earliest pottery at the Kotosh site, to that of Upper Amazonian Tutishcainyo; and he sees both Tutishcainyo and Waira-jirca as linked to Ecuadorian coastal Valdivia, although all with ultimate origins in the Amazonian Basin. He also sees Andean and Chavinoid elements in his later Amazonian Shakimu culture. It would be his interpretation that the general currents of influence were first running from the Upper Amazonian cultures to the Andes and then, after the rise of Chavín, from the Andes down to the jungle regions. Whether one accepts all of Lathrap's directions of influence and points of origin, he has established his central thesis, which is that between 2000 and 500 B.C. the Peruvian Andes and the Upper Amazon were in the same "interaction sphere."

John Rowe's paper is in the combined art-historical-anthropological tradition which he has followed so well. He discusses the two kinds of artistic continuities which he conceives of for Peru: archaisms and persistent conventions. The first includes those Moche vessels which in shape and color are obviously a part of Moche culture but which bear unmistakable Chavín designs. It is hard to quarrel with Rowe's reasoning that the makers of these particular pieces had much earlier Chavín specimens at hand as models. He also makes the same case for some Middle Horizon vessels and for a Chimu piece. Persistent convention, on the other hand, is another kind of process. It is seen in the Huari-Tiahuanaco retention of certain Chavín conventionalizations in art, such as the "staff-god pose." Here, the probabilities favor some kind of cultural continuity, as yet untraced but perhaps via chronologically intermediate Paracas and Pucara styles.

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Astronomical Activities

The Harvard College Observatory. The First Four Directorships, 1839–1919. BESSIE ZABAN JONES and LYLE GIFFORD BOYD. Belknap (Harvard University Press), Cambridge, Mass., 1971. xvi, 496 pp., illus. $15.

Unlike older-style institutional histories which solemnly report statutes, donations, and formal justifications, this fascinating book is about people. A coherent history spiced with well-chosen and marvelously told ancedotes, gleaned from the archives of the Harvard College Observatory, it illustrates the daily, very human activities behind the scientific observations and discoveries.

What was involved in the establishment of an astronomical facility in early 19th-century America? When appointed Astronomical Observer to the University in 1839 William Cranch Bond was given a house in Cambridge—but no salary, no observatory, precious few instruments, no assistants, and no students. (Flamsteed, the first Astronomer Royal, was provided with an observatory at Greenwich and a small salary, but no instruments.)

Although Alvan Clark in Cambridgeport ground beautiful lenses, precision instruments still had to be ordered from abroad. In January 1869, the London instrument maker William Simms wrote to Joseph Winlock at Harvard that his new meridian circle was "completed"; the following June he reported it "nearly finished"; the instrument arrived in Cambridge in the summer of 1870. Winlock's great spectroscope ordered from John Browning in London never arrived.

Astronomers exhibited surprising ingenuity in their search for support for their researches. Edward C. Pickering, the highly talented fund raiser who in 25 years increased the Observatory's endowment from less than $200,000 to over $900,000, found it worthwhile to sell the grass cut from the Observatory grounds for $30 a year.

Harvard astronomers had their share of scholarly squabbles. Pickering's method of measuring magnitudes differed from that used by Pritchard at Oxford. When the Royal Astronomical Society awarded its gold medal jointly to the two men, Pickering hesitated to accept, lest his action be construed as an endorsement of Pritchard's method.

What was the relation of a research institute to its parent university? Although the Observatory was part of Harvard, and the astronomers were known as professors, not until 1887 was university credit given for observatory work.

To what extent did donors understand the work they supported? Unlike Charles Yerkes and James Lick, for whom the purpose of large telescopes was to ensure social acceptance now and immortality later, Mary Anna Palmer Draper and Catherine Wolfe Bruce tried to support work rather than monuments. Pickering wrote frequently to Mrs. Draper, detailing the progress of the Henry Draper catalog of star spectra. Guided by Pickering, Miss Bruce provided funds for small but worthwhile projects—Charles A. Young at Princeton wrote that with $500 he could pay an assistant's salary and restore to usefulness $100,000 worth of idle equipment—in addition to money for expensive, experimental telescopes.

The hazards involved in directing research from afar were many. Edward Pickering's extensive plans for collecting photographic spectra of the southern stars were delayed for months when, alone in Arequipa with various large telescopes, his brother William chose to observe Mars instead.

With ambitious plans and limited funds the Harvard astronomers were eager to get the most work for their money. Realizing that much of the routine work of an observatory usually done by trained astronomers could just as well be done by bright assistants, Pickering hired women at 25¢ an hour to reduce observations, measure photographic plates, and classify stellar spectra. Most of these women, with little or no previous training, proved immensely valuable. Antonia C. Maury, one of the few college-educated women at the observatory, found the work stultifying.

Through details like these the authors of this book build up a picture of the complexities and diversity of scientific life. Rather than leaping from observation to insight to public recognition they explore the problems of establishing, directing, and using a great research facility.

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A History of Oceanography

Scientists and the Sea, 1650–1900. A Study of Marine Science. MARGARET DEACON. Academic Press, New York, 1971. xvi, 446 pp., illus. $16.

Oceanography has long needed a comprehensive history by someone who understood the significance of findings in the diverse disciplines utilized by questioning men who have sought to understand the sea and its processes. Perhaps such a comprehensive treatment is too much to hope for; this work (by the daughter of Britain's present grand old man of oceanogra-