HOMO ERECTUS IN AMERICA:

POSSIBILITIES AND PROBLEMS

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ABSTRACT

With archaeological dates of >30,000 supporting human presence in the New World, there emerges the possibility that Homo sapiens may not have been the first human occupant in North America. The possibilities for Homo erectus as the original candidate for peopling of the New World is explored in this paper. Problems of chronological entry, routes of entry, archaeological evidence, skeletal evidence, and migration rates are discussed in this overview. Special attention focuses on the early claims of >30,000 years B.P. for man's presence in the New World.

INTRODUCTION

In the late 1800's and early 1900's the impact of Boasism and the conservatism of Hrdlicka saw the development of an orthodox view that man entered the New World no earlier than 4,000 years B.P. This belief was extremely difficult to alter until the Folsom discovery in the early 1900's. Since that time the pendulum has swung the other way with evidence of man in the New World between 10,000 and 20,000 years ago. Despite this earlier evidence of man in the New World (as early as 20,000 years or maybe earlier), there are those that adhere to the now shifted orthodox view, that man was not present in the New World earlier than 12,000 years B.P.

More recently, "ancestor worship" has generated claims of considerable antiquity for man's presence in the New World. Claims as old as 70,000 years at Calico Hills in California (Simpson, 1982) and the Sunnyvale skeleton (Bada, et. al. 1974) have challenged the orthodox view which holds for a much more conservative picture. Still other dates as early as 60,000 years have been claimed for the Old Crow Basin by Morlan (1980) and 50,000 - 40,000 years at the Woolley Mammoth Site on Santa Rosa Island (Berger 1982). George Carter's Texas Street material from Southern California and the dating of the Del Mar Skull from the San Diego area by the controversial amino-acid racemization has placed man in that area around 50,000 years ago (Bada, et al. 1974).

If any or all of these early claims of man's presence in the New World is proven to be accurate, then we are probably not talking about Homo sapiens in the New World at 70,000 years or even 50,000 years, but a probable Homo erectus (Neandertal, if you prefer that term).

Assuming that Homo Sapiens evolved only in the Old World at about 40,000 years and that the transition from erectus to sapiens took about 5-10,000 years (Krantz, 1981) then valid claims of man in the New World earlier than 40,000 years would support the hypothesis that Homo erectus must have migrated into the New World in a similar fashion as the later modern populations.

The purpose of this paper is to present the evidence for early man in the Americas as seen primarily through the archaeological record. Only those claims of man's presence in the New World prior to 30,000 years are examined here. Table 1 consists of a list of the Old World and New World sites which researchers have claimed as having considerable antiquity and which have direct bearing on the above stated problem.

Man's Time of Entry

In America, thanks to radiocarbon dating, it has been possible to fit the Wisconsin glacial stage into a tight chronological framework. Because of this, researchers have been able to determine at what time periods the Bering bridge could have been open for man's entry into the New World. According to Butzer (1971), the Wisconsin glacial stage lasted approximately 60,000 years with four major advances opening Beringia to human traffic. The early Wisconsin advance began approximately 60,000 years ago and ended by 50,000 years B.P.; the first Mid-Wisconsin advance began approximately 44,000 years ago and ended by 40,000 years; the second Mid-Wisconsin advance began approximately 33,000 years ago and ended by 28,000 years B.P; and the Late Wisconsin advance began at 23,000 years ago and ended about 13,000 years B.P. Even earlier entry dates of 260,000 - 170,000 years can be postulated for man's entry if the Illinoian glacial period is considered (Haynes, 1969).

Arrival into the New World via the Bering Land bridge was only one of the many migration obstacles that early man would have faced. Early immigrants of 40,000 years B.P. would have found the way eastward blocked by the Laurentide ice and to the west the Cordilleran glacier. At about 40,000 years ago these two glaciers would have made passage into the interior very uncomfortable if not impossible at times. After 25,000 years the two ice sheets separated allowing an ice-free corridor into America (Jennings, 1983). The implications of the opening and closing of this passageway to early human entry will be examined later in this paper.

Early Man in America: Archaeological Problems

Northeast Asia

The generally accepted idea that modern man evolved in the Old World and migrated via Beringia into the New World is supported by excellent archaeological as well as physical anthropological data. If we assume that the migration pattern originated from Northeast Asia and progressed into the New World, and that the migration began as early as 70,000 B.P. (trusting the early man claims from America), then dates of this magnitude should be available from Northeast Asia. Unfortunately, this is not the case.

Early evidence of tool-making in China is represented by the small assemblage of flakes and a utilized pebble from

Kungwanglin (Lantian locality). Aigner and Laughlin (1973) feel that the fauna there is comparable to the Djetis fauna of Java, which, Jacob (1978) reports may be 1.5 million years old. From Choukoutien (locality 1) the vast number of quartz artifacts, associated with Homo erectus, date to a period of between 0.4 million and 0.6 million years ago (Butzer and Isaac, 1975:892).

On rather shakey grounds is the Middle Pleistocene material reported by Okladnikov (1978) and Derevianko (1978) for the area between North China and the Bering Strait. This material includes chopper-and-flake assemblages and some scholars (Klein, 1971; Powers 1973) remain skeptical that these specimens are actually artifacts.

The most convincing evidence for man in Northeast Asia comes from Mochanov (1973) who describes his "eastern" or Diuktai tradition which is characterized by leaf-shaped bifacial points, triangular bifacial knives, and wedge-shaped cores. Mochanov believes that this tradition began in Northeast Asia about 35,000 years ago and lasted until about 10,500 B.P., when it was replaced by a unifacial blade tradition. Mochanov (1973, 1975) cites a number of radiocarbon dates including 35,000 + 600 B.P. (LE - 954), 33,000 ± 500 B.P. (LE - 1000, and 30,000 ± 500 B.P. (LE - 1001) for a cultural horizon at Ust Mill II which contained wedge-shaped cores, pebble cores, and flakes, together with horse and mammoth bones some of which were transversely cut. Mochanov (1973) includes the islands of Sakhalin and Hokkaido within the distributional sphere of his Diuktai Tradition.

The earliest evidence for man in Northeast Asia comes from Mochanov's data. This time period corresponds to the appearance of modern man (Homo sapiens) in other parts of the Old World, and I believe that we are on solid ground if we postulate an early entry of modern man into the New World at this time. However, it is possible that the earlier evidence is no longer recoverable (or extremely difficult to find) with the early inhabitants preferring the milder climates close to the Pacific Shore, and their remains may have been obliterated by subsequent marine atrocities. Another possibility might be that early inhabitants left evidence which can not be defined within a cultural context and archaeologists have passed over this evidence in search of the so-called "archaeological site." This possibility will be dealt with later in this text.

The 35,000 year B.P. date for the occupation of Northeast Asia fits well into Krantz's (1981) hypothesis that only Homo sapiens would be capable of crossing the 53 vitamin D barrier at that period of time. However, the

research data provided by Morlan (1980) contradicts this hypothesis, since claims of >40,000 years for human occupation of the Old Crow Basin seems to be on increasingly solid ground. Furthermore, it may well be that sapiens occupation of this northerly terrain (60 north latitude) may have been possible if it can be shown that the sapiens transition occurred earlier in some areas of the Old World and more specifically the more northern populations - even more specifically Northeast Asia.

Old Crow Basin

The best documented and researched area supporting early man in the New World comes from the multidisciplinary work conducted in the Old Crow Basin under the guidance of Richard Morlan. The Yukon Refugium Project, after five years of multidisciplinary research (conducted by Richard Morlan, C. R. Harington, John V. Matthews, Owen L. Hughes, and Charles Schwegar), produced valuable data concerning stratigraphy, paleontology, and paleoecology of the Old Crow Basin. The discoveries from this aarea have helped in the process of interpreting bone, antler, tusk, and tooth specimens which have been altered by both natural and artificial agencies.

From the many claims of early man sites in the New World there has evolved a need to establish "standards for evidence" to help separate fact from fiction or just plain wishful thinking. MacNeish (1982:312) has outlined theses standards as follows: (1) do the materials come from good archaeological contexts; (2) are the items truly of human manufacture; and (3) can the remains be accurately dated? According to MacNeish (1982) all three of theses problems can be solved by good archaeology.

Morlan also agres with MacNeish concerning the importance of standards, but Morlan has repeatedly argued that much valuable data can go unnoticed if we try to place all ancient human activity in a cultural context or within a definable "archaeological site."

Through the exhaustive task of analyzing thousands of bone fragments, antlers and tooth fragments, Haynes (1971), Harington, et al, (1975), Bonnichsen (1978, 1979) and Morlan (1980) have brought the science of taphonomy closer to answering problems concerning naturally and artificially altered bone. Out of the exhaustive task of trying to scientifically distinguish between bone which was naturally versus artificially altered, Morlan (1980) was able to separate the artificially altered material into human and

nonhuman classification based upon specific observable rules. According to Morlan (1980:47) it is possible to conclude that proboscidean bones seem to lie entirely outside the scope of carnivore alterations. Further, green bone fractures with well defined points of impact and/or evidence of intersecting fracture fronts on proboscidean bones seem to constitute secure evidence of human presence even in the absence of other kinds of artifacts.

Three major hypotheses emerge from Morlan's analyses and form the basis for all assignments of green bone fractures to artificial causes (Morlan, 1980:49-59):

1. The two most common agencies of point loading frequently involved in green bone fracture in the natural world are carnivore jaws and artificial hammerstones and other such devices.

2. The diameter of the loading point is a useful attribute for separating these two agencies of fracture, and the upper limit of carnivore tooth contact area is smaller than the upper limit of hammerstone contact area.

3. Green bone fractures in adult proboscidean limb bones are indicative of artificial fracture techniques, particularly if point loading can be demonstrated.

In terms of bone flaking, Clark (1972:10-11) and Bonnichsen (1979:188-192) have shown explicitly that some of the techniques and rules of lithic fracture can be transferred to bone. Even though bone is a multi-phase material, it can be made to produce conchoidal flakes very similar to those which come from cherty or glassy stones. Experiments by Bonnichsen (1979:51) have shown that green bone is more suitable for flaking than dry bone.

Morlan admits that many specimens cannot be interpreted with confidence because our incomplete understanding of carnivore capabilities and the effects of trampling. However, evidence of heavy dynamic loading and retouched platform remnants are very important in recognizing artificially struck flakes, and none of the flakes reported in his works as artifacts exhibit signs of carnivore tooth contact (Morlan 1980:53).

Cut marks on bone is another useful characteristic which can lend itself to interpretations of human activity. According to Morlan (1980:54) stone-tool cut marks may be quite deep and narrow, usually having U or V shaped cross-sections depending upon the precise width and sharpness of

the cutting edge, and are characterized by sharply defined rather than ragged edges. Carnivore scoring generally maintains a uniform depth regardless of the bone contour, whereas stone tool cut marks are deeper on convexities and shallower on concavities within the length of a single cut.

Using the above hypotheses to separate naturally fractured, chipped and cut bone from that which is artificially altered by carnivores or man, Morlan (1980) has been able to separate the artificially altered bone into two samples - one sample altered, presumedly by man and the other by carnivores. With tight stratigraphic controls Morlan has been able to relatively and absolutely date this human-altered bone. The oldest of these bones are associated stratigraphically with what Morlan calls Disconformity A. According to Briggs and Westgate (1978) a maximum age for Disconformity A has been derived from a fission track estimate on the volcanic ash layer located 30-50 cm below the disconformity. The analysis of the ash revealed that it was not older than 80,000 years B.P. According to Morlan (1980):22) this brackets the human modified bone between 51,000 years B.P. and 80,000 B.P. and Morlan has adopted the round-number of 60, 000 years for Disconformity A.

If the modified bones are indeed human altered then these data have created a totally new and complex problem of interpreting who these early inhabitants were and how they were capable of adapting to this harsh environment. If the date of 60,000 years holds, then are we dealing with members of a group of Homo sapiens or Homo erectus? Problems of adaptation, intelligence, social organization and communication may have to be addressed from a totally new perspective.

Other claims of early man in the New World have also produced dates as old as the Old Crow Basin. However, most if not all of these claims have not been supported with "good archaeology" and hence, lack for credibility.

Calico Mountains

Many of the early-man claims in the New World have come from California. In 1963 under the leadership of Louis Leakey and funding from the National Geographic Society, work began in the Calico Mountains in an area that produced seemingly primitive chopping and scraping tools. After the death of Louis Leakey in 1972 the work of Calico continued under the direction of Ruth Dee Simpson. More than 3,500 stone tools and 6,000 technical flakes have been recovered along with fragments of an elephant tusk and an apparent fire circle (Simpson 1982:182).

Chronologically, the Yermo Formation, in which the artifacts were recovered, dates to between 70,000 and 100,000 years ago, possibly developing during the Sangamon Interglacial Period. Radiocarbon dating of fragments from an elephant tusk also support a >50,000 year date. Artifacts (?) were associated with these tusk fragments.

Much disagreement has been generated over whether these stone artifacts have been modified by man or through natural processes (who knows what goes on in those mud flows?). Payen (1982) approached this problem by using the Barnes' test on the Calico assemblage in hopes of determining whether the measurement of platform-scar angles from uncontrolled and controlled samples of lithics would reveal the authenticity or lack of it for the Calico assemblage. Barnes (1939) showed that populations of human-chipped stones are characterized by a low frequency of obtuse platform-scar angles (not more than 25% over 90°), and the natural fracturing is characterized by a high frequency of obtuse angles (more than 25% over 90°). Barnes (1939) insisted that such measurements provide an objective criterion for differentiating between human and natural flaking.

Payen's control sample consisted of various Paleo-Indian and Neo-Indian series preforms and roughouts. A total of 7375 platform-scar angles were measured on 1548 specimens. The actual percentage of obtuse angles present in each sample ranges from 0-17%, with the typical sample having about 6% greater than 90 . The uncontrolled sample consisted of fracturing by natural geologic, road breakage, and experimental mechanics (shattering with dynamite, trumbling for 12 hours, crushing with an 8-ton roadroller and passing through mechanical rock crushers). Angles in the uncontrolled-fracture samples range from 30-156° with the typical sample ranging from 40-114° . The actual percentage of obtuse angles in each sample ranges from 33-62% (Payen 1982:194-197).

When the Calico series is compared with the Controlled and Uncontrolled series the alleged artifacts from the Yerno deposit fall within the range of the Uncontrolled fracture series (Payen 1982:200). Based upon these data Payen concludes that the Calicoliths are geofacts not artifacts. Flenniken, (personal communication) a flintknapper from Washington State University, also supports the position of Payen.

It seems that the Calico site has produced much conflicting evidence for the authenticity of early man's presence in that area. At present the evidence for man's antiquity at Calico seems rather dubious.

This date radically conflicts with the uranium date of 11,000 years supplied by Bischoff and Rosenbauer (Baskin 1982:4).

Archaeologically, in support of the early date of Del Mar Man, Carter (1978) reports a flake and core industry at the Texas Street site in San Diego which is embebbed below an alluvial cover which dates >80,000 years. According to Krieger (1958) and Flenniken (1984, personal communication) these flakes and cores are nothing more than geofacts. Therefore, it seems rather dubious whether the greater antiquity for the Del Mar Man is valid at all.

Pikimachey Cave

Although sites dating less than 30,000 years falls outside the scope of this paper, a brief mention of the evidence for early man in South America is warranted here. Nothing has been reported for early man in South America which shows any antiquity greater than 25,000. MacNeish (1974) has uncovered an occupation sequence at Pikimachey Cave in the Andes highlands of Peru which apparently has a sequence which is as long as Meadowcroft. On the oldest assemblage of tools, animal bones and carbon samples, MacNeish place the date at 20,000 years B.P. This has implications for early man in the more northerly latitudes of North America if one assumes that the early migration into South America did not occur over-night. If 20,000 years is in fact, the oldest evidence for a man in South America and we assume that man migrated into the New World via Beringia, then by applying Krantz's (1977) migration model for speed of peopling, we can predict the most logical time of entry across Beringia. This hypothesis will be discussed in more detail later in this paper.

Homo erectus in America: The Skeletal Evidence

At present there is no skeletal evidence which supports an erectus presence in America. The many claims of ancient types such as the Del Mar, Yuha skeletal material and the Sunnyvale skeleton fall short of being anything but modern. But, the early dates, based upon controversial dating techniques, contradicts the picture of sapienization which seems to be quite clear in the Old World. The sapiens transition in the Old World points to a beginning date of about 40,000 years (Howells, 1976; Krantz, 1981) and a very short transformation time of 5,000 but not more than 10,000 years. This would account for the fully modern Cro-magnon

camelops, horse, and mammoth of Late Pleistocene or Early Holocene times. According to Gerow (1981:2) fresh water snail shells collected from the lower soil horizon at the general level of the grave pit have yielded two radiocarbon dates of approximately 10,000 years B.P. Also, there is excellent evidence (Bickel 1978) that the San Francisco Bay rose rapidly up until 5,000 to 6,000 years ago and has since continued to rise at a reduced rate of about 1 to 2 meters per millenium. The soil containing the Sunnyvale bone sample has been deposited since the bay reached within a few meters of its present level (Gerow, 1981:2). Other evidence, like the small amount of soil that entered the foramen magnum, and the flexed burial pattern, points to a relatively late date for the skeleton.

Anthropometrically, the reconstructed skeleton is statistically indistinguishable from a local population of females (see Table 5 in Gerow (1981:10) from Ala-329.

According to Baskin (1982:4) James L. Bischoff and Robert J. Rosenbauer of the U.S. Geological Survey in Menlo Park, published a date of 8,300 for the Sunnyvale remains based on uranium analysis. Therefore, based upon the conflicting early evidence and the overwhelming and blatant support for the later status of the Sunnyvale skeleton, it can be ascertained that the racemization date of 70,000 years B.P. is off by at least one order of magnitude.

Del Mar Man

A similar scenario unfolds when the amino acid racemization dates on the Del Mar Man from Southern California are considered. Bada (1974) reported dates of 41,000 - 48,000 years for the Del Mar Man, and he is convinced that the date is correct based upon the same D/L aspartic acid ratio of an extinct horse Equus occidentalis. Bada and Master (1983:178) explain:

> The charcoal radiocarbon dates and the age of the marine terrace which underlies the horse skeleton indicate that the horse bones have an age in the range of >30,000 to <120,000 years. This age range is consistent with the 50,000 year racemization age estimated for the horse. Since the Scripps horse bones have essentially the same D/L aspartic acid ratio as Del Mar Man, it implies that the age of this skeleton also falls in the range of >30,000 to <120,000 years.

Woolley Mammoth Site

According to Berger and Orr (1966) it is certain that Santa Rosa Island and its neighboring islands of Santa Cruz and San Miguel was connected at some time to the mainland during low ocean levels of the last glacial epoch. This land mass was apparently large enough to support a self-sustaining dwarf mammoth population.

Of archaeological interest in Santa Rosa Island were large fire-reddened hearth-like features which Orr (1968) suggested were pit-barbecues where mammoth was cooked. Up until this discovery, the earliest human bone fragments on Santa Rosa Island dated from 10,000 years ago (Olsen and Broecker, 1961). It was not until 1975 that many of the fire areas were discovered - exposed in the face of the seacliffs. In that same year Berger (from UCLA) was shown one of these features. It contained a fire area three meters in diameter with mammoth bones and stone tools around the periphery. During the excavation of this site, abundant charcoal samples were taken for radiocarbon dating. The first sample came from the uppermost levels of the feature; the second came from above some burned bones at the same level as the stone tools; the third sample near the mammoth bones; and the fourth underneath the consolidated burned red alluvium (Berger, 1982). None of the four samples evidenced any radiocarbon activity, therefore, were older than 40,000 years. Do we have, at the Woolley Mammoth Site, human behavior in association with the so-called cultural context? It is going to be interesting if future evidence will support this antiquity.

Skeptics of the Woolley Site, have challenged its authenticity on the grounds that the artifacts are geofacts or that the artifacts are not in association with the feature.

Sunnyvale Man

A skeleton from the Sunnyvale East Channel area near San Francisco, California, has received considerable notoriety as a result of an aspartic acid racemization date of 70,000 years as determined by Bada and Masters (1978). Prior to any amino acid racemization analyses there was solid evidence that the age of the Sunnyvale skeleton was less than 10,000 years and most probably 4,500 years or less (Gerow 1981:1).

The underlying soil horizon into which the burial was injected contains Rancholabrean fauna, specifically

peoples in Europe at 35,000 years B. P. If we assume that only a Homo sapiens type migrated into the New World from the Old World about 35,000 years B.P., then logically, we would expect no evidence of human occupation in the New World before that time. But, this hypothesis would also assume that Homo erectus was incapable of migration into the New World at an earlier date. This problem will be discussed in more detail later in this text.

As mentioned above, all the early human skeletal remains in the New World are modern. However, the early skulls from Del Mar and early Yuha share some unique traits which do point to an early type. The rather long-headedness (dolichocranic) and large cranial capacity of the Del Mar Man (>1600 cc), early Yuha and other early peoples of early California have led some to believe that these early characteristics are more on the line of caucasoid than mongoloid (Hooten, 1946; Coon, 1969; Birdsell, 1951). It appears that an evolutionary trend in skull shape has taken place with the dolichocranic shape appearing earlier than the more recent brachycranic form. This has important implications since the closest Old World analog of the Del Mar skull shape is its morphological kinship with the Ainu people of northern Japan (Austin, 1976). Unfortunately, long-headedness and abundance of body hair (especially noted by Birdsell among the Yuki Indians of California) has led many authorities to claim a caucasoid admixture among the early native Americans. The facial and body hair that is abundant among a few native American populations is also a trait which parallels many of the Ainu characteristics on the island of Hokkaido north of Japan. There have been many explanations offered to account for these un-mongoloid traits among the Ainu - that they were Australoids extending up the eastern Asian offshore islands, or a caucasoid intrusion, but the explanation which I believe best fits is that the Ainu represent a primitive populations of people located in Northeast Asia which later was overrun by the agricultural mongoloids sometime after 10,000 years ago. If an early sampling of Ainu were able to migrate across Beringia into the New World then this may well account for the dolichocranic shape of the early skulls and the bearded condition of the Pomo and Yuki of California.

When examining the dentition of these early skulls from California, it was noted by Harris and Turner (1974) that the prehistoric California teeth are very similar to those of North Asians and unlike those of all other populations in the world. The high frequency of "shovelling" among Asians can be traced well back in time with Homo erectus at Choukoutian showing a high frequency of this trait (Weidenreich, 1937). Therefore, "shovelling" seems to be an excellent diagnostic line trait which has maintained its

stable frequency among the mongoloids over a long period in Asia, hence, eliminating the possibility of a Caucasoid intrusion.

Another explanation for a 70,000 year old Homo sapiens in America has been presented by Goodman (1981) in which he views the sapienization process as occurring in the New World, first and foremost, with the modern product migrating into the Old World via Beringia. This controversial theory is based upon the assumption that all the extremely old dates around 50,000 and 70,000 are correct. On this basis alone Goodman's hypothesis has failed. The other problem with his theory is that he proposes that "shovelling" appeared in the New World first, and by migration became a late mongoloid trait in Asia. Since it has been shown by Weidenreich (1937) that Peking Man had this trait in high frequency at 500,000 years ago, Goodman's theory fails again.

Based upon the lack of erectus skeletal evidence in the New World and the unstable credibility of the dating techniques used to date the Del Mar and Sunnyvale material, I think that we are on solid ground when we reject the idea of erectus in America. Although, lack of the skeletal evidence does not disprove the notion either.

The Possibilities for Homo erectus in the Americas

Considerable discussion, up to this point, has focused on the archaeological as well as skeletal evidence for early man in the Americas. The proposal of man in the New World greater than 30,000 years B.P. has met with a whole set of observational problems which has led to a dubious early man picture. Most of the early man claims (Calicao Hills, Del Mar, Sunnyvale) can be eliminated solely on the enigmatic evidence. More work needs to be conducted at the Woolley Mammoth Site on Santa Rosa Island before any defineable position can be taken in favor of early man there. As for the Old Crow Basin material, and Morland's position that human activity there is in excess of 50,000 years, additional questions concerning the agents involved in bone fracture, needs further investigation. However, of all the claims for early man in the New World greater than 30,000 years B.P., Morlan's research is potentially the most promising.

When discussing the problem of early man in the Old Crow Basin with Dr. Ackerman at Washington State University, a somewhat more conservative picture emerges. According to

Ackerman (1984, personal communication) the evidence for man in Alaska and Siberia at 14,000 years is trustworthy. Beyond that period of time, even though something definitely is going on, it becomes extremely difficult to get a handle on the dating and evidence as it relates to the "archaeological context." According to Ackerman, Morlan's work deserves considerable credibility, but additional research is needed to determine the absolute status of broken bone in that area.

So, if something is going on, what is it? If Morlan's position of 60,000 years for man in the Old Crow Basin is correct, then what species of hominid was present there?

At 60,000 years ago in the Old World the sapiens transition is not overwhelmingly observable in the fossil record. If our assumption is that Homo sapiens migrated into the New World from the Old World sometime after 40,000 years, then this problem generates some very interesting possibilities. Could the sapiens transition have occurred in or near Northeast Asia earlier than any other geographical area of the Old World? In other words, can we postulate a focal point from which the sapiens transition could have occurred at some time greater than 60,000 years ago, and is this focal point Northeast Asia? Here, I am implying that Homo erectus was incapable of any adaptability in the extreme northerly latitudes where less than 100 days of the year were frost free. Maybe my assumption is not valid and late erectus did have the capabilities to move into this area for at least a portion of the year, when conditions were more favorable or at least into refuge areas which may have been unglaciated most of the late Pleistocene. My own personal view would support late erectus as a capable candidate for adaptation to these northerly climates if we can create a hypothetical picture which allows for a more comfortable means of access to the resources in that area.

First, it is important that we judge the intellectual capabilities of erectus in making a successful adaptive transition from the more temperate climate of East Asia to the harsh cold climate of Siberia and Alaska. By late erectus time in Europe the cranial capacity, on the average, had reached approximately 1500 cc (Neandertals). This additional cortical mass may well be a necessary adaptation to the extreme seasonality that necessitates more long-range management and a greater mental time span (Krantz, 1981). Although there is no direct anatomical evidence in Northeast Asia that would support a large brained erectus, it might well be presumed that adaptation to this high latitude environment requires a large brain. Greater length of darkness in the winter months and the use of fire would

facilitate behaviors which would be dependent upon additional cortical sophistication and more complex social organization. This mode of adaptation may well have generated greater mental imagery and led to a need to communicate by verbal expression (Krantz 1980:778; 1981:386). Therefore, I am going to propose three working hypotheses for the appearance of early man in the New World which would account for the human activity at Old Crow Basin around 60,000 years ago and the possibility for Homo erectus in America:

1. The sapiens transition occurred at the most northerly fringe of human habitation, somewhere near Northeast Asia, at a date greater than 60,000 years B.P.

2. Homo erectus was present at Old Crow Basin 60,000 years ago and his somewhat successful adaptation to this harsh climate refugium later led to the acquisition of speech and subsequent sapienizatioin in both the Old and New World.

3. Late Homo erectus entered the New World during glacial maximum via Beringia on the Aleutian Island chain; migrated along the Pacific coastal rim finding refuge at many unglaciated coastal refugia; and exploiting a diverse maritime ecology.

The first hypothesis would imply that sapienzation occurred earliest near the 53° north latitude vitamin D barrier in East Asia and spread northeast into Beringia around 60,000 years B.P.

The second hypothesis implies that Homo erectus was adapted to the harsh northerly climates, present at Old Crow Basin 60,000 years ago, and sapienized from this focal point into North America and back into Northeast Asia. In all three cases the Beringia would have been open for migration at 50,000 - 60,000 years ago (Butzer 1971). Also, the palynological evidence indicates that the passageway between the Laurentide and Cordilleran glaciers was open between 40,000 - 25,000 years ago and closed briefly at about 14,000 years (Jennings 1983:30). This would allow potential sapiens or erectus to interior America quite early in time.

The third hypothesis presumes that Homo erectus was capable of entry either through Beringia and or the Aleutian Islands; able to migrate southward along the partially glaciated coast; and populate the more southerly latitudes at a much slower rate than later Homo sapiens because of advancing glacial stages.

Migration Routes for Early Man

The most obvious migration route for an erectus into the New World might well have been a coastal route originating somewhere near Beringia and continuing along the Aleutian Islands to the mainland of Alaska. From the Alaskan mainland Homo erectus could have 'refuge hopped' down the Pacific Coast as suggested by Fladmark (1978, 1979). This route would be better suited for erectus migration rather than across Beringia into the interior Alaskan land mass for a number of reasons. First, erectus would not have to deviate from the 53 north latitude vitamin D barrier drastically since almost the entire Aleutian Island chain falls between the 50 and 55 north latitude lines, and access via this route may have been possible during glaciation when sea levels in the area dropped as much as 100 meters. In the more northerly latitudes vitamin D could have been ingested, in the absence of adequate ultraviolet irradiation, by adaptation to a maritime subsistence strategy where consumption of large quantities of fish would naturally have supplied the vitamin. Fish, which obtain the vitamin by ingesting plankton living near the surface of the seas and so exposed to sunlight, are extremely high in vitamin D (Davidson et al., 1979). Sea mammals such as whales (which ingest large quantities of plankton) and seals, (which consume fish containing Vitamin D), may have been valuable sources of the vitamin (Table 2 gives a list of the possible sources of natural vitamin D, the quantity of the vitamin by specie and the recommended human intakes by age). Fladmark suggests (1979) that coastal refugia probably supported a relatively large fauna and flora. Short outwash-laden streams could have supported cold-tolerant species like the pink salmon, which were capable of spawning in the intertidal zone. Other resources such as shellfish, most marine fish, sea mammals probably existed in these refugia.

Another reason for the attractiveness of the coastal route is that the Japanese Current was continually bringing in warm subtropical water masses along the outer edge of the continental shelf, leaving the mean annual temperatures at sea level above freezing (Fladmark 1979:61). This condition would probably promote a relatively luxuriant flora.

According to Fladmark (1979), Queen Charlotte Islands, the western portion of the Alexander Archipelago, the coast between Cape St. Llias and Lituya Bay, Prince William Sound, and the Kenai Peninsula, remained unglaciated. The endemic insular flora and fauna in these areas also support the possibility of a significant series of refugium along the Pacific Coast during glacial maximums (Heusser, 1960).

Archaeologically, the early cultural complexes of the Northwest Coast are ill defined beyong 9,000 years B.P. This is understandable since much of the inglaciated continental shelf (refugia), where early man may have been, is overridden and at least partially reworked by the rising sea level. An unifacial pebble tool, pebble cores, large tool flakes and debitage assemblage has been reported in the "Paskia Phase" assemblage from the lower Fraser River Canyon, which may predate the Vashon glaciation of 14,000 years (Borden 1975). Also, a similar assemblage on the Northern Queen Charlotte Island seems to predate 8,000 - 9,000 B.P. (Fladmark 1970).

These early assemblages have parallels with the Diuktai culture of Northeast Asia which Mochanov (1975) reports, traces back to 35,000 years.

It seems quite clear that if there is any hope of discovering Homo erectus in America, it will be along the Pacific Coast and probably submerged under 200 feet of water. In any event, the migration along the coast was probably slowed by large ice sheets separating the few refugia isolating human populations for extended periods of time. It is possible that the erectus condition may have lasted even longer in the New World than erectus in the Old World, and it is quite possible, that later migrating populations of Homo sapiens may have simply overran whatever erectus there may have been in the New World. Just a side note to this problem is warranted. There was a Pacific Coast population in California known as the Yuki which Gifford (1926) noted as a somewhat unique physical type. Not only were they shorter, darker, and wider nosed than their neighbors, but they possessed considerable facial and body hair as well. Observations of the skulls, housed at Lowie Museum, Berkeley, California, revealed a low vaulted (wider across the base than the parietals), gabled, and heavily browed sample of individuals. I am not going to go through the erectus cranial characteristics at this point, but the above Yuki cranial traits suggest an erectus relationship. However, as mentioned earlier, these deviant types might well represent an early Ainu sampling into the New World as well.

CONCLUSION

If I have not proven a thing by this general overview of early man in America, then I hope that many of the problems addressed in this paper may give birth to future investigations which specifically challenge these problems. As Dr. Ackerman explains the problem . . . "the chances of finding an early man site of considerable antiquity in the northerly latitudes of Beringia and Northeast Asia are 1 in 1,000,000." The problem, as Ackerman see it, derives from a small sample to begin with coupled with a rather unstable geological picture in those areas.

I would like to address one final problem before closing. Using Krantz's (1977:10) migration theory for expanding populations into a new frontier, how long would it take to reach the Pikimachey Cave (Peru) from the Seward Penninsula (Alaska), assuming an ideal advancement of 100 miles per 25 years? Since the approximate distance from Lima, Peru to the Seward Penninsula is 8,000 miles, then according to the formula, under ideal conditions, the early immigrants into the New World could have entered Beringia at 24,000 years ago and colonated (or at least reached) Peru, South America by 22,000 years B.P. One problem with using this formula is it's over simplification of the problem of migration. Certainly there will be times when this rate will be interrupted for many reasons such as seasonality, carnivore predation, and frontier expansion. So, if we reduce the rate by half, then an entry at 26,000 years may very well have placed man in South America by 22,000 years. Hence, maybe we should not look for any early man sites in America earlier than 30,000 years because they simply are not there!

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