man is his "constant need for progress."

Destinations that progress leads to must also, I think, be explored if the history of technology is to be more than an exercise in antiquarian description or an uncritical celebration of the single-valued progress implied just above. Daumas says specifically that his volumes are intended only to describe; political, social, and economic context is mentioned only when "indispensable." Surely he must be aware that the assumptions he and his collaborators make regarding the nature and importance of political, social, and economic context cannot help coloring their criteria for success, progress, importance, and other attributes of the technical developments they describe. A shift in point of view may even switch cause and effect. Context is not only indispensable but in fact unavoidable. History is not science. Better, then, that the reader be reminded frequently and explicitly of the assumptions surrounding the history of technology that he reads.

It ought to be possible to combine accurate technical description and an analysis of the relationships between technical alternatives and the dynamic situations of men in history. The general historian or any other reader of these books hardly needs 12 pages on Papin, but he is entitled to an explanation that will enable him to appreciate the technical alternatives that were open to Papin and the further possibilities that they opened for those who followed him. If the reader knows nothing of the technical milieu, he can only perpetuate the myth of a logical and rational pattern of technological development.

Perhaps the most important lesson to be learned from technical understanding would be the absence of an expected cause-effect relationship. The logical decision-making process of the technologist exists largely in his imagination, and his resemblance to the economic model of man is hard to maintain in the face of his enthusiasms and his loyalties. Historians of science have scuttled the stereotype of a scientific method leading inexorably in only one possible direction. Historians of technology may, one hopes, contribute to undermining our world view that sees technology as a benign social determinant that can be neither criticized nor controlled.

EUGENE S. FERGUSON
University of Delaware, Newark,
and *Hagley Museum, Wilmington*

Intercultural History

Clerks and Craftsmen in China and the West. Lectures and Addresses on the History of Science and Technology. JOSEPH NEEDHAM. Based largely on collaborative work with Wang Ling, Lu Gwei-Djen, and Ho Ping-Yü. Cambridge University Press, New York, 1970. xx + 472 pp. + plates. $22.50.

In the 1940's Joseph Needham abandoned a distinguished career in the biological sciences. As the 1970's open, he is without doubt the world's greatest intercultural historian. One may—indeed, one must—disagree with him on some details, but no controversy can dim the majesty of the task which he has set for himself. His massive *Science and Civilisation in China* (nearly half of its planned 12 volumes have been published) deals not only with China's very considerable achievements in technology and science but also with the radiation of these achievements to the rest of Asia and to the West. But these great systematic tomes are formidable even for specialists.

Fortunately Needham has now begun to gather, revise, and republish the many less formal addresses and papers which are partial sketches or by-products of his great work. Here his thinking is much more accessible: indeed, the fluidity of the lecture form, and Needham's artful way with words, make the casual reading of this book a delight. To pick it up is to join one of our century's remarkable minds as it ranges the whole of Eurasia and the millennia of history. It is also to learn to share Needham's moral commitment to studies which "may turn out to be a contribution not only to objective history, but also to the cause of international understanding and friendship."

The items assembled here are an intellectual smorgasbord. The essay on "The translation of old Chinese scientific and technical texts" is a revelation of the linguistic difficulties surrounding Needham's enterprise. "The earliest snow crystal observations" demonstrates that long before Albertus Magnus first pointed in the West to the geometry of these crystals the Chinese were familiar with it. Nowhere does the amazing empirical skill of the Chinese tradition emerge more luminously than in Needham's discussion of "Proto-endocrinology in medieval China": it is startling to learn of the extraction of male and female sex hormones from urine for pharmaceutical purposes, the early use of iodine-rich seaweed as a cure for goiter, and the intelligent efforts to aid diabetics. The metallurgy of iron and steel, Chinese clockwork, Chinese contributions to shipbuilding and the nautical arts which in the 15th century enabled great fleets to sail as far as Africa, the origins of chain suspension bridges, "The pre-natal history of the steam-engine," and much else are here to expand our horizons of both time and space. And always there is Needham's insistence on "The unity of science: Asia's indispensable contribution." As the astronauts look back at our small terrestrial globe and perceive it as a unit, so will Needham's readers.

LYNN WHITE, JR.
Department of History,
University of California, Los Angeles

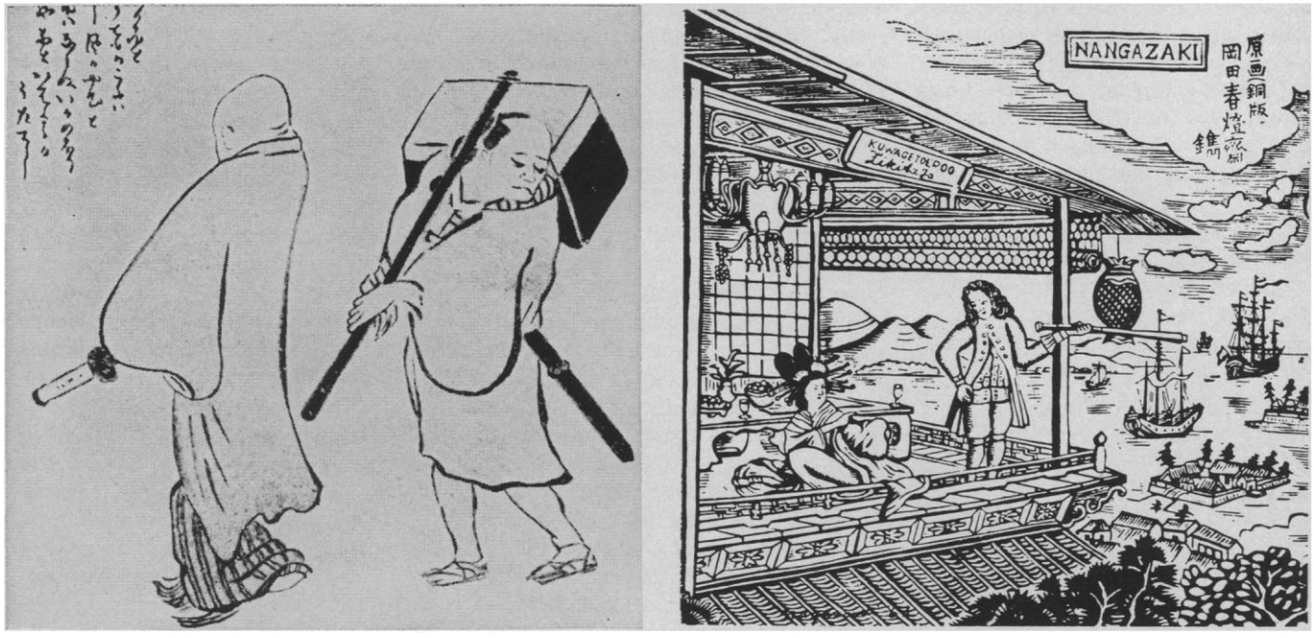
East and West

Western Medical Pioneers in Feudal Japan. JOHN Z. BOWERS. Published for the Josiah Macy, Jr., Foundation by the Johns Hopkins Press, Baltimore, 1970. xvi + 248 pp., illus. $8.95.

Dawn of Western Science in Japan: Rangaku Kotohajime. GENPAKU SUGITA. Translated from the Japanese by Ryōzō Matsumoto, supervised by Tomio Ogata. Hokuseido Press, Tokyo, 1969. xii + 74 pp., illus. 400 yen.

John Z. Bowers spent a year and a half as a visiting professor on the faculty of medicine of the Kyoto National University. After his return from Japan he published an important historical study entitled *Medical Education in Japan* (Harper and Row, 1965), which actually deals with the sequence of foreign medical systems imported into, and absorbed by, Japan and with a great many extraordinary personalities who were involved in this educational transfer. Now, in *Western Medical Pioneers in Feudal Japan*, Bowers devotes a complete volume to the first importation of Western medicine into Japan.

Western medicine was not the first foreign medical system to be adopted by the Japanese, who had begun their art of healing with the adaptation of Chinese ideologies and practices. Hence, in order to set the stage, Bowers presents in his new book a chapter on "Medicine before the Dutch." This brief chapter deals in an all too cursory manner with the more than 1000 years



Illustrations from *Western Medical Pioneers in Feudal Japan.* (Left) A Japanese doctor on his way to visit a patient. He is followed by an attendant who carries a case of instruments. [From a drawing made by Keisai Kugawata in the middle of the Edo period, 1616–1867, reproduced by courtesy of CIBA Symposia] (Right) "Porch scene, Nagasaki. A Hollander dividing his attention between a geisha and sake, yet watching Deshima." When foreigners were excluded from Japan in 1636, the Dutch were permitted to remain on the islet of Deshima, which thus became an important point of entry for Western ideas into Japan. [From the author's collection]

of Korean, Chinese, and Portuguese influences which preceded the arrival of the Dutch East India Company.

But although medicine in Japan still retains some vestiges of Chinese influence, which Bowers prefers to call *Chung-I*, it is the European physicians who were attached to the small Dutch trade settlement on the island of Deshima, near Nagasaki, who are remembered gratefully by the Japanese, and these men become the heroes of Bowers's new volume. Of the five physicians who served the Dutch East India Company in Japan, only two were natives of Holland; one was a Swede by birth, and the other two were of German origin. These three last-mentioned men did the most for the mutual discovery of Europe and Japan, and also had the most adventuresome lives and left the most important documents of their Japanse explorations. Engelbert Kaempfer's superb *History of Japan* (1777) contains a narrative of his own origins and travels to and in Japan; Thunberg kept a meticulous diary in which he recorded his observations; and Philipp Franz von Siebold left his famous narrative, *Nippon* (1897), which was published posthumously by his sons. In order to connect the impressions recorded by these men with those he had gained during his own stay in Japan, Bowers traveled to their places of birth in search of additional documentation. As a result of these thorough studies, we find in *Western Medical Pioneers in Feudal Japan* sketches of five great personalities, rather than of merely adventurous physicians. They were ambassadors of culture and goodwill in the best sense of the word, able to convey superior medical practices to Japan while retaining their grateful curiosity in every new experience that was afforded them by their stay there. In return for transmitting their knowledge to Japan, they brought back to Europe a glimpse of the beauty of Japan, its ancient culture and traditions, before it had been affected and altered by its contact with the West, and it is Bowers's merit to have brought before us his own affectionate narrative of these extraordinary men.

It is a curious coincidence that the publicaion of Bowers's book was preceded by but a few months by the appearance of another, much smaller, volume on a related subject, entitled *Dawn of Western Science in Japan: Rangaku Kotohajime*, by Genpaku Sugita. This book, which was prepared for publication by two distinguished Japanese scientists, differs from that of Bowers in that it does not deal with the personalities who imported European science into Japan but concentrates upon the man who made it possible for the Japanese to make use of this knowledge. It is the autobiographical story of Genpaku Sugita (1733–1817), a Japanese physician trained in the Chinese medical classics, who was puzzled by the extreme differences he found between the scant illustrations of Chinese anatomological texts and those of Dutch origin. To resolve the contradictions he found, he decided to make a detailed comparison between the familiar Chinese texts and the anatomical tables of Johann Adam Kulmus (1734), which had happened to come into his hands. In order to carry out this unusual scheme, he had to obtain the Shogun's permission to transgress the Japanese interdicts inherent in the laws of National Isolation and to study the written form of Dutch, which was somewhat known in spoken form. Genpaku Sugita was joined in the venture by another physician, Ryōtaku Maeno, and together they worked their way through this totally unfamiliar Dutch text. In the process, *Rangaku*, that is, "Dutch learning," found its entrance into Japan; and intellectually, at least, the period of National Isolation had ended.

In their idiomatic and highly entertaining translation of Genpaku Sugita's report, Ryōzō Matsumoto and Tomio Ogata take us through all the following stages of Dutch medical learning

in Japan, and we find mention of a great many subsequent Japanese physicians who elaborated in practice and theory upon the earliest Dutch translation. Genpaku Sugita's narrative takes us from 1765 to 1815, and thus the period it covers coincides with the heyday of Western medical influence in Japan.

Both books here reviewed are attractively bound in red and well illustrated. Together they furnish a thorough insight into the longest and most important period of Japanese medicine, when East and West first came to know each other and to exchange ideas and established a contact which was to persist to the present day.

ILZA VEITH
Department of the History of Health Sciences, University of California Medical Center, San Francisco

Curative Practices

American Indian Medicine. VIRGIL J. VOGEL. University of Oklahoma Press, Norman, 1970. xx + 588 pp. + plates. $12.50. Civilization of the American Indian Series, vol. 95.

The value of Vogel's large volume on American Indian medicine lies more in its compilation than in its interpretation. A historian, the author has extracted from travelers' accounts, reports of botanists, researches of ethnologists and physicians, and various other sources a vast amount of information on Indian therapeutic methods and agents and has organized these data helpfully. Most useful is an alphabetical appendix by common plant name giving information about some 170 botanicals used as drugs by Indians dwelling north of Mexico, botanicals which at one time or another were official in the *Pharmacopeia of the United States* or the *National Formulary*. Briefer information is provided on some four dozen other drugs that became official that were introduced into medical use by Latin American Indians. An index of both common and botanical names permits easy access to desired data.

Vogel disavows the task of evaluating the efficacy of Indian medicine, yet this is obviously the theme that engrosses him. Influenced perhaps by a cultural climate that regards contributions by "dark-skinned peoples" with less "ethnic arrogance" than formerly, Vogel observes that it is "a cause for wonder" how many botanicals the Indians learned to use correctly. While recognizing the healing power of nature, the placebo effect, and wrong diagnosis as possibilities underlying alleged cures reported by lay observers, Vogel recites so many cure stories that the weight of his emphasis seems to overglorify Indian healing prowess. Nor is admission to earlier editions of the *USP* and *NF* quite the achievement that the tone of Vogel's writing implies. What this does reveal, of course, is the tremendous influence of Indian practice on white practice, a theme that Vogel develops well. Without Latin America, however, he is hard pressed to make the case his enthusiasm would wish for Indian contributions that today's scientific medicine would credit as valuable.

Nor have "folk and native medicines . . . lost their old halo." Indian healers still dispense many of the crude drugs that Vogel discusses, sometimes from stores in the very shadow of metropolitan hospitals.

JAMES HARVEY YOUNG
Department of History, Emory University, Atlanta, Georgia

Statistics in a New Land

Demography in Early America. Beginnings of the Statistical Mind, 1600–1800. JAMES H. CASSEDY. Harvard University Press, Cambridge, Mass., 1969. xvi + 358 pp. $8.50

Although modestly describing his book as "an inquiry into early America," in reality Cassedy has carefully examined the sources of American history and come up with an astonishing amount of information. From the beginning, colonial leaders recognized the need to collect vital statistics, to know the size of their population, and to use this information in determining policy. Familiar with the London bills of mortality and the system of parish registers, they understandably sought to duplicate them in the colonies.

The most striking colonial innovation was a Massachusetts law in 1693 providing for the civil registration of births, deaths, and marriages, a notable improvement over the English system in which religious authorities recorded baptisms, marriages, and burials. By the second half of the 17th century, the founders of new colonies had learned the value of statistical data, but their efforts to collect them were often frustrated. A scattered population, illiterate town clerks, and religious objections all reduced the effectiveness of colonial registration systems. In addition, many colonists equated census taking with taxation and military duty. The perennial warfare had the incidental result of promoting the collection of statistical data, since military service was a fact of life and muster rolls of the county militia were kept as a matter of course.

The recurrent outbreaks of smallpox, yellow fever, and other epidemic diseases were another major stimulus to the gathering of vital statistics. As Cassedy indicates, smallpox, more than any other disease, occupied the attention of 18th-century Englishmen and led them to collect and analyze mortality figures on both sides of the Atlantic. The ubiquitous Cotton Mather deplored the lack of mathematical knowledge among physicians, the one means, he thought, whereby they might discover the cause and cure of diseases. Mather was responsible for introducing, in 1721, the practice of inoculaton for smallpox into the colonies. Attempting to justify his innovation by statistical evidence, Mather compared the deaths from smallpox among the inoculated with deaths among those who caught the disease under normal conditions. In experimenting with inoculation, he aroused the opposition of William Douglass, the best-trained physician in Boston. Although Douglass eventually accepted the practice, he accused Mather of manipulating his figures. In glancing back over the controversy years later, Douglass recognized that the chief weakness of the early inoculation statistics lay in the inadequacy of the sampling. In doing so, he became one of the first to recognize the law of large numbers.

The American Revolution further stimulated an interest in demography. The rapidly growing population and wealth of the colonies inevitably invited comparisons with the home country, and for Englishmen who turned to demography it was clear that colonial claims to equality no longer could be ignored. The success of the Revolution gave the states a chance to revise their laws concerning vital statistics, but, Cassedy says, the opportunity was largely lost. The resulting hodgepodge of registration laws set back the cause of American demography for many years. The one redeeming result of Independence was the enactment of a national census law. The census in 1790