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## EARLY MAN IN EDEN VALLEY: A REVIEW

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Kirk Bryan once asserted that to evaluate properly the age of archaeological sites involving climatic changes due to glacial fluctuations, mutual cooperation of workers following several lines of endeavor was necessary. "Early Man in the Eden Valley" is such a collaboration. The strength of the dating of the Finley Site in Eden Valley lies in the meticulous research of John H. Moss, who, in joint publication with Kirk Bryan, G. William Holmes, Linton Satterthwaite, Jr., Henry P. Hansen, C. Bertrand Schultz and W. D. Frankforter, has produced an ideal combination of stratigraphy, glacial geology, geomorphology, archaeology, paleobotany, and vertebrate paleontology.

Published in 1951 by The University Museum of the University of Pennsylvania (Philadelphia, Penn., \$1.50) and edited by Loren C. Eiseley, this is the sixth in a series of Museum Monographs based on archaeological research. It is lithoprinted with left-hand margin control, measures  $8\frac{1}{4}'' \times 10\frac{3}{4}''$ , and is attractively paper bound in blue. Errors, such as printing Moss' Figure 7 and Plate VI upside down, or too great reduction of some figures (Figs. 8, 12, 18) limiting legibility, will not detract from the complimentary attention this monograph should receive. Photographic reproductions and the panoramas illustrating Moss' paper are excellent. The monograph is dedicated appropriately to the memory of Edgar B. Howard, 1887-1943, and Kirk Bryan, 1888-1950, both pioneers in the study of Early Man in America.

The series of articles following Bryan's foreword (4 pp.), mistakenly titled "Forward," are entitled, "Glaciation in the Wind River Mountains and its Relation to Early Man in the Eden Valley, Wyoming" by Moss, 85 pp. incl. 9 pls. & 27 figs.; "The Regional Significance of the Pleistocene Deposits in the Eden Valley, Wyoming" by Holmes, 6 pp.; "The Temporal Association of The Artifacts with the Middle Sand" by Satterthwaite, 7 pp. incl. 3 figs.; "Pollen Analysis of Peat Sections from near the Finley Site, Wyoming" by Hansen, 6 pp. incl. 2 figs.; "A Preliminary Report on the Bison Remains from the Finley Site (Eden Bison Quarry)" by Schultz and Frankforter, 4 pp.

Always ready to systematize his thinking for his reader, Kirk Bryan arranges the problems of researchers concerned with the antiquity of Early Man into archaeological, chronological, and paleogeographical. Archaeological difficulties revolves around the meager number of artifacts collected to date, correlations based on typology, and the inadequate number of excavated sites. Geologic dating of sites by paleontologic and stratigraphic-geomorphic means involves certain inherent weaknesses—lack of a proved sequence of faunas from the beginning of the Pleistocene to the present. For the geologic method of attack to succeed, it is necessary to establish (in Bryan's words of 1940) that the cultural objects of the site are associated with a definite bed or beds, that these are related to some definite geologic event, that this event is related to other events or is of wide geographic extent, and that all can be correlated with some known worldwide geologic chronology. The difficulty in correlation with a worldwide glacio-

chronology is that glacial geologists are not at all agreed upon the glacial sequence of the Rocky Mountains and its correlation with that of the mid-North American continent and of Europe. Bryan calls attention to the weaknesses intrinsic in the great span of years indicated by his geologic methods in dating the deposits of the Lindenmeier Site in northern Colorado, those of the Sandia Cave east of Albuquerque, New Mexico, and the early deposits in the Ventana Cave west of Tuscon, Arizona. A complete anthropological understanding of the factual data accumulated by archaeological studies requires a paleogeographic approach.

The bulk of the monograph is a carefully written dissertation by Moss. He leads the reader through a mass of information gathered with premeditated and well-advised logic. His case for the geologic antiquity of the Eden-Yuma points of the Finley Site is presented with clarity and dispatch. His introduction is primarily for those not acquainted with the environment of Eden Valley, with a reiteration of the geologic method of dating archaeological sites, emphasizing the value of the date of 11,000 years as determined by radiocarbon dating for the Mankato substage of Wisconsin glaciation and the figure of 5,000 to 3,500 B.C. for the recent warmer, drier period, known by some as the Climatic Optimum and by others as the post-Wisconsin xerothermic interval.

Eden Valley is a shallow depression in the northeast corner of Bridger Basin, located in west-central Wyoming near the south end of the Wind River Mountains. Streams that flow southwest through Eden Valley to the Green River rise in the glaciated Wind River Mountains. The present cold arid climate of the Valley is extremely sensitive to minor climatic changes, and dry years weaken vegetation to such an extent that prevailing westerly winds move about the sand of the great Kilpecker Dune Field at the east edge of the Valley. The unpleasantness of such aridity suggests that the margins of the bison grazing ground of the Great Plains expanded into Eden Valley only during moister conditions of glaciation in the neighboring mountains. With the advent of glaciation came expansion of the grasses; the bison followed and so did Early Man. The discovery of bison bones in the dune sands of the Finley Site indicates the migration of bison in former moister periods into an area which is relatively arid today. The Finley Site may have been on one of the migration routes taken by Early Man from the Great Plains to the Great Basin.

A complex fluctuating eolian history for the eastern border of Eden Valley is recorded at the Finley Site by three superimposed windblown sands separated by two soil zones. The soil zones are shown to have climatic significance and are related to a sequence of glacial advances and retreats in the Wind River Mountains. The bison bones and Eden-Yuma points are associated with a definite bed—the Middle Sand.

Moss' greatest effort is expended in a careful account of the multiple glaciation that occurred in the southern Wind River Mountains. The earliest substages of glaciation represented by deeply weathered gravel or till patches, Moss correlates with Blackwelder's Buffalo advance. The next substage, Bull Lake I, consists of a dissected deeply stained moraine with a dissected outwash plain. Half a mile upstream, a slightly less dissected moraine with subdued topography comprises the Bull Lake II substage. Two to five miles farther upstream are the Pinedale I moraines with strong morainic topography, only slightly modified by erosion, and still farther upstream are the Pinedale II moraines also slightly modified by erosion. Up in the cirques, Moss finds sizeable moraine loops which have been designated the Temple Lake moraines. A few hundred feet in front of the present ice fields are small well-defined moraines, which Moss terms the Cirque moraines (his Neoglaciation).

The flight of terraces found in Big Sandy Creek valley fits neatly with episodes of glaciation in the mountains. High gravel-capped terraces are not traceable directly to any moraines, although the lower of two might have been formed during the Buffalo substage. The High Eden terrace and Low Eden terrace are traced

upstream to Bull Lake I and II substages, and the Upper Farson terrace and Lower Farson terrace are correlated with Pinedale I and II substages. Two lower terraces, Parker terrace and the Floodplain terrace are the equivalent of the Temple Lake Readvance and the Neoglaciation. Photographs used in illustration depict the flight of terraces superbly.

The sands at the Finley Site all overlie gravel of the Upper Farson terrace and are younger than Pinedale I. The Lower Sand at the Site was deposited during the drier time between Pinedale I and Pinedale II. A soil was developed on it during the cold, wet period of Pinedale II advance. The Middle Sand was deposited during the dry interval between Pinedale II and the Temple Lake substage. During the moderately wet period of the Temple Lake substage, Eden Valley became grass-covered, and the bison bones and Eden-Yuma points were introduced. According to Moss, Early Man was present during the Cochrane substage of Wisconsin glaciation. The time when Early Man lived in Eden Valley is estimated by Moss to be approximately 7,000–9,000 years ago. This date was determined by geologic means in 1948 and was presented in a doctoral dissertation in May, 1949. A radiocarbon date for bison bones from Sage Creek, near Cody, Wyoming, Yuma Site of Eiseley and Jepsen (now called Horner Site) of an average age of  $6,876 \pm 250$  years (Sample 302, Arnold and Libby, 1951, p.118) closely approaches Moss' estimate. It seems that this work of Moss somewhat vindicates Kirk Bryan's geologic method of dating archaeological sites.

Moss still adheres to the division of the Wisconsin, following the practice of Kirk Bryan, wherein it is divided into the Iowan (W1), Tazewell-Cary (W2), and Mankato (W3), with a minor later refrigeration, the Cochrane (W4). Moss correlates the Buffalo advance with the Iowan, Bull Lake I and II substages with Tazewell-Cary, Pinedale I and II with Mankato, Temple Lake Readvance with Cochrane, and his Neoglaciation with Matthes' Little Ice Age. The tendency in the past has been to parallel the European threefold division of the Würm, but a wealth of facts is accumulating which points to division of the Wisconsin in North America into at least four substages, the first two, Iowan (W1) and Tazewell (W2), separated by a major time break from the Cary (W3) and Mankato (W4). In 1947, Flint established these as the four Wisconsin substages, emphasized the shortness of the interval between the Iowan and Tazewell (1947, p.249), and inferred that the Two Creeks interval between the Cary and Mankato also was short (1947, p.252). Support in favor of greater duration for the Tazewell-Cary interval comes from other sources. The persistent work of John C. Frye, A. Byron Leonard, Ada Swineford, and others, on soils and stratigraphy of loesses in Kansas indicates that the Tazewell-Cary interval was a major time break in the Wisconsin (Frye, 1951, p.406; Frye and Leonard, 1951, p.302; Leonard, 1951, p.325). Evidence of a great length of time between Tazewell and Cary is shown in topographic discontinuities where study is made of stream drainage patterns. Analysis of drift topographies by Robert V. Ruhe show that Iowan and Tazewell drifts are closely related in time, and that drainage patterns of Cary and Mankato drifts are so similar to each other that these, too, are closely connected in time (Ruhe, 1950, p.441; 1952, pp.49–50).

Holmes has provided a compendium regarding the present status of Wisconsin glaciation in the Middle Rocky Mountain area. The substages described are similar to those found by Moss: a Buffalo substage which may represent two very old substages, a compound Bull Lake substage, a compound Pinedale substage, a Temple Lake substage, and a Little Ice Age—all of which substantiate the multiple sequence of deposits in Eden Valley.

Satterthwaite describes the dune deposits of the Finley Site and the positions of 17 Eden-Yuma points found in 1940 and 1941. Much reliance is placed upon other papers for information that might have been reproduced profitably for readers of the monograph. The points regrettably are not described, their typology not discussed, nor are they pictured, save for Figure 1 of Plate I of Moss' paper.

Information regarding the positions of the points is discouraging, for some were not observed first in place, some were discovered later on a refuse pile or after heavy rains, some are undoubted inclusions, and some were moved by or introduced by rodents. On the other hand, there seems to be no doubt that the points belong "in time with the bison bones on the Middle Sand Horizon."

Hansen established two pollen profiles from a swamp in Washington Draw, one-quarter mile northwest of the Site. The sand in the swamp bottom is stratigraphically equivalent to the lowest dune sand at the Site. The profiles represent the accumulation of debris and pollen since Pinedale I. The fir pollen indicate merely a warming up throughout the profiles. The spruce pollen are so poorly represented that little trend is shown, although at least three maxima can be seen in the three meter deep profile. Hansen places greatest significance upon the expansion of grasses, which was greater in the past than now. Throughout the Pacific Northwest, the grass maximum came early in the post-Wisconsin xerothermic interval, and is dated between 8,000 and 4,000 years ago. In the Bridger Basin, Wyoming, Hansen puts the grass maximum earlier, from 10,000 to 8,000 years ago, and perhaps contemporaneous with the Temple Lake substage. The grass maximum and the associated available water attracted both bison and Early Man.

Of vertebrate remains, only bison bones were found at the Site—those of at least 48 individuals. They were brought to the Site by hunters in numerous trips. The bones are similar to those found at Scottsbluff Bison Quarry and Lipscomb Bison Quarry. Schultz and Frankforter suggest that the specimens can be referred tentatively to *Bison occidentalis* Lucas.

With the exception of Satterthwaite's paper, the six articles in the monograph were written as independent units. Satterthwaite's is dependent upon its inclusion in the monograph and his descriptions are well integrated with Moss' stratigraphy and terminology. Schultz and Frankforter do not mention the work of any of the others. Hansen refers to Moss once. Holmes interrelates Moss' work on glaciation with that of others throughout the Middle Rocky Mountain area. Moss appropriately renders an account of the work of each of the others whenever it becomes necessary to discuss their efforts and to weave the various phases into a complete story. Field work on the archaeology and vertebrate paleontology was accomplished before World War II, whereas the glacial geology, geomorphology, and paleobotany were not begun until afterwards. With the exception of Moss and Holmes, none of the other specialists were in the field together at the same time (John H. Moss. Written communication, January, 1952), and as a result the monograph suffers somewhat from lack of necessary field discussions, and hence from integration.

Publication of all the aspects of a Pleistocene problem in one volume furnishes a unity that individually published papers cannot achieve. The writers and editor of this monograph are to be commended for their joint production and in bringing into one place the ideas and efforts of seven specialists. It is hoped the dating of other archaeological sites the world over may be fulfilled by similar collaboration.

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