New Interpretations of Aboriginal American Culture History

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TABLE OF CONTENTS

THE COMING OF AGE OF AMERICAN ARCHEOLOGY

Betty J. Meggers

THE PAPERS in this volume provide us with interpretative summaries of the status of archeological research in a number of New World areas. Many of the ideas put forth are new and exciting; some would have been inconceivable a decade ago and even now are revolutionary in their effect on our traditional view of cultural development in the Americas. Some readers, I am sure, have been able to accept the majority of these conclusions. Others have probably rejected the same reconstructions of the development and diffusion of culture on the ground that they are unscientifically derived or at least lacking in sufficient proof. Between these is a third type of reader, who probably represents the majority opinion. He is uncertain because, although he is stimulated by the apparent reasonableness and simplicity of these explanations of cultural development, he remembers the discredited evolutionary and diffusional theories of the past and cannot overcome the reservation that these archeologists have been led into similar errors.

The important question is, therefore, are the new ideas and interpretations "scientific"? One thing we can be sure of: to dismiss Ekholm's trans-Pacific influence, Spaulding's Mexican origin for Adena and Middle Mississippi traits, or any of the other reconstructions of past events as merely prejudice on the part of the writer would indeed be unscientific. Because this question must be answered before we can accept or reject the interpretations on their own merits, it will be appropriate to examine briefly those sciences we consider to be models of the scientific approach—the physical sciences—to see how the procedures and assumptions employed by these archeologists rate as examples of scientific method.

If we look at the papers together rather than as separate, distinct contributions, it is readily apparent that most of the authors have made use of the same basic cultural principles and have drawn similar general conclusions from them. One of these is the principle that the existence of a complex trait or group of traits in two geographically separated regions cannot be the result of independent development, but must be attributed to cultural contact. Whether this is diffusion of culture or migration of people,

we are accustomed to visualize it as a typically slow and gradual process. However, one striking conclusion reached by several writers is the speed with which cultural traits spread in a number of instances in the Americas. Willey is the only one who can support his conclusion by actual dates derived from Carbon 14, but it is implicit in the reconstructions made by Evans and Spaulding. Willey was able to demonstrate that certain non-contemporary traits, among them rocker stamping, platform mounds, negative painting, and mold-made figurines, appear at almost the same time in Mexico and Peru and must in each case be considered to have diffused from a single origin. Since there is little prospect of discovering a geographically intermediate source of diffusion, this represents a rapid movement of traits that have no apparent practical value to explain their swift spread. Similarly, Eiseley sees the expansion of the human race to the ends of the earth as something that occurred, as he so graphically phrased it, "in the blink of a geological eye."

Rapid movements of whole complexes that seem to require the assumption of migration of peoples were postulated by Evans for northern South America and by Spaulding for eastern North America. These share with Ekholm's conclusions on the origin of certain Mesoamerican cultures the feature of absence of evidence as yet along the presumed route of transmittal and, what is more striking, absence of an as yet defined ancestral complex in the presumed place of origin. Evans traces the Marajoara culture at the mouth of the Amazon, an intrusive culture with close Circum-Caribbean and Sub-Andean affiliations, to the northwestern corner of South America but correspondences in that part of the continent are scattered and general in our present state of knowledge. Spaulding, in a similar way, derives the Adena culture of the Ohio Valley from northeastern Mexico but acknowledges that a predecessor in that region has not yet been found. Ekholm faces the same problem in his attempts to find a specific derivation for the elements of Asiatic appearance in Mesoamerica. When Spaulding and Evans make these reconstructions, we remember the terrestrial links and are prone to accept the conclusion that contact took place, but when the sea intervenes, as it does in Ekholm's case, we are more resistant. It is well to keep in mind, however, that these three individuals are drawing on the same type of evidence and if detailed resemblances preclude the possibility of independent invention, as we usually agree that they do, then the transmittal must have occurred whether we can visualize the method or not.

Another cultural principle that has been drawn upon by several of our writers is environmental determinism. Eiseley visualizes an Old World Paleolithic culture adapted to the hunting of large game, which was funneled through or dispersed over grasslands that occupied large areas of the earth's surface in glacial and early post-glacial times. As this world environment gave way to diverse local conditions, cultures became locally specialized, producing the differences represented archeologically by Paleo-Indian and Archaic complexes in the Americas. Spaulding resorted to environmental explanations several times in assessing the possibilities of cultural diffusion into the eastern United States from Asia and from the boreal zone of North America. Evans discussed it in greater detail as it explains the absence of archeological evidence to support Steward's hypothesis that the Tropical Forest type of culture developed in the Guianas and spread from there throughout the Tropical Forest Area.

A third important principle employed by several writers is cultural evolution. Both Evans and Spaulding express cultural differences in terms of stages or levels of development and both relate these levels to subsistence resources, with a well-developed social organization, elaborate arts and crafts, funerary practices, and earthworks dependent upon a productive agricultural economy. Willey utilizes such terms as "Formative" and "Early Classic" to refer to comparable stages of development in Mexico, Yucatan, Central America, and the Andean Area of South America, and Reed notes the increasing acceptance of this type of evolutionary framework in the American Southwest.

If we are to accept any or all of these "new interpretations of American culture history," we must be prepared to accept the assumptions or principles upon which they are based. This includes some form of evolutionary development of culture, some form of environmental determinism, and the recognition that detailed cultural resemblances are evidence of cultural diffusion whatever the obstacles to its occurrence appear to have been. All of these are old ideas in anthropology, all have been enthusiastically espoused and vehemently denied. Our problem is to decide whether they are scientific theories that can be accepted as working tools, or whether they are products of distortion and ignorance of the facts and, therefore, misleading if not useless.

In order to do this, we must find a satisfactory method of determining what is "scientific." The achievements of the physicists have built up for us, as for other laymen, the image of "Science" with a capital S. This "Science" is composed of two parts carefully controlled experiments, one part meticulous measurement, and three parts complex mathematical equations or formulae. Before this spectacle, some anthropologists have stepped back in awe and declared that "social science" can never be "real science." Others have praised Boas for his "rigorous methodology" and devoted themselves to following his lead in substituting fact gathering and the solution

of specific local problems for "armchair theorizing" and "premature generalization." The latest effort to draw the mantle of Science over anthropology appears to be inspired by the fact that mathematics is one of the more obvious ingredients in modern physics. The pressure to make it also an ingredient of anthropology impinges upon us constantly. In fact, we can hardly open a recent copy of any of our journals without finding an article admonishing us to retreat from the swamps now supporting our shaky conclusions to the firmer ground of statistical tests and demonstrations. While we can protest that the application of statistical formulae gives no new or better results, this answer gives us no assurance that to operate without mathematical proof is a scientific procedure. What we really need to know is, what is "scientific analysis."

When we think of physics, one of the first associations we make is with scientific laws. Physics means the law of gravitation, the laws of motion, the laws of thermodynamics, etc. We think of these as the basic rules obeyed by the atoms and the stars, immutable, inescapable, and eternal, and our reaction is that anthropology can never achieve anything like this. If we investigate further, however, we find the physicists eager to explain that many of their laws are not a description of a process followed invariably and uniformly by each and every atom but instead are a statistical average. An example is the law of mechanics, which states that there is an increase in molecular motion with the rise of temperature and that this increase proceeds at an even rate. This law does not apply to each individual particle in a mixture, however, because the heavier ones always move more slowly than the lighter ones. The proposition is only statistically true, as at any given moment any given molecule may be traveling at an extraordinarily great velocity or may be almost motionless. The majority, however, would be close to the average value and this average value is the same for molecules of any substance at any given temperature (Gamow, 1945, pp. 24-26). There are two possible reasons for our ready acceptance of such statistical laws in physics and our resistance to accepting them in the social sciences: First, we cannot see the exceptions when they are atoms or molecules and it is easy to forget that they exist; and Second, we are not accustomed to explaining the actions of deviant atoms or molecules as motivated by choice. In the social sciences, the deviant particles are human beings with individual personalities, whom we find it inhumane to reduce to the level of a statistic.

Even in those situations where the deviant particle is a culture or a tribe, we resist the application of a statistical approach to generalization. This is evident in the opposition to the concept of environmental influence on culture. While the proponents of this view have variously insisted that a culture is determined by its environment or that it is at least limited in certain ways by its environment (as in the example that snow houses cannot be used where there is no snow), its opponents have pointed out that similar cultures exist in very different geographical settings and that any systematic connection between environment and culture is thus obviously refuted.

However, the more we learn about the basis of cultural development, and especially the significance of the subsistence pattern, the clearer it becomes that environment does have an important influence upon cultural development through the differential potentiality it has for subsistence exploitation. By and large, environments that do not permit agriculture limit the cultural adjustment to a far lower level than those where agriculture can be employed. There are also differences in the intensity of agricultural production that can be achieved in different climates and soils, which in turn influence the cultural adjustment. This is not a uniform or invariable correlation, but it can be shown that hunting and gathering groups exist where the environment prohibits agriculture and that, while they differ in details of their culture and even in degree of primitiveness, on the average they are nomadic, their material culture is simple, their social organization is on the family level, and their religious concepts are vague. Other types of environments with different subsistence resources are associated with other general types or levels of culture, forming a continuous sequence that culminates in our own civilization (cf. Meggers, 1954).

If we think back a moment to the physicists' statistical law of mechanics, it will be noted that the kind of association anthropologists make between environment and culture is similar to that made by the physicists between temperature and molecular motion. Their law says, when the temperature rises, the molecules move faster *on the average*. Our law says, as the environment improves in subsistence potential, the culture advances in complexity, *on the average*. Once the physicists recognized their law of mechanics, they went on to discover that the deviant particles also obeyed a law and this discovery has had an important application to the problems of the liberation of sub-atomic energy (Gamow, 1945, p. 28). Since such statistical laws work so well for physicists, there is no reason why anthropologists should not give them a try. There is everything to gain, since such an approach not only permits prediction but also suggests new avenues for investigation.

Some laws of physics are not averages but are statements of the reaction that will always occur in a given situation, other things being equal. "Other things being equal" is the stereotyped way of saying that disturbing factors are not present to influence or alter the expected outcome. In the case of the first law of motion, however, other things are never equal. This law states that the natural motion of a body is motion at a uniform speed in a straight line. Nowhere in the universe can this be observed; it is something of which we have no experience for, if all other disturbing factors are removed, gravitation is always present to distort the motion. In justification of reliance on such a law, one scientist says:

"Why, then, did scientific men choose, as the foundation for their reasoning about motion, a law that can never be verified by observation? They chose the law because it was the most convenient possible law to choose. It introduced an unrivalled simplicity and economy into the complicated phenomena of motion. . . . It describes an unobservable state of affairs, but all observable states of affairs can be accounted for much more simply if we assume it . . . The first law describes what would happen if there were no disturbing forces, and the fact that what it describes never does happen is explained by the fact that there always are disturbing forces" (Sullivan, 1933, pp. 58-59).

If we turn back for a moment to the theories of anthropology, we are immediately struck by the resemblance between this approach and the criticisms that have been directed at the law of cultural evolution: that few if any tribes have passed through the stages of development described, that this possibility is actually obviated by the universal presence of diffusion, and that to divorce culture from its specific occurrences and to describe it as if it had a vitality of its own is unwarranted. On these objections, the theory of cultural evolution has not only been denied the status of a law but has been labeled as a false, misleading, indefensible, and even ridiculous doctrine.

The above discussion of the first law of motion, however, indicates that a scientific law need not describe any observable condition. Its validity stems from the fact that observable conditions can be more easily understood and more simply explained if the law is assumed. An increasing number of anthropologists, and particularly archeologists, are beginning to recognize this advantage in the law of cultural evolution. Willey, Strong, Bennett, and Armillas have profitably used the concept of developmental stages in analyzing the archeological sequences of Peru and Mexico (Kroeber, 1948a, pp. 114 and 116). Childe (1951) has clearly stated the same kind of approach to the prehistory of Europe, and Steward (1949b) has attempted to show that all of the ancient high cultures of the world followed a similar evolutionary pattern of development. Thus, although cultural evolution is often denied in the abstract today, it is being relied upon with increasing frequency as a research tool because of the fact that, as with the first law of motion, "all observable states of affairs can be accounted for much more simply if we assume it."

There is a third category of physical laws that is purely descriptive. An example is Kepler's laws of planetary motion: that the planets move in elliptical orbits, that their velocity increases as they approach the sun, and that they move more slowly the farther their orbits are from the sun. These laws are statements of fact and describe an observable situation with no exceptions. We might equate this kind of law with a third basic assumption employed in these papers, namely, that a complex composed of a number of distinctive elements or traits can originate only once, and that all occurrences must, therefore, be related. Numerous diffusion studies have provided evidence for this belief and it appears to qualify as a descriptive law, although it has been objected that man is not so uninventive that it is necessary to fall back on such a conclusion.

If we concede, for the moment, that our anthropological principles have the same outward form as some of the laws in physics, we may go on to examine what the physicists require in the way of proof for their laws. There is a possibility that our cultural "laws" may have the form but lack the substance. In anthropology, the burden of proof usually rests with the person who bases his conclusions on the terms of a generalization rather than on the person who questions these conclusions. In the case of trans-Pacific diffusion, the basic postulate that two identical or nearly-identical complexes cannot arise independently is rarely attacked. Instead, unanswerable questions are raised such as: "If this is so, why did not the wheel diffuse also?" Or, in the case of Andean-Mesoamerican relationships, "Why was writing not adopted by the Peruvians?"

Such objections, of course, get us nowhere because they lead into the realm of pure speculation. For each of these questions we can think of an answer, but the answers are irrelevant to the facts and can bring us no progress in the understanding of cultural processes. It is a measure of the immaturity of our science that we insist upon asking ourselves why certain things did not occur instead of trying to understand first why things happened as they did. The physicists have long since abandoned this dead-end approach, having learned that when they were able to explain what did happen they could also generally explain what did not. What ignorance suggests to be equally possible alternatives often turn out in reality not to be so at all.

That we still fall into these errors is also partly a result of the intimacy with which we are related to our subject matter. A modern physicist is under no obligation to reduce the behavior of the stars and planets to

rational explanations in terms of human personality, as did his astrologist predecessor. However, we still preserve this approach to the explanation of past human events. As if anthropocentrism by itself were not a sufficient mistake, we tend to take the point of view of twentieth century American culture, thereby violating one of our cardinal principles—that objectivity is inconsistent with ethnocentrism. Once we divorce ourselves from such notions as that writing and the wheel are the foundation of civilization, and recognize the fact that advanced civilizations have existed in the absence of both, we will be better able to formulate for ourselves questions whose answers can be found.

If we should come to a conclusion about the operation of culture, how are we to determine its validity? It is somewhat disappointing, at first, to learn that the most eminent physicists assert that proof of a scientific hypothesis is impossible. Jeans, for instance, states:

> "In real science . . . a hypothesis can never be proved true. If it is negatived by future observations we shall know it is wrong but if future observations confirm it we shall never be able to say it is right, since it will always be at the mercy of still further observations" (1943, p. 181).

Eddington speaks in a similar vein:

> "We cannot pretend to offer proofs. *Proof* is an idol before whom the pure mathematician tortures himself. In physics we are generally content to sacrifice before the lesser shrine of *Plausibility*" (1928, p. 337).

Einstein also has been quoted as saying, "No amount of experimentation can ever prove me right; a single experiment may at any time prove me wrong" (Heyl, 1954, p. 274).

Although it may be shocking at first to hear the physicists themselves state in such uncompromising terms that their laws are not the hard and fast, tried and true, tested and proved, permanent and immutable formulations that we have conceived them to be, it is of the greatest significance to us that such is the case. It changes the whole situation in regard to the possibility of arriving at generalizations or laws in the realm of cultural phenomena. If the laws of physics are as the physicists themselves describe them, then some of the objections that are offered against cultural laws—that they are not proved, or that they may turn out to have exceptions—lose their force.

If proof is not possible, what are the criteria that are used to judge the relative validity of two physical theories? If we set aside the cases where a theory was abandoned because it failed to account for a newly observed situation, in other words, where it was disproved, we find that one criterion of truth keeps reappearing in the writings of physicists. As Jeans puts it:

"When two hypotheses are possible, we provisionally choose that which our minds adjudge to be the simpler, on the supposition that this is the more likely to lead in the direction of the truth" (1943, p. 183).

A striking example of the application of this criterion exists in the history of astronomy. About 140 A.D., Ptolemy of Alexandria outlined a scheme of the universe based on the principle that the earth was its fixed center. He put forth strong arguments against the possibility of the earth's moving, including the conclusion that if it did the air would be left behind and the flying birds could not keep up. Although these "proofs" sound ridiculous to us today, they convinced the best scholars for more than a thousand years. It was not until Copernicus' work was published in 1546 that an alternative hypothesis was proposed, in which the earth and the other planets were asserted to revolve about the sun. Although Copernicus could offer no real proof for his conclusion, and was able in the last analysis to point only to the greater simplicity of his theory as its major advantage over Ptolemy's this was sufficient to gain it a foothold in scientific thought (Reichenbach, 1942, p. 18). It was only when Newton came along more than a hundred years later that the first real demonstration that Copernicus was correct was advanced.

In explaining why Newton's first law of motion—that the natural motion of a body is in a straight line at a uniform speed—has been adopted by physicists as the cornerstone of reasoning about motion in spite of the fact that such motion can never be observed, Sullivan falls back on this same virtue of simplicity:

"They chose the law because it was the most convenient law to choose. It introduced unrivalled simplicity and economy into the complicated phenomena of motion. For it must be remembered that what scientific men mean by truth is, in the last resort, convenience" (1933, pp. 58-59).

Jeans has remarked that in our search for truth,

"Apart from our knowledge of the patterns of events, our tools can only be probable reasoning and the principle of simplicity" (1943, p. 190).

And finally, Dirac, who won the Nobel Prize for Physics in 1933, says:

"With all the violent changes to which physical theory is subjected in modern times, there is just one rock which weathers every storm, to which one can always hold fast—the assumption that the fundamental laws of nature correspond to a beautiful mathematical theory. This means a theory based on simple mathematical concepts that fit together in an elegant way,

so that one has pleasure in working with it. So when a theoretical physicist has found such a theory, people put great confidence in it. If a discrepancy should turn up between the predictions of such a theory and an experimental result, one's first reaction would be to suspect experimental error, and only after exhaustive experimental checks would one accept the view that the theory needs modification, which would mean that one must look for a theory with a still more beautiful mathematical basis" (1954, p. 143).

Note the criteria that are emphasized here—simplicity, convenience, beauty—and compare them with the oft-repeated terms of derogation used in anthropology and the bitterness with which "simpliste" explanations and efforts to reduce the infinitely variable and complex individual expressions of culture to their fundamental generalities have been assailed. Whereas a simple theory is considered the highest ideal in physics, in anthropology it is decried as suspect or branded as useless.

Since one of the arguments brought up with considerable frequency to refute cultural interpretations is that they violate the "dictates of common sense" (Herskovits, 1948, p. 512; Dixon, 1928, pp. 189-190 and 265-6), it might be well to see what the physicists think of this criterion of truth. We have all heard of Einstein's theory of relativity but most of us know little of it beyond the name. There is one interesting situation deriving from this theory that is pertinent here, and that is the conclusion that movement exercises a retarding influence on clocks. If two clocks register the same time and one is moved about while the other remains stationary, the moving clock will be slower than its stationary counterpart when it is finally returned to its original position. This effect is produced in all running mechanisms, including the physical-chemical changes in the human body, since all are based on atoms. Furthermore, the faster the movement, the greater is the retardation. In the realm of ordinary experience, this situation has little significance. However, when the speed approaches that of light and is maintained over great distances, striking implications develop. Such a situation will arise if we ever succeed in developing interplanetary travel. Our space ship will cover astronomical distances at speeds approaching that of light. According to the theory of relativity, the human passengers on this flight will have their bodily processes slowed down, so that they will age more slowly than they would normally. If they returned to earth after an absence of several decades, they would look and feel only slightly older than when they departed, but they would find that others of their generation who had remained behind were aged or already dead. This conclusion sounds incredible, so let us turn to an authority for justification. Reichenbach says:

"This example has caused much surprise and even controversy in the discussion of the theory of relativity; but it is impossible to deny that it follows necessarily from the theory of relativity and that all physical facts speak for the correctness of the contention. The theory of relativity will not declare, to be sure, anything concerning the possibility of ever traveling across the space of the universe, for the simple reason that prophesies with regard to technical progress are outside its domain. But it may assert that, if such a trip is undertaken, the travelers are bound to age slower. . . . The hypothetical form of the assertion is right, even compulsory, insofar as all available facts are in favor of the doctrine of relativity. We cannot accept the objection that the case is inconceivable. Quite the contrary, everything described in it is quite conceivable; and fiction has more than once restored to such imagery. . . . The novelty of the case consists only in that it is now the imagery which represents the truth" (1942, pp. 69-70).

I am sure that few of us would presume to question these assertions. Our faith in modern physics is such that however fantastic the conclusions seem, we marvel but believe. Why is it, then, that when it is suggested that men may have crossed the Pacific in boats a few centuries before Columbus traversed the Atlantic, we protest that our credulity is being overstrained and insist that absolute proof be adduced not only that this could have been done but that it actually was done? Why do we resist the lesser marvel while we accept the truly incredible? We would do well to give this paradox serious thought, and to ask ourselves whether our resistance really has a scientific basis. The absence of striking advances in non-mathematical sciences comparable to those in physics has not escaped notice by other scientists, and one physicist has commented that "it may be through the limitations of common sense that these sciences are in their relatively unsatisfactory condition" (Sullivan, 1933, p. 282).

There is one final point on which we might profitably examine the attitude of the physicists and this concerns the way in which scientific theories are derived. With the sharp criticisms directed against the cultural theorists of the past still ringing in our ears, we have generally concerned ourselves with sticking close to the facts and proposing conclusions only when they seem to be proved beyond the possibility of contradiction. We tend to feel that when the data are complete, the conclusion will be self-evident, like a ripe fruit that only needs plucking from the tree. However, the physicists think differently. Einstein has said:

"We now realize, with special clarity, how much in error are those theorists who believe that theory comes inductively from experience (1950, p. 72).

Sullivan goes even further to say:

"The present-day difficulties of physics itself probably spring from the fact that its imaginative efforts have not been imaginative enough. We are still hampered by our habitual modes of thought even when, as with the modern mathematical physicist, they have departed a long way from common sense" (1933, p. 282).

The problem of training imaginative researchers has become a matter of deep concern in physics, and is one of the major points made in a recent address by R. E. Gibson, Director of the Applied Physics Laboratory of Johns Hopkins University. Among other things, he remarks:

". . . while I recognize the full importance of fundamental training in the scientific discipline—namely the inculcation of habits of careful observation and critical reasoning, together with the acquisition of technical skill—as essential for a research scientist, I do wish to emphasize that an alert mind and a fertile and disciplined imagination are characteristics which are absolutely indispensable to the scientist whose work is to rise above mediocrity" (1953, p. 396).

Having familiarized ourselves with the physicists' concepts of science, let us take a look at the recent trends in American archeology. According to our new perspective, scientific laws cannot be proved, only disproved; they may be statistical averages or they may describe no observable situation; and they cannot be derived without the exercise of "disciplined imagination." After paying a visit to the realms of the incredible where physicists are accustomed to spend much of their time, our wildest speculations about the processes of culture look tame indeed, and we might even say sensible, although this has ceased to be an adjective relevant to their truth. I do not think anyone can deny that the cultural interpretations given in this volume have a seductive simplicity, that they introduce a significant amount of order into the chaotic jumble of facts unearthed and heaped up by the archeologists. On the basis of the evidence just reviewed, we are obliged to conclude that, whether or not their conclusions stand the test of time, these synthesizers are proceeding in a scientific manner by applying to their problems basic explanations of cultural phenomena.

These synthesizers are all archeologists. Since the subject of this series is New World culture history, the significance of this fact is easily overlooked. It is only when we review current work in the general field of anthropology that we become aware that archeologists have been quietly assuming an increasingly important role in recent years. One measure of this can be taken from an analysis of the fields represented by the officers of the American Anthropological Association, who are listed in the front of each issue of the *American Anthropologist*. The proportion of officers who are archeologists averaged only $\frac{1}{5}$ to $\frac{1}{4}$ of the total in the five-year period from 1945 to 1949, but in the five years since 1949 this figure has risen to between $\frac{1}{3}$ and $\frac{1}{2}$. Since archeologists are greatly outnumbered by ethnologists and social anthropologists, this rise is significant. It implies the recognition of archeologists by their colleagues as anthropologists rather than as narrow specialists concerned only with recovering and preserving surviving remnants of the forgotten past.

This is a considerable achievement and represents a largely unconscious acknowledgment of the fact that American archeology has developed a "new look." The leading anthropologists of the past, from Tylor down to Boas and his students, were all primarily ethnologists or linguists. By the time archeology outgrew its antiquarian stage and began to develop special techniques to extract the maximum interpretative value from its data, ethnology was turning from material culture studies to psychological matters, and culture was being redefined as essentially a psychological phenomenon. From this point of view, archeological results were stigmatized as being hopelessly deficient and relegated to secondary importance. In a general anthropology text published as recently as 1949, such a view was expressed by a leading ethnologist:

> "Archeology . . . is always limited in the results it can produce. It is doomed always to be the lesser part of anthropology. The use and meaning of any object depends almost wholly upon non-material behavior patterns, and the objects derive their true significance from such patterns. . . . Thus, when the archeologist uncovers a prehistoric culture, it is not really the culture that he unearths but merely the surviving products of that culture, tangible remains of the intangible reality. The actual culture became extinct when the society that carried it passed out of existence. No culture can exist divorced from living beings. . . ." (Hoebel, 1949, p. 436).

Although no explicit contradiction has been made, the actions and results of recent years indicate that archeologists are no longer convinced that they are inevitably doomed to being second-class anthropologists. Of basic significance in producing this change are the great strides that have been made in archeological interpretation. Refinements in the techniques of excavation, among them a more widespread application of the stratigraphic approach, and better methods of analysis, including numerical treatment of pottery types to give fine temporal distinctions and greater use of ethnographic parallels to fill out gaps in the non-material aspects of the extinct culture, have opened new vistas. The emergence of a radiocarbon method of absolute dating provides a more adequate basis for correlating cultural sequences in widely separated areas and thus determining not only relative speed of cultural development but direction of diffusion.

In making a break with the ethnology of the past, which gave rise to the basic theories of cultural evolution and diffusion, of culture areas and culture types, of the relation of culture to environment, and of culture as a superorganic phenomenon, modern ethnologists have left the way open

to the archeologists to follow in the research paths opened by Tylor, Kroeber, Lowie, Wissler, and Boas. Fortified by their improved techniques, archeologists are beginning to show that they are singularly well equipped to take over this legacy. The strides that have been made in recent years indicate that far from being a handicap, there is a considerable advantage in being forced to deal with culture artificially separated from human beings. Shorn of the complicating and confusing psychological reactions of numbers of unique human personalities, cultural processes emerge in a stark and clear light. The remarkable accomplishment lies not with the archeologists who have recognized and profited by this advantage, but with those ethnologists like White (1949) who have been able to penetrate to fundamental cultural insights through the psychological maze.

American archeology has come of age. We have accumulated enough details about prehistoric cultures in most parts of the New World to begin drawing the kind of general conclusions that are contained in this volume. These results are of greater significance than the addition they make to our knowledge of New World prehistory. They offer a means of testing the cultural theories upon which anthropology is based, and archeologists are beginning to capitalize on this situation. It is a safe prediction that major contributions to cultural theory in the next few decades will be made by archeologists, whose laboratory encompasses the whole world and the whole history of culture.

If the possibility of achieving status for anthropology as a science with the prestige that physics now enjoys seems discouraging, it must be remembered that by comparison with physics, anthropology is very young. Newton's discoveries were made in the first part of the 18th century; those of Kepler and Galileo, 100 years earlier. Even if we consider that physics as a science begins with Newton, it is more than 200 years old. Before Newton are centuries of observation and explanation of natural phenomena, which although "unscientific" for the most part, formed a foundation for the emergence of physics as a science. Anthropology is frequently said to date from the middle of the 19th century, 150 years later than the latest date for the birth of physics and 250 years after Galileo and Kepler. When physics was 100 years old, the "atomic age" could not have been suspected. Anthropology is only 100 years old and exciting possibilities lie ahead. We know very little about them; but we can look forward with confidence in the knowledge that the science of culture will one day come into its own.