Military Patronage

Science and the Navy. The History of the Office of Naval Research. HARVEY M. SAPOLSKY. Princeton University Press, Princeton, NJ, 1990. xvi, 142 pp., illus. $34.95.

The Office of Naval Research (ONR) has a reputation in scientific circles as the most enlightened supporter of basic scientific research among the federal mission agencies. The reputation lingers from a golden age, 1946 to 1950, when ONR was waggishly called the Office of National Research. The National Science Foundation was struggling to be born, and the Navy took up the slack, providing munificent and virtually unrestricted support for basic science in America's leading universities.

Two explanations of ONR's behavior are usually advanced. Some argue that the Navy in World War II had come to see science as the reservoir of knowledge from which future technical advance would flow; it behooved all agencies of government to feed this reservoir. Others have argued, perhaps more cynically, that the Navy simply wanted to coopt a new source of power to serve its own institutional interests, that is, to militarize science.

Both views are myth, according to Harvey Sapolsky, professor of public policy and organization and director of the Defense and Arms Control Studies Program at the Massachusetts Institute of Technology. The real reason for ONR support of basic research, Sapolsky argues, was a "bureaucratic accident." Admiral Harold G. Bowen, the founder of ONR, wanted an institutional base from which to build a nuclear-powered fleet. The Army, which had controlled the development of nuclear power during the war, was guarding the new technology closely; Bowen hoped to get at the knowledge through the Manhattan Project scientists who were then returning to their universities. As it happened, Bowen was outmaneuvered bureaucratically within the Navy, but the staff that remained after his early retirement turned his institutional creation into an "enlightened, if initially purposeless" funding agency. The Navy failed to notice.

This kind of candid and revealing institutional history has become something of a hallmark of Sapolsky's work. His 1972 study *The Polaris System Development*, done like the present work under Navy sponsorship, revealed among other things that the highly touted and widely emulated PERT (Program Evaluation and Review Technique) system was more a public relations ploy to deflect meddling congressmen than a system for actually managing the development of large-scale technology. Comparable revelations grace this latest study.

But there are reasons to be disappointed with this book, as many students of government science no doubt will be. It is painfully brief. It is late, appearing a full decade after the research began. It relies on interviews with 250 scientists, military officers, and government officials, but gives no specific sources, promising only that Sapolsky's records of the interviews "will be preserved and made available for inspection by interested scholars" at some indeterminate future time. Finally, and perhaps most substantively, the book never makes clear exactly what ONR did, except distribute money. Chapter 5 promises to treat "the research successes and failures of ONR," but focuses instead on "managing naval science," providing a comparative study of ONR and other government programs in support of science. This is interesting and informed analysis, but not what many scholars will look for in a book with this title.

These shortcomings, however, are far outweighed by the book's virtues. Sapolsky casts his subject in the broadest context of science policy, a topic he knows well. He examines basic versus applied research, geographical distribution of research funds, the politicization of science, and the formulation and execution of science policy throughout the government since World War II. He reports with insight and candor how and why ONR and its related Naval Research Advisory Committee functioned as they did. And he reveals with his accustomed iconoclasm that the ONR experiment was both more and less than the legend that grew up around it. Along the way he has some home truths for scientists as well as for government bureaucrats and politicians.

Sapolsky argues that the military services were never convinced of the efficacy of science, not even in the warm afterglow of World War II. Whether they ever bought into technology is another question, but according to Sapolsky they established institutional connections with science that allowed them to keep the scientists and their work subordinated to military purposes as defined by the military. Vannevar Bush's idea of an autonomous science was never realized (fortunately, according to Sapolsky). And the scientists did precious little to resist the trend. When the political winds blew ONR toward more directed research, the scientists let it go. When university campuses turned on the military, the grantees who had benefited from ONR support went quietly to their offices to fill out grant applications to NSF or NIH. The two sides conspired to dig the chasm that Sapolsky now sees between science and the military, a hole into which free societies run the risk of falling.

Nor is the danger to society the only hazard in this record. Sapolsky believes that academic scientists have paid a high price for their estrangement from the military. They have ended up chasing other rationales for government largess—space exploration, the environment, energy, cancer, AIDS—engaged in "an endless search for objectives." It is not clear, Sapolsky argues, that these other objectives provide either motives or agendas for basic research that are superior to those of the military. Sapolsky's message, then, is not just a lament that the golden days of the ONR passed away, but that the scientific community was implicated in their passing and is much the poorer for the loss. That theme alone makes this thin book provocative and important beyond its size.

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Particle Astrophysics

The Early Universe. EDWARD W. KOLB and MICHAEL S. TURNER. Addison-Wesley, Redwood City, CA, 1990. xxii, 547 pp., illus. $48.50. Frontiers in Physics, 69.

Often remarked upon, by now to the point of becoming hackneyed, is the connection between physics at the very smallest scales—manifested in high energy particle theory and experiment—and physics at the very largest scales—theoretical and observational cosmology. Repetition makes this connection no less profound, however. Only dimly suspected a generation ago, it is now taken as fact by most cosmologists and particle physicists that the gross nature of the universe today, both its chemical composition and its aggregate structure, was determined at very early times by processes