Reports of the

UNIVERSITY OF CALIFORNIA ARCHAEOLOGICAL SURVEY

No. 16

The University of California Archaeological Survey
Department of Anthropology
University of California
Berkeley 4, California

SYMPOSIUM OF THE ANTIQUITY OF MAN IN CALIFORNIA

Presented before the

SOUTHWESTERN ANTHROPOLOGICAL ASSOCIATION

Los Angeles, California

October 27, 1951

C o n t e n t s

INTRODUCTION

Walter Goldschmidt

The three papers included in the symposium on the antiquity of man in California were presented before the Southwestern Anthropological Association in the Fall of 1951. The writing of this introduction and editing these papers has been one of the pleasanter aspects of my role as president of the Association. In this symposium there were brought together three of the outstanding scholars of California and inter-mountain pre-history. Bringing as they do a variety of background and special interests and techniques to a common problem, they serve to highlight the present state of knowledge of this particular aspect of anthropology, and to point toward future needs and expectations.

Though the scholars themselves and other specialists in far Western archaeology may here and there see points of disagreement and even perhaps of controversy, the outsider to this special interest is impressed with the general concordance. This unity of opinion rests upon the solid foundation of empirical research, for each of these scholars has devoted himself to the evidence at hand; neither endeavoring to press some exceptional claim nor refusing to be swayed by the data before him.

One is impressed in this with the strong evidence that man's tenure in California can be reckoned in millennia but does not go beyond the confines of the late Pleistocene. I take it that none of the three scholars would be shocked to discover a dated human remains as old as 20,000 years, though it is clear from the content of these papers that such antiquity is not yet established by any satisfactory archeaological technique. Indeed, the cultures that have been examined would appear to have their maximum antiquity at about 10,000 years; that is, nothing in the presentations of Heizer and Brainerd would question the antiquity that Antevs presents in Chart 1 of his paper. Such a scholarly approach to archaeological evidence stands in strong contrast to the kind of assertions that were made in the earlier part of the century with regard to specific finds of human remains in the Americas. Such assertions, it would appear from the recent publications of G.C. Carter, are not a thing of the past and while intriguing claims for higher antiquity may turn out ultimately to be correct, the development of a science of archaeology rests with these more modest assemblages of evidence.

The development of new scientific techniques in archaeology is most impressive to a person whose archaeological experience terminated over 15 years ago. The recent surge of popularity of what might be called atomic-age dating has, of course, caught the attention of all persons interested in anthropology. What impresses me here, however, is that these specialized techniques do not provide the touchstones for the solution of chronological problems. Each specific technique is fraught with its own problems and the blind use of any of them would undoubtedly lead the archaeologist to error. The lesson goes beyond the limits of archaeology itself and applies to any technique used in all the sciences. The scholars here seem to recognize this

problem and are beginning a critical use of carbon 14, fluorine and similar dating methods. I would be derelict, however, if I did not point out that occasionally their use seems a little opportunistic; that is, they quote the carbon 14 date where it serves the purpose at hand, but deny it where it leads to embarrassment. This it seems to me is an inevitable stage in the development of new technical methods; it means merely that a carbon 14 dating is substantiating evidence and must be seen in the perspective of the total assemblage of archaeological data.

The present symposium collates many evidences on the antiquity of man in California, and raises important methodological and cultural problems. Heizer reviews the data from ethnology, linguistics and physical anthropology, and discusses the problems inherent in carbon 14 and fluorine dating. He closes his discussion with an effort to summarize the positive evidences for antiquity and offers his view of the early peopling of the area under discussion.

Brainerd's investigations focus attention on the more arid portions of the state. He calls attention to the virtue of survey technique in developing knowledge of culture history. This is made possible by the development of a statistical means of seriating a number of assemblages from different sites. Brainerd is also interested in going beyond the problem of culture sequence and facing the ecological involvements. He recognizes the relationship between the technological accomplishments and the environment, on one hand, and the density of population and the character of social organization. These are problems that stand before the prehistorians of the California area.

Antevs' presentation of the climatic conditions of the past 20,000 years offers a detailed framework within which the archaeologist must examine his data. The implications for the climatological changes both for dating specific sites and for understanding the social economy of the ancient cultures is of extreme importance. Even more significantly Antevs has ventured a placement of the more important archaeological findings of the desert area within this chronology.

The three papers presented here serve, I believe, as a summary of achievement and a benchmark for further research on the antiquity of man in California.

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A REVIEW OF PROBLEMS IN THE ANTIQUITY OF MAN IN CALIFORNIA.*

Robert F. Heizer

Introductory

Most of us will agree that we know very little about the total sequence of prehistoric cultures in the State of California. This is not to deny that we now control a wealth of factual data and that our museums house many hundreds of thousands of tools and implements, but as of this moment no person has found it possible to synthesize the larger picture of California prehistory by stating that man first appeared in such and such a region at about such and such a date, and that the other portions of the State were occupied subsequently by populations deriving from this initial settlement or from later ones and possessing cultures which were characterized by certain imperishable artifact forms which have been recovered by excavation. The large size of the state, the evident variety of cultures present both in space and time, the large numbers of sites known to occur, and the fact that the workers must, almost without exception, devote their main efforts to earning a living and doing archaeology as a spare time pursuit, all combine to explain why the stage of synthesis has not yet been arrived at.[1]

The fascination surrounding the problem of ancient man is one which both the non-professional public and the archaeologist share. The archaeologist who is doing history and development naturally aims his program toward finding origins and first appearances. The older the remains he discovers, the more important they are to him in furnishing a time perspective into which to project the development of the cultural remains of more recent age. This is why the subject of the antiquity of man is important.

It is my own opinion, based upon information known to me, that within the confines of California there has not yet been discovered a single human skeleton or implement about which one can say, "This is without doubt truly ancient," and by the use of the word "ancient" I mean something in the order of 10 to 15,000 years. Now I hasten to add that I am aware of a very large number of individual finds, as well as sites producing an abundance of tool forms, which add up to quite respectable culture complexes, which have been described and to which have been attributed great antiquity. Some of these, such as the Calaveras skull about which such controversy raged in the last century, are rejected by all either as hoaxes, or as honest misinterpretations inspired by wishful thinking. Others of the finds, such as the Lake Mohave shoreline complex, possess a high degree of probability of antiquity. All that I am saying is that incontrovertible and dead-certain evidence of very ancient man in California is thus far lacking. [2]

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* Superior numbers refer to "Notes" section at end of paper.

What I propose to discuss, with my earlier remarks as background, is first, the indirect or inferential evidence which may be cited in support of the view that California shared in the earlier settlement of the New World by man, and second, to suggest some methods and techniques which may be employed to determine the actual or relative age of certain types of remains found under conditions suggesting extreme antiquity.

Significance of Data Based upon Living People

Since the Indian tribes occupying California at the time of discovery and earliest Caucasian settlement are to be looked upon as the descendants of the people who left the later prehistoric remains, we may logically turn to the cultural and racial studies of these peoples in order to see if these investigations can suggest anything as regards ultimate antiquity of man in the state. A number of inquiries by physical anthropologists concerning the racial history of the New World or of particular populations, contain reference to the belief that some of the physical types of Californian Indians are morphologically similar to types which are believed to be very early arrivals in the New World. Although it is often difficult to pin authors down to a single decisive statement to this effect, such is, nonetheless, the sense of their conclusions. In illustration of this, note the following statement of Dixon who says, "Although the evidence is still rather contradictory as to the relative priority of the broad-nosed and narrow-nosed long-headed types, it seems on the whole probable that the Proto-Australoid must have been one of the earliest, if not the earliest, type to spread into the North American continent. On the Pacific Coast in California and Lower California it appears to constitute the oldest stratum, characterizing as it does the crania from the lower layers of the shell-heaps, from the islands of Santa Catalina and San Clemente off the coast . . ." [3] Klimek, in his sweeping reconstruction of the development of California Indian culture,[4] includes a chapter on "racial composition" in which he identifies the Paleoamerican type in the San Joaquin cranial type, and in the living Yuki, Pomo, Costanoan, Salinan and Chumash peoples. He further identifies this type as the dominant one in the Hokan speaking tribes. [5] Although the Yuki are so distinctive in both physical type and language that Kroeber [6] was inclined to believe them the strongest contenders as California's original inhabitants, Klimek nevertheless assigns the Hokan peoples clear priority as original settlers. [7] T.D. Stewart [8] includes California as an area of early or ancient populations as evidenced by high-vaulted, long-headed and broad-nosed crania in the older archaeological deposits. Imbelloni [9] identifies Fuégids, believed by him to be the earliest type population wave to reach America, in the prehistoric population of Humboldt Bay, on the northwestern coast of California, and von Eickstedt [9a] identifies the Central Californian peoples as representatives of ancient marginals (gruppe margide). Earl Count in his several papers on Australoids in the New World [10] goes too deeply into anthropometric metaphysics for me to follow him, but he clearly envisages the presence of ancient and primitive Australoids in California, and for whatever it means he has selected as one of his type examples a skull which comes from a site which recent Carbon-14 dates indicate is well over 4000 years old. I shall close my summary by citing the recently published view of Birdsell that the living Pomo, Yuki and Cahuilla, among all American Indians, represent foci of Amurian traits. The implication is strong that these people may be recognizable survivors of a very ancient archaic Caucasoid migration to the New

World from northeastern Asia.[11] Enough opinions have been cited, I believe, to show that a number of students who profess to polyracialist theories of American Indian origins, have seen in California Indians archaic phenotypic traits. The upshot of all this, for my purposes, is to suggest that with all the smoke there is some fire, and that the suspicion may be entertained that California was settled early in the populating of the New World.

From the evidence of language, different students have concluded that the great linguistic diversity of California Indian tongues is also indicative of antiquity.[12] Kroeber and Klimek agree that Hokan is almost certainly the most ancient tongue surviving today in the state,[13] and an opinion by a reputable linguist[14] has been printed to the effect that the most ancient North American language stock is that superfamily called by Sapir[15] Hokan-Siouan. Yuki speech, considered as unique, separate, and ancient by Kroeber, is classed as of independent rank in Sapir's Hokan-Siouan superfamily.[16] Intriguing as these hints of antiquity from studies of language may be, I fear that they are rather shaky ones to build a concrete hypothesis upon, and they are best left for what they are -- judgments not susceptible to proof, and at most offering the possibility that California Indians retain, in the person of the Hokan speaking tribes ranging from the Chimariko and Karok in the north to the Yuman peoples in the south, one of the most ancient surviving speech forms in North America.

Other aspects of California Indian culture such as religion and material forms which, on the whole, are of a simple and archaic stamp, have led many authors to suggest that there survives in large parts of California an earlier culture type which has its roots in the ancient substratum of New World culture.[17] Such analysis, like those of language and existing racial types, cannot give us absolute answers, but it does not deny, and even affirms insofar as the limitations of the method go, that the California Indians have deep historical roots in the North American culture growth.

My review of indirect evidences is now at an end. I have considered it worth doing primarily because it has exhumed, if nothing more, the much neglected conclusions of experts on race, language and culture in regard to the antiquity of man in California. The historically minded students in these fields are generally agreed on the probability that some of the earliest representatives of the modern American Indians resided in California, and that these early population elements can be seen in some of the surviving California Indians.

Specialized Techniques for Determination of Antiquity

The same problem which faces the ethnologist or linguist also confronts the archaeologist when he attempts to find ultimate origins by working back down the time scale from the present, for he soon comes to the point where his continuous sequence is interrupted by lack of information. True, he may have evidence which he feels certain antedates the earliest culture phase of his sequential series, but in order to fit this older cultural material in its proper position he must have some idea of the duration of the time gap between the last known time point and the material which hangs suspended in the pre-dated or undated past. Dating of ancient cultural materials is always difficult. It is this matter of dating of which I want to speak in the second part of my paper.

Dating of ancient finds can only rarely be made through application of the Carbon-14 method. Thus far the earliest announced California radiocarbon date is for one Early Central California Horizon site 4052 ± 160 years old. I do not entertain very high hopes that the radiocarbon method will solve many of our problems of long-range California chronology. The chief limitation of the Carbon-14 method lies in the materials which may be used for analysis. In older occupation sites charcoal has been reduced to such small pieces that it is not possible, with present techniques, to recover the 20 grams needed for a date determination. Other finds may consist simply of a single isolated skeleton, or of a few stone tools exposed in an alluvial cutbank, or lying on an ancient beach surface, and for these we cannot expect to secure associated organic materials for radiocarbon analysis. These ancient sites which do yield organic materials suitable for Carbon-14 dating will be of the utmost significance in affording very old and precise dates.

Ancient finds are often made accidentally and the positional and stratigraphic record is often disturbed. All things lose, in the long run, the race with time. Geological processes such as erosion or deposition which give us a chronological sequence of events often also destroy or obscure some requisite part of the record for establishing a definite chronological interpretation. Generally speaking, the completeness of the stratigraphic or positional record of an archaeological find is inversely correlated with its antiquity; the older the remains are, the more difficult it is to reconstruct the history of local events which have occurred since the remains were deposited.

Application of the special knowledge of geologists and climatologists to determine the relative antiquity of cultural or skeletal materials found in certain situations has been made in California. The work by Ernst Antevs in the Southern California desert lake basins, by T. Clements of the Los Angeles Man site stratigraphy, and by Bailey Willis at the site of the Stanford skull find, stand as examples of the value of this approach. There are other problems still awaiting attention, among which is the large one of the progressive rise of sea level and its bearing upon the age of certain California coastal sites.[18]

Paleontologists or paleozoologists can contribute to a solution of some archaeological problems. They can identify the animals found in association with human skeletal or cultural remains as those of still living or extinct types, but neither they nor the physical anthropologist, through their virtuosity in taxonomy, can tell the archaeologist whether the human and animal remains were deposited at the same time. An old method, newly revived and now being applied both in England and the United States, for determining the relative antiquity of fossil human and fossil animal bones found in the same geological stratum may be invoked in some cases. The method depends upon the gradual uptake of fluorine in bones. Bones long buried and subjected to ground water influences will show a higher F level than bones inhumed recently. S.F. Cook and I have been applying the fluorine dating method to several putatively ancient human remains found in association with bones of extinct animals to: Tepexpan and Melbourne finds; some Sierra Nevada cave skeletons associated with extinct sloth and horse; the Tranquillity site human remains which their discoverer, Gordon W. Hewes, believes were possibly contemporaneous with the bones of camel, horse and bison; [19] and the human skeletal remains ("Los Angeles Man") found in the same geological stratum as the teeth of the Imperial elephant (Archidiskodon). We have prepared our

results for publication, [20] and they show that while the Sierran animal bones are decidedly more ancient than the human cave remains, both the Tranquillity and Los Angeles human remains appear to be contemporaneous with the bones of the extinct animals found in immediate proximity. The fluorine method of relative dating is still too uncertain to establish a case for man's presence in California in Late Pleistocene times, [21] when the now extinct fauna was still living. The case for the antiquity of the Los Angeles skeleton is the better, for reasons which I will not detail here. The Tranquillity instance is made questionable by the apparent association of artifact types which seem to belong to the Middle Central California culture horizon. If these artifacts are properly identified by me as to culture horizon, they are too late in time to be associated with Upper Pleistocene mammals (unless of course my Central California sequence is in error). There remains also the possibility that these cultural remains were associated by chance with the human bones. Further work must be done at the site. The most interesting aspect of our experiments is, I believe, that chemical determinations seem to support certain claims of actual contemporaneity of man with extinct mammals in California.

One point worth emphasizing is that the geologist who reconstructs the local depositional or geomorphological history of a site, the paleobotanist, paleoconchologist or paleozoologist who applies his specialized techniques of interpretation and identification, or the physicist who runs a carbon sample through the Geiger counter to derive a date -- each and all of these are only assisting the archaeologist. For the ultimate decision on antiquity must be judged by the general fit of the form and quality of the cultural or morphological data, a judgment which the anthropologist alone, among these, is qualified to make. I am not denying that we should actively seek the assistance of specialists in these outside fields, but merely that their techniques are not so infallible that we must accept their conclusions when they run counter to the general culture-historical picture of the archaeologist, provided his data are sufficiently full to afford the major outlines of the historic development. Let me illustrate this point by referring to the radiocarbon date of 4283 ± 250 years ago derived from charcoal from a hearth at the site of the type find of the Folsom culture at Folsom, New Mexico. The date was, at first glance, probably incorrect for several reasons. The excavation had been done carefully, and no doubt existed as to the actuality of the association of the fluted projectile points with the bones of an extinct species of Bison. Since other controlled excavations, especially that by F.H.H. Roberts at the Lindenmeier Site, verified the association, and none of these instances gave any indication of dating under 5000 years ago, the archaeologist could with justification view the Folsom site radiocarbon date as probably in error. As it later turned out, the date did not refer to the Bison bone pit with fluted points, but to a nearby, and quite separate spot which was probably of later date.

Let me call your attention, in further illustration, to G. Carter's recent proposal that a single grinding stone (mano), some hearths and flint flakes from the La Jolla terrace exposures indicate the presence of man in California at least 40,000 and probably 100,000 years ago.[22] It is essential to note the fact that his geological reconstruction has not been verified, and his time allotments for the several stages of events seem rather liberal and are admittedly based on pure guesswork. Carter's proposal does not now seem acceptable because it claims man's presence on the basis of doubtful evidence in the New World at a time much earlier than all other information

at hand seems to indicate. True there must always be a first discovery, and perhaps Carter is correct in being the first to recognize third interglacial New World man, but any claim of such significance will have to be backed up with more evidence.[22a] A primary necessity is to have qualified geologists check Carter's reconstruction of the sequence of events which he believes is represented at the locality. The La Jolla mano is undistinctive and similar to other pieces found to the north and south along the California coast from horizons known to be of more recent date than that which he claims for La Jolla man. One critical test may be the testimony of the charcoal from the La Jolla hearths by the radiocarbon dating method.

One means of determining the antiquity of California sites may be through cultural comparisons with sites outside California which have been dated by geological or radiocarbon means. To cite an example, there are beads of Olivella shell from Leonard Rockshelter in west central Nevada which date about 7,000 years old.[23] Since these marine shells must have come from the Central California coast, we may therefore take this as indicating occupation of Middle California by 5,000 B.C. We have not yet found, so far as we can tell, any actual evidence of man's presence in Central California of this order of antiquity, but we may confidently look forward to the day when that evidence will appear.

Positive Evidences for Antiquity

It is only fair, after having taken the liberty of indulging in critical remarks, to state as positively as seems warranted by the evidence, my own estimation of our present state of knowledge and understanding of the matter of the antiquity of man in California. Speaking most generally, I believe the present status of information is that it is too deficient both in quantity and quality, to enable us to do more than construct a series of working hypotheses which may be tested, either to be verified or rejected, by future field investigation. It is my impression that the coastal area of northwestern California was settled relatively recently by man. The sites now known demonstrate only a type of culture patently ancestral to the modern Yurok and Wiyot configuration. Earlier culture phases may be present and thus far unrecognized or undiscovered, but the rain forest is difficult of access, and I should guess was settled after more attractive regions had been occupied. Central California, by which I mean the Interior Valley exclusive of the higher Sierran elevations, but including the coastal strips north and south of San Francisco Bay, was probably settled at a remote time. We may, as detailed earlier, look for occupation here as early as 5,000 B.C. or toward the end of the Anathermal Age.* The Tranquillity site in Fresno County may prove to be yet older, perhaps early Anathermal or pre-Anathermal, judging from the possibility of contemporaneity of the human remains with the bones of Bison, Equus, and Camelops.[24] Certain spots on the coast, notably about San Francisco and Monterey Bay, may have shared in settlement this early, though of this there is not yet any evidence.[25] The whole eastern trans-Sierran border of the state from the Oregon line to Mono Lake and including the Modoc Plateau, and from Mono Lake south and west to the

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*For date of Anathermal period, see chart in Antevs' paper (Ed.).

Pacific, an area which is open to penetration from the Basin-and-Range province, was probably settled very early, perhaps in the Late Pleistocene period. I should say that 10,000 or 11,000 years ago would be a reasonable age estimate for this occupation. It is easier to find old archaeological remains by surface reconnaisance in the arid portions of interior Southern California than in most other portions of the state because of less topographic alteration and obscuring of evidence by vegetation. In addition the really habitable areas of the past, as well as present, are somewhat limited, so that directed and intensive search for remains can be carried out. In the Sacramento-San Joaquin delta region, by contrast, man-made artifacts have been recovered from the alluvial sediments up to 70 feet below the present surface. The finding of really ancient evidences, if they are present, will come here by accident, and not by conscious, directed search. At key points in the Great Basin area, specifically in southcentral Oregon caves, Leonard Rockshelter in west central Nevada, and Gypsum Cave in southern Nevada, we have reliable radiocarbon dates -- i.e., taken from good materials in clear association -- indicating man's presence at least 10,000 years ago. Recent work in the Lovelock region of Nevada has yielded indications of a stone tool complex which resembles the Lake Mohave-Playa complex of Southern California. One might propose that the whole region from the Columbia River southward into the Peninsula of Lower California, and from the Pacific to the Rockies forms a grand unit, where local sequences have evolved, and within which cultural connections between neighboring subareas did operate and will probably be definable. [26]

There are two projects in Southern California which I would consider to be of primary value. First would be a careful and critical summary of all known information pertaining to ancient man in this region, with an attempt to correlate the various workers' interpretations and the variably defined and designated culture horizons, together with some comparison of the Southern California data with those from Oregon, Nevada, and Arizona. [27] Second would be the search for an excavation of habitation caves in desert Southern California in order that the climatic and human occupation sequences might be illuminated by vertical stratigraphy rather than by inferences derived from the occurrence of stone artifacts on surface sites. [28]

Kroeber in his general summary of the archaeology of California published in the Putnam Anniversary Volume in 1909, made a statement which I quote here for the purpose of emphasis and because, over 40 years after its writing, it is still to the point. He says:

> "The single problem of greatest importance [in the study of California archaeology] is undoubtedly that concerning the origin and early antiquity of man. The final answer to this is likely to bear on the question of the origin of man in general and to be of more than regional or geographical interest. The greatest opportunity for the discovery of evidence on this question seems to lie in the exploration of caves. The [auriferous] gravel deposits so far have yielded negative results, and the shellmounds while their antiquity is great from a historical point of view, are almost certainly too recent to throw much light on the first appearance of man in the region. If man existed in California in Quaternary times, the chances are greater that he inhabited the country in late epochs of this period than in earlier ones. While

> the search in caves dating to the early or middle Quaternary accordingly promises more fundamental and more sensational results, if positive results are obtained, the question, if not of the origin, at least of the geological antiquity of man in western America, is likely to be sooner answered by investigation of caves that are somewhat more recent." [29]

It is my impression that we are making fair progress on the problem of the antiquity of man in California. Each year sees more discoveries made. The public is becoming increasingly conscious of the importance of archaeological materials which turn up in earth moving projects, and it will not be long before one or several significantly ancient evidences of man are discovered, reported to, and studied by qualified workers. These discoveries which I am forecasting, will probably be made along the coast or in the Coast and Peninsular Range valleys, for these areas have for long been most favored for primitive occupation, and are at present the chief scene of earth moving activities as a result of residential, industrial, and agricultural expansion. Buried sites and caves can tell us more than open surface sites, and it is for these that we should keep looking. With the growing systematization of efforts of archaeologists through the various local organizations and societies, coupled with new techniques of interpretation, and a public which is gradually becoming concerned with prehistory, we may confidently hope for accelerating progress in all aspects of California archaeology.

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NOTES

[1] For a bibliography of ancient man in California, see Heizer (1948); for a general bibliography of California archeology, see Heizer (1949a).

[2] A similar situation obtains in the study of the antiquity of man in South America. For a precise and carefully worded statement to this effect, see McCown, 1950.

[3] Dixon, 1923, p. 401.

[4] Klimek, 1935.

[5] Ibid., pp. 31, 33.

[6] Kroeber, 1925, p. 159.

[7] Op. cit., pp. 61, 63, 65; see also Kroeber 1923c, pp. 130, 142.

[8] 1940, p. 41.

[9] 1943.

[9a] 1934, pp. 709-711.

[10] 1938, 1939, 1941. See criticism in Birdsell, 1951.

[11] Birdsell, 1951, passim, p. 63.

[12] Dixon, 1923, p. 399.

[13] Kroeber, 1923, p. 130; Klimek, 1935, p. 63, Table 9.

[14] Voegelin, 1945.

[15] 1925, 1929.

[16] Sapir, 1925. pp. 525-526.

[17] For example, Kroeber, 1917, p. 392; 1923a, p. 16; 1923b, p. 388; Klimek, 1935, p. 68; Fisher, 1935, p. 67; Dixon, 1913, p. 558; Cooper, 1941, pp. 9-13.

[18] This matter has recently been touched upon by R. Greengo, 1951.

[19] Hewes, 1943, 1946.

[20] Heizer and Cook, n.d.

[21] In this paper I am defining "Pleistocene" in the sense that Antevs (1948) employs the term. The Pleistocene -- post Pleistocene boundary according to Antevs falls about 9,000 years ago (7,000 B.C.). Other workers (e.g., Krieger, 1941) would terminate the Pleistocene at the end of the Anathermal Age from 6-7,000 years ago (4-5,000 B.C.).

[22] Carter, 1949, 1950a, p. 75, 1950b.

[22a] Linton (1949) develops the idea that man might have found it possible to enter the New World during the last interglacial with a Pebble Axe type culture.

[23] Heizer, 1951.

[24] The Late Pleistocene or Rancholabrea type fauna includes numerous forms of Carnivora and Rodentia which continue today plus extinct species of Mammuthus, Mammut, Camelops, Equus, Bison, Smilodon, Megalonychidae and others. See on this: Savage, 1951; Hay, 1927; Stirton, 1939; Stock, 1946.

[25] The oldest dated site in this region is the shellmound deposit at the mouth of Willow Creek, on the southern coast of Monterey County (site Mnt-282). Charcoal from this deposit yielded a radiocarbon date of 1879 ± 250 years (Johnson, 1951, p. 19). The date, while not of great magnitude, is still of interest because the culture represented includes C-shaped shell fishhooks which in the Santa Barbara region not far to the south occur only in the Late culture horizon (Heizer, 1949). If the latest culture is 2,000 years old, the earliest (Oak Grove or Early Mainland) at Santa Barbara may be 5,000 or 6,000 years old. The point here is that the Mnt-282 radiocarbon date implies that the Central Coast archaeological horizons may extend farther back in time than is now generally supposed.

[26] See Steward, 1937, p. 123; Roberts, 1940, pp. 108-109; Antevs, 1948, pp. 15-17.

27 Cf. references cited in note 20. Though the report by Haury (1950) on Ventana Cave, Arizona, has received uniformly favorable and uncritical reviews, it does in fact contain much that is questionable, and I find some of the wider interpretations (pp. 521-541) entirely unacceptable. Much of the Ventana interpretation is based upon a reinterpretation by Rogers of the cultural sequences he had already published for Southern California (Rogers, 1939). The basis of this revision is not set forth, yet it alters, for example, the age of San Dieguito from 1200 B.C. to 8000 B.C. So flexible a foundation can hardly bear the edifice that is constructed upon it.

28 A single cave site with cultural stratification could settle conclusively the problem of whether men left their implements on the Lake Mohave beaches when the lake was at high water point in the pluvial period (the view of Antevs), or whether later fillings might have attracted temporary settlement and the artifacts thus date from more recent times (the view of Rogers and Roberts). Recent fillings of Lake Mohave are mentioned by Rogers (1939) and Thompson (1921). Hubbs and Miller (1948, p. 24) also discuss this problem.

29 Kroeber, 1909, pp. 40-41.

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ON THE STUDY OF EARLY MAN IN SOUTHERN CALIFORNIA

George W. Brainerd

This paper is an effort to define some of the archaeological problems to be met in developing an understanding of human antiquity in southern California, and further to raise certain questions as to the kind of archeological work needed and as to its order of precedence.

The term "Early Man", as used in the Americas, has been generally applied to archeological remains found associated with evidences of a climate, fauna, or flora demonstrably different from that of the present. Thus the chronological placement of such finds has started as a geological problem and has so far inclined to remain so, save in certain areas where seemingly continuous cultural sequences following the early finds have been discovered.

Fortunately for studies carried on in the desert area of southern California, certain sites are located on long extinct water courses which Dr. Antevs can date from his climatic studies. The Mohave and Pinto cultures have been so dated and the large site at Little Lake under excavation by M.R. Harrington, which shows features of both the Lake Mohave and Pinto cultures, can also probably be so dated, adding assurance to the early dating of the other two cultures. Unfortunately these cultures are not as yet placed in a documented desert sequence, although there are increasing evidences that explorations in Death Valley and elsewhere may soon establish sound working descriptions of other culture phases, datable on geologic evidence. The earliest cultural materials at Gypsum Cave in Nevada have been placed with reasonable certainty by radio carbon analysis which supports the earlier tentative dating of the site, although unfortunately the scarcity of artifacts similar to those of Gypsum Cave in the California area has made placement of these finds relative to the desert cultures extremely dubious. It seems reasonable to expect that the desert sequences may eventually be anchored at various stages by additional evidence in the form of bones of extinct animals, found until now only in questionable association with culture remains, and by radioactive carbon dates.

The archeology of the coastal and adjoining areas which surround Los Angeles has until recently lacked a sound chronological framework, despite the large number of excavations and surveys which have been made by various individuals and institutions over many years. Certain characteristics of late sites as opposed to early have been generally conceded such as the extensive use of mortars and pestles, of small projectile points, of elaborate work in steatite, cremation and various other traits, most of which are known to have been present at European contact in this area. Geological evidences of climatic change such as have allowed the desert datings have not thus far been recognized on the coast save at Carter's site near La Jolla where the very early dates assigned have been viewed dubiously by most archeologists. By the definitions with which I started this talk, these materials are not at present eligible for designation as "early" cultures. I shall ask your indulgence to discuss them in hopes that they may sometime become eligible.

The sequencing of archeological materials on internal evidence rather than from the results of other sciences is usually feasible, and is indeed the commonest archeological procedure. The simplest and most straightforward manner of doing this is by stratigraphic excavation, which, however, is dependent on locating a site to which the technique is applicable. Records of such sites in this area are rare. Even our best candidate, the Malaga Cove site, dug by Mr. E.F. Walker, has yielded but very scanty materials from its lower levels. A second archeological sequencing technique is variously known as stylistic analysis, or (Spier's term) seriation. This sort of analysis requires no stratigraphic superposition in the deposit, depending instead on the detection of evidences of culture change for the chronological ordering. The advantage of this technique is allowing the use of unstratified material is a decisive factor at present in the Los Angeles area. A disadvantage is the possibility of the intrusion of nonchronological factors to distort or disarray the order. We have been working for some time at U.C.L.A. on chronological ordering by a statistical technique which, using a mathematically objective analysis of artifact tabulations of the sort standard among archaeologists, will produce an ordering of sites. This technique looks promising. By its use Mr. Charles Rosaire has recently been able to produce an ordering of some 26 sites in the Los Angeles area which shows a very logical pattern of the change in artifact use through time. It is fixed in early-late direction by the ethnologically known late traits and European trade objects. Tests of the statistical technique on previously formulated chronological sequences have been made for the Santa Barbara area and for the Sacramento Valley cultures by Mr. Russell Belous. These tests gave a somewhat dubious and qualified confirmation of the Santa Barbara sequence but in general a clear confirmation of the stratigraphically determined Sacramento Valley sequence. As materials from more desert sites become available there is no reason why the chronology of this area should not also be amenable to statistical ordering.

Thus it may be seen that the archeological chronologies of the Southern California desert and of the Los Angeles areas, although not yet clear and well ordered, still look hopeful. A major chronological problem in all the California area is that of synchronizing regional sequences. The simplicity, regional variability, loosely observed stylistic usages, and conservativeness through time which characterize the artifacts of California Indians make the recognition of trade and immediate cultural copying difficult to recognize. These difficulties are illustrated by the contrasting published statements of Heizer and Treganza on Topanga-Oak Grove culture relationships, and by Heizer's recent claim for close relationships between Early Sacramento and Oak Grove coupled with the explicit statement that the artifacts of the two groups are not similar, the only stated cultural similarity between the two being extended burial position. I should be harder put to it than was Heizer, however, were I asked to show cultural relationships between the coastal and desert cultures of this area. Trade relationships, if at all present in the material we have, must have been tenuous.

Archeological chronology is but a starting point in the reconstruction of culture history. It provides the framework into which the reconstruction may be fitted. Perhaps the next type of information necessary for an archeological reconstruction is information on population and economy and the closely related data on settlement pattern and social organization.

The solution of some of these ecological problems is simplified in

California by the absence of plant domestication over most of the state; this absence eliminates from the field of reasonable conjecture the possibility of many elaborate cultural situations which are known to be found only in agricultural communities. But the simplicity of aboriginal California culture, on the other hand, should not be overstated; Kroeber's estimates on population density suggest this as do records of complexity in perishable artifacts, and the advanced organization of food gathering activities of various of the native groups. A factor which must be considered to have exercised a peculiarly strong effect in California prehistory (as it does now), is the California climate; in interaction with the varied physiography of California today it is coupled with a remarkably closely spaced variation in types of flora and fauna, including man. If we add to this complex situation the climatic changes of the last 10,000 years, the problem appears bewildering, although certain constants can unquestionably be applied to simplify the picture. The prevalence of close-spaced physiographic zones immediately suggests the likelihood of seasonal population movements, and such movements are well documented ethnologically. It seems entirely possible, to me at least, that we might classify as two separate culture phases the dry and rainy season camps of the same people.

The problem of archeological sampling must certainly be the first point of attack in the determination of the history of population density and settlement patterning. This problem is far from solved for most archeological situations but is much more difficult for nonagricultural groups than for others. An identifiable archeological habitation site is formed only where a considerable group of people have lived for a considerable time, and only when these people have left relatively imperishable remains. Dry cave deposits constitute a partial exception to this rule, as do open deposits in such an arid area as the Peruvian coast since in such dry deposits the refuse per man-year is much greater due to better preservation. The relationship between amount of refuse and the factors of population size and duration among nonagricultural peoples is not well known, although S.F. Cook and A.E. Treganza have made a valuable start in the study of this problem.

There is certainly a minimum sized group who will form an identifiable site, and a minimal length of occupation necessary to produce it. It is theoretically conceivable that a preagricultural occupation of some density might not leave remains identifiable by our present archeological techniques. Artifact yields of certain California sites which are recognizable by concentrations of shell and stained earth are extremely small; and both shell and carbon are known to have leached out of other sites, recognizable in their turn only by artifact concentrations. This problem -- looking for people whom one, archeologically speaking, can't see -- is a frustrating one. Unfortunately, it is not merely a philosophical dilemma.

Another deterrent to proper archeological sampling which may cause even more spectacular errors, but at the same time is fortunately more likely to be solved, is the error introduced by geologic action following cultural deposition. In simplest terms, the earth's surface seldom stays as it was over a long period. Either soil is taken away by air or water action, or a soil mantle is deposited by the same and other agencies. Where extensive erosion has occurred and modern vegetative cover is slight, surface sampling is the only possible procedure, and customarily gives excellent material for analysis of population and settlement pattern. For the materials

gathered in such situations, statistical seriation is the indicated procedure for recovering chronology. When geological deposition has been heavy, excavation is necessary and proper sampling is difficult unless arroyo cutting has occurred or some efficient artifical earth-moving technique is available. Although archeological survey is difficult and unreliable in country which bears a heavy overburden, the deposits are usually in good condition for stratigraphic work and for detailed dissection and study. Good examples of generally eroded archeological areas are the Southern California deserts, Yucatan, and many parts of the Southwest. Examples where deposition has complicated sampling are most large river flood plains, probably including the Sacramento Valley as a local example, and many areas such as Guatemala, the Northwest United States, and parts of central Arizona and the Valley of Mexico where recent vulcanism has mantled the landscape.

If we assume that man lived wherever he could get to, and wherever he could economically support himself in the past, and I believe this is a safe assumption, there are many archeological blanks in well explored country which must be a direct result of incomplete sampling. Rigorous, properly conducted sampling should be the first aim of an archeologist studying any area. This is the only way whereby the fundamental facts of population size and distribution, and the patterns of settlement can be studied. It should be pursued, and its techniques improved. The search for the strategic site which will lay down a clean cut chronology of an area, and its meticulous excavation at considerable cost in time may at times have to be postponed to allow time for the less spectacular but even more exacting work of survey. Either excavation or survey will produce chronology, but only survey will allow reliable estimates on population patterning. It is only after we know the chronology, general economics, and population patterning of a culture that we can properly fit more detailed knowledge into place.

So much for the primary value of survey in the California area in the determination of population density and settlement patterns. Density is of course closely associated with the economy which allows it and with the environment which in turn limits the economy. This is short-circuiting the cultural as well as biological factors with a vengeance! There is one cultural factor active in much of California which must certainly have complicated the relationship between the food supply and the population size in California. This is the eating of acorns, which presumably depends on the process of acorn meal leaching. If we accept the well documented fact that in many areas the dense aboriginal California population was overwhelmingly dependent on acorns for food it is obvious that the advent of leaching that permitted acorn eating wrought a change in population density of the same general order as did the advent of plant domestication in other areas. Archeological criteria for the recognition of the use of acorns would be of crucial value. Perhaps directed research might produce such criteria.

The degree and type of social organization is a partial function of settlement pattern, which is dependent in turn on population density. Population density depends to a major degree upon economy. In all of these relationships a variety of cultural factors, often undiscoverable to the archeologist, may at times exert a major influence. Direct, although only partial, archeological evidence on the last three factors named can be gotten, but social organization can only be inferred, usually on quite fragmentary evidence.

In the Los Angeles area, the southern desert area, (and this situation is true for most of California) we can claim only a tentative chronology, and we still have many weak spots there. I am convinced that the most fruitful approach both for an immediate chronology and eventually for a more finely graded one is in typological analysis. I think that surface collecting, particularly in the desert area, is likely to be a rewarding procedure and that, at this stage, survey techniques are likely to yield more important results than concentration on intensive excavations.

I am also particularly enthused, as you may have gathered, by the possibilities of demographic archeological studies in relation to climatic and physiographic factors. California is particularly well suited to such studies due to its strong geographic variability and to the presence of a long sequence of nonagricultural peoples whose final culture period has been intensively recorded ethnologically. Techniques and general theory which can be evolved here may shed light on man's past at many other times and places.

University of California and Southwest Museum
Los Angeles

CLIMATIC HISTORY AND THE ANTIQUITY OF MAN IN CALIFORNIA*

Ernst Antevs

Since most records of Early Man in the West occur in dry regions and derive from moist ages their dating is closely connected with the dating of the moist ages. This paper will present the evidence of Late Pleistocene climatology and the archeological evidence for human antiquity in the light of such geological data.

Climatic History

At present precipitation in California is controlled by an anticyclone, an area of high atmospheric pressure, in the eastern Pacific. In summer when this anticyclone is strong and to the north, centering about Lat. 40°, it blocks cyclonic storms, and as a consequence summer rains are scarce and scanty. In winter the anticyclone is weaker and is located to the south, centering on Lat. 30°. Sometimes it is absent. Then cyclonic storms reach the continent and bring rain.

Location and development of the Pacific anticyclone determine to a great extent where the winter precipitation will come (16, 17; 19, pp. 143-149). When the Pacific anticyclone is relatively strong and far to the north and extends west-east, and when there is no strong anticyclone over western Canada, then as a consequence the difference in pressure on Lats. 35° and 55° is relatively large so that the cyclones travel to the north and bring precipitation to British Columbia, Washington, and Oregon. On the other hand, when the Pacific anticyclone is very weak and abnormally far to the south, or when it is absent, and when at the same time a strong anticyclone extends from western Canada over the Plains and the Rocky Mountains so that the pressure difference between Lats. 35° and 55° is very small or negative, then the cyclonic storms take a southerly route and bring rain to southern California. When these conditions are intermediate the storms enter central California.

The rainfall is heaviest in the latitudes of the British Columbia-Washington border, where in places it exceeds 100 inches. It is 20 inches in San Francisco, 15 at Los Angeles, 10 at San Diego, and 5 inches at Needles.

During the glacial ages the large ice sheets forced the belts of pressure and precipitation south of their modern positions. In California and the Great Basin the winter and especially the rainy season were longer. The Pacific anticyclone did not develop to block cyclones as it does during our present summers. Therefore, in the Great Basin the pluvials were contemporaneous with the ice sheets; and the pluvial lakes may have attained

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*Parenthetical numbers refer to numbered items in "References" at end of paper.

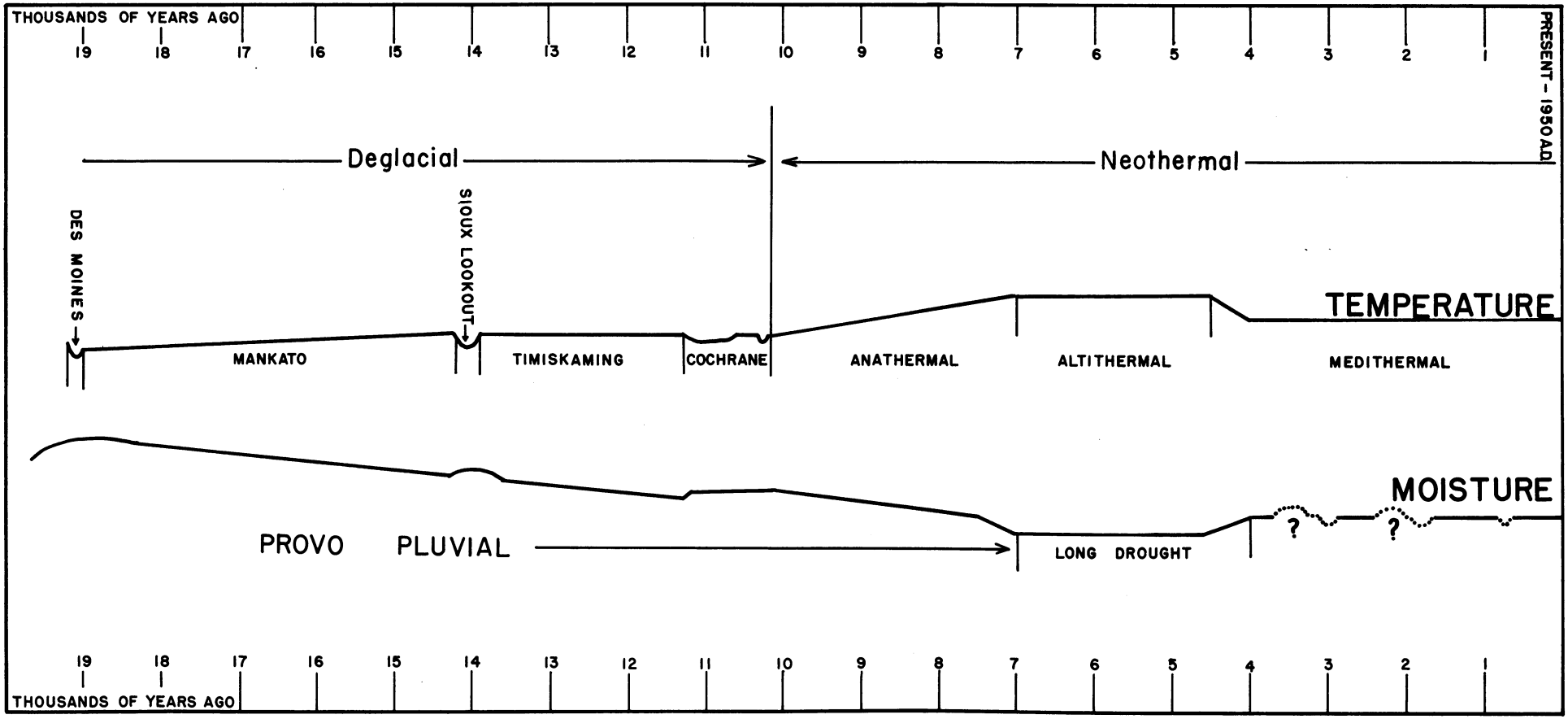


Chart I.

Tentative graphs of temperature and moisture.

Main time divisions of Deglacial and Neothermal ages.

their highest levels just after the glacial maxima. The largest lakes centered on Lat. 40°, suggesting that the belt of heaviest precipitation was 8° of latitude south of its present position. Most of the precipitation undoubtedly came as snow in the high mountains. Dependent on pressure changes, which may have occurred every few weeks as they do today, the winter storms entered the continent at different latitudes; and the precipitation was dispersed during the course of the winter in a wide north-south belt. Also in southern California it must have been heaviest when the ice sheet and the climatic belts were farthest south.

Therefore, the pluvial lakes in the entire belt in which the bulk of the precipitation now comes in winter, that is from Oregon to the Gulf of California and western Arizona, may have attained their highest levels just after the glacial maximum. The last great pluvial, the Provo, corresponded to the Mankato maximum of the Wisconsin Glaciation. After the Provo culmination the lake levels slowly fell, as evaporation began to exceed nourishment most of the time. But at times, as during cold ages, the subsidence ceased or was interrupted by a temporary rise. (While the Provo Pluvial in the Great Basin and California was mainly a result of heavier winter precipitation and coincided with the glacial maximum, the main pluvial in New Mexico and contiguous regions, the Estancia Pluvial, which was out of proportion to the puny glaciers in the adjacent mountains, apparently were caused by heavier summer rains and relatively small evaporation, and probably culminated during the cold Cochrane age.)

In Europe, there is abundant evidence of a distinct drop in temperature, when the ice border stood some 35 miles south of Stockholm and an equal distance north of Helsingfors. The ice sheet ceased to retreat and advanced forming stadial moraines, the Central Swedish moraines and the Finnish Salpausselkäs I and II. Arctic vegetation flourished again, provoking paleobotanists to name the age the Younger Dryas age. A Finno-Swedish chronology based on 650 historical years, 380 interpolated years, and the remainder on postglacial and glacial clay varves (annual deposits) date the age at 10,810-10,150 B.P. (before the present).

This cold Salpausselkä-Younger Dryas age, together with preceding centuries of generally falling temperature, is probably represented in North America by the ice re-advances at Cochrane south of James Bay. By this correlation the Cochrane stage is dated at 11,300-10,150 B.P. Going backward in time, varve counts (with low estimates for the gaps in the varve records) date the Mankato maximum at Des Moines, Iowa, at about 19,000 years ago.

The radiocarbon date of 11,000 years for the Mankato maximum (actually 11,400 for the slightly older Two Creeks forest bed in Wisconsin, determined, like other C-14 dates mentioned here, by W.F. Libby and J.R. Arnold) is much too low, while that of 11,450 for charcoal, wood, and dung in sand in front of Danger Cave, Wendover, Utah, is excessively high. During the Provo Pluvial the water level rose more than 625 feet, perhaps 1,000 feet, above the zero of Great Salt Lake which is 4,203 feet above sea level. The sand at Danger Cave stands 100 feet above Great Salt Lake and must therefore date from the very last part of the Provo Pluvial. The C-14 dates, however, suggest that this last lake stage antedated by half a millennium the glacial maximum which in all reasonableness coincided with the Provo culmination.

Chart 2 -- LEVELS ON OWENS LAKE

Feet:	
3790	Highest beach
3764	Divide in overflow channel, filled by alluvial fan
3675	Crest of big bar at Dolomite
	Mohave industry
	Pinto industry
3650	Folsom industry
3615	Highest soft beach
3597	Owens Lake in 1872, highest modern level
3547	Floor of basin

* * *

While the Provo maximum cannot have lasted very long, the decline of the pluvial lakes occupied many millennia. Several records of Early Man derive from the time when the pluvial lakes (without overflow) were much reduced but still fairly high. The pluvial was followed by a transitional stage and this in turn by a long, very dry age, the Long Drought, during which most basins in the West went dry.

In Europe, the period of approximately 7,000-4,500 years ago was distinctly warmer than the present. This warm age should have prevailed in North America, for the modern temperature rise is common to both continents. In the West the high temperature should have increased the evaporation producing a dry age. This reasoning has been confirmed by Hansen (7, p. 114) who has found evidence of warmer and drier age at comparable levels in peat bogs in the Northwest. The Long Drought in the West may thus have been the correlative of the warmer age dated in Europe, and its beginning has been set at 7,000 B.P. Heizer (12, pp. 95, 96) inclines to the belief that the drought began somewhat later, because a burned basket with an infant (sample 554) from the lower 4 inches of the eolian dust in Leonard rockshelter, Nevada, has a C-14 age of 5,735 years. However, since the child must have been buried, this evidence has little weight.

When the climate again grew moister several basins began to store water which they would still do, if white man had not tapped their supply streams. The amount of salts, accumulated in these reborn lakes, indicates that they have existed for some 4,000 years. That is, the dry age ended about 4,000 years ago.

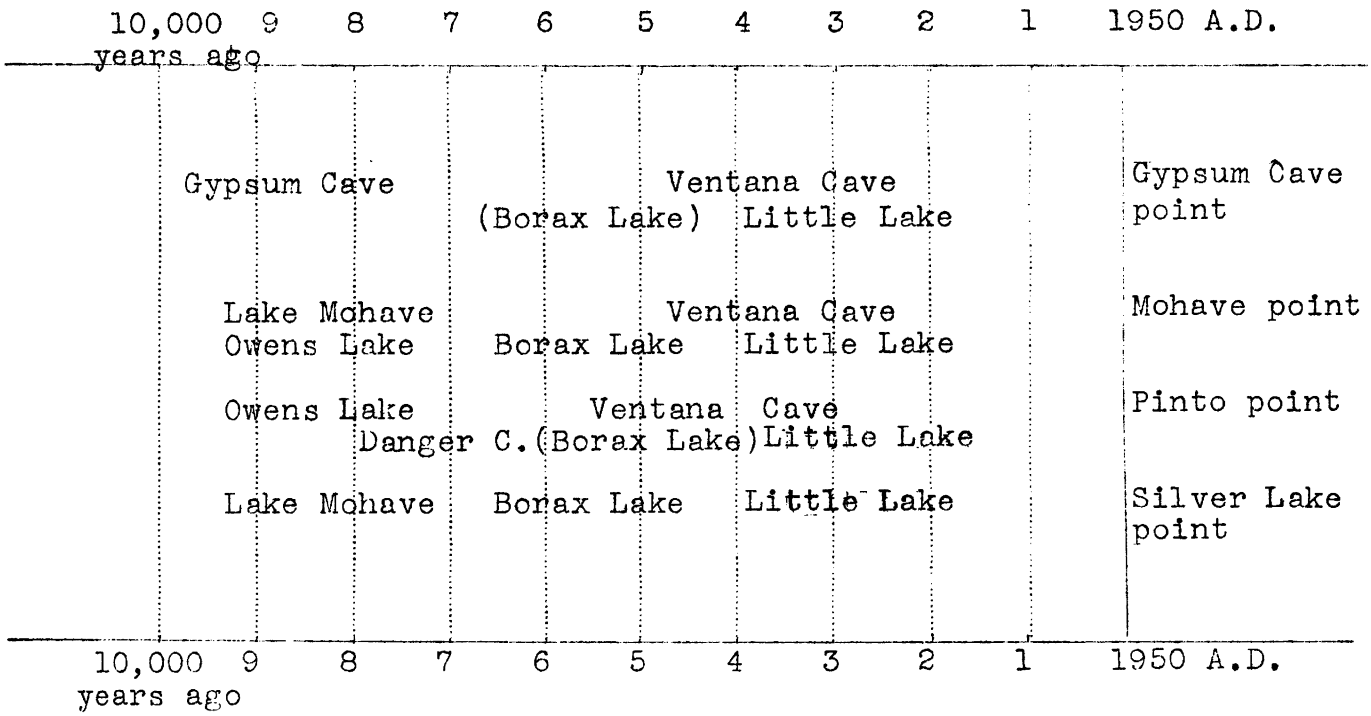
During the past 4,000 years the lakes once or twice stood higher than at any time since 1850, but not much higher. For instance, Great Salt Lake reached 4,262 feet, while it attained 4,211 feet during the 1870s. Pyramid Lake, Nevada, attained 3,930 feet, while it reached a maximum of 3,879 feet during the 1860s. Compared to the pluvial lakes which at their culminations stood several hundred feet higher, these prehistoric lakes were puny. The higher lake levels seem to have been attained before Christ, and their age will probably be determined more accurately from the beds in Hidden Cave near Fallon, Nevada, which Norman Roust and Gordon Grosscup excavated in 1951.

Age of Industries

Gypsum Cave point. Sloth dung from an unspecified level in Gypsum Cave, Nevada (8), contains remains of a vegetation which is found at present only at elevations of 3,000 or more feet higher than the cave, and which consequently postulates a much moister climate than now prevails in the region (13). It must derive from the Provo Pluvial. Still, the radiocarbon age of 10,450 of dung (sample 221) from the lowest occupation level in the cave seems high, especially when compared with other C-14 dates.

Mohave industry. On pluvial Lake Mohave, California, camp sites and artifacts occur at the overflow levels, about 40 feet above the playa floor near the north end (4, pp. 32, 35, 40-43). The range of the occupation levels is about 10 feet. Since the lake naturally fluctuated with rainy and dry seasons, the camp sites and artifacts at low overflow levels may derive from the seasonal low-water stages.

Chart 3 -- PROBABLE AGES OF SOME POINTS



At present the evaporation from shallow lakes in the region is 7 feet (15, map 4) rather than the 4 feet that seemed probable to me in 1937. Therefore, to exist today Lake Mohave would require several times the present inflow to the basin. The fact that the exceptional rains of January, 1916, which gave rise to the heaviest flood on record in the drainage basin, produced a 10-foot deep lake in the Silver Basin, has been much overplayed, for all the water had disappeared by July, 1917, after a year and a half (4, p. 47). The data we have on Medithermal lake levels in the Great Basin indicate that no part of this age was sufficiently moist to maintain Lake Mohave at the overflow level. This lake must have existed during the Provo Pluvial. Since the lake overflowed and could not rise higher, it may have maintained this level for a long time. The cultural remains probably derive from the last stage of the Pluvial, from about 9,000 B.P.

Mohave artifacts also occur on Owens Lake, California, which together with the adjoining Little Lake region was included in an archaeological survey by Mr. and Mrs. W.H. Campbell (5), a survey in which I partook in 1936 and 1939. The main data are given in Table 1, most of the levels after Gale (6). The big bar at Dolomite near the north end must mark the overflow level during the Provo Pluvial, and since that time the channel must have filled with 90 feet of fan debris. Beaches above 3,615 feet are firm and old-looking, while those at 3,615 feet and lower are soft. The former may antedate the Long Drought, and the 3,615-foot level may mark the highest stand reached by the lake during the last 4,000 years, or since more than 7,000 years ago.

The Mohave artifacts occur on and just below the crest of the big bar. They must derive from the Anathermal.

Pinto industry. The age of the Pinto culture in the Pinto Basin, California (3), is difficult to judge. In Owens basin Pinto artifacts were found by the Campbells on the north side of the big bar, just below the crest, or at about 3,660 feet elevation. They thus occur 45 feet above and a distance from the young beaches and must be old. Also old is the Pinto-Amargosa II industry in the lowest occupation level in Danger Cave, Wendover, Utah, which Jesse Jennings reported at the Pecos Conference at Point of Pines, San Carlos, Arizona, in August, 1951.

In Ventana Cave, southwestern Arizona, non-typical Pinto points occurred in the red sand, in Ventana-Amargosa I, and true Pinto points were found in the lower layers of the midden as part of the Chiricahua-Amargosa II culture (11, pp. 203, 293, 523). If the dates of the typical Chiricahua stage are applicable, these Pinto points may range from 6,000 to 3,500 or 3,000 years old.

On the other hand, the Pinto industry at Little Lake, some 45 miles south of the Owens Lake sites, derives from the last two millenia before Christ and the succeeding centuries (10). There were then probably other springs in the region besides the one which feeds the existing lakelet.

It therefore appears that Pinto points were made during thousands of years, from well before till long after the Long Drought.

Secondary Occurences. The mentioned points have also been found in small numbers or solitary specimens in younger deposits. Thus, a few Gypsum Cave points occurred in Ventana Cave, in the lower level of the midden, in the Chiricahua-Amargosa II (11, pp. 280, 295, pl. 22). At least one point was found at Little Lake (10). One Mohave point occurred in the lower midden at Ventana Cave (11, pp. 275, 276, 298), and a few points have been found at Little Lake (10). The Silver Lake point, which is frequent on the beaches of Lake Mohave, is represented by a few specimens at Little Lake (10).

Of course, these few or solitary points can occur in secondary position: They can be actually old points which had been picked up, brought home, and lost again. Therefore, it is uncertain that the Gypsum Cave, Mohave, and Silver Lake points spanned the Long Drought.

However, Mohave and Silver Lake points, and possibly Gypsum Cave and Pinto points, were found by Harrington also at Borax Lake, 90 miles north of San Francisco (9, pp. 87, 90, 91). This site which produced many other kinds of artifacts, including fluted point, occurs mainly in an alluvial fan. The occurrence is very difficult to date, but my latest suggestion is that the fan was built when the vegetation cover was reduced and the erosive effect of occasional heavy rains was great, that is during the Long Drought (see 20, p. 104). If so, the site would partly fill the gap between the old and the relatively young occurrences of the points under discussion.

The Corral
Globe, Arizona

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