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Cross-Dating the Archeology of Northwestern Alaska

A sequence of coastal and interior archeological sites establishes cultural successions in the Arctic.

J. L. Giddings

One of the most coveted windfalls in archeology is a body of unfamiliar tools and weapons sandwiched firmly but separably between layers of artifacts easily recognized. This is particularly true in the Arctic, where vast space and thin populations have seldom combined to produce a stratigraphy that has hearth over hearth with the cultural leavings of generations of campers. Aside from the immense and often frozen Eskimo and Aleut village mounds found only at exceptional seal- and whale-hunting points, the sites excavated in Alaska are usually pit-house floors or tent ovals that do not overlap. Flints picked up on exposed ridges may be dated only by comparison with other flints. Yet for those who persist, early stratigraphy can be found both on the coast and in the interior, and from it the time order of included artifacts may be clearly read and cross-compared in the field.

My first experience with hard and fast stratigraphy in which one culture-bearing layer was continuously separated from another by a clearly defined sterile zone came in the years 1948 through 1952, when we excavated the Norton Bay site called Iyatayet at Cape Denbigh, Alaska (Fig. 1) (*1*). There, Eskimos whose weapon-heads, utensils, and engraving art resembled those from the widespread Thule culture of Canada and Greenland had lived upon and dug into the surface of a hillside bench some 12 meters above the sea. Their thick deposit, laid down for some hundreds of years after A.D. 1000, contained objects dredged up from lower levels.

Under this Eskimo layer, and separated from it in a few places by peaty beds, were the leavings of an earlier people, called Norton, whose culture is dated between 600 and 100 B.C. Ranging to 1 meter in thickness, the Norton bed contained little well-preserved wood, antler, or ivory, but its flints, ground slates, stone vessels, pottery, and the like, along with the harder bones and teeth of food animals, made possible an understanding of its ancient economy. Norton people hunted seals even more persistently than did their Eskimo successors and appear to have resembled them in other respects.

A thin layer of peat underlay the Norton deposit in some places, but even where there was no such layer, a still deeper sandy layer firmly separated the third cultural deposit from those above. Countless small chips and miniature artifacts of chert, chalcedony, and obsidian lay flat on a firm soil that capped the disintegrated bedrock. These we called the Denbigh Flint complex.

This complex was a puzzling collection from the first, and we scarcely knew whether it stood for Eskimos, Indians, or some tribe of visiting Asians. Its microblades—thin, parallel-edged, sharp ribbons of chert or obsidian—and the cores from which they had been struck (Fig. 2, *a* and *b*), were clearly related to similar Mesolithic or Neolithic objects distributed widely throughout Central Asia and neighboring Siberia (*2*). Its burins (the "gravers" of the Paleolithic of Europe), though curiously dwarfed, probably because designed for binding into hafts (Fig. 2, *c*), were nevertheless similar to their European counterparts in range of types. Other Old World forms also occurred. Yet, for all the prevalence of such exotic types, some weapon-heads, including a fluted point, resembled those in America to the south; and small, bifaced side blades (Fig. 2, *d*) and end points (Fig. 2, *e*), made with very much greater precision, had outlines similar to those of inset blades for arrows and harpoons at the Ipiutak site over 300 kilometers north in Alaska (*3*).

We thus had a choice of dating that ranged from the Aurignacian of Europe, 40,000 years ago, to Ipiutak of Alaska, 2000 years ago. The venerable rule of archeologists that an association of artifacts must be dated to its latest types clearly did not apply here, thanks to stratigraphy, for we knew that the more recent Norton levels, which lay above the Denbigh Flint complex, were the age of the Ipiutak site, if not older. And time enough had passed since the deposition of the Denbigh objects for all the perishable materials to rot away. This we learned by dissecting one great, inactive solifluction lobe and part of a second, in which the old Denbigh layer had turned over on itself repeatedly with no dislocation of the flints (*4*). Both chips and artifacts were stuck to the claylike "bottom," whether this was overturned in folds or not. The lobes had apparently formed in a cold period

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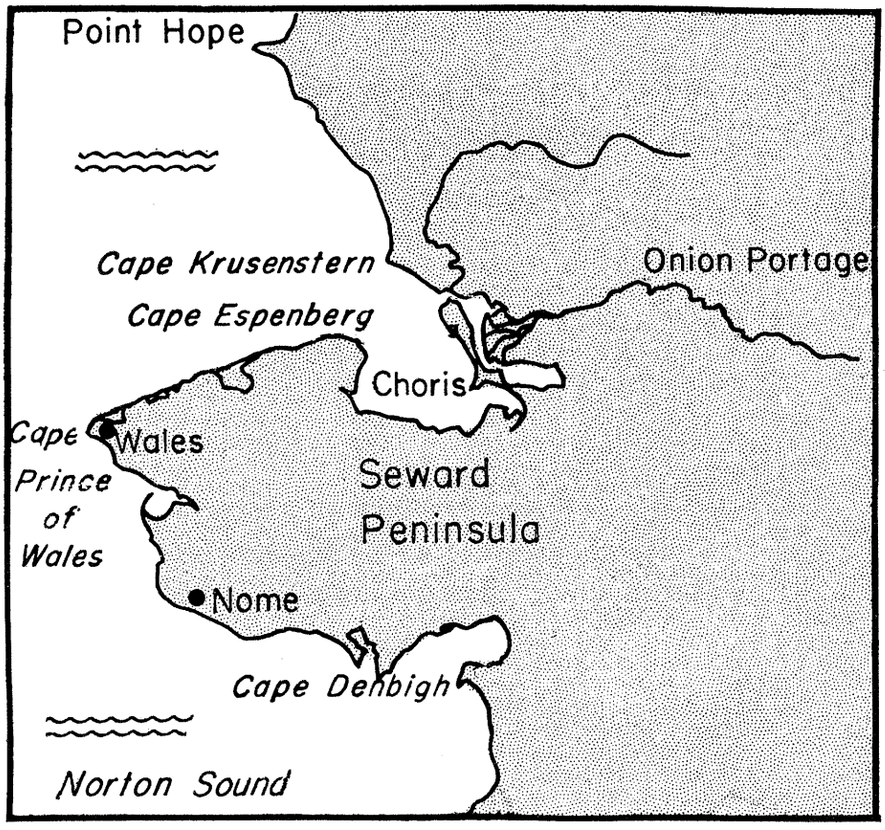


Fig. 1. Site map of northwestern Alaska.

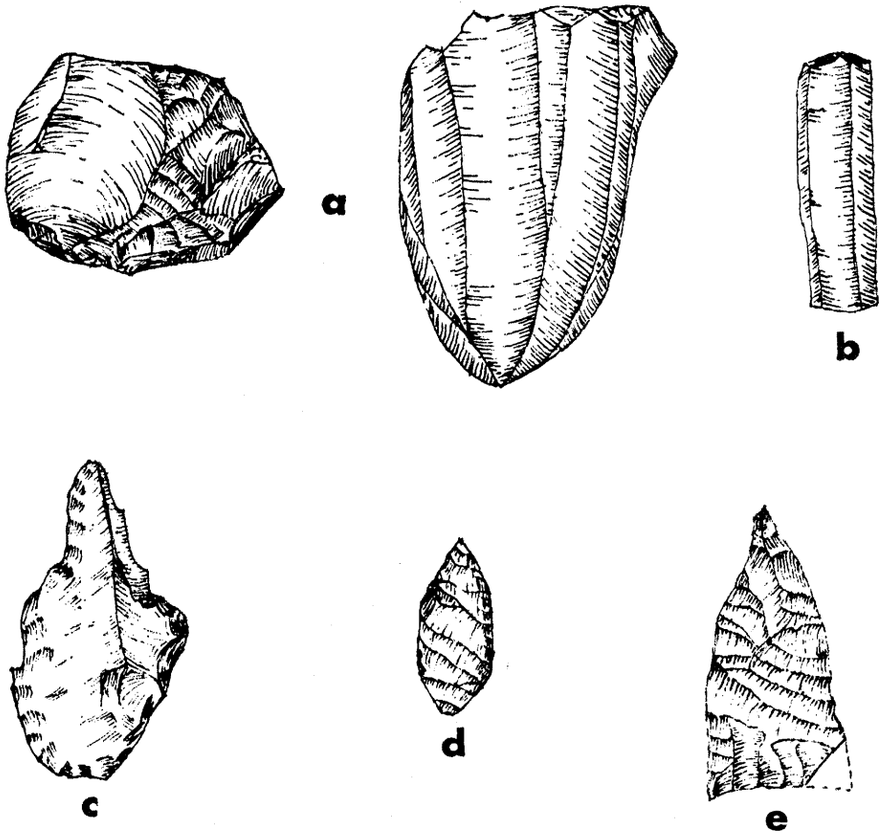


Fig. 2. Denbigh Flint complex artifacts. *a*, A microcore, viewed from the top (left) and longitudinally (right); it is 2.2 centimeters thick and 3.9 centimeters long. *b*, Microblade, 2.6 centimeters long. *c*, Burin, 3.7 centimeters long. *d*, Side blade, 1.9 centimeters long. *e*, End blade, 2.8 centimeters long.

following the relatively warm one in which the Denbigh flints were deposited.

The Denbigh Flint complex is now known over a wide geographical range stretching from the Bering Strait into the mountains of northern Alaska (*5*) and, in modified form, all the way to Greenland. There, in Pearyland, people living within 7 degrees of the North Pole used burins, microblades, and bifaces of Denbigh types. That they had been there for many centuries was indicated by the fact that remains of their houses turned up on a number of high fossil beaches that vary widely in age (*6*). Radiocarbon counts of charcoal from the older house hearths show that people lived in Pearyland some 4000 years ago. Materials from the original Denbigh site at Cape Denbigh appear to be older (*7*), and one sees a hint of later Eskimos in these remains. Though skeletons have not been found and the Denbigh language can never be known, we judge from their remaining manufactures that the old Denbigh people may well have been the first Eskimos, putting together the varied elements of their culture in the Bering Strait region around 5000 years ago (*8*).

After those years at Cape Denbigh, I felt quite strongly that we must find another Denbigh site, preferably one still frozen and deeply stratified. Try as we did in those years, however, we found no other multilayered site. Then, one day in 1956, while searching a series of strand lines at Choris Peninsula, our field party discovered three enormous, old, oval pit houses on the innermost of eight of the former sea beaches (*9*). With their excavation, the "Choris culture" emerged, indicating a 3000-year-old way of life that led to the later Norton pattern but was out of line with the earlier Denbigh. A coarse, heavy-handed stone technology recalling that of Indian country in the far interior blended strangely with Eskimo-like ivory carvings and sealing apparatus. These new findings were thoroughly rewarding, yet what struck me most of all was the promise held by the strand lines or beach ridges.

A Horizontal Stratigraphy

The eight parallel crests at Choris Peninsula all stood about the same height above sea level, showing as many lapses of time. The current beach ridge, at the sea's edge, was broad, and flat enough for landing a small plane. Pit houses had been dug into it, both

in this century and some 400 years ago, and from this I concluded that whatever it was that caused a new beach to rise and be separated from its predecessor had not happened here for at least half a millennium.

On the crests of the fourth and fifth beach ridges from the sea occurred flints like those of Norton culture, and on the oldest ridge were the oval houses of Choris culture. Each of these ridges, at the time it was inhabited, must have lain along the sea and formed its shoreline. As the centuries passed and a combination of causes gradually built a new beach forward, later generations would have ignored the beach of their predecessors, now back from the sea, in favor of the beach then at the water's edge. This seemed to imply that if we could find a series of old beaches elsewhere, in even greater quantity and thus representing a longer time span, we might find not only beaches containing Norton and Choris cultures, but possibly even the ones that had been occupied by Denbigh Flint people. This kind of succession could be called "horizontal" stratigraphy. H. B. Collins had earlier described a succession of cultures on stranded beaches, and we had observed the time order of beach ridges at Point Hope in 1939, but without putting the observations to work (*10*).

Attacking the problem anew in 1958, our field party from Brown University traversed by small boat the entire shoreline of Kotzebue Sound, some 320 kilometers, examining series of beach ridges wherever they existed. Our first breakthrough came on a wide series of ridges at Cape Espenberg (Fig. 1). We walked 2½ kilometers back from the present shoreline, crossing one broad ridge after another, the crests of which all stood only about a meter above sea level, and found, in order, traces of Recent, Ipiutak, Norton, and Choris cultures. To our great pleasure, finally, on the innermost ridges fronting a Pleistocene mud bank, we found rock-strewn hearths surrounded by Denbigh flints. People of the old Denbigh culture had hunted seals from these first beaches at Cape Espenberg at the same time that other Denbigh people were hunting from the grassy slope of Iyatayet at Cape Denbigh. Our view seemed borne out that the people of any period on these Arctic coasts would have chosen to camp at the edge of the sea and that the number of cultural phases now to be found in a series would be limited only by the number of uninterrupted spans of beach ridges.

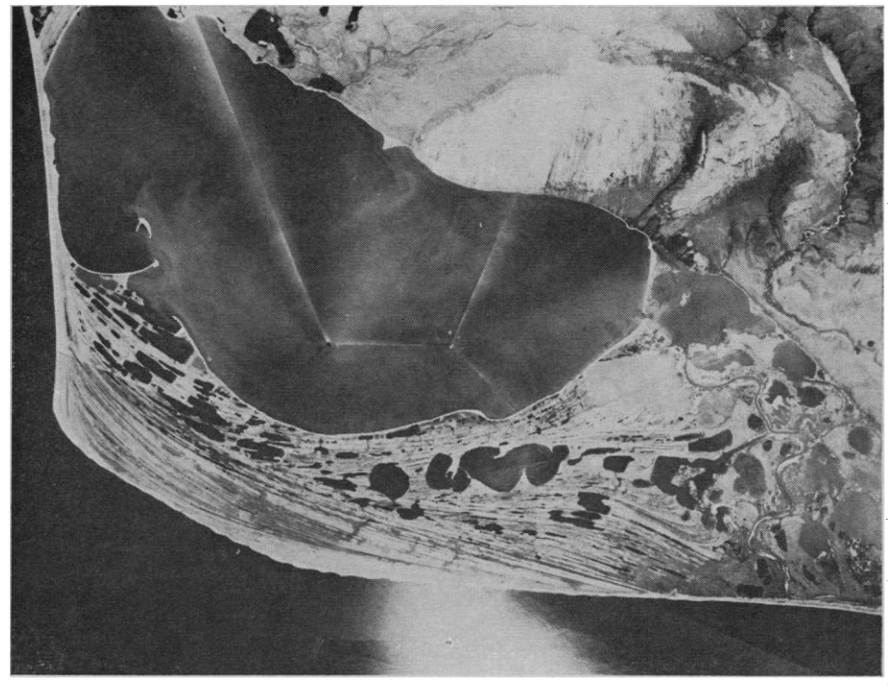


Fig. 3. Aerial photograph of the beach ridges at Cape Krusenstern. [Photo courtesy U.S. Coast and Geodetic Survey]

Another long series of strand lines near Cape Prince of Wales, sandy like those at Cape Espenberg, repeated the sequence of cultures from shore to inner ridges, culminating in Denbigh hearths over a kilometer inland.

It was at Cape Krusenstern, however, at the northeastern margin of Kotzebue Sound, that we discovered the best series from the standpoint of archeology (Fig. 1). The beaches there numbered 114 by the best count we could make (Fig. 3). Their crests were of coarse sand and gravel, in contrast to those of dune sand to the south, and in most cases they were covered by a protective coat of sod that scarcely concealed the house and storage pits of earlier inhabitants.

During four seasons, 1958 to 1961 (*11*), we excavated house pits, burials, caches, tent sites, and even whole set-

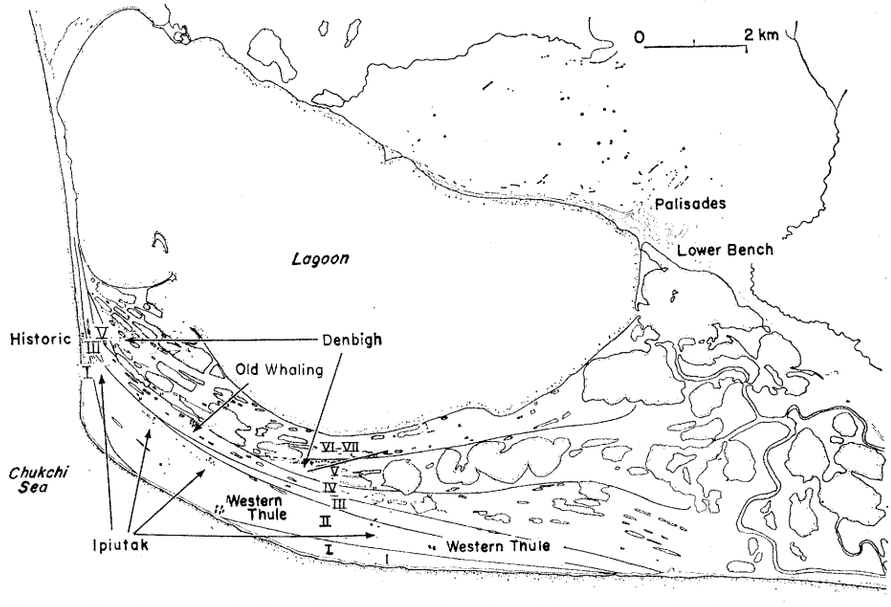


Fig. 4. Sketch map of Cape Krusenstern beaches. Most recent beaches are in foreground, and oldest beaches are back toward lagoon. Segment numbers I to VII correspond to Beaches 1 to 104. Lower Bench and Palisades sites are at upper right.

tlements of a succession of peoples (Fig. 4). On the front beach were the house pits of Eskimos whose way of life had been casually described by explorers of the last century. Back nine beaches and more were the multiple-roomed, deep house remains of Western Thule people (*12*). Still farther away from the sea were beaches containing features of Birnirk culture, ancestral to Thule, and back around Beach 35 were the large, square pit houses and clusters of shallow summer lodges representing Ipiutak culture. From there, spread across another 15 ridges to a crest

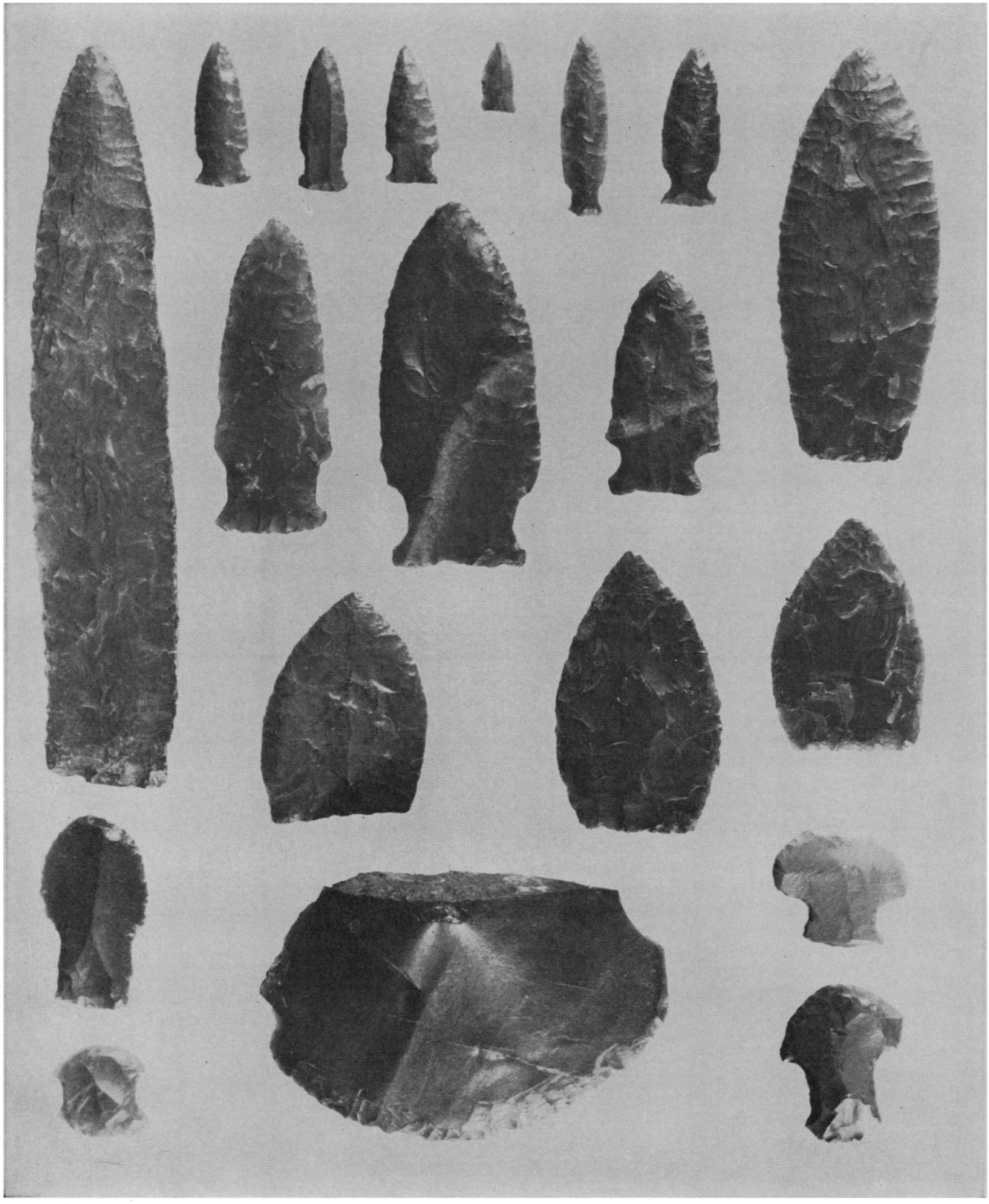


Fig. 5. Artifacts of the Old Whaling culture, showing their size range. Blade at upper left is 21.8 centimeters long.

more than a kilometer from the sea, we located hearths and tent sites of Choris culture and an ancestral form (Choris-Trail Creek) (*13*) containing spear points similar to weapons used much earlier by Indians in the Western Plains to hunt species of bison now extinct.

Beach 53 held a ruined settlement of five deep, multiple-roomed winter houses and five shallow summer lodges. This was a village of whalers who hunted right whales in open boats, Eskimo-fashion, but whose flint work held little in common either with the delicate work of Denbigh or Ipiutak peoples or with the Choris pottery-makers and caribou-hunters. The bones of whales were frequently encountered on the crest of Beach 53 as well as in and about the houses, whence the designation for their culture, "Old Whaling." Among their heavy knives and scrapers were side-notched points, both small and large (Fig. 5), which we at first viewed with disbelief, for the notching of points seldom figured in other sites of the western Arctic, although the practice had been widespread in the eastern part of the continent. We had no clue as to the origin or appearance of such points here.

Another third of a kilometer across beach crests and mossy swales brought us to Beach 78, on which were many hearths of the Denbigh Flint complex, and from there on, back to Beach 104, we found abundant tent sites of those ancient people.

The beach ridges at Cape Krusenstern stretch as much as 13 kilometers from east to west. Not all extend the whole distance, however. Periodically, unconformities appear, either where the sea has eaten back into part of the series, erasing segments of several beaches, or where the trend of beach formation has changed. Six times this trend of beaches has shifted, each time between 20 and 32 degrees (Fig. 6). Geologist George Moore attributes this to periodic changes in wind direction (*14*). Northwest winds now prevail at the Cape, and studies of sediments show that the beaches have been built largely of gravels slowly shifted southward along the coast by persistent longshore currents.

Ancient Sites on the Palisades

All of this, of course, has bearing on sea level. The region appears to be exceptionally stable. No glacier depressed

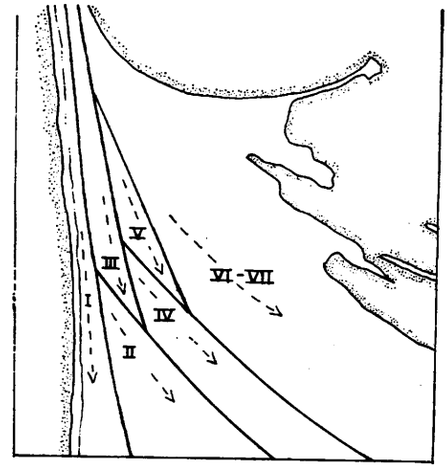
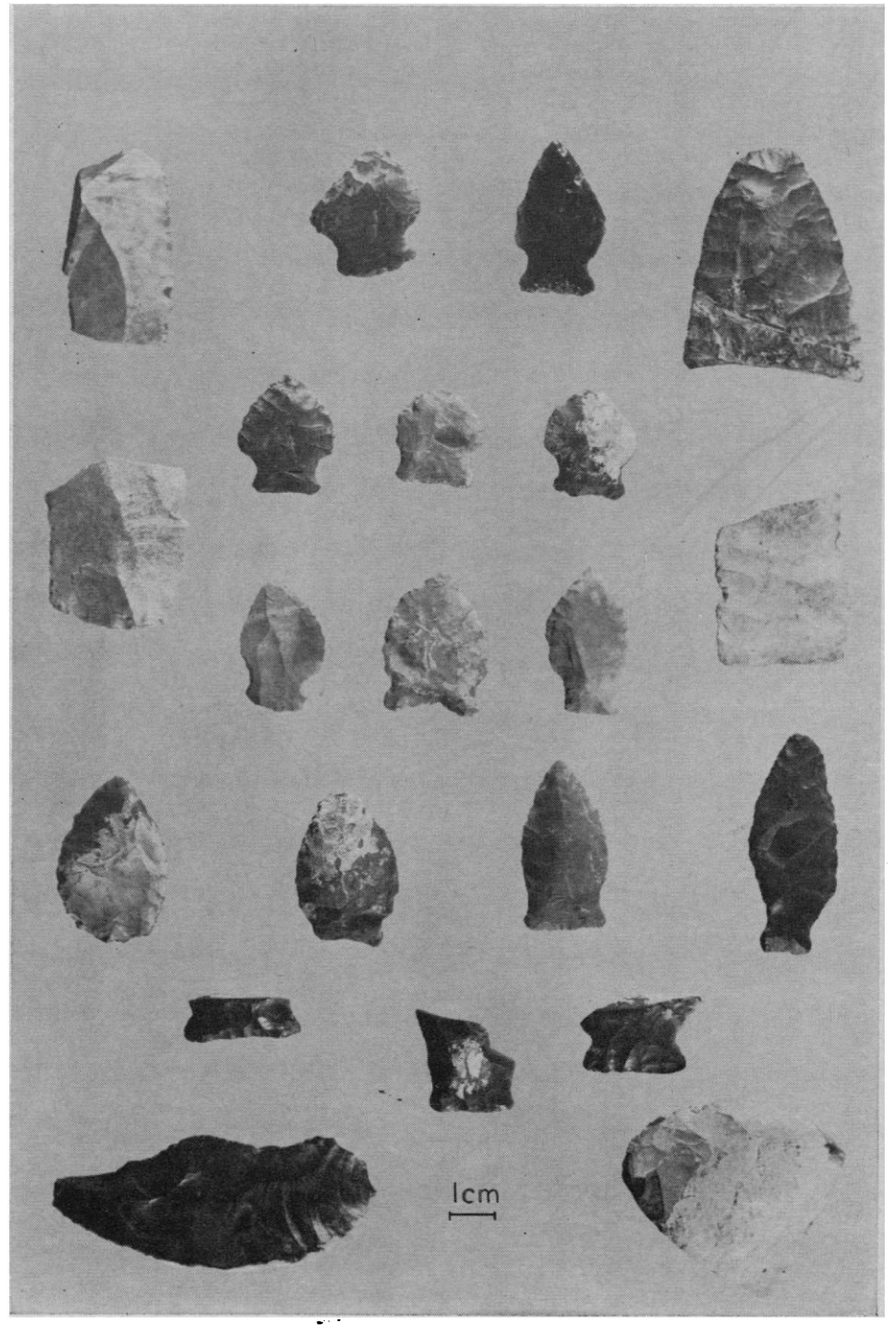


Fig. 6 (right). Enlargement of western section of Cape Krusenstern map, showing beach segments as they were naturally formed. Arrows indicate the trends of beach crests.

Fig. 7 (below). Some artifacts of the Palisades II complex. Blade at upper left is 4.7 centimeters long.



the neighboring land in Wisconsin times, nor do the small rivers emptying into Kotzebue Sound carry much sediment such as might weigh heavily and downwarp the earth's crust. These facts, along with evidence that the locality has not been disturbed by recent earthquakes (*15*), make it uniquely suitable for studies of sea level change.

Here, though, I disagree with Moore's conclusion that sea level has "been rising slowly, probably at an uneven rate . . ." since the beach ridges began to form (*15*). I note that the highest crest of any ridge, the one we numbered Beach 35, where Ipiutak people lived 2000 to 1500 years ago, is 3 meters above mean sea level. No crest beyond Beach 35 in either direction reaches this height, but some crests, even in the oldest segment, reach 2 meters or more. The Old Whaling village on Beach 53, which, according to radiocarbon analysis, dates from 3700 years ago (*16*), is on a crest more than 2 meters high.

All of the more than 100 Denbigh hearths on Beaches 78 to 104 were on crests more than a meter above sea level, and most were closer to 2 meters. The far ends of the old gravel bars dwindled in height, as do later crests at the eastern end of the series, and Denbigh hunters placed their hearths on the highest parts of the crests, well above danger from ordinary wind tides, and their sites have never since been washed over by the sea. If the Denbigh Flint complex beaches (not yet subjected to radiocarbon dating) are proportionately older than Ipiutak or Old Whaling beaches, as their distance from the sea indicates, the beginning of the Cape Krusenstern series would seem to have been 4000 or 5000 years ago when the first Denbigh camper built his fire on Beach 104. From these considerations, I think that sea level has risen no more than about a meter since Denbigh times. No matter what the ultimate archeological conclusions, the beach ridges at Cape Krusenstern and elsewhere on the Alaskan shores of the Chukchi Sea promise to be an ideal laboratory for further studies of sea level and peripheral sea currents.

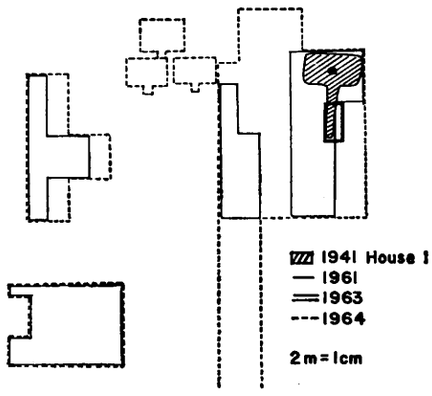


Fig. 9. Excavations of 1941, 1961, 1963, and 1964, Onion Portage site.

Northward from the ridges, across a lagoon, the slopes of Ingitkalik Mountain show no signs of still earlier beaches. Two surface sites were found, however, on benches, or terraces of the mountain well above sea level. One of these, called simply "Lower Bench," contained microblades like those of the Denbigh Flint complex, but few other distinctive pieces. This may have been the lookout site of hunters who were the immediate predecessors of the Denbigh people of the beaches.

Much higher on the slope, and rather remote from the sea or marshy plain that probably once reached its foot, is a bench we call Palisades. There, after separating flakes and artifacts strictly on the basis of whether they were weathered throughout or were merely encrusted with lime or thinly patinated, we found two kinds of flint work. In the first group, the Palisades I complex, were only coarsely flaked specimens, including choppers or axes and the fragment of a shouldered point; in the second, Palisades II, were small, side-notched points of chert and obsidian, larger bifaced knives, square-based spear-point fragments, and a variety of scrapers (Fig. 7). In neither group did microblades or burins appear. The notched points of Palisades II, except for being notched, were unlike the skillfully made and varied notched points of Old Whaling culture. I concluded that the less weathered group of artifacts was older than any found in the beach ridge series or on the Lower Bench, and that the coarse, chemically altered group might be extremely old—probably dating back to the Pleistocene.

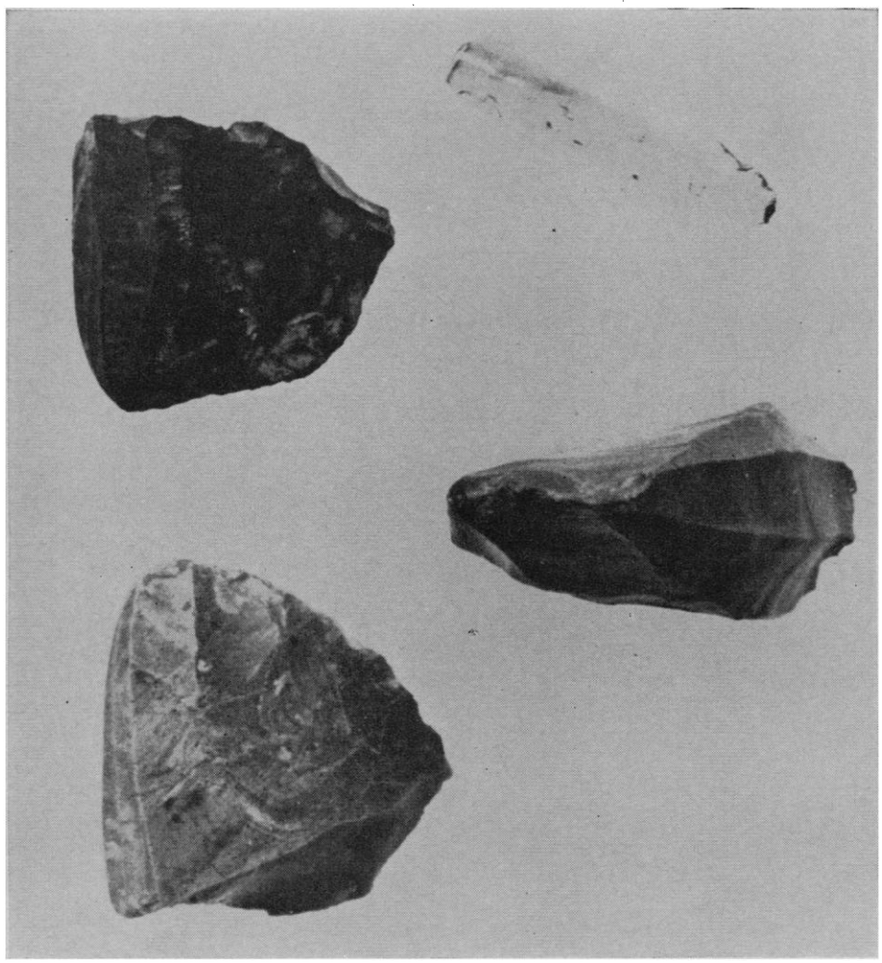


Fig. 8. Three microcores and a microblade found at Onion Portage on the Kobuk River, 1941. The microblade is 3.0 centimeters long.

Objections to the earlier-than-Denbigh dating for the notched points of Palisades II were soon expressed. Some felt that the order of dating should be more as it was in the eastern United States and neighboring Canada: fluted and lanceolate spear points first; then, in the Archaic Period, dating generally less than 6000 years ago, notched points (*17*). This was a question that could not be quickly settled, for neither the Palisades sites nor the sites of archeologists working in the interior of Alaska had produced pertinent radiocarbon dates, and artifacts had not been found in indisputable stratigraphy. I began to feel that the horizontal stratigraphy of the beach ridges was too limited. Stranded beaches older than the beginning of the Altithermal were not likely to exist in this region where the earth's crust was so stable. It was at this point that I remembered an old question about stratigraphy in a site of the wooded interior.

Onion Portage: Many Cultures or Vertical Stratigraphy

While excavating a series of Eskimo sites on the Kobuk River in 1941, I had puzzled over the discovery of a microblade and three microcores (Fig. 8) on a house floor no more than 700 years old. The house was at Onion Portage, 200 kilometers inland from the Chukchi Sea and a few kilometers north of the Arctic Circle (Fig. 1). There, at an excellent fishing place and caribou crossing, we excavated four house pits: three on a steep birch- and spruce-covered slope, and the other, containing the miniature cores and blade, on a gentler grassy slope beneath poplars. We excavated the lower house pit somewhat economically, shoveling and troweling only within the indicated house outline (Fig. 9). Removing earth as soon as it was thawed, we reached the floor and outer walls simultaneously, so that the ice held fast the decayed bases of vertical wall poles. Had the ground not been frozen, we would have tested below the floor as a matter of course, but since it was, we left the site the day we exposed the stone-lined hearth and removed the last artifact from the charcoal-blackened old floor.

Frequently, in the years following, I speculated about the anachronistic flints found among the familiar, recently used things at Onion Portage. The making of microblades might have persisted in this site of the forested interior because of the backwardness of its residents. But with the discovery of the Denbigh flints and, later, the knowledge that microblades had disappeared from the coast 4000 years ago, I became convinced that we had missed some aspect of the site. Either the microcores and blade had been collected by the old residents of our excavated house, or they had been unearthed by the residents while digging.

In 1961 I took time off from coastal work to learn what we had missed at Onion Portage. We had missed a great deal! The old floor of House 1, from which came the small cores and blade, had been dug by its builders into layer after layer of old ground surfaces, most of which bore either the charcoal and chips, or the artifacts and hearths, of still earlier residents of the site (*18*).

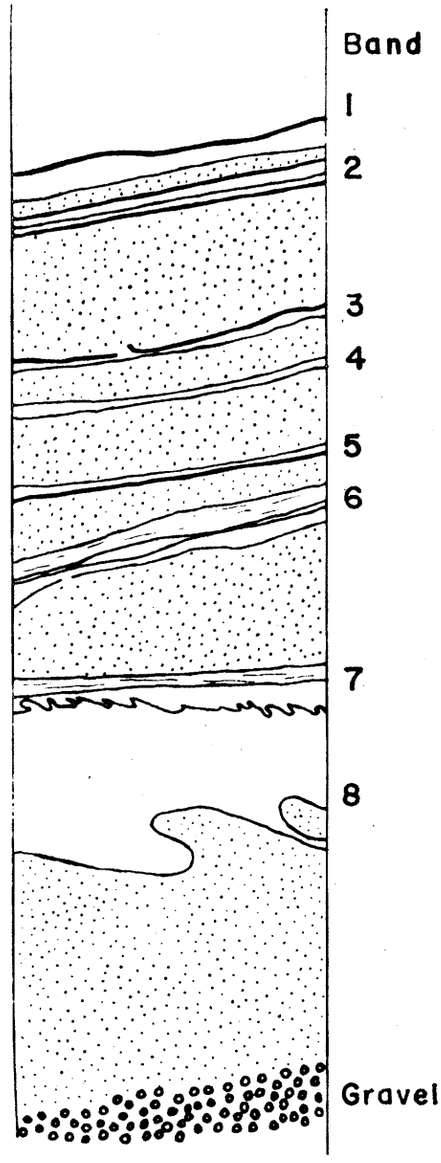


Fig. 10. Profile of a section of the West-18 wall, Onion Portage site. Eight culture-bearing bands are separated from one another by sterile soils (small dots).

Currently, Brown University is carrying out a major excavation at Onion Portage (*19*), where more than 30 layers, one lying above another and reaching a depth of more than 4 meters in places, are culture-bearing. Most of the layers seem to represent former ground surfaces that long remained stable. These layers, in the deeper part of the site, are separated into bands by lenses of yellow loam that tend to define the major cultural periods.

Thus, from the surface down (Fig. 10), we find in Band 1 the familiar Eskimo workmanship of Western Thule and later cultures. In Band 2 are several distinct cultural deposits, the upper containing opaque obsidian and resembling nothing coastal, and the lower containing a range of stone work (side and end blade insets for small weapons, discoidal scrapers, and knife blades) that is closely related to the Norton-Ipiutak culture of the seacoast (Fig. 11). In Band 3 is a new assemblage to be compared first to scattered finds in early Indian country of the far interior of Alaska, but also containing a few knife and scraper types similar to those of the Choris and Old Whaling cultures of Cape Krusenstern.

Band 4 has at least five layers of hearths and tent floors, all containing Denbigh Flint complex artifacts that show the same range in variety as do collections from the coast, and the band boasts significantly large numbers of microblades and some microcores (*20*). Below the Denbigh culture layer lies Band 5, containing a drastically different assemblage of artifacts. Thus far, its oblanceolate spear points, steep-edged scrapers with tiny graver tips, and knives, many of these objects of obsidian, may not be tied in with cultures of the coast.

In Band 6, composed of as many as 14 layers, numerous hearths contain side-notched points like those of Palisades II, as well as other forms not previously encountered, and styles of flint work are like those of the far interior. Band 7 was not exposed widely enough to reach hearths until late in the 1964 field season, but it promises to have new kinds of artifacts whose affiliations we can only guess at now. These bands and layers may not yet

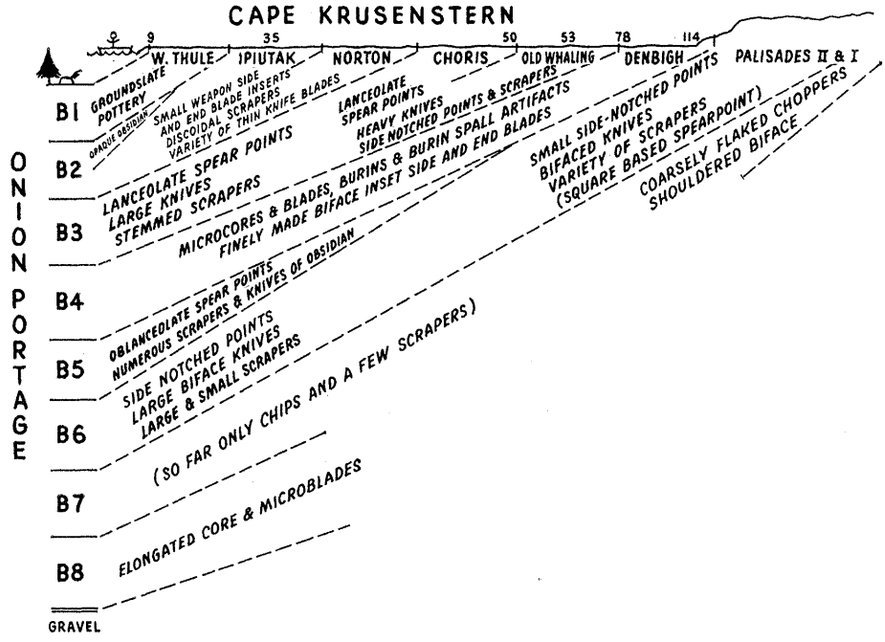


Fig. 11. Chart showing cultural correlations between artifacts found in horizontal stratigraphy on the beaches at Cape Krusenstern and in vertical stratigraphy in the bands at Onion Portage.

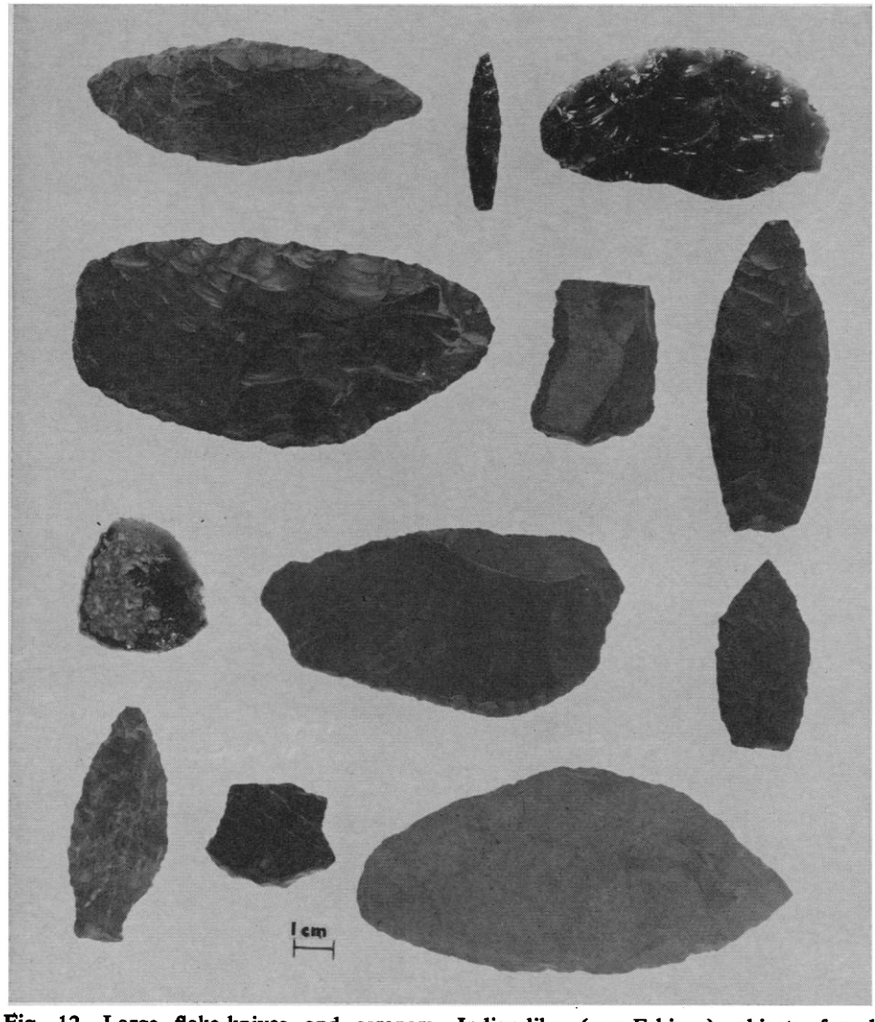


Fig. 12. Large flake-knives and scrapers—Indian-like (non-Eskimo) objects found in some of the bands at Onion Portage.

show the entire range of cultures at the site (*21*).

Certain characteristics of Onion Portage point to the far interior where only Athapaskan Indians are known to have lived, and these set apart the cultures of bands 6, 5, 3, and the upper part of Band 2 from the cultures of other bands and layers in the site. These Indian-like evidences are: the extensive use of obsidian (a material which, as far as we know, is available only along the Koyukuk River, 160 and more kilometers from Onion Portage); the use of quantities of red ocher, especially as a base for hearths in the earlier levels; the practice of crushing the bones of food animals, presumably for boiling to extract oil, and the burning of these bones in the hearths; and certain forms of extremely large flake-knives and scrapers (Fig. 12).

On the other hand, all of the successions of people who camped on the site appear to have shared certain traits: they built tents or lodges of birch or spruce bark, and they presumably gathered here in part, at least, for the yearly spring and fall crossings of caribou.

The most dramatic cultural change appears above bands 6 and 5, where the minuscule, sophisticated flints of Denbigh, in Band 4, replace the heavy, relatively coarse forms of the earlier peoples. This we suspect was replacement of Indians by Eskimos, although ethnic conclusions of this kind are generally frowned upon in archeology. Surely the continuities within the site do not indicate a long time lapse at this juncture. Rather, there is good evidence, in the reappearance of earlier traits in some upper bands at Onion Portage, where Denbigh flints are no longer found, to suggest that during Denbigh times the site's current residents—people with more Indian-like cultures—retreated inland; and this was undoubtedly caused by something more pressing than mere new devices—it was very possibly brought about by the appearance of a dynamic people on the move. We know now, at any rate, that the transfer of Denbigh flints, all together, in a complex, to as distant a place as Greenland could not have been purely a matter of the drift of people along sparsely settled shores and tundras but would have involved their successful adaptation, for a while at least, to the milder climates of the wooded interior.

Although it is much too soon to guess what is yet to come from the

strata at Onion Portage, we may be sure that side-notched points are indeed old in the Arctic, while many forms of lanceolate spear points closely like those of Early Man on the slopes of the southern Rockies are not. And, surprisingly, the only artifacts to turn up in the lower part (the solifluction zone) of Band 7 are an elongate core and the thick, short microblades struck from it—the core like some described from Japan's Shirataki time, perhaps 11,000 years ago. In view of some very early microcores recently described from Anangula Island in the Aleutian chain (*22*), we may well be tapping a vein of early influence that owes less to Arctic dwellers than to more southerly Asians who, during the late glacial period, when boats were unnecessary to reach the land to the east, spread with a skilled technical hand across the broad stretch of land between continents and settled in favored spots of what is now northwestern Alaska.

References and Notes

1. In 1948 and 1949 for the University of Alaska, supported by the Arctic Institute of North America; in 1950 and 1952 for the University of Pennsylvania, supported by grants from the Office of Naval Research, Department of the Navy, and the Wenner-Gren Foundation for Anthropological Research. The Cape Denbigh excavations were first reported in J. L. Giddings, *J. Wash. Acad. Sci.* **39** (No. 3), 85 (1949), and *Amer. Antiquity* **16** (No. 3), 193 (1951). A comprehensive report is J. L. Giddings, *The Archeology of Cape Denbigh* (Brown Univ. Press, Providence, 1964).
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3. H. Larsen and F. Rainey, "Ipiutak and the Arctic Whale Hunting Culture," *Anthropol. Papers Amer. Mus. Nat. Hist.* No. 42 (1948).
4. J. L. Giddings, *The Archeology of Cape Denbigh* (Brown Univ. Press, Providence, 1964), pp. 200–201; figs. 37–39; D. M. Hopkins and J. L. Giddings, *Smithsonian Inst. Misc. Collections* **121**, No. 11 (Washington, D.C., 1953).
5. W. N. Irving, *Amer. Antiquity* **17**, (No. 1), 52 (1951); ———, *Anthropol. Papers Univ. Alaska* **1**, (No. 2), 55 (1953); R. S. Solecki, *Amer. Antiquity* **17** (No. 1), 55 (1951); J. M. Campbell, *Arctic Inst. North Amer. Tech. Paper* No. 11, p. 44 (1962).
6. E. Knuth, personal communication.
7. Brief descriptions of the "New Mountain" culture of the Firth River site, Engigstciak [R. S. MacNeish, *Anthropol. Papers Univ. Alaska* **4** (No. 2), 91 (1956); R. S. MacNeish, *ibid.* **7** (No. 2), 41 (1959)], suggest a mixture there of the Denbigh Flint complex and later materials rather than a distinct phase of culture. Yet these and other early microblade and burin collections [E. Harp, *Arctic* **11**, No. 4 (1958); J. Meldgaard, *Polarboken* **1955**, 113 (1955); G. R. Lowther, *Nat. Mus. Can. Bull.* No. 180 (1960); M. S. Maxwell, *ibid.*] may be only slightly later than a basically Denbigh-like manifestation excavated by Knuth in the extreme north of Greenland [E. Knuth, *Arctic* **5**, No. 1 (1952); *Amer. Antiquity* **19**, No. 4 (1954); *Proc. Intern. Congr. Americanists, 32nd, Copenhagen, 1956* (1958)] and especially another excavated in Pearyland during the 1963 and 1964 seasons (E. Knuth, personal communication).

   I do not subscribe to the term "Arctic small tool tradition" [W. N. Irving, *Arctic Inst. North Amer. Tech. Paper* No. 11, 55 (1962) and elsewhere] for these reasons. First, I prefer to use the term "tradition" in a more limited geographical sense to describe transmission upward through time. Second, we must not yet rule out the possibility of rapid spread of Denbigh culture in essentially a horizon. And, third, the use of "small tool tradition" by several authors has been confused [as in R. S. MacNeish, *Anthropol. Papers Univ. Alaska* **10** (No. 2), 103 (1963)]. This does not mean, however, that Sarqaq and Dorset cultures of the eastern part of the continent have not descended directly from the older, Denbigh-like base in the same area. Recent excavations by H. B. Collins, W. E. Taylor, J. Meldgaard, E. Harp, M. Maxwell, G. M. Rousseliere, T. Mathiassen, H. Larsen, and others clearly show that they have.
8. Denbigh materials, submitted to the Radiocarbon Laboratory of the University of Pennsylvania and carefully tested and analyzed there show a large range of firm dates reaching back to 4500 B.C. A mean date for classic Denbigh would be 2000 B.C., with the sites at Cape Denbigh, Lower Bench at Cape Krusenstern, and Trail Creek appearing to be older.
9. The work of 1956 was financed by Brown University. See J. L. Giddings, *Amer. Antiquity* **23**, No. 2 (1957) and **27**, No. 2 (1961).
10. H. B. Collins, *Explorations and Field-Work of the Smithsonian Institution in 1931*, pp. 103–112 (1932); H. Larsen and F. Rainey, "Ipiutak and the Arctic Whale Hunting Culture," *Anthropol. Papers Amer. Mus. Nat. Hist.* No. 42 (1948).
11. For Brown University, supported by grants in 1958 from the Arctic Institute of North America and the American Philosophical Society, and in 1959–1961 from the National Science Foundation.
12. This and the following cultures and phases have been briefly described by J. L. Giddings [*Nat. Hist.* **69** (No. 9), 10 (1960) and *Amer. Antiquity* **27** (No. 2), 155 (1961)].
13. A personal communication to me from H. Larsen describes large, parallel-sided blades, ancestral to those of Choris, which he found in the middle layers of his Trail Creek cave site on Seward Peninsula.
14. G. W. Moore and J. L. Giddings, *Geol. Soc. Amer. Spec. Paper* No. 68, p. 232 (1962).
15. G. W. Moore, in "Geological Survey Research, 1960," *U.S. Geol. Surv. Prof. Paper 400-B*, p. B-336 (1960).
16. A long series of dates from charcoal taken from house hearths of Old Whaling culture support this estimate, though the dates from rotten wood are more recent. The latest statistics on radiocarbon dating in the Arctic, prepared at the Radiocarbon Laboratory of the University of Pennsylvania, will be released by R. Stuckenrath and D. D. Anderson in an early issue of *American Antiquity*.
17. J. B. Griffin, *Arctic Inst. North Amer. Tech. Paper* No. 11, p. 154 (1962); J. M. Campbell, *ibid.*; W. N. Irving, *Anthropol. Papers Univ. Alaska* **10** (No. 2), 63 (1963).
18. J. L. Giddings, *Arctic Anthropol.* **1** (No. 1), 6 (1962).
19. Supported by a grant from the National Science Foundation.
20. In the 1965 season, three Denbigh houses were exposed—two within Band 4 and one in the top level of Band 5.
21. The enlarged excavations of 1965 added an eighth band. Though hearths are plentiful in these deepest levels, artifacts are as yet scarce. Further work is planned at the site in coming seasons.
22. R. F. Black and W. S. Laughlin, *Science* **143**, 1321 (1964).