References

1. See C. Truesdell, *Essays in the History of Mechanics* (Springer-Verlag, New York, 1968), and E. Winter, Ed., *Die Deutsch-russische Begegnung und Leonhard Euler* (Akademie-Verlag, Berlin, 1958).
2. For another view of Wolff see R. S. Calinger, "The Newtonian-Wolffian confrontation in the St. Petersburg Academy of Sciences (1725–46)," *J. World His.* **11** (3), 417–36 (1968).
3. L. Euler, *Letters of Euler on Different Subjects in Natural Philosophy Addressed to a German Princess*, notes by D. Brewster (Harper, New York, 1840), vol. 1.

Unsimple Views of Science

Science, Medicine and Society in the Renaissance. Essays to Honor Walter Pagel. ALLEN G. DEBUS, Ed. Science History (Neale Watson Academic) Publications, New York, 1973. Two volumes, boxed. vi, 276 pp., and vi, 338 pp., illus. $50; prepaid, $35.

Today one scarcely need make the point that a revolution is under way in our understanding of science. Whether one's concern lies in the history, the sociology, or the philosophy of science; whether one's interest lies in the social relations of science or in the possible linkages between science, technology, and environmental and ecological change; or whether one's most immediate problem is with obtaining continuing funds for one's own scientific research—in every case the shifting cultural valuation of science is immediately obvious. The dimensions of the shift become starkly apparent if one turns back to the later Victorians.

Few could now agree with E. Ray Lankester's 1883 claim to the British Association for the Advancement of Science that "there is no greater good than the increase of science . . . through it all other good will follow." Likewise, few would accept R. H. Thurston's statement to the AAAS in the following year that science is "a spiritual agent, promoting morality" or that "it has generated 'sweetness and light.'" It is therefore salutory to be reminded that as late as 1927 George Sarton could claim with the utmost seriousness that "the history of science is the history of mankind's unity, of its sublime purpose, of its gradual redemption." Today it is hard for us to make the imaginative leap necessary to recapture such simple faith. Yet late Victorian and Edwardian patterns of thought still underlie much of our discussion of the scientific enterprise. To dissolve those patterns and replace them with less simplistic approaches is the common task of contemporary analysts of science. And among that particular subset of analysts known as historians none has been more wholehearted or influential in this task than Walter Pagel. The appearance of a handsome two-volume festschrift to celebrate his 75th birthday thus offers an opportunity to examine at least one facet of our changing perceptions of the nature of science.

Walter Pagel, the son of the eminent German historian of medicine Julius Pagel (1851–1912), graduated M.D. at Berlin in 1922. The greater part of his professional life has been spent as a practicing pathologist in England (first in Cambridgeshire, then in London). Yet well before he was 30 he had begun that second career in the history of science and medicine for which he is best known. From 1933 to 1939 he found time to serve as founding secretary of the History of Science Lectures Committee of Cambridge University. He thus played a critical role in helping to stimulate interest in, and define the standards of, the emerging academic discipline of the history of science. But Pagel's major impact is in his writing. Over the last half century he has put out more than 400 books, articles, and reviews—written in three different countries, often under difficult conditions and, since 1933, without benefit of any regular university position. His writings have transformed our understanding of the roots of modern science.

In large part because of Pagel's work (notably aided by the somewhat differently inspired researches of D. P. Walker and Frances Yates), it is no longer possible to see modern science as simply the heroic creation of a series of workers in technical physics and astronomy. Pagel has plainly demonstrated the influence on the 17th-century mind of Paracelsus and Van Helmont. Through this demonstration he has highlighted the importance of philosophic, mystical, and religious motives in the quest for an ordered understanding of nature. In emphasizing the debt of William Harvey to Aristotelian modes of thought he has illustrated the futility of any simple dichotomy between ancients and moderns. Above all, Pagel's prolific writings have revealed the complexity and variability of man's search for a comprehension and mastery of nature. His achievement stands as fitting historical counterpoint to our own contemporary awareness of the inadequacy of viewing science as simply "systematized positive knowledge."

The authority, power, and subtle influence of Pagel's work are well reflected in the essays in this festschrift. The 38 contributors range from the regius professor of modern history at Oxford to the editor of the *Bulletin of the New York Academy of Medicine* (and represent the United States, England, Germany, Italy, Poland, Denmark, and Austria). Their essays discuss topics as varied as medieval optics, Renaissance anatomy, and "Newton and the Hermetic tradition." A sympathetic introduction by the editor, a bibliography of Pagel's writings, and a plethora of illustrations complete this handsome and well-produced work. Among the gems thus offered to us, this reviewer was particularly impressed by A. G. Keller's provocative study of "The idea of technical progress in the sixteenth century," J. R. Ravetz's thoughtful discussion of "Francis Bacon and the reform of philosophy," and I. B. Cohen's careful examination of "Newton and Keplerian inertia." Any full evaluation of the riches present in these two volumes will obviously require the combined attention of many specialist scholars. But the general reader who wants to know why the origins of modern science aren't what they used to be could well begin by browsing through these essays.

ARNOLD THACKRAY
Department of History and Sociology of Science, University of Pennsylvania, Philadelphia

History through Bibliography

Natural Science Books in English, 1600–1900. DAVID M. KNIGHT. Praeger, New York, 1972. x, 262 pp., illus. $22.50. Illustrated Books Series.

Knight addresses this book to the book-lover. Collectors and bibliophiles, who find in books a pleasure needing no particular justification beyond itself, and historians, for whom books constitute the stuff from which to fashion an understanding of the past, and who often tend to develop an esthetic attachment to the printed word and picture—these are the readers Knight claims to have in mind in surveying, through its books, the English-language scientific tradition from 1600 to 1900. The result is a look at British science in the 17th, 18th, and 19th centuries (American science justifiably receives relatively

slight notice) that is well-informed, often entertaining, and sometimes illuminating.

It is not clear, however, that a single message serves the needs of a wide audience sharing little more than concern with books. Knight's text will be only of modest use to the serious collector or the professional historian. In this treatment of books of and about science, and books that, though not scientific, significantly influenced scientists, there is little on them *as books*. Despite occasional remarks about the rarity, beauty, or publication peculiarities of these books, the great bulk of Knight's exposition is devoted to the task of placing their purposes and contents in historical context. In 11 topically designed chapters (plus introduction and epilogue) one finds something closely resembling a condensed series of lectures on the history of modern British science, with both the strengths and the weaknesses associated with that form of presentation. Knight's learning is broad, but he covers too much too rapidly to penetrate very much beyond a superficial interpretative level, or to present recent historical thinking more than hastily. The chapter "Scientific publications in the nineteenth century," which may most nearly approach fulfillment of Knight's avowed aim to offer "a book about books," almost equally approaches the character of a bibliographical essay. The book's substance, format, and price, however, seem to suggest the hope of attracting a genteel reader in search of erudite entertainment. While anyone can read it with profit, perhaps the greatest service this book can be expected to perform is to lead the curious dilettante to the serious literature of the history and bibliography of science.

The bibliographies after each chapter yield a total of over 1500 original works —including journal titles and English translations of works in Latin and Continental vernacular tongues—as well as more than 260 citations of works of secondary scholarship and reference. The 100 illustrations include some seldom-reproduced plates, but generally contribute rather marginally to the textual material. The index is far from thorough, diminishing the book's reference utility.

KENNETH L. TAYLOR
Department of the History of Science, University of Oklahoma, Norman

Naturalist under attack by toucans. The frontispiece to volume 1 of H. W. Bate's *Naturalist on the Amazons*, 1863. [Reproduced in *Natural Science Books in English*]

Egyptian Accomplishments

Mathematics in the Time of the Pharaohs. RICHARD J. GILLINGS. M.I.T. Press, Cambridge, Mass., 1972. xii, 286 pp., illus. $25.

What is really at the root of the belief, still widely held and promoted, that the ancient Egyptians were sophisticated, but clandestine, mathematicians? Just this, I think: that the cotangent of the batter of the great pyramid of Cheops was (that is, before the smooth casing was stripped) very nearly $\pi/4$. Now in general the pyramid builders favored batter angles in the 45° to 54° region—doubtless for a mixture of esthetic and functional reasons. Here are the relevant data on the three pyramid tombs of Giza:

	batter angle, α	$\cot \alpha$
Mycerinos	50° 46′	$(\pi/4) \times 1.0396$
Cheops	51° 52′	0.9995
Chephren	53° 4′	0.9571

If you decide that the Cheops data, in this context, are unremarkable, and if, in addition, you are aware that $\pi/4$ happens to be numerically close to $1/\sqrt{\tau}$ (where τ is the parameter of the golden section), you need not waste time pondering the extraordinary ar-