parts, may be due to more stringent selection by early mortality in the black population. The broader base of social support available to the black oldest old, who, like their white counterparts, have often outlived the capacity of spouses, siblings, and children to care for them, holds lessons for all of us.

The book presents a number of frustrations to the reader. Several of the chapters were written (and published elsewhere) to report very early findings from the surveys and have not been updated to reflect later survey waves. At the very least, allusions to the policy context for the data, for example current spending on Medicare and Medicaid, should have been revised from 1983 and 1984 levels. With income and assets so important to the well-being of the elderly and so sensitive to cohort effects, it is unfortunate that the chapter on economic resources relies on 1984 income data. The definition of the oldest old, although usually meaning those 85 and older, is taken as 80 and older in some reports, hampering a comprehensive view of the population. The Grade of Membership technique, used in several chapters, is a method of identifying types within a population (for example, the most likely combinations of mentioned causes of death or of personal characteristics and functional limitations) that is not widely used and will not have been encountered by the average reader. The presentation of findings relying on this method is quite opaque and does little to increase insight or suggest policy responses. A chapter on the politics of aging, in a jarring shift of tone, presents a diatribe against those who pit generations against each other rather than recognize that the young will one day become the old and that allocation of resources over lifetimes is a legitimate problem.

What can we draw from such a compendium to inform our response to the challenge of an aging population? Unfortunately, casting the findings about our elderly as epidemiological science diverts attention from the impact of public policies on almost every aspect of these data. For example, the transition to institutional care is an important outcome for the elderly. But Medicaid and other state policies shape the configuration of long-term care in every state, so that the probability of use of an institution depends not only on personal health characteristics but on whether the individual lives in Nevada, with 27 nursing-home beds per thousand elderly, or in Minnesota, with 89. The chapter by Pamela Doty on international comparisons of institutional use begins to address the context of these rates. In like manner, though health status may depend largely on personal factors, it is also affected by access to health services, which varies by location and economic status and over time. During the time covered by these surveys, the rate of hospitalization of the elderly has shifted by diagnosis, as hospitals have responded to Medicare's Prospective Payment System and many surgical procedures have been moved to outpatient settings. How has this affected observed health services use, and how will future developments, such as ongoing increases in Medicare provision of skilled care at home for beneficiaries needing it and shifts in access to physician services under the 1991 Medicare fee schedule, affect the health status and survival of the oldest old?

Statistics from these surveys are being used by proponents on many sides of policy debates, and projections must be viewed with healthy skepticism. The actual and potential effects of public policies and unmeasured social trends must be considered along with the cohort effects stressed here, and it should be recognized that relatively small shifts in the definition of population subgroups (the disabled, the institutionalized, the cognitively impaired) can transform what may be a gross exaggeration to an equally perilous minimization of future needs. Projections of mortality and disability may be sensitive to technical longitudinal survey issues, like the treatment of nonrespondents (who may be more likely to be nonsurvivors).

It is an opportune time to highlight the diversity of the elderly, especially the oldest old. Our health sector, so much under attack for its high cost, should get at least some credit for their growing numbers. We need not be simply overwhelmed by the future burdens the statistics in this volume seem to foretell. Findings about the correlates of healthy aging support better education for our young people and promotion of healthy behavior for everyone. Functional disability is clearly not a necessary accompaniment of advanced age, and identification of the health events that lead to disability should direct health technology development and provision of high-quality primary, acute, and long-term care. The current policy debate is being waged by those who may be among the oldest old in 2020 or 2030. Stereotypes about old age and fears concerning potential cost of health and other care for these survivors can only be countered with knowledge, informing personal and public plans for the next generations of elderly, and for ourselves should we by good fortune enjoy long life.

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R&D Powerhouses

The Cold War and American Science. The Military-Industrial-Academic Complex at MIT and Stanford. STUART W. LESLIE. Columbia University Press, New York, 1993. xvi, 332 pp., illus. $42.

The impact of the predominantly military funding of research and training in the physical sciences and engineering at the Massachusetts Institute of Technology and Stanford University during the Cold War years is examined in this valuable, informative, and well-written book by Stuart W. Leslie, a historian at the Johns Hopkins University. The two institutions form prime subjects for such scrutiny—MIT because it emerged from World War II as the nation's largest university defense contractor and remained at that rank, Stanford because, although a minor player in the wartime mobilization of science, it deliberately sought to emulate MIT and succeeded handsomely.

Leslie's story nominally begins with World War II, but he enriches his tale by reaching back into the prewar decades, sketching the engineering enterprises at each institution, their connections with industries such as aeronautics and electrical power, and the eagerness of both to become first-class in physics. Although the Depression stifled such ambitions, World War II revived them. After the war, faculty and administrators at MIT, which had been home to wartime research on microwave radar, obtained rich support from the armed services for an interdepartmental program on all phases of microwave electronics. Louis Smullin, who ran the postwar microwave tube laboratory at MIT, later remarked, "We were the real war profiteers; there's just no question about it" (p. 27).

At Stanford, the drive to follow MIT's

Frederick L. Terman, "the father of Silicon Valley, greets two of his most famous former students, David Packard (left) and William Hewlett (right). Terman wanted to build up an independent West Coast electronics industry and strongly encouraged his students to go into business for themselves. He often invested in these start-up companies and served on their boards of directors. Terman's investments, personal and financial, paid big dividends for the economic growth of the region and for [Stanford] university, where the names on the buildings read like a who's who of Stanford Engineering alumni." [From *The Cold War and American Science*; Stanford University News and Publications Service]

"Instrumentation Laboratory workers watch as Cambridge police clear the streets of antiwar protesters on November 5, 1969. Though police quickly routed the demonstrators, sit-ins, teach-ins, and similar events focused national attention of military-funded research at MIT, and ultimately led to MIT's divestment of the Instrumentation Laboratory." [From *The Cold War and American Science*; MIT Museum Collections]

example in exploiting postwar opportunities came from Frederick L. Terman, who in the 1930s had taken a Ph.D. in electrical engineering at MIT and during the war had run the major radar countermeasures laboratory, at Harvard. Back in Palo Alto, Terman adopted a policy of what Leslie calls "steeple building"—raising towers of excellence in selected fields—and erected his first steeple in microwave electronics, where military support would be abundant and could be used for education and research. By 1950, electrical engineering at Stanford was pulling even with that at MIT.

Drawing on Stanford and MIT archival records, interviews, and the growing secondary literature on the history of postwar science and engineering, Leslie authoritatively recounts the ventures in microwave electronics at the two institutions and further programmatic developments at each, including electronic detection and antiaircraft control, missile guidance and instrumentation systems, supersonic fluid dynamics, nuclear science and reactors, atomic clocks, high-powered klystrons, and linear accelerators. All of them were militarily oriented and supported, and Leslie helpfully sets their origins in the context of larger trends—for example, in the 1950s, Atoms for Peace or the stepped-up commitment to a missile program—in national security policy.

Leslie manages to keep straight the dizzying array of special laboratories and centers that were established at the two universities to house and foster these various branches of research. Indeed, he provides illuminating historical sketches of facilities such as MIT's Lincoln Laboratory, which originated in a request from the Air Force in December 1950 for work on air defense, and the pioneers who built them—for example, Charles Stark Draper, the founder of the Instrumentation Laboratory at MIT, a brilliant, hard-drinking, no-nonsense innovator of inertial guidance devices who would constantly stalk the laboratory peering out from under a green visor to check that all was going right. By 1969, the Instrumentation Laboratory's annual budget totaled $54 million, a sum equal—not counting the budget of the Lincoln Laboratory—to the budgets of all of the rest of MIT.

MIT and Stanford became powerhouses in the new branches of engineering and physics that the military generously supported. Although a number of the laboratories and projects were classified, they provided ample opportunities for unclassified training and thesis-writing for hundreds of doctoral students—and also advanced instruction for staff from military agencies and industrial firms. Professors and students together produced an enormous amount of significant research and a panoply of textbooks that quickly became classics. The Stanford and MIT programs spun off knowledge and trained people who turned the knowledge into a plethora of new companies. By the early 1960s, the Instrumentation Laboratory alone had stimulated the formation of 27 firms, with 900 employees and total sales of $14 million, and Stanford Industrial Park, which bordered the campus on university land that had been designated for the purpose with Terman's strong encouragement, had 27 tenants, with some 8600 employees.

Yet in Leslie's view, all the triumphs and achievements cost Stanford, MIT, and even the nation at large a great deal—the militarization of engineering and much of physics. He argues that the faculty bargained away their academic independence in favor of "an academic program directed by the demands of its sponsors" (p. 74). By this he means that faculty research subjects became predominantly military in orientation, that military considerations insinuated themselves indirectly—in the types of topics emphasized—into graduate and undergraduate curricula, and that the environment of classified laboratories and big money for military contracts bred a pro-military pecking order on the campuses. As Leslie writes of physics at MIT, "Younger people could see who got ahead and who did not, and that more often than not the fast track ran toward the big defense projects, military advisory boards, and consulting for major defense contractors" (p. 148). According to Leslie, MIT and Stanford graduates diffused their acculturation to military ends and military technologies through the system of high technology, helping to foster what Leslie regards as among the worst consequences of the Cold War—"our scientific community's diminished capacity to comprehend and manipulate the world for other than military ends" (p. 9).

One is inclined to think that matters were more complicated. An unspoken premise of Leslie's argument is that in the absence of military patronage engineering and physics would have proceeded along a different route, that the ubiquitous military patronage perverted these fields from some presumably more socially or commercially useful course. Yet he

omits serious examination of what that course might have been—neglects, for example, to deal in any depth with the question, If not microwave electronics, what instead? Then, too, Leslie treats the military as a faceless, autonomous entity, uninfluenced in its R&D policies by the scientists and engineers whom it was supporting. In fact, academic physicists and engineers lived in symbiotic partnership with the military, helping to shape defense agency research programs as advisers and consultants and using military support to pursue their own purposes.

In retrospect, the military's salient presence on the campuses appears chilling in many respects, not least to the idea of an open university. (A high official in the electronics program at Stanford noted, without irony, that not much was secret about the program's activities, since virtually all the faculty and a third of the students held security clearances.) However, it is not necessarily the case that a heavy emphasis on defense R&D in and of itself is crippling to American civilian competitiveness, even though Leslie is in good company these days in advancing that view. After all, at least through the 1970s military R&D seems to have spun off a good deal into the civilian sector, including jet transports, navigation systems, microelectronics, semiconductors, and computers. To understand why that spinoff worked so well then—and apparently has not in recent years—requires close examination of all that figures in the translation of innovation into commerce, including not only the modes of R&D that Leslie so ably illuminates but the patterns of public and private investment, incentives, and markets in which those modes are imbedded.

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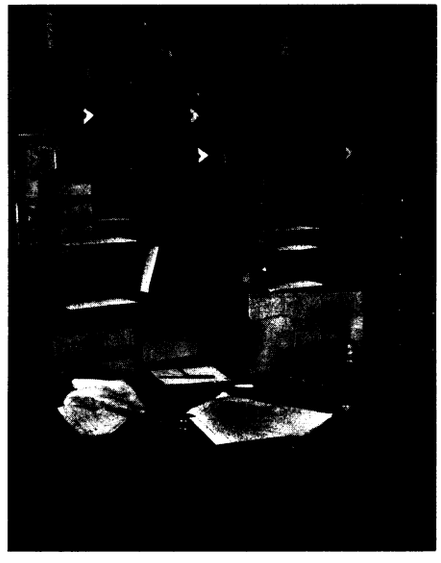
Naturalist Administrator

Spencer Baird of the Smithsonian. E. F. RIVINIUS and E. M. YOUSSEF. Smithsonian Institution Press, Washington, DC, 1992. xii, 228 pp. + plates. $29.95.

Spencer Fullerton Baird (1823–1887) served as assistant secretary and then secretary of the Smithsonian, as head of the U.S. Fish Commission, and in numerous other central administrative capacities. These facts suggest that studying his career can tell us much about American science and its setting, yet he is one of the architects of American science who have not yet received much attention. Dean Allard began to look at Baird in a 1978 book documenting his role with the Fish Commission but did not proceed to a full biographical study. Fortunately, Rivinius and Youssef have begun that work. They have used the rich collections at the Smithsonian Archives, as well as their own familiarity with the Smithsonian and its history, to produce a valuable introduction to this important figure. They describe and analyze the man as well as his administrative work, painting Baird as human and fallible in some respects even while he seemed superhuman in others.

Portrait of Baird from a cigar box, "indicative of the popular esteem and recognition accorded him during his career." [From *Spencer Baird of the Smithsonian*; Smithsonian Institution]

Baird began his naturalist career as a socially well-placed boy in rural Carlisle, Pennsylvania. There he loved observing and collecting and also developed what Rivinius and Youssef see as his compulsive need to drive himself—perhaps sublimating other physical drives—with extremely long walks in the country. Though real (that is, paying) jobs pursuing these interests were practically nonexistent, Baird did manage to secure a teaching position at his alma mater, Carlisle's Dickinson College. There he continued his collecting. In the naturalist tradition, he also established his requisite network of correspondents with whom to exchange specimens, information, advice, and influence. In the process he became, as Rivinius and Youssef put it, a "collector of collectors."



Spencer Baird's desk—a "Wooton Patent Secretary"—at the Smithsonian Institution. "On the desk are personal Baird memorabilia from the national collections, including . . . two volumes of *A History of North American Birds* . . . and a white cloth napkin reportedly used by Napoleon I at his breakfast on the morning that he left the Island of Elba. How this last item came into Baird's hands is a mystery." [From *Spencer Baird of the Smithsonian*; Richard Strauss, Smithsonian Institution]

Turning that influence and the political clout offered by his family and that of his new wife (Mary Helen Churchill) to good effect, Baird gained perhaps the one paid position in the federal government in 1850