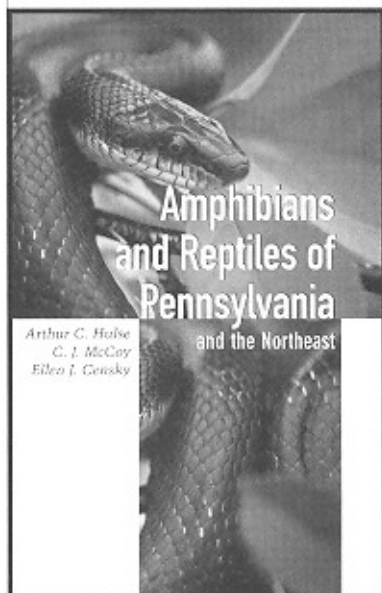
Fat: Fighting the Obesity Epidemic. Robert Pool. x + 292 pp. Oxford University Press, 2001. \$27.50.

In *Fat: Fighting the Obesity Epidemic*, Robert Pool sets out to do for modern obesity research what Natalie Angier did almost two decades ago in *Natural Obsessions* for the molecular genetics of cancer and the discovery of oncogenes: He puts a very human face on scientific discovery and offers non-specialists, and even nonscientists, an opportunity to learn about the entire history and current status of the field while vicariously enjoying the thrill of discovery. The book thus belongs to a genre represented at its pinnacle by James Watson's *The Double Helix*.

There are many fascinating stories in the history of obesity research, and Pool tells several of them quite well. He describes much of the medical and psychological thinking about obesity over the past century, such as the rise and fall of the *externality hypothesis*—the notion that the obese overeat because they are inherently more sensitive to certain external cues than to internal physiological ones. He also discusses the fabulous physiological experiments by A. W. Hetherington and Stephen Ranson, Jules Hirsch, and Rudy Leibel, which demonstrate that energy stored in the form of fat tissue is homeostatically controlled by the hypothalamus. This work shows that the brain actively attempts to reestablish homeostasis by adjusting metabolism and hunger, driving an individual who has lost weight back to his or her prediet weight. Thus it explains why so few people who lose weight are able to keep it off over the long term.

Pool then discusses the history of research on the genetics of obesity in the mouse. Through a series of interviews with Douglas Coleman, he provides some insight into the tremendously

Amphibians and Reptiles of Pennsylvania and the Northeast



Arthur C. Hulse
C. J. McCoy
Ellen J. Censky

- Contains complete and easy-to-use keys to all the reptiles and both the adult and larval amphibians of the Northeast.
- Features high-quality photos to illustrate all species of amphibians and reptiles in the region as well as their significant color variations and life history stages.
- Includes detailed spot-distribution maps of each species within Pennsylvania and outline maps of each species' distribution throughout the northeastern United States.
- Presents extensive new data on the status and distribution of the amphibians and reptiles of Pennsylvania.

Comstock Books in Herpetology
Aaron M. Bauer, Consulting Editor

83 maps, 42 line drawings, 57 tables,
32-page color insert, \$39.95

Cornell University Press

www.cornellpress.cornell.edu

At bookstores, or call (800) 666-2211