Together these two books begin to provide a novel and important account of how American professional science was formed. If the high elites of that science found models and inspiration in Europe, the experience of a sparsely settled continent of endless diversity was equally important in defining American realities. The rich history of American professional science—itself a kind of last frontier—is now beginning to be opened up. The works under review conclusively show how important and unexplored is the terrain of the mid-19th century. In the bicentennial year it would be churlish to welcome too loudly this move away from traditional preoccupations with colonial science. One may perhaps be allowed to hope that these pioneering reports will encourage other historians to venture into the real virgin territory—that of American science *since* the Civil War. It is after all not outrageous to claim that it is only in the 20th century that American professional science has found its true significance. Today both the German universities and the British Association have long ceased to offer tempting models to a professional community deeply absorbed in the elaboration and defense of its own styles of complex enterprise. As yet we understand little of how those styles evolved. We possess not one scholarly general history focused on the period since the Civil War. Still, there's much to recommend beginning history at the beginning. And now, thanks to Kohlstedt and Rossiter, we can do that for American professional science.

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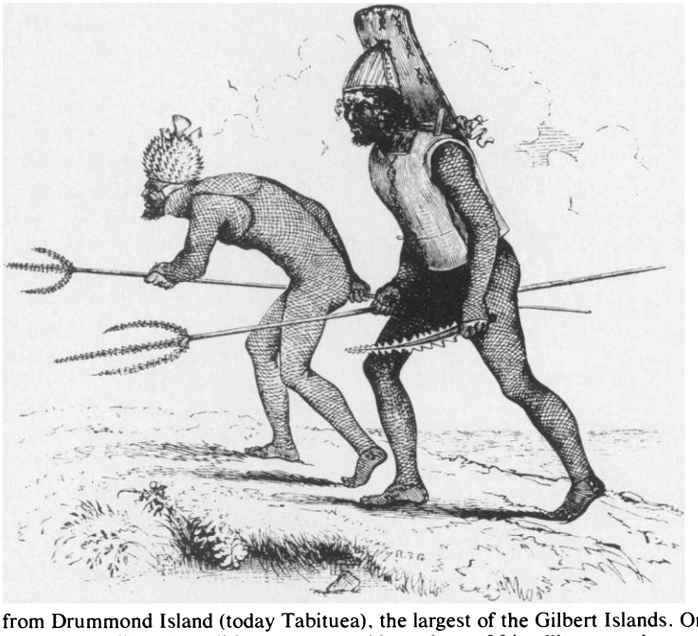
An Unlikely Success

The Great United States Exploring Expedition of 1838–1842. WILLIAM STANTON. University of California Press, Berkeley, 1975. x, 434 pp., illus. $14.95.

The United States Exploring Expedition of 1838–1842, often called the Wilkes expedition after its commander, Charles Wilkes, was America's first attempt at systematic scientific exploration. In this book Stanton has provided a splendidly readable account of the expedition's four-year circumnavigation of the globe. The book originated in self-indulgence, he says, and he claims for it only that it should be seen as "an exercise in the picaresque." But that is all false modesty. Stanton is instead absorbed with the dynamics of able leadership and with presenting history in a manner that is both vigorous and urbane. To see what he is really about, one has only to compare his version of any given event during the expedition's cruise with the same event in David B. Tyler's *The Wilkes Expedition* (published by the American Philosophical Society in 1968 and, except as the source for a single illustration, curiously unnoticed by Stanton). The urge for strong characterization and a fast-moving narrative occasionally leads Stanton astray, but he tells the story very well and I regretted coming to the end.

The motivations for a scientific expedition to the Pacific Ocean formed a curious medley. In the first instance, the voyage was proposed to verify the idea, put forth by John Cleves Symmes, Jr., a former army captain from Ohio who was regarded by his supporters as "the Newton of the West" and promoted as "a standing refutation to the notion that Americans who went West reverted to 'savagism,' " that the earth might be hollow at the poles. But there were also commercial interests to be served; the China trade and the whaling industry, in particular, demanded a better knowledge of the Pacific basin. And where business pursuits led, political concern followed—especially in the major island groups and on the northwest coast of North America. Finally, and the loudest of the arguments, there was the matter of national pride. Could the United States continue its slavish dependence on British sea charts? Did not equal standing in the family of nations call for an American contribution to the world's store of knowledge? In an era when government support of science in the United States was a novelty, all these ambitions were required to defend such an unparalleled raid on the public treasury.

The cast of characters was a similarly strange mixture of foot-dragging politicians, jealous naval officers, and frustrated scientists. Charles Wilkes, the protagonist, is described as a Captain Queeg type—a martinet of limited talents who feared that others were always plotting against him. He imagined himself better suited than more experienced officers to command the expedition because of greater scientific knowledge, but in the judgment of the enterprise's civilian scientists, he displayed an outright con-



Warriors from Drummond Island (today Tabituea), the largest of the Gilbert Islands. On arriving at the island the Wilkes Expedition was greeted by a show of friendliness on the part of the natives. Later, however, a shore party was "promiscuously huddled" by a crowd of natives: "The women were decidedly pretty and their gestures alarmingly provocative as they sought to attach themselves to the explorers. . . . One could hardly take offense at this sort of welcome, but the explorers soon discovered that while the women dallied, the men were efficiently picking their pockets." A battle ensued. The native warriors retreated, but only after standing their ground "with a boldness that astonished all." The visit to Drummond Island was not without its satisfactions for the explorers, however. For navigating the archipelago they had had only an incomplete chart based on Duperrey's exploration of the area in the *Coquille* in 1824. On making their own survey they discovered that the chart "was a poor piece of work. The Frenchman had somehow got the lagoon on the wrong side of the island."[From *The Great United States Exploring Expedition of 1838–1842*]

tempt for science. Indeed, what with petty disputes and missed opportunities and the loss of men and ships that seemed a mark of the expedition's leadership, the wonder is that anything was accomplished at all.

And yet, the great U.S. Exploring Expedition proved a considerable success. It established America's political and military interest in the Pacific and, by virtue of important contributions to knowledge, it also established the nation's claim to intellectual maturity. In fact, so great was the number of specimens brought back, a generation of scientific activity was required to analyze them. Publishing the results involved some of America's best talent—Asa Gray, James Dwight Dana, Horatio Hale, and Charles Pickering—though in a final piece of lunacy Congress authorized the printing of only a hundred copies. At the beginning the scientists had been powerless to control the shape and direction of the expedition, but a decade later, when it came time to make sense of the collections, Wilkes had no one else to turn to. By that process, the United States and its scientists gained a reputation. However, Stanton argues, the expedition's legacy was more than the careers it advanced or the institutions it created. At a time when democracy seemed to portend cultural mediocrity, the expedition proved that the life of the mind had found a place in American society.

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Colonial Science Elsewhere

Scientists in Nineteenth Century Australia. A Documentary History. ANN MOZLEY MOYAL, Ed. Cassell Australia, Melbourne, 1976. viii, 280 pp. Paper, $5.95 Australian.

Science played a major role in bringing the English to Australia. The justification for Cook's voyage can be traced back to 4 December 1639, when Jeremiah Hurrocks became the first man to predict the occurrence of and to observe the passage of Venus between the earth and the sun. Following on the suggestion of another Englishman, Halley, that transits of Venus could be used to determine the distance of the sun, the British awaited the subsequent transits of 1761 and 1769 with considerable national interest. Two expeditions were mounted to observe the 1761 transit; one party went to St. Helena, where observations were marred by clouds, and the other sailed for Sumatra but was waylaid by the French and never got there. Given that no further observations would be possible until 1874, even greater significance was attached to the 1769 expedition. Suffice it to note here that Cook was dispatched to the South Pacific, that he successfully observed the transit at Tahiti, and that on his way home he discovered the east coast of Australia.

In the book under review, patterned on Nathan Reingold's *Science in Nineteenth Century America* (Hill and Wang, 1964), social historian Ann Moyal outlines the course of Australian scientific history during the colonial period. Skillfully using excerpts from 140 documents from Australian and British archives, she captures the essence of this hitherto neglected subject. The accompanying text and notes, which constitute a third of the volume, serve as an excellent primer for those unfamiliar with the details of the local situation. Historians of science will be interested in the specifics of the Australian chronicle and the contrasts and parallels that may be drawn between the Australian experience and that of other areas. Far from entering a *terra incognita*, readers will find they are already familiar with many of the scientists discussed.

Australia's early years as a convict-emancipist society were not conducive to the development of a resident scientific community. The continent remained, as visiting geologist J. D. Dana noted, "a grand place for Scientific Exploration." Other scientific visitors included botanists—Joseph (Botany Bay) Banks, Robert Brown, and William and Joseph Hooker—and zoologists—Charles Darwin, Thomas Huxley, and John Gould. The significance of the "colonial interludes" of these scientists has sometimes been underestimated, and Moyal's volume will begin to redress the balance. Darwin, for example, held that J. Hooker's *Flora Tasmaniae* was "the greatest buttress to the theory of evolution"; and Huxley's scientific career began, by his own admission, in Australian seas. Still others, like Richard Owen, built reputations on specimens shipped "home" from Australia. Moyal makes extensive use of the correspondence between these biologists and the gifted naturalists who aided them in their explorations of the Australian "never-never."

One of the most fascinating figures of this period is the zoologist W. S. Macleay. Trained at Cambridge and in Cuvier's laboratory, Macleay had gained a considerable reputation in the 1820's, before moving to Sydney, for his Quinary system of classification. Whether his systematics motivated Darwin's barnacle studies remains debatable. It is clear from Moyal's account, however, that he had a major impact on Huxley's scientific development at a critical time in the latter's career. In 1850, a year after returning to England, the young Huxley wrote to Macleay, "In England there is nothing to be done—it is a most hopeless prospect," and sought his help in securing the new University of Sydney's projected natural history chair. We are left wondering what would have happened to Darwin had his "bulldog" emigrated.

Around the middle of the 19th century we see a growing self-confidence among colonial scientists. Moyal traces the development of regional Royal Societies, universities, astronomical and meteorological observatories, geological surveys, and herbaria and museums. She illustrates the antipodean challenge to the hegemony of English scientists and their institutions with a series of examples. In botany the debate is between Hooker and the Victorian botanist Mueller over the authorship of the *Flora Australiensis*; in geology it involves the British Museum and the National Museum of Victoria and concerns the disposition of the Cranbourne meteorites; in paleontology, Australian Museum zoologist Krefft disputes Richard Owen's reconstruction of the "marsupial lion" *Thylacoleo* as a leonine carnivore (holding, possibly correctly, that the animal was a vegetarian).

Moyal goes on to illustrate the rise of science in the new universities and focuses on the careers of physicist William Bragg, chemist David Masson, and physiologist J. T. Wilson. She concludes her excellent survey by discussing three scientists who worked outside academia: physicist William Sutherland (of the Sutherland constant), wheat breeder William Farrer, and aeronautical engineer Lawrence Hargrave. Hargrave was a remarkable inventor whose curved wing surfaces cropped up, though unacknowledged, in the Wright brothers' successful plane. Clearly, by the end of the century, Australian scientists had begun to overcome the tyranny of distance and assume their true positions around the international table of science.

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