substitution in the transferrin molecule. Previous experiments (*11*) have shown that the purified transferrins B_2, C, and D_1 have similar overall amino acid compositions, as determined by the method of Moore *et al.* (*19*) and Spackman *et al.* (*20*), and similar sedimentation properties in the ultracentrifuge. It has also been shown that transferrins B_{0-1}, B_1, B_2, C, D_1, and D_3 are immunologically identical (*11*). These observations, together with the similar sialic acid content of the ten variants which have been examined, are compatible with a single amino acid substitution as the basis of the variation in human transferrin. Of particular interest are the cluster of transferrin variants in the D_1 region. The five transferrins D_0, D_4, $D_{Montreal}$, D_{Chi}, and D_1 appear to differ from transferrin C by a single charge unit; the characteristic electrophoretic mobility of each variant suggests that the alteration in charge is expressed slightly differently in each case. The closely similar mobilities of these transferrins considerably strengthen the suggestion of Smithies and Connell (*18*) that starch gel electrophoresis is capable of resolving small differences in macromolecules at the level of expression of single charge units; it appears from the present experiments that under suitable conditions such resolution can be extremely fine.

The transferrin gene locus appears to be capable of numerous viable mutations, none of which has been associated with a clinical abnormality. It is essential that new variants, especially those occurring in relatively high frequency in particular populations, be carefully compared with known variants. In the absence of a common selective advantage or a chemical predisposition favoring a given mutation, it is unlikely that the same transferrin variant will occur in unrelated populations (*21*).

W. CAREY PARKER
ALEXANDER G. BEARN
Rockefeller Institute, New York 21

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Revision of Aleutian Prehistory

Abstract. Mongoloid skeletons of the Eskimo-Aleut stock, bone, stone and ivory artifacts, together with sea mammal, fish, bird, and invertebrate remains date to 1788 ± 180 B.C. at Chaluka, Umnak Island. Faunal composition and physical type of the human population present no appreciable changes for over 3000 years. Styles of artifacts change, but none indicate that ecological adaptation was affected.

New radiocarbon dates from the ancient village site of Chaluka, Umnak Island, in the eastern Aleutians, confirm an earlier radiocarbon date and locate the earliest recognizable appearance of Eskimo-Aleut people in association with their material culture and a large, varied series of faunal remains. Hrdlicka first recognized the importance of this site (*1*). He recovered many "pre-Aleut" skeletons here and estimated that the population arrived about the time of Christ. Three age measurements derived from charcoal specimens recovered in excavations of 1961 have been made by Isotopes, Inc. (Table 1). These figures are in excellent agreement with one determined by Libby (*2*) of 3018 ± 230 years; Libby used a sample from a nearby trench with equivalent stratigraphy less than 1 meter above the floor. The size of the Chaluka midden, some 215 m long, 61 m wide, and up to 6.8 m deep, reflects its antiquity. This depth has served to prevent contamination and disturbance. In an excavation at Krugloi Point, Agattu Island, western Aleutians, Spaulding (*3*) recovered a bottom specimen with an age of 2630 ± 300 years, suggesting that the westward migration might have taken as long as 1000 years.

Sixteen Paleo-Aleut skeletons from Chaluka (pre-Aleut of Hrdlicka) conform to Spaulding's basic description. They are Mongoloid, rather than American Indian; this is indicated by dental traits; dehiscences of the tympanic plate and mandibular and palatine tori; simple sutures; general cranial physiognomy; and short lower leg in comparison with upper leg. In contrast to the later Aleutian population (Neo-Aleuts), the Paleo-Aleuts have narrow, long heads. In some respects they resemble two groups, the much later Ipiutak people of Point Hope, described by Debetz (*4*), and the Paleo-Konyags of Kodiak. A lifespan longer than arctic Eskimos, which is evident in the later Aleuts, cannot yet be confirmed for this series, though there is presumptive evidence. One marked case of cranial hyperostosis in an adolescent establishes the presence of a hemolytic anemia. Aside from three diverse specimens in the Upper Cave, Chou Kou Tien, and the partial remains of Tzeyang man and Liu-chiang man, China, the Chaluka series appears to contain the oldest existing indubitable Mongoloids, and raises the important questions of rates of evolution, in general, and the recency of Mongoloids, in particular. Though the ultimate origin of these Mongoloids is Asiatic, there is ample biological, artifactual, and physiographic evidence that they migrated westward from the Alaska mainland. Failure to find older series on the mainland and in the Bering Strait region apparently reflects sampling deficiencies and also indicates that populations in the less favored areas were very small and widely spaced, in contrast to the Aleutians, where a higher frequency of closely spaced villages was supported by a lavish environment.

The artifactual remains consist of a variety of harpoon heads and spear heads (side prongs of the three-pronged bird spear included), stone lamps, chipped adze blades and whalebone wedges (indicative of a heavy woodworking industry essential for boats and houses), scrapers and gravers made on prismatic or lamellar blades, chipped stone semilunar knives, tanged knives, chipped stone end points for harpoon heads (one found embedded in a sea lion humerus), bolas, compound fish hooks, labrets, and bird bone and sea otter bone awls. Large stones (68 cm

Table 1. Three radiocarbon dates from the ancient village site of Chaluka, Umnak Island. The measurements were derived from specimens recovered in 1961 excavations, and were determined by Isotopes, Inc.

Specimen No.	Depth in midden (cm below surface)	Age (yr)
I-494	150	2875 ± 160
I-495	275	3600 ± 180
I-493	300*	3750 ± 180

* 60 cm above native sterile bottom.

long), set on edge and forming an oval outline, suggest house bases.

Verification of the functions of the artifacts and of the ecological base is found in the abundant faunal remains. The bulk of the bones consists of pinnipeds with greatest frequencies of harbor seals, sea lions, and fur seals. The mustelid sea otter (*Enhydra lutris*) is represented by several hundred elements. Remains of whales are present in the lower levels; their bone is the most common fabricational material for harpoon heads and spear heads. Ivory labrets identify the sperm whale; sample limitations do not permit an estimate of their proportional frequency. There is a marked deficiency of sea otter fibulae and an excess of harbor seal and sea lion hyoids. A possible explanation for the paucity of fibulae is their conversion to awls, some of which have been identified. The numerous hyoids may reflect the extensive fabricational use of oesophageal parkas (waterproof kamleikas) and pants, both well known from ethnographic records. More immature specimens of sea otter are found in the lower levels, indicating a possible alteration in hunting habits as the population grew larger.

Of about 20 species of birds represented in the site, two species of cliff-nesting murre, two species of puffin, a cormorant, and the glaucous-winged gull contributed the majority of individual bones. The albatross, including the yellow-billed type, is well represented and suggests the use of kayaks in hunting, although Chamisso (*5*) states that albatross were formerly hunted while they nested in the mountains. Fish bones, incompletely identified, include halibut, cod, salmon, and smaller fishes from the intertidal zone. Large quantities of sea urchin with chitons, limpets, whelks, mussels, and clams indicate extensive use of the intertidal zone.

Comparison of the Chaluka materials with those of an Eskimo site at Rolling Bay (Saataq), Sitkalidak Island, on the south side of Kodiak Island, sharpens the contrast in modes of ecological exploitation and verifies the uses of artifacts. Many more fish bones and fewer pinniped bones characterize this site. This food habit is reflected in large numbers of ground slate ulus (used by women in cleaning salmon and other fish). An absence of compound fishhooks indicates less reliance on the larger, deep-water fish; the absence of fish spears indicates greater reliance on nets or weirs. The scarcity of pinniped and sea otter bones is adumbrated in the dearth of harpoon heads. The absence of bird spear prongs is similarly in functional agreement with the existence of fewer bird bones. Both the earlier Paleo-Konyag (pre-Konyag of Hrdlicka) and the Neo-Konyag skeletons have been found.

A significant fact is the absence of any appreciable change in the composition of the fauna at Chaluka. Four thousands years of exploitation were continuously based on sea mammal hunting, birds, fish, invertebrates, and, by inference, on land plants and marine algae. The absence of sea ice in winter and the presence of easily collected invertebrates have clearly been factors in the continuous development and eventual large population (16,000 at the time of discovery in 1741). These factors favored survival of children, women, and the handicapped in the population. For at least 3000 years the human population appears to have consisted of the Paleo-Aleut variant, persisting through a variety of changes in styles of artifacts. The artifactual changes do not appear to have affected the way of life of these people.

The Paleo-Aleut skeletons are easily distinguishable from their eastern neighbors, the Paleo-Konyags. This suggests that their differentiation precedes 2000 B.C. by a long period. Whether the early Aleuts were replaced by or evolved into the later Neo-Aleuts remains the basic question. More closely spaced samples, in both time and space, are needed to distinguish local evolution from the effects of gene flow or actual migration of people. Ample time is clearly available for evolution of the later, broad-headed population (with higher frequencies of tori and other discrete traits) to have taken place in the Aleutian Islands (*6*).

W. S. LAUGHLIN
W. G. REEDER
Departments of Anthropology and Zoology, University of Wisconsin, Madison

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Evidence for Direct Stimulation of the Mammalian Nervous System with Ionizing Radiation

Abstract. Exposure to x-rays of low intensity immediately arouses the sleeping rat. Activation of the central nervous system, indicated by behavioral and heart rate responses, depends upon the rate but not the dose of exposure. The arousal reaction is not dependent upon direct visual stimulation. The nervous system is probably directly sensitive to ionizing radiation.

Investigations dependent upon neurophysiological and histological techniques have generally failed to produce evidence of any marked reactivity of the adult mammalian nervous system to ionizing radiation (*1*). Behavioral methods have been used to demonstrate that a low dose of radiation can act as an unconditioned stimulus in the conditioning of avoidance responses (*2*), and it was considered likely that a behavioral criterion might also be utilized to detect the most immediate effects of radiation in the intact mammalian nervous system.

For this purpose, rats were exposed to x-rays while they were asleep in a glass exposure chamber (Fig. 1), and observational measurements of behavioral arousal were made. Heart rate measurements were also made to provide additional evidence of central activation during arousal (*3, 4*).

Young adult male Sprague-Dawley rats served as subjects. Prior to exposure the animals received 40 hours of adaptation (*5*) which included exposure to x-ray-machine and room noises. Heart rate values during the sleep state, obtained in the last 8-hour period of adaptation, were used to equate experimental groups.

Behavioral arousal was measured by a rating scale which identified *any* visible departures from the condition