

derstandable in an ideological context. The most famous example, of course, is the Aztec reception of the Spanish under Cortés, whom they took for good iconographic reasons to be the returning god Quetzalcoatl. Coe makes the particularly interesting observation that the first real iconography in Mesoamerica was directly associated with early social stratification. Certainly, legitimation of hierarchical position was an important issue in early complex societies; one that involved necessary ideological transformations. How such transformations might be achieved is both important and poorly understood.

Richard W. Keatinge sees religion as providing a mechanism for manipulation of populations in emerging centralized systems. He draws an example from Peru, where the spread of ideological elements associated with the Chavin art style over much of the region may have been important in generating relative ideological uniformity that facilitated expansion of the later Inca empire.

Finally, David A. Freidel takes a more ambitious position in arguing that it is "cultural reality," systems of belief, that structures social action. He provides a detailed and interesting case for the association of sociopolitical and ideological variability over both time and space in the Maya area. Freidel's and related work makes it increasingly clear that the material expressions of ideology reflect the storage, transmission, and manipulation of information that may be critical to processes of stability and change in societies of all degrees of complexity.

It is interesting that several contributors remark upon the apparently discontinuous and rapid change that often characterizes the development of complex societies. This suggests the presence of threshold values for significant alteration of systems already far from equilibrium. We might do well to begin consideration of such concepts as dissipative structures in our search for general theory of the evolution of social systems.

The reader will have detected that I disagree with a number of the perspectives presented in this volume. While the presence of so many conflicting positions on state formation reflects more on our ignorance than on our theoretical sophistication, it also indicates intense interest and activity that promise progress on one of the central problems of archeology.

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Inca Encodements

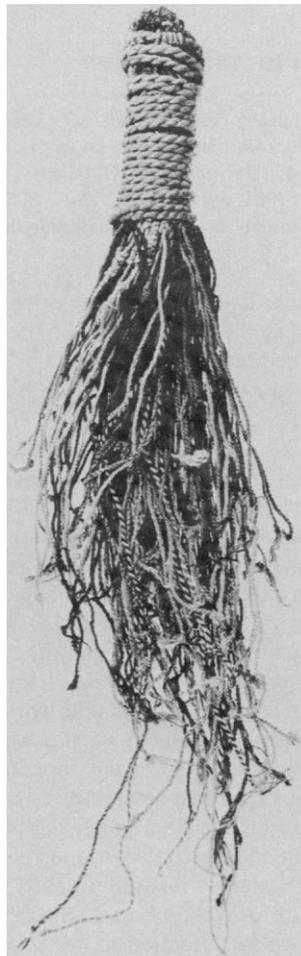
Code of the Quipu. A Study in Media, Mathematics, and Culture. MARCIA ASCHER and ROBERT ASCHER. University of Michigan Press, Ann Arbor, 1981. x, 166 pp., illus. Cloth, \$18.95; paper, \$8.95.

There are several characteristics that make the Inca empire unique in the history of states and empires. One distinguishing trait, it has traditionally been thought, is that it did not develop a system of writing. One of the principal contributions of Marcia Ascher and Robert Ascher's book *Code of the Quipu* is to argue convincingly that the Incas did, in fact, have a form of writing, embedded within a more general recording system based on several complex numerical-logical concepts. The system utilized pieces of wool and cotton string called quipus ("knots"). Information drawn from a wide range of contexts, such as censuses, accounts of stored products and tribute collected, and even oral histories and myths was encoded by the positioning

and coloring of secondary and tertiary strings appended to a primary cord and by the arrangement of knots along these strings; Inca writing was therefore a three-dimensional system in which information was recorded by tracing figures in space with pieces of string.

To concentrate on writing in a review of *Code of the Quipu*, however, is not to accurately represent the principal focus of the book, for the Aschers are primarily interested in describing how quipus were used for recording numbers, by means of a base 10 positional system, and in establishing the place of quipus in the history of mathematics; in these goals they succeed admirably. The book is remarkable in its clear exposition of Inca and Western mathematics and in its careful exploration of the implications of mathematical concepts in the broader context of Inca culture.

There are several important numerical principles discussed throughout the book. These include the principle of position (which is central to the coding of information in quipus), the concept of zero (which the Incas had), evidence for the encoding of fractions and ratios, and several different principles of calculation. Although quipus were devices for recording, rather than calculating, it is shown that arithmetical ideas embedded within the logic of hierarchical and cross categorization on the quipus include addition, division into equal parts, division into simple unequal fractional parts, division into proportional parts, multiplication of integers by integers, and multiplication of integers by fractions. The Aschers' conclusion that "the way the concepts of number, geometric configuration, and logic were formed together by the quipumaker was unparalleled in other cultures" is justified by their careful analysis and exposition.



A completed quipu, shown rolled and unrolled. [From *Code of the Quipu*; quipu from the collection of the Smithsonian Institution]

The success of *Code of the Quipu* is due partly to its organization and mode of presentation. An introduction to Inca culture, in its broad outlines, defines the context within which quipus functioned. The physical characteristics of quipus are then elaborated so that one becomes familiar with their structural features (for example, types of cords and the directionality, hierarchy, and spacing of cords) as well as symbolic elements, such as the range and variable patterning of colors, by which information is coded. The Aschers then introduce the notion of "insistence," a concept borrowed from a lecture given by Gertrude Stein, which refers to the phenomenon or process whereby a culture, for instance, expresses itself in a number of consistent and predictable ways by whose recurrence an observer is able to recognize it. The particular features of Inca insistence include concern with spatial relations, portability, cloth, methodological arrangements, conservatism, natural fit, and symmetry. The quipu, it is argued, is the quintessence of the elements that characterize Inca insistence.

After an account of the place of the quipu-maker in Inca society, there are three chapters ("Format, category, and summation"; "Hierarchy and pattern"; and "Arithmetical ideas and recurrent numbers") that examine numbers and the arrangement of numerical data on quipus according to several logical structures. The structures include cross categorization, hierarchical categorization, rhythm, and symmetry. For each an example, such as box scores of baseball games, from a familiar context is given, and then specific quipus that appear to incorporate the concept are described and analyzed. Marginal notes also refer the reader to the Aschers' *Code of the Quipu Databook* (University of Michigan Press, 1978; on microfiche from University Microfilms International, Ann Arbor), which contains detailed descriptions of 191 quipus studied by them. Finally, exercises are provided in which the reader is asked to construct quipus for imaginary situations for which the concept that has been elaborated is the most efficient means of encoding information. By this kind of "insistence" one comes to understand the differences between the organizational concepts and their relative utility in storing different kinds of information. The specialized analysis of mathematics simultaneously provides a clear elucidation of a number of more fundamental characteristics of Inca structural and organizational principles and of the concepts that underlay

Inca systems of classification. In this respect, the book would serve as an excellent introduction to Inca thought and culture in courses dealing with more traditional topics in Andean archeology and social anthropology.

One contribution of the book, which remains implicit throughout, is the light it sheds on Inca concepts of history. As devices for recording and storing information for future reference quipus provide perhaps the best evidence we have concerning what the Incas considered vital to the description, as well as the functioning, of the empire.

There are a few criticisms that must be made of the book. First, though it is well referenced with marginal notes, there is no general bibliography. Nor is there an index. This is especially unfortunate in a book that should be useful as a reference work. Finally, the book leaves the impression that Inca culture is dead and that there are no possibilities for observing reflections or remnants of Inca-like patterns of thought and culture. However, the Incas were a particular example

of a more general phenomenon: cultures successfully adapted to the Andean environment. Recent ethnographies clearly demonstrate that many Inca-like principles of organization underlie and give coherence to the lives of Quechua-speaking Indians who live in the Andes today, who cultivate traditional Andean crops with traditional forms of technology and scheduling, and whose social organization incorporates such Inca institutions as ayllus. There is also no mention of the fact that the fundamental skills required to make the physical material of a quipu are very much alive today in the hands of Andean spinners and weavers.

These few criticisms notwithstanding, *Code of the Quipu* is an important contribution to the comparative study of the history of science and to our understanding of Inca thought and culture.

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Pre-Columbian Dress

Indian Clothing before Cortés. Mesoamerican Costumes from the Codices. PATRICIA RIEFF ANAWALT. University of Oklahoma Press, Norman, 1981. xx, 232 pp., illus. \$35. The Civilization of the American Indian Series, vol. 156.

In much of ancient Mesoamerica, particularly in the hot country of the Gulf Coast, the Maya lowlands, and the Pacific drainage, there was really no biological need to wear clothes. And yet such peoples as the Maya, in the midst of humid forests, chose to cover their naked forms with incredibly rich textiles. It is folk wisdom to say that clothing both conceals and reveals. On the one hand, it removes from sight those portions of the anatomy culturally considered "shameful" (usually the genitalia and other sexually powerful details), while on the other it proclaims to the outside world the status and achievement of the wearer. Unfortunately, if we wish to examine and analyze Mesoamerican costume, with the ultimate goal of understanding its role in society, politics, and religion, there are almost insurmountable problems. The gravest of these is that, in contrast to the situation in Peru, almost no pre-Spanish textiles have survived the damp climate of Mesoamerica, excepting a few rags from dry caves and

the carbonized fragments dredged up from the Cenote of Sacrifice in Chichen Itzá, Yucatán.

Patricia Anawalt has chosen, therefore, to limit her analysis to clothing as depicted in the surviving pictorial Mexican and Maya codices and as described in certain post-Conquest documents. Examples are taken from the Mixtec codices of Oaxaca (which are largely historical); from the so-called "Borgia Group" of ritual books, which most but not all scholars would ascribe to the central Mexican region; from the Codex Mendoza, a post-1521 book with a section on Aztec ethnology; from the Relación de Michoacán, our unique, early colonial source on the Tarascans; and from three Post-Classic codices from the Maya lowlands. Since Anawalt does not even mention a fourth Maya codex, the Grolier, I presume that she has accepted the view held by the late Eric Thompson that it is a fake, a view with which I definitely do not concur.

Anawalt suggests that Late Post-Classic Mesoamerican garments can be classified through five basic principles of construction: (i) draped (such as the wraparound skirt for women, and the loincloth, hip-cloth, and cape for men); (ii) slip-on (the *quechquemil* and *huipil* blouses for females); (iii) open-sewn (the