

sponse frequently resolve a hanging detail.

Finally, some perseverance may be required to read through the text in its entirety, not because of turgidity in style or any lack of clarity, but because the pages are packed with so many evocative ideas that one's imagination can interrupt concentration. Of course, this is the purpose of the book, and its intentions are superbly fulfilled. The memory of J. A. F. Stevenson is well served by this outstanding volume.

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Practical Scientists

Thinkers and Tinkers. Early American Men of Science. SILVIO A. BEDINI. Scribner, New York, 1975. xx, 522 pp., illus. \$17.50.

In the past, historians of science tended to concentrate their attention on the major figures whose intellectual labors were said to have determined the development of modern science. Copernicus, Galileo, Newton, Darwin, and the like were seen as creating science in Europe, and a smaller group as playing a similar role in America—Benjamin Franklin, Joseph Henry, Asa Gray, J. Willard Gibbs, T. H. Morgan. No one of these great men of science, however, could have carried on his work in a cultural milieu devoid of the supporting scientific and technical activity of a host of lesser practitioners. Recent historical research, based on a recognition of this fact, has shifted to the study of the social and intellectual ecology of a community of scientists and technicians who exhibit a wide range of talent and achievement. It is in this modern spirit that Bedini writes about the "little" men who cultivated practical science in America from the time of the first settlements to the early decades of the 19th century. Benjamin Franklin does not dominate the pages of this book; he takes his place in the midst of dozens of now forgotten "thinkers and tinkers."

When a new land is opened to settlement it supplies many opportunities for natural historians to appraise and catalog its geological, botanical, and zoological wonders. A fair amount has been published on this phase of American science, and hence Bedini looks to other examples of the early scientific spirit. A new land must be explored, surveyed, and mapped, its rivers and seacoasts navigated and charted, its cities, towns, and farmlands plotted in a more or less rational fashion. All this calls for spe-



"Woodcut by an unknown artist [showing] a figure making astronomical observations with an unidentifiable instrument and surrounded by other scientific instruments. This woodcut, first known from ca 1758, was reprinted several times." It is reproduced in *Thinkers and Tinkers* as part of the title page of *Bickerstaff's Boston Almanack, for the Year of our Redemption 1783. Being the ... Seventh of Independency*. ... The ephemeris for the almanac was calculated by Benjamin West.

cific scientific and mathematical instruments: a variety of compasses, surveying tools, telescopes, navigating equipment, clocks and marine chronometers, and astronomical devices. Initially these instruments were obtained from European suppliers, but their construction and repair were soon to be the responsibility of a colonial band of mathematical practitioners who were able to wed rudiments of abstract science to specific toolmaking skills. The results were American-made instruments and the origins of a class of specialized craftsmen conversant with scientific ideas. The subsequent expansion of the United States, on land and sea, by peaceful and warlike means, accentuated the need for more and varied scientific instruments, texts of instruction, and technical innovations to match peculiar national needs.

This, in rapid summary, is the essence of *Thinkers and Tinkers*, a well-written and detailed book based upon careful research, illustrated with some one hundred photographs of instruments and their makers, and accompanied by a useful glossary of technical terms.

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