Book Reviews

Early American Science

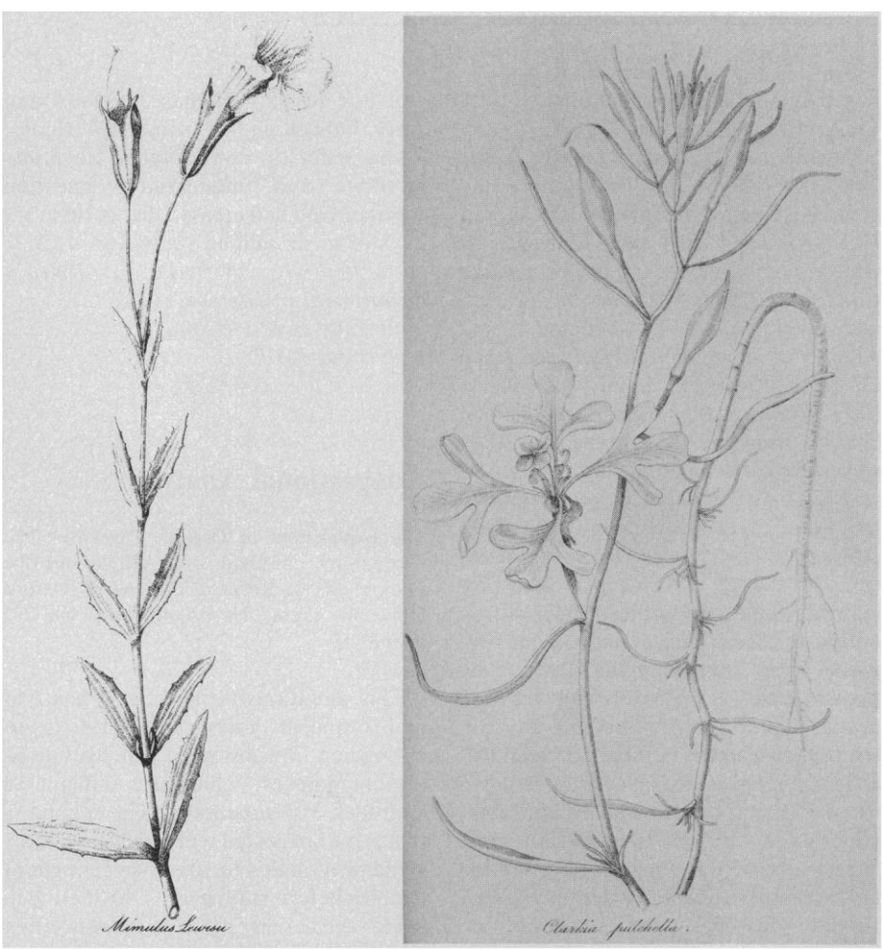
American Science in the Age of Jefferson. JOHN C. GREENE. Iowa State University Press, Ames, 1984. xiv, 484 pp., illus., + plate. $39.95; paper, $24.95.

In one of his better one-liners, President John F. Kennedy once told an august assemblage of prizewinning scientists that they constituted "the most extraordinary collection of talent, of human knowledge, that has ever been gathered together at the White House, with the possible exception of when Thomas Jefferson dined alone." It is Jefferson's standing as a scientist, rather than as president, that furnishes the title for this book. Jefferson's mind had a huge, if not penetrating, range even in the field of science. From the end of the American Revolution to about 1820 Jefferson's eclectic fascination with the natural world mirrored much of the broad spectrum of scientific inquiry in the young republic.

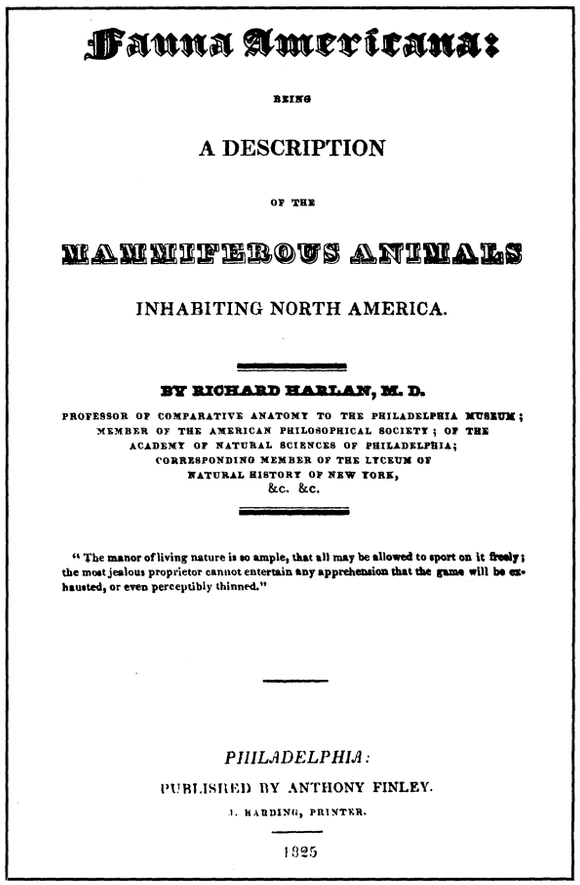
Greene, who is a practiced historian of science, offers a thoroughgoing catalog of American scientific efforts during those years. Judiciously recounting both attempts and accomplishments, he first considers the institutional bases that supported some but not all American scientists. The winning of national independence saw the revival of the American Philosophical Society in Philadelphia, which had previously been the only viable scientific organization in Britain's American colonies. The city of Philadelphia also boasted Charles W. Peale's museum, very much a predecessor of the Smithsonian Institution in the decade when Philadelphia was the political capital of the United States and the new Federal City largely a paper design imposed upon a swampy patch of ground along the Potomac River. Not to be outdone, scientists in Boston founded the American Academy of Arts and Sciences, which soon had informal links with Harvard and its new school of medicine. There were scientists at Yale, too, but that institution lacked the support of a metropolis. For complex reasons the atmosphere in New York City was less conducive to scientific enterprise, though it was the seat of Samuel L. Mitchill's *Medical Repository*—despite its name one of the most important and broadly scientific journals of its day. Elsewhere American science operated from what Greene rightly calls "outposts," such as Charleston in the South and Lexington and Cincinnati in the West.

The author devotes the body of his book to an encyclopedic review of American scientific efforts in the period. Numerous outstanding men (not "persons") are sketched and several hundred more (including Europeans) are mentioned. None of these men emerge vividly as people, but their roles as scientists come across clearly and with balanced assessments. Greene shows but does not show off a deep and thorough grounding in historical sources. Ellicott, Silliman, Waterhouse, Rafinesque, Bowditch, Barton, Bartram, Wilson, and so on are scarcely household names in the history of modern science, but at the time they were recognized as able practitioners on both sides of the Atlantic.

In some ways this book represents a chronological extension of Raymond P. Stearns's *Science in the British Colonies of America* (1970). Prior to independence, most American scientists had felt and acted like colonials even in the realm of science. The outstanding exception, of course, was Franklin, whose many careers refuted the seeming impossibility of being typically American and utterly cosmopolitan at the same time. After the Revolution scientists in the young republic faced a novel challenge. As Greene puts it, the pursuit of science in the new nation "meant two things: as the example par excellence of useful knowledge, science must be cultivated to promote the interests, prosperity, and power of the rising American nation; and as the supreme example of the powers of the human mind . . . science challenged Americans to prove to the world that republican institutions were as favorable



"Plants named in tribute to Lewis and Clark in Frederick Pursh's *Flora Americae Septentrionalis*: a specimen of the species *Mumulus lewisii* (left) and another of the genus *Clarkia*." [From *American Science in the Age of Jefferson*; courtesy of the American Philosophical Society]



Fauna Americana:

BEING

A DESCRIPTION

OF THE

MAMMIFEROUS ANIMALS

INHABITING NORTH AMERICA.

BY RICHARD HARLAN, M. D.

PROFESSOR OF COMPARATIVE ANATOMY TO THE PHILADELPHIA MUSEUM; MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY; OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA; CORRESPONDING MEMBER OF THE LYCEUM OF NATURAL HISTORY OF NEW YORK, &c. &c.

"The manor of living nature is so ample, that all may be allowed to sport on it freely; the most jealous proprietor cannot entertain any apprehension that the game will be exhausted, or even perceptibly thinned."

PHILADELPHIA:

PUBLISHED BY ANTHONY FINLEY.

J. HARDING, PRINTER.

1825

"Title page of the earliest systematic description of American mammals, which drew heavily on Anselme Desmarests's *Mammalogie* but added much new information." [From *American Science in the Age of Jefferson*; courtesy of the American Philosophical Society]

to intellectual achievement as they were to liberty" (p. 6).

Greene concludes that these efforts met with some but not outstanding success. Post-Revolutionary American scientists pursued their tasks during a titanic struggle between the world's two superpowers, Great Britain and France, a contest that badly buffeted many Americans even though they remained on the political and military periphery. Yet scientists in the new nation remained largely unscathed. As Greene says, they were animated by "patriotism, utilitarianism, love of science and scientific reputation, and admiration of the Creator's wisdom, power, and goodness" (p. 418). Their basic cosmology remained whole and strong. They had no notion that scientific inquiry might produce dangerously ambiguous results for human society. They were not yet fully aware that they were helping to construct an arena for combat between science and religion. To be sure, if they had listened they could have heard faint rumblings of such construction, but most American scientists paid little attention and remained convinced that the revelations of scientific inquiry could only do honor to the truths of a faith that had long since been revealed. As the author says in a vivid summation that makes one itch to put Thomas Jefferson and Jerry Falwell in the same TV studio: "And Jefferson considered it an unanswerable and uninteresting question whether God had created the world in six days or in six million years" (p. 412).

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Adaptational Analysis

The Explanation of Organic Diversity. The Comparative Method and Adaptations for Mating. MARK RIDLEY. Clarendon (Oxford University Press), New York, 1983. viii, 272 pp. $37.50.

This ambitiously titled book has two more modest goals. The first is to strengthen our ability to test evolutionary hypotheses, which are difficult to approach experimentally. The second is to use the suggested techniques to understand why males in some species guard females before mating and why mating in some species is positively assortative with respect to size.

Many evolutionary hypotheses have the general form "Character A is more likely to evolve when condition B exists." The diversity of characters and conditions in the natural world can be used to test such hypotheses, but, as with any experimental test, the comparisons to be made and their implicit assumptions must be carefully thought out.

Ridley argues that to test such a hypothesis one needs to know how often character A has evolved in the presence and absence of condition B and how often character A has been lost in the presence and absence of condition B. This application of cladistic techniques (that is, the focus on shared, derived characters) allows him to range freely across taxonomic levels, which is useful because the relevant variation may exist among genera in a family for some groups and among families in an order for others. Thus sample sizes for statistical tests are increased by combining data from the most appropriate taxonomic level for each of many groups.

The first hypothesis tested is that precopulatory mate guarding should evolve when female receptivity to mating is limited to a short and predictable interval. The second is that correlation in size between males and females of mated pairs should be found when larger females are more fecund, when larger males are more effective competitors for mates, and when mating is time-consuming. In each case Ridley reviews an enormous amount of widely scattered literature on the mating habits of many groups, particularly the Crustacea, and concludes that the hypothesis is supported.

There is no question that students of the reproductive biology of the groups covered will find Ridley's review of considerable use; the bibliography and index make up 50 of the 272 pages. The predictions are interesting in their own right, and those looking for support for the adaptationist program will appreciate the pointed commentary of chapter 1. But the most important measure of the success of this book depends on the extent to which the author has contributed to our ability to test evolutionary hypotheses with comparative data.

My overall assessment is that the suggested method is sound in theory but, like cladistics, not always easy in practice. Much of the book consists of detailed justifications for the many decisions that were necessary in order to score the data—for example, for a particular taxon does precopulatory mate guarding occur, is it primitive or derived, and is female receptivity short and predictable? The necessity for dealing with the first and last of these is not unique to