of power and influence in the courts of England, Bavaria, and France. A colonial country schoolmaster at 18, he was a fellow of the Royal Society at 27, a knight at 30, and a count of the Holy Roman Empire at 39. From major of the American colonial militia he climbed to lieutenant general and chief of the Bavarian general staff with a permanent British colonelcy and nearly a dozen civilian offices taken in along the way. All the while he pursued the scientific and technical researches that brought him membership in most of the scientific societies of Europe and led ultimately to his spending his final years among the savants and intellectual salons of Napoleonic Paris.

Sanborn Brown has spent several decades tracking down the documentary records of Rumford's career, and now after many articles and an edition of Rumford's collected works he has chosen to concentrate here upon the man rather than the scientist. The result is a detailed chronological narrative that retraces much of the ground covered by George Ellis a century ago. Many of the same letters and diary notes are quoted—but more selectively—and many of the same well-worn anecdotes are repeated. Nonetheless, this book is far from a mere rehash of Ellis's very Victorian biography. Brown has searched out and reexamined the original sources and has found much to add to the file. But more to the point, Brown's "warts and all" portrait of Rumford is often sharply at odds with Ellis's Victorian apologia. As Brown notes early on, "Count Rumford was a man with more faults and failures as well as more successes than most" (p. vii), and faults rather than successes tend to dominate this biography. Rumford was certainly a man of obstinate self-assurance, and he combined a compulsion to succeed with a ruthless opportunism. But he was also greatly talented, and, though Brown makes this latter fact apparent, it is often obscured by a relentless scrutiny of motives as well as actions. Thus at the end we are left wondering just what was the attraction that drew attention and support to Rumford throughout his life.

Science and technological innovation were, of course, an intimate part of Rumford's life, and Brown introduces them at the appropriate chronological moments in his narrative. Unfortunately, this approach results in the least satisfactory part of the book. Present-mindedness and passages that read uncomfortably like extracts from an elementary general science lecture detract from the already skimpy and sometimes logically disconnected discussion of Rumford's science. His inventions, particularly those dealing with the efficient utilization of heat and fuel, fare better. They are treated in more detail and with greater clarity than the purely scientific work, and numerous illustrations complement Brown's discussion.

On balance, this is a rather uneven but valuable and interesting book. Certainly it is not the final word on Rumford's scientific work, nor is it intended to be, but it will provide a useful context for such an assessment. And if, as I suspect, Brown is a bit hard on Rumford's character, he no doubt comes nearer the truth than did Ellis. At all events, this is a refreshing change from scientific heroes and hero worship.

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Formative Efforts in American Science

The Sciences in the American Context. New Perspectives. Papers from a meeting, Boston, Feb. 1976. NATHAN REINGOLD, Ed. Smithsonian Institution Press, Washington, D.C., 1979. iv, 400 pp. Cloth, $19.95; paper, $9.95.

In 1838, Joseph Henry wrote from Princeton to a friend: "We will not now be so remote a province of Great Britain in reference to literature and science as we have been." Henry was both wise in his assessment of America's status in world science and prescient. If the American Revolution had broken the colonial status of the former British dependencies, the young American nation still remained in some measure a cultural colony. This state of affairs is particularly noticeable in science and medicine, for scientific institutions and communities after the Revolution were in most states relatively meager, nonexistent, or pale images of British models. Early-19th-century America had other priorities; the building of the infrastructure of American science remained sluggish while nation-forming proceeded apace in other sectors. It was not until after the Civil War and the turmoil of reconstruction that the rapid development of science and scientific institutions became highly visible. It required a new America—urbanizing, industrializing, modernizing—and a new conception of science. Looking forward to the 20th century, Americans began to see science and the scientific community as organizable, constructible, and producible. America began to march in double time to scientific and technological pre-eminence.

For the 1976 bicentennial celebration Nathan Reingold, editor of the Joseph Henry Papers, organized a session for the AAAS meeting to highlight what he calls "a notable upsurge in research in the history of the sciences in the United States." The papers included in this volume are wide-ranging, differing in style and substance and (as always in such collections) in quality. The result, however, is a sensible, useful, and sometimes provocative volume that both scientists and historians can read with profit.

What unites the papers (some of which have been published elsewhere) is their common attention to the institutions and communities of science from the post-revolutionary era on, reaching, just a bit, toward the period after the Second World War. Reingold opens the book with a sweeping overview of the past two centuries, describing what he sees as a tension between the scientific elite and the "mass community" resulting in a research ideal that remained, "despite all the exertions of many generations of scientists," a blend of theory and practice. The first group of authors describe the nature and growth of the scientific-technical infrastructure during the 19th and early 20th centuries in certain special areas. William Goetzmann calls attention to the "second great age of discovery" and the role of American scientists and others within it; Stanley Guralnick argues against undervaluing the role of the college (both ante- and postbellum) in fostering science; Charles Rosenberg underscores the importance of agriculture in the growth of science in America; and Kendall Birr provides a useful review of the rise of industrial research. Robert Post, Deborah Warner, Bruce Sinclair, and Steve Pyne all contribute interesting essays on the earlier period.

The changing basis for support for scientific work commands the attention of several contributors. Stanley Coben documents the post-World-War-I ways and means of large foundation support for research and teaching, without entering the deep waters of their effects upon science or upon American life. Robert Kohler, on the other hand, treats Warren Weaver and the Rockefeller Foundation as an active force in the formation of a scientific subdiscipline, molecular biology. Spencer Weart's interesting essay, "The physics business in America, 1919–1940," provides a statistical recon-

naissance of physics during periods of boom and bust and argues that academic physics rode out the Depression surprisingly well.

Finally, two contributors address part of the sea change that occurred between science and the federal government during and after the Second World War. Caroll Pursell's all too brief essay on the Office of Scientific Research and Development raises the important question of the continuities and divergences between the pre- and postwar scientific establishments; Harvey Sapolsky's short essay, "Academic science and the military," illuminates the skeleton in academic science's closet. He traces the roots of each group's search for isolation, a situation that serves, the author says, neither the nation nor its defense.

This collection is doubtless valuable to the historian; whether the essays within it separately or collectively are "unmistakable harbingers of a vastly altered history of science" is less clear. Garland Allen's paper, "The rise and spread of the classical school of heredity, 1910–1930," goes some distance in attempting to integrate the conceptual and the social; Rosenberg's paper and to some extent Kohler's provide useful pointers as well. But even the best of the others have little to say about the disciplinary component of the scientific enterprise. Their contribution remains within the still "externalist" tradition of the history of American science. One need not be a seer, however, to predict that Reingold's hopes for an integrated, "contextualist" approach are coming to realization.

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An Institution for Rational Amusement

Mr. Peale's Museum. Charles Willson Peale and the First Popular Museum of Natural Science and Art. CHARLES COLEMAN SELLERS. Norton, New York, 1980. xiv, 370 pp., illus. $14.95. A Barra Foundation Book.

When in 1786 Charles Willson Peale, portraitist of the Founding Fathers, announced in the newspapers that, "ever desirous to please and entertain the Public," he would convert a part of his Philadelphia house into "a Repository for Natural Curiosities" where citizens might observe "the Wonderful Works of Nature," he assumed a new career. But he was only championing the republican experiment in a new way. With his exhumation five years later (in the country's first organized paleontological expedition) of the very nearly complete skeleton of a mastodon, and its mounting and display, the museum came to be, with Niagara Falls, one of the nation's great attractions. Eleven feet at the shoulder, the skeleton stood as the New World's refutation of the Old World's slander that the American climate was deleterious to life. But the "mammoth" only heightened the patriotic note conveyed in the museum's depiction of the inalterable laws of nature that underpinned the new political system.

Peale was at pains to exhibit his specimens in a reconstruction of their natural habitats and to arrange them according to the Linnaean system. These innovations, which, taken with his practice of exchanging specimens, made him the father of the modern natural history museum, offered entertainment enough. Public curiosity thus piqued, public education might begin, for *rational* amusement was the aim. In the euphoric years of early republicanism, how could Peale foresee that learning and amusement would not forever jog along together in harmony?

Three abundant generations of Peales and assorted relations labored at the museum, and with relish. The swelling flood of donations and exchanges pushed it into ever larger quarters until in the magnitude of its collections it had no peer at home or even, it might be said, abroad. In his lifetime Peale succeeded in holding to the scholarly course he had laid down and brought out the five-legged, six-footed, two-tailed cow giving milk to a two-headed calf only on special request. Fearful of entrusting his educational enterprise to his talented but miscellaneous sons, in old age he sought to sell it to government. When federal, state, and local declined in succession and on his death in 1827 the sons took over after all, the unusual cow predictably appeared with increasing frequency and P. T. Barnum stood by to pick up the pieces. In more ways than one Peale's museum thus established the pattern that natural history museums in America would follow in the future.

But for 40 years the long rows of glass cases, the gaslit illumination of the laws of nature, had been a national wonder. Late in his career Joseph Henry recalled his first youthful visit to Mr. Peale's museum "with a vividness which will be among the last to be obliterated by advancing years." That Henry also had firmly, if futilely, opposed burdening the Smithsonian with a museum suggests that he had followed with interest Peale's attempt to educate an equalitarian people in science.

Written with authority, sensitivity, and humor, *Mr. Peale's Museum* is a handsomely illustrated biography of an institution that amused, amazed, inspired, even educated a generation of Americans, not least the family who created and maintained it.

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First ticket to Peale's museum, etching by C. W. Peale, 1788. [Elise Peale Patterson de Gelpi-Torro; reproduced in *Mr. Peale's Museum*]