

add a Bayesian touch that might help some workers who have only vague ideas about the actual size of an effect.

The use of graphs to illustrate the concept of population overlap and to show power as a function of effective size would have helped the discussion of these concepts.

The book is presented as being both a handbook and a supplementary text for an intermediate course in statistics. As a supplementary text the book is very good. It contains almost 100 examples which illustrate both the use of the tables and some of the problems investigators face in planning their research. The most common problem is that the sample size required for reasonable power is larger than the experimenter can afford.

It is disappointing that a book dealing with a matter so close to the heart of science as how one proves the existence of a hypothesized or predicted effect gives the student so little of the philosophical or broader statistical issues involved. In particular, there is no attempt to relate tests of hypotheses to either confidence-interval estimation or more general forms of decision theory. Situations in which these ideas are relevant occur in the examples, and surely an intermediate student should be acquainted with both these concepts. In fairness to the author, it is the richness of his examples that seems to cry out for a broader basis of discussion. Cohen clearly is alive to these issues, but he never seriously discusses them with the reader man to man.

Those who know statistics and simply want to look up the power of the test they have in mind are not going to find their answer quickly. This is true even though each chapter is organized on the same general plan. The minimum information required, for example, to look up the power for a *t* test with equal variances but unequal sample sizes is so scattered that one must skim the whole chapter. This problem is aggravated by the way the book is set in type. The illustrative examples are interspersed throughout the material explaining the use of the tables and are numbered in a boldface type more prominent than the heading of the substantive section, with the result that these important sections are hard to find by leafing through the chapter. They can best be found by looking in the table of contents, rather than the index.

The way the headings of the tables

themselves are set in type is a classic example of what not to do. The title of the table, which tells the type of test and the level of significance, is in a lightface of the same size as that used for references in *Science*. The level of significance is not labeled as such but is called "a," presumably for alpha, the usual statistical notation. The "a" has a subscript which is the only clue to whether the table is for a one- or a two-tail test. Mistaking a one-tail for a two-tail table produces a serious error. When a table is contin-

ued onto a second page, not even this microscopic information is reprinted.

Despite these typographical roadblocks this book should have a widespread and beneficial effect upon the social sciences. By putting power tables for so many common statistical tests into one book with a unified treatment, Cohen will save many experimenters from trying to prove too much with too little.

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The Rise of Native American Civilization

A Comparison of Formative Cultures in the Americas. Diffusion or the Psychic Unity of Man. JAMES A. FORD. Smithsonian Institution Press, Washington, D.C., 1969 (available from Superintendent of Documents, Washington, D.C.). xviii + 214 pp. + plates. \$7.75. Smithsonian Contributions to Anthropology, vol. 11.

This posthumous book is a monumental and scholarly synthesis of its author's life's work. Here the results of his broad and active participation in the archeological investigation of New World culture history come finally to bear upon major problems of culture theory. So do his concerns with archeological methodology and theory.

The book has two main foci: the definition and delineation of that part of native American culture history that gives the book its title—the Formative—and a test of one of culture theory's most important problems, the extent of human creativity.

For Ford the Formative was more a culture-historical process than a chronological period:

... it is preferable to define the Formative more loosely as the 3000 years (or less in some regions) during which the elements of ceramics, ground stone tools, handmade figurines, and manioc and maize agriculture were being diffused and welded into the socio-economic life of the people living in the region extending from Peru to the eastern United States.

This culminated in the appearance of the first American civilizations. Ford eschews the traditional tripartite division of the Formative into Early, Middle, and Late phases. Instead he proposes a "Colonial Formative," 3000 to 1200 B.C., during which ceramics were being distributed over the Americas by seafaring colonizers, and a "Theocratic Formative" "rather sharply de-

fined by the first appearance of mound structures and other appurtenances of political-religious control" between 1200 and 400 B.C.

Through a detailed analysis and comparison of data and chronology Ford comes to the conclusion that the main stimuli giving rise to both the Colonial and the Theocratic Formative were of trans-Pacific origin. At this level the work constitutes an exploration of theoretical problems of long standing in anthropology and history. As I have mentioned, the most important of these lies in the delineation of human creativity, its incidence and nature. Adjunct to and illuminative of this are the factors of parallel invention and discovery, cultural determinism of human behavior, and the role of diffusion in culture growth, all hoary with age as concepts and problems, faddishly in and out of style with students of human behavior, but incessantly providing a background dissonance to our attempts to understand ourselves. It has long been the hope of anthropologists and culture historians of the American tradition that the rise of native American civilization would provide an independent "laboratory" test of cultural evolution through which universal principles and laws of human behavior could be formulated. Only when the results of the "busyness" of synchronic investigations of human behavior are assessed can the importance of this hope be evaluated. But Ford's conclusions amount to a major challenge to all theorists of human behavior.

The test of the two opposing views lies in the interpretation of available data. The presentation here is the most serious challenge so far to the thesis that prehistoric American civilization

was indigenous. Nevertheless, in the end a basic question is not fully answered. If (as Ford agrees) the same necessary cultural elements were present in both the Old and the New World immediately prior to the development of the Neolithic and the Formative, respectively, could not the same cultural synthesis have been achieved independently in both places? The negative answer given here is the most convincing to date, however.

Any adequate evaluation of this work demands the recognition of the theoretical level of discourse at which Ford operates. The concern is with a synthesis of culture history and culture historical process of intercontinental scope. With such a goal a certain arbitrariness of trait selection is almost inevitable. Likewise, there are chronological disparities in the comparison of regions, and a glossing over of areal details emerges. Ford was aware of all these difficulties. His was a purposeful attempt to integrate facts, comparisons, conclusions, and speculations.

. . . with regard to the establishment of pottery types or any other useful historical device, the classificatory units must be selected on the basis of a reasoned guess as to the actual sequence of events. That there is an empirical methodology for the selection of "traits," "types," or cultural phases that will reveal the historical facts when properly manipulated is a fallacy that at the moment is wasting thousands of dollars spent on computer time.

It is precisely in this context that one must assess Ford's selection and interpretation of the data available. If there is ever to be a synthetic statement of New World culture history, then rational and logical linking and organization of data must be based upon more than empiricism. Empiricism does not impart insight and meaning—this is achieved only when the scientist supercedes empirical data.

The level of theory is not the same as that of the proponents of the "new archeology." Ford's concern is with the broader scope of the nature of culture, theirs with the reconstruction of the sociocultural aspects of individual archeological sites. Although the two approaches to archeological data are working toward the same goal and an ultimate fusion of the two seems inevitable and necessary, at present one cannot successfully apply standards of evaluation from one to the other.

It would be impossible in any review to describe and evaluate in detail the procedures and methods by which

Ford's propositions are demonstrated; the highlights will have to suffice. A rigorous evaluation of the chronological aspects of the problem and the radiocarbon dates available for 15 regions extending from the Ohio Valley to central coast Peru is made. The distribution of selected cultural traits is placed in this chronological framework. All these data are summarized in 22 synoptic charts at the end of the book. From them four general categories of trait distribution are derived: First, features, mainly ceramic, transported usually by sea during the establishment of small colonies during the Colonial Formative; Ford ultimately derives these from Valdivia and the later Machalilla coastal Ecuadorean cultures which in turn are the result of trans-Pacific voyages—the Valdivian from the Middle Jomon Neolithic of Japan and the Machalilla from a less well defined western Pacific rim location. Second, traits that are earliest in Valdivia and Machalilla but diffuse subsequent to the Colonial Formative. Third, traits that are earliest in North America (including Mexico) and diffuse principally between 1000 and 1 B.C. Fourth, traits that first appear in the Theocratic Formative and diffuse between 1200 and 1 B.C. It is from these four categories that the two aspects of the Formative are devised.

The Colonial Formative is restricted to 11 widely spaced areas of pottery making from Stallings Island, Georgia, to the Peruvian north coast Gualaquiza. This distribution was achieved through intentional voyages of considerable length, and in some cases there was repeated contact. Because complexes of culture traits are not identical in all 11 areas Ford proposes that only a part of the donor complex (Valdivia) was transported to each colony. Further, Ford is convinced that a series of purposeful voyages from the Jomon Neolithic cultures of Japan occurred and that these account for certain differences in the Valdivian sequence and the subsequent migration of ceramic traits to the other colonies. This is the weakest part of his argument.

It is true that the earliest ceramics in the New World fall at the 3000 B.C. date. However, it is still not completely clear to the reviewer why Valdivia is chosen to be the origin point of New World diffusion rather than Puerto Hormiga on the north coast of Colombia. There is extensive sharing of ceramic traits between the two sites, and Puerto Hormiga is likely to be ante-

cedent on the basis of radiocarbon dates. Beyond this it is crucial to Ford's thesis that there are no American origins for the ceramic traits of these sites and that the traits are found in scattered coastal colonies with the exception of the Purón phase in the Tehuacán valley of Mexico and the Kotosh Waira-jirca phase of north highland Peru. But there are archeologically unknown areas, such as the east coast of Central America, between these 11 colonies. Until these areas have been explored we shall not be certain whether there is an American origin of ceramics. For although Ford maintains that the Valdivian complex, especially in its extensive range of decoration, includes a significant number of traits that are important to the centuries to come in American culture history, many American archeologists question Valdivian priority and Jomon ancestry. The question boils down to the number of ways in which the earliest pottery decoration could have been achieved. Even though the decoration possesses a surprising complexity the possibilities tend to be exaggerated. Moreover, even if the decoration appeared suddenly, it is the type that a priori one would expect would develop.

In sum, Ford's Colonial Formative is characterized by a series of ceramic traits carried by sea-migrating people, who preferred seacoast settlements and often a C-shaped ground plan, and to some extent by a shift in physical type. It is significant not only that the Colonial sites were scattered but that the Archaic cultures adopted relatively little of the Colonial Formative culture. The Archaic was as efficient a way of life as that of the ceramic-making, non-food-producing Colonials.

The Theocratic Formative is another matter. Some time between 1500 and 1000 B.C. a major cultural revolution occurred. Although domesticated food plants had been known and utilized by Archaic peoples before and after the Colonial Formative spread without the adoption of the ceramics, Ford and others consider the perfection of maize domestication to have been critical. But Ford also believes the new religio-political ideas will prove more important in that significant shift of cultural orientation. The Olmec of southern Mexico achieved this shift around 1200 B.C. Just as the sudden appearance of ceramics was crucial to the Colonial Formative, the introduction of religio-political features such as complex ceremonial centers with exact orientation,

basalt blocks, tombs, calendar, animal deities—the jaguar or cat god and the rapacious bird—and baby face figurines marks the Theocratic Formative. Again these are considered to be of extra-American origin. Most of the ceramic traits are not new, the food products are American. This holds for Chavín in the Peruvian highlands as well. Neither Olmec nor Chavín cultures have local cultural ancestors in religious and political traits. But Chavín has Olmec. Olmec has none. Lamentably, Ford was unable to complete the analysis and exposition of the Theocratic Formative. However, all the data are given in the section on selected cultural traits. The Theocratic Formative spread widely, laid the basis for civilization in Meso-America and the Central Andes, and importantly influenced the culture history of eastern United States and the American southwest.

Underlying the obvious goals of this work is a serious attempt to define the several cultural traditions which contributed to the Formative as a whole: the role of the Archaic cultures in eastern North America, in its Desert culture expression in Mexico, and in a slightly different expression in coastal South America; the interaction between the Archaic and the new Formative traits; the effect of the late Upper Paleolithic and Mesolithic traditions of northern Asia on North America and maritime North Pacific Asia, specifically on Jomon patterning; the influence of an early ceramic-making pattern of southern Asian origin on Japan, and ultimately on the Americas through Valdivia and Machalilla; and finally, the role of Archaic-derived traits on South America and Mesoamerica.

Even in a review of this length it is impossible to touch upon all the significant features of this book. The evaluation of the trait selection and analysis, the judgment of regional authorities of Ford's sometimes cavalier treatment of data, a continuing reassessment of the evidence for extra-American stimuli to cultural reorientation, and the implications of Ford's conclusions that humans do not invent or create significant cultural behavior to the degree that the Formative or civilization could have arisen independently in the Americas all will have to emerge from extensive discussion and debate. The effect of this book on those American archeologists and culture historians of chauvinistic bent, of which group the reviewer has always considered himself

a member, will result in a fascinating and tumultuous time for us all. Finally, I would venture to guess that the effect that the long view of human behavior emphasized in this book and the implications it poses for the "now" generation will "involve" archeologists in universities. That is, if anything so old as the Formative is considered relevant.

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