systematizing the multiplicity of details which the "natural history" of organisms provides. Verne Grant is an evolutionist who has concentrated his attention for some 20 years on the angiosperm family Polemoniaceae. With regard to the fashions of biology, his search for data spans the equivalent of a time scale from present-day genetics to observations of floral ecology that were popular in the heyday of Darwinian naturalists.

The question that Verne and Karen Grant take as the theme of their book is, "Do the various flower forms within a diversified family represent floral mechanisms specialized for pollination by different kinds of agents?" This question seems innocuous, and its answer is easily anticipated by anyone convinced of the importance of natural selection in evolution; yet surprisingly, there are strong and conflicting opinions among students of pollination ecology. The Grants' position is safely in line with neo-Darwinian theory. The major portion of their text consists of a systematic presentation of data concerning floral mechanisms, breeding systems, and animal visitors for 18 genera and some 122 species (out of about 327 in the family). Such topics as flower form, color, odor, and periodicity comprise the sections on floral mechanisms; data on breeding systems come from experimental studies; the kinds of animal visitors and their relative effectiveness as pollinators are described principally from the authors' own field observations. Cross-pollination by animals falls into nine modes: bees (see cover on this issue of *Science*), long-tongued flies, scavenger flies, hummingbirds, butterflies, hawkmoths, noctuid moths, beetles, and bats. In genera of temperate zones, bee pollination is most common and is considered the original mode. Autogamy is frequent, but wind pollination is absent.

The many pages of descriptive material will be a most useful reference for future students, and will be of immediate interest to those familiar with the phlox family or with the numerous groups of insects mentioned. The book is profusely illustrated with life-sized drawings of the plants and their pollinators. A summary chapter presents an interpretation of evolution along orthodox lines that are a modern extension of classical floral biology. Differences in modes of pollination between races of a species are believed to arise gradually in allopatric populations, by adaptation to different spectra of flower-visiting animals. The authors hold the widely accepted view that speciation is an extension of race formation. An alternative idea, put forward by another student of the California flora, is that species barriers of a genetic sort may arise swiftly, in ecologically marginal populations subjected periodically to catastrophic decline in numbers. Many of the Grants' examples of racial and species diversity, as in *Gilia*, are in desert-border regions where "catastrophic selection" may be significant for rapid changes in flower form, and this should perhaps not be overlooked in the analysis of evolution in Polemoniaceae.

KENTON L. CHAMBERS
Department of Botany and Plant Pathology, Oregon State University, Corvallis

History of Technology

A Theatre of Machines. A. G. Keller. Macmillan, New York, 1965. vi + 115 pp. Illus. $6.

Near the turn of the 16th Century there appeared three books of mechanical inventions that were intended to show the potentialities of machinery derived from the Middle Ages, in particular the waterwheel and windmill, and which also attempted to show the artisan how important it was to apply theoretical considerations to machines, instead of merely putting the machines together by rule of thumb. The books were Besson's *Livre des Instruments Mathematiques et Mechaniques* (1571–1572), Ramelli's *Diverse et Artificiose Machine* (1588), and Zonca's *Teatro Nuovo di Machine et Edificii* (1607). Although the mechanical inventions depicted in these books were not revolutionary, and it is doubtful whether some of them could ever have worked in practice, they provide historians with insight into the level of early modern technology as well as the imaginative quality of Renaissance technicians. Unfortunately, the fascinating illustrations that form the core of these books on machines are seldom reproduced and are known to only a handful of scholars who consult the original editions in collections of rare books.

Now Keller, who teaches the history of science at the University of Leicester (England), has compiled an anthology of 52 of the most interesting plates from the three major books of mechanical inventions, as well as from some minor sources. Choosing his plates on the basis of esthetic attraction, the boldness of their creator's mechanical imagination, or as early crude prototypes of what later became important inventions, Keller proceeds to indicate the particular machine's interest from the standpoint of the history of technology and to show how the machine worked—providing it could work at all.

Most of the plates depict hydraulic engineering machines; for the late Renaissance was fascinated with waterwheels and pumps, partly because of the needs for drainage and irrigation, but also because of the esthetic appreciation accorded fountains. But Keller does not neglect war engines, cranes and hoists, ingenious devices for the transmission of power, and other machines, including a homely "instrument for keeping the feet warm" and a pioneer parachute—an essential for an age whose technical imagination overflew its technological capabilities.

Keller has selected his illustrations well, and they are reproduced in good size with fidelity to the detail shown in the originals. Above all, he has written perceptively, and wittily, about the accomplishments and limitations of the Renaissance technologist. This book will fascinate, enlighten, and entertain all those who are interested in the development of mechanical inventions.

MELVIN KRANZBERG
Graduate Program in History of Science and Technology, Case Institute of Technology, Cleveland, Ohio

Snow Line between Cultures

Wayward Servants: The Two Worlds of the African Pygmies. Colin M. Turnbull. Published for the American Museum of Natural History by Natural History Press, Garden City, N.Y., 1965. xiv + 390 pp. Illus. $7.95.

Colin Turnbull is one of those rare and hardy anthropologists who has studied a single band of forest nomads intensively throughout a calendar year. He was prompted to make this micro-sociological study of net-hunting Mbuti pygmies of the Ituri Forest in the northeast Congo (Leopoldville) in order to arrive at a valid picture of the