

### Auroral observers complete work

Mr. Alan Goodman, who was the Arctic Institute auroral observer at Eights Station, Antarctica, during the 1963 austral winter, has completed a study on photometric data obtained at Eights Station and its conjugate point station at Baie St. Paul, Province of Quebec. Both stations were equipped with National Bureau of Standards air-glow photometers, operating with several optical filters. The study was carried out under a National Science Foundation grant at the Washington Office of the Arctic Institute. Mr. Goodman has now left the Institute and has entered graduate school in physics at Dartmouth College.

Mr. James Kinsey, Arctic Institute auroral observer at Byrd Station, Antarctica, during the austral winter of 1963 has completed a study of auroral heights measurements taken during his stay at Byrd. The work involved detailed analysis of auroral photographic pairs that were taken simultaneously from Byrd Station and from an under-snow "satellite station" 47 miles away. This project was supported by a grant from the National Science Foundation and the analysis was performed under the advice of Professor Carl Gartlein and Dr. Gale Sprague, both of Cornell University. Mr. Kinsey is now taking advanced studies in physics at the University of Maryland.

## Reviews

THE ARCHEOLOGY OF CAPE DENBIGH. By J. L. GIDDINGS<sup>1</sup>. *Providence, Rhode Island: Brown University Press. 1964. 7 x 10 inches, xv+331 pages, 73 plates, 60 text figures, 16 tables. Appendix I: The ceramic complexes at Iyatayet, by James B. Griffin and Roscoe H. Wilmeth, Jr.; Appendix II: Skull fragments from Norton Levels at Iyatayet, by Doris R. Swindler. \$12.50 (U.S.).*

This important and substantial study by an astute and experienced Arctic researcher has taken several years to prepare. Every year of manual labour in the field, of laboratory analysis and of thoughtful interpretation is abundantly justified in this handsome publication. The early prehistory of the Eskimos or their immediate progenitors, an intervening stage, a later culture and thereby the recent culture of living Eskimos, are considerably illuminated with archeological documentation and

by comparison with contemporary Eskimo culture. Dr. Giddings speaks with authority based on his systematic archeological investigations of well over twenty years and his familiarity with Eskimo culture gained through having lived for several years among Eskimos in the Alaskan and Canadian Arctic.

At first glance there appear to be three books within one cover. However, a historically sound integration between the successively older Nukleet, Norton and Denbigh cultures, spanning some 5000 years, has been skillfully achieved by comparison and careful examination of the data. The quality of the analysis, the amount of new information, the reports on geology, pottery and skeletal remains, and the many figures, tables and superb plates establish this as a major and definitive study in Eskimo prehistory.

Working backward in archeological time, but forward in his research periods which for this volume began in 1948, Giddings first treats the Nukleet

<sup>1</sup>An obituary of Dr. Giddings appears on page 66.

culture of the twelfth to eighteenth centuries, excavated from a site on the southeast side of Cape Denbigh on the opposite side of the Cape from Iyatayet that contained the earlier Norton and Denbigh cultures. The similarity between Nukleet culture and that of present day Eskimos of this vicinity is evident. The artifacts can be recognized by Shaktoolik Eskimos and Giddings makes appropriate use of contemporary ethnography, thus confirming the archeological interpretations and providing a tangible basis for the evaluation of stability and change in Eskimo culture. Among the distinctive features of this culture are the emphasis upon working wood by means of a hafted beaver tooth, a scarcity of flint work and an abundance of pottery. Some previously known elements whose time depth is substantially extended are snowshoes, net shuttles, birch-bark baskets and grass matting. Though changes through time are apparent especially in pottery forms and harpoon heads, there are none that indicate basic changes in the way of life. One factor in explaining the stability of Nukleet culture is the absence of dog traction on a large scale until only some 250 years ago. The few reworked sled shoes recovered close to the surface may have been used by seal hunters. The descriptions under the headings: Tools and Manufactures, Community, Food Preparation and Household, etc., and the summaries for each of them focus on how the people lived, thus making the report comparable to an ethnographic study while at the same time carefully noting all the items that may be used in estimating affinities with other cultures. The discovery of snowshoes of good design from earliest times also throws light on how these people lived and shakes an old correlation between Athapascans and snowshoes.

The principal site, Iyatayet, provides both the Norton and the earlier Denbigh culture. The Norton deposits extend back into the sixth century B.C. and embrace some 1000 years in all. Whereas the general way of life must have been similar to Nukleet there are several

interesting differences in technology. The workmanship is much poorer, more utilitarian and coarser than that of the later Nukleet culture, and certainly is clumsy in contrast to the extremely fine chipping of the much earlier Denbigh Flint complex. A high proportion of harpoon heads, stone sinkers (for fishing) and small stone lamps, small projectile points, side blades, flakeknives and sidescrapers with a paucity of slate work, characterize much of this culture and distinguish it from Nukleet. Flakeknives, sidescrapers, lamps, labrets and adze blades are among the items that show some resemblance to those of the Aleutians, though their greatest similarities are with geographically closer cultures. The greater abundance of flint work provides a marked contrast to Nukleet. The paucity of caribou bones (2 per cent) combined with some increase in those of sea mammals (small seal, bearded seal, beluga and walrus) suggests even less effort devoted to caribou hunting than that suggested by the 11 per cent of caribou bones noted for Nukleet. Caribou hunting is inferred from projectile points that were presumably arrow points, the many side blades, perhaps also mainly for arrows, and the heavy stone points presumed to be spear or lance heads rather than knife blades. In reading these descriptions and discussions the reader will find a model of scrupulous distinction between the presentation of the factual evidence and the inferences concerning the identification of artifacts and of their uses. In the area of interpretation the possible magnitude of caribou hunting never suffers and there is clearly no danger that it will be minimized. The actual bone counts invariably point toward the sea.

The Denbigh Flint complex, first discovered by Giddings in the lowest levels at Iyatayet, is presented in a form entirely commensurate with its significance in Arctic archaeology. This is the first significant "break-through" in Eskimo prehistory since the early work of H. B. Collins on St. Lawrence Island. The materials themselves and their analysis are presented in detail.

The remains consist primarily of an abundance of small flint implements and weapon edges, all made with meticulous skill. The microblade technique as such accounts for more than half the artifacts. Whereas bifacial flaking is dominant there are some unifacial forms. The manner of striking microblades from microblade cores is neatly and definitively discussed. These microblades, ranging from 14 to 45 mm. in length, were retouched into end-notched microblades, and scrapers on microblades, knives and, in five cases, burins on microblades (true burins), and bifacial side blades. The latter are believed to be reduced from microblades, though the prismatic surfaces have often been effectively obliterated by the fine, usually diagonal flaking. Burins, "true" burins, distinguished by their negative bulbs, are one of the most prominent features of Denbigh and have become key items in tracing the influence of this culture across the American Arctic. Burin spall artifacts, consisting of small chisel-like tools made by minute flaking of the hinge-end of a burin spall, were most likely hafted and used like an engraving tool. Variant forms suggest similar uses. Following Giddings' identification of these tools others have been discovered across the Arctic to Sarqaq sites in Greenland. They are therefore strictly a product of the American Arctic.

Flakeknives, among the important unifacial forms, show similarities with Norton culture deposits, with Ipiutak, and with the Aleutians among others. A sizeable number are fashioned from parallel-edged flakes approaching the form of blades or microblades in the European sense. As Giddings notes, "While no large cores exist to show that the true blade technique was practised at Cape Denbigh, a few of the flakeknives have come off their cores ridged on the dorsal surface and parallel-edged, as they might be if they had been struck from prepared cores" (p. 223). Presuming on the presence of similar specimens in Norton and Ipiutak, the presence of large parallel-edged blades at Choris Peninsula and the

knowledge that fairly large microblade cores have existed at some past time in the Brooks Range, Giddings assumed that prepared cores for large blades were in use at Cape Denbigh (p. 226). This discussion appears at variance with Giddings's discussion of "parallel-edged instruments" on page 210. Incidentally, I did not suggest that such artifacts at Ipiutak were made on microblades. I simply called attention to exactly the same degree of similarity to true blades that Giddings has done here. Attention should have been called to this degree of similarity to true blades in the original description of the artifacts, as Giddings has done for Denbigh. Ultimate explanations will have to await the recovery of a more complete series of steps in the actual manufacture of these artifacts. The presence of only two cores and seven fragments (microblade cores) at Denbigh, and the fact that the site was most likely visited only seasonally, for sealing and caribou hunting, by people bringing with them their flint materials, does not of course permit a very strong assertion of prepared cores for large blades at Denbigh. Although Anangula, in the Aleutians, is quite far removed, both in distance and in time (8,000 BP), it is interesting that similar tools (all Anangula tools are unifacial) were produced within the span ranging from microblades up through macroblades, and that similar tools are found in the lower levels of Chaluka. One explanation of the association of large blades exceeding their cores in size is the proven method of reducing cores by means of rejuvenating the striking platform. This results in a series of core or platform tablets. Although it is not very likely that this Anangula technique persisted as late as Denbigh times, nor that it strayed that far north, platform tablets are tentatively reported for the Campus site. However, speculation on the method of production should not be substituted for the cores themselves or for more tablets if such a method was actually used. The microblade technique is expertly analysed by Giddings and his analysis will deservedly be the

fundamental source for reference.

The consummate skill and artistry of the authors of Denbigh cultures are lavishly demonstrated in the delicately thin and exquisitely flaked bifacial side blades. These are thought to have been set in grooves along the sides of antler or ivory arrowheads, spear points, and harpoon heads.

A detailed discussion of the geology of this site, by David Hopkins, and of the radiocarbon dates, forms an important section of the book.

Quite apart from the culture history of the Eskimos and their antecedents, students who are interested in the manufacture of stone tools will consult this work for many years to come. All persons interested in culture history will be compelled to use this documented sequential study, and of course everyone interested in Eskimos and the north will find it richly rewarding.

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**LINEAMENT ANALYSIS ON AERIAL PHOTOGRAPHS:** exemplified in the North Sturgeon Lake area, Alberta. By PETER J. HAMAN. *Calgary: West Canadian Research Publications. Series 2, Number 1. 1961. 12 x 8½ inches, 23 pages, 14 figures. \$2.50.*

**GEOMECHANICS APPLIED TO FRACTURE ANALYSIS ON AERIAL PHOTOGRAPHS.** By PETER J. HAMAN. *Calgary: West Canadian Research Publications, Series 2, Number 2 1964. 12 x 8½ inches, 84 pages, 21 figures.*

Aerial photographs commonly show straight or slightly curved lines formed by differences of topographic level, valleys, stream channels, differences in vegetation density or vegetation type, or differences in the tone of soil resulting from variations in moisture content. Most of these lineaments are thought to be the surface expression of fractures which may be buried under bedrock or surface deposits of varying thickness. Lineaments produced by geologic processes such as glaciation and wind

action must be separated from those presumably caused by an underlying fracture system. In the first paper the author presents a method of analysing the lineaments in the northern part of an area in Alberta by classifying them into two categories, micro-lineaments which are from 0.1 to 2.0 miles in length (this is redefined as a meso-fracture in the second publication) and macro-fractures which exceed 2 miles in length. Meso-fractures are plotted on a map as the number per unit area, and macro-fracture intersections are plotted to yield a map contoured in intersections per unit area. The macro-fractures are also plotted on histograms that show their average lengths, total lengths, and the number of macro-fractures that have various azimuths. In the second publication, which gives similar analysis for the southern part of the same area, the directions of glacier flow are also plotted to remove one source of confusion. The object of the study ("photogeophysics") is to detect anomalies in the distribution or orientation of the fracture patterns which may be related to underlying geological structures that are concealed by overburden or sedimentary rocks overlying a Precambrian basement.

Of these two papers the second is the more important and contains 84 pages of discussion of the interpretation of the data. Haman assumes, as do many authors, that most lineaments are the manifestations of a fracture system and though he gives a brief discussion of lineaments caused by glacier processes, the possibility that they may have been the result of other surficial processes such as freezing and contraction of saturated soils is not considered. While there is a considerable body of evidence that in many areas such as the Mississippi delta the surface lineaments represent fractures in buried bedrock, it would still seem necessary to consider all the surface processes that could produce lineaments in any area studied.

Most of the second paper is a useful discussion of the mechanics of fracturing and the various fracture patterns that result, followed by discussion of