

centas derived from matings of either C57 males with Balb/C females or Balb/C males with C57 females. On the other hand, their survival is compatible with immunological theory. The injection of F1 cells into the newborn of either parental strain should result in surviving cells that do not cause runtting (3).

A final consideration was the possibility that the lethal effect of C57 placental suspensions was produced by small numbers of immunologically competent maternal cells present in the suspensions. Although the maternal tissues had been carefully dissected away before preparing the placental suspensions, it was of course impossible to exclude all maternal cells. To clarify this situation, Balb/C males were mated with C57/B1 females. The placenta was therefore F1 and incapable of causing runtting; however, the maternal tissue was pure C57 in origin. If the lethal results of the previous experiments with placenta cell suspensions had been caused only by contaminating maternal cells, this preparation should also cause death. In fact, omitting deaths occurring during the first 3 days of life, in 10 of 10 experimental animals receiving placental suspensions all survived. However, the injection of spleen cells from the mothers bearing these placentas resulted in death in 12 of 13 animals, and the surviving animal was obviously runted. This demonstrated that if a sufficient number of immunologically competent *maternal* cells had been present in the placental suspensions, death should have resulted. The only reasonable explanation of the previous experiments is that placenta does contain immunologically competent fetal cells. It is evident that this makes even more remarkable the success of the placenta as a homograft (5).

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Dispersal Patterns of Pleistocene Sands on the North Atlantic Deep-Sea Floor

Abstract. Glauconitic, quartzose sands previously modified on the continental shelf from feldspathic glacial detritus were transported through submarine canyons onto the Hudson deep-sea fan, the Hatteras abyssal plain, and the western and central Sohm abyssal plain. These feldspar-poor, quartzose sands contrast with highly feldspathic sands derived directly from a glacial source and probably transported through the Newfoundland abyssal gap onto the eastern and southern Sohm abyssal plain.

The discovery of sand layers of Pleistocene and Recent age interbedded with deep-sea clays and oozes is one of the surprising and important discoveries of recent oceanographic research. On the physiographic map of the floor of the northwestern North Atlantic (1) is shown the location of 50 long piston cores containing Pleistocene (Wisconsin) sand layers which have been analyzed for their mineral composition and texture (Fig. 1). The Wisconsin-Recent boundary in the cores had been previously delineated on the basis of the ratio of cold- to warm-water planktonic foraminifera (2). The quantitative mineral composition of the sands was determined in impregnated petrographic thin sections by the point-counter technique. The heavy mineral assemblages (specific gravity over 2.9) were measured quantitatively by the line-count method in separate mounts. Graphic summary

statistics (Folk) for mean size, standard deviation, sorting, skewness, and kurtosis were calculated from cumulative grain-size distributions based on sieving and pipette analysis.

Most of the deep-sea Wisconsin sands in the western North Atlantic (Fig. 1) are relatively quartzose, having quartz-to-feldspar ratios often exceeding 90:10, omitting calcareous fossils, clayey matrix smaller than 0.03 mm, and miscellaneous grains. These sands are largely very fine-grained to fine-grained, and moderately sorted to moderately poorly sorted (standard deviations of 0.60 to 0.90 predominate). The derivation of these quartzose sands from originally feldspathic glacial detritus is shown by the consistent ratios throughout this large area of various varieties of minerals, and the typical glacial assemblage of many heavy mineral species. Potassium feldspar consistently predominates over plagioclase, and metamorphic quartz (schistose and highly strained quartz plus metaquartzite rock fragments) forms about a third of the total quartz. The transparent, nonmicaceous heavy mineral assemblage is dominated by 20 to 60 percent amphiboles (about one-third blue sodium-bearing metamorphic amphiboles), lesser amounts of garnet, staurolite, tourmaline, hypersthene, sillimanite, and apatite, and traces of many other minerals.

The occurrence of marine sandstones in the Sangamon or Wisconsin inter-

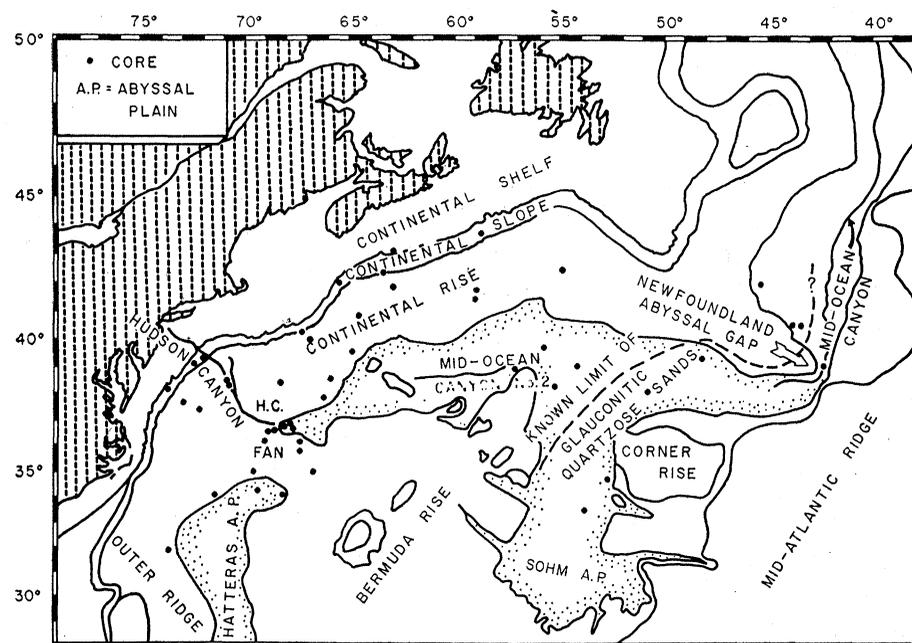


Fig. 1. Location of long piston cores containing Pleistocene (Wisconsin) sand layers which have been analyzed for their mineral composition and texture.

stadial Cape May formation in New Jersey, having quartz-to-feldspar ratios averaging 95 : 5, and 3 percent glauconite among the grains (3), indicates that an extensive reservoir of glauconitic quartzose sand existed on the continental shelf prior to the last Wisconsin glaciation. Concurrent with the lowering of sea level by 400 to 500 feet during the subsequent Wisconsin glaciation (4), it is probable that appreciable quantities of this quartzose sand were swept by longshore currents into the submarine canyons that cut the margin of the continental shelf, particularly the Hudson Canyon. The sand was transported, possibly by slumping and turbidity currents, onto the deep-sea floor.

Although most of the sand layers in the Hudson deep-sea fan, excluding the abyssal plains, are quartzose, a few are highly feldspathic with quartz to feldspar ratios as low as 72 : 28. Unlike the quartzose sands of the Hudson deep-sea fan which average 3 percent glauconite among the terrigenous grains, the feldspathic sands contain no glauconite or only traces of it. These feldspathic sands are derived from glacial sources and were probably transported by the Hudson River in the Hudson Channel across the continental shelf during lowered sea level and carried without appreciable modification directly into the Hudson Canyon and down to the Hudson deep-sea fan. Both the quartzose and feldspathic sands in the Hudson deep-sea fan come from mineralogically similar glacial detritus, but the contrast in abrasion history allows them to be differentiated on the basis of mineral composition. Rather surprisingly, the Wisconsin sands in the Hudson deep-sea fan are predominately glauconitic quartzose sands derived from the continental shelf, rather than feldspathic sands from the Hudson River, despite the obvious physical connection of the Hudson Channel, the Hudson Canyon, and the Hudson deep-sea fan.

In contrast to the feldspar-poor, glauconitic quartzose sands to the west derived from the continental shelf, the Wisconsin sands in the eastern and southern Sohm abyssal plain are highly feldspathic, very fine-grained to fine-grained, and poorly sorted (standard deviations of 1.00 to 2.00). These feldspathic sands have quartz to feldspar ratios from 85 : 16 to 71 : 29, and contain several percent distinctive carbonate rock fragments that are absent in the western and central Sohm abyssal

plain, and only traces of glauconite. The feldspathic sands are probably derived without appreciable modification of the grains from glacial sources to the north of the Newfoundland abyssal gap. The sands were apparently transported through the Newfoundland abyssal gap and then southward down the regional gradient of the Sohm abyssal plain to ocean depths exceeding 5000 meters.

The association of the Mid-ocean Canyon with the dispersal pattern of feldspathic sands in the eastern and southern Sohm abyssal plain, and the Mid-ocean Canyon No. 2 with quartzose sands in the central Sohm abyssal plain, supports the idea that these little-understood mid-ocean canyons may be related to the transportation of sand to the deep-sea floor (5).

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Cutaneous Sensory End Organs of Some Anthropoid Apes

Abstract. The organized end organs of nerves in glabrous skin of the chimpanzee, orangutan, and gibbon are similar to those of man in form and distribution but are more numerous on the soles of the feet than in man. I found cholinesterase in all the end organs of all these animals and, in the gibbon, alkaline phosphatase as well.

Cutaneous sensory end organs of man and monkey, as studied 100 years ago by Krause (1) and, more recently, with histochemical and silver techniques by me (2), differ greatly from those of mammals with paws, claws, or hoofs. The Meissner corpuscle and mucocutaneous end organs, the only specialized dermal endings in man and monkey, consist of masses or rolls of neurofibrils. The corresponding end organs of lower mammals are tubular, encapsulated

structures containing a nerve within an enzyme-laden inner bulb. My study of gorilla skin (3) indicated that the nerve-ending pattern is simple and suggested that study of the great apes in more detail would provide a basis for future comparison with other primates and lower mammals.

Skin and mucous membrane were obtained from a 3-year-old orangutan, a 3-year-old chimpanzee, a 7-year-old chimpanzee (4), a white-handed gibbon (*Hylobates lar*), and a black gibbon (*Hylobates hoolock*). While the animals were under anesthesia, specimens for biopsy were obtained from mucocutaneous tissues, mucous membranes, and distal glabrous and hairy skin. Sites of sampling included the volar and dorsal surfaces of the digits, hands, feet, legs, and arms, the shoulder, back, genitalia, perianal region, lip, conjunctivae, nares, gingiva, palate, scalp, and face.

Portions of tissue were frozen for histochemical studies, and portions for silver preparations were placed in sucrose-ammonium formalin. Diazo coupling, alkaline phosphatase, thiocholine, cholinesterase, and silver techniques were used as outlined elsewhere (3).

Meissner corpuscles were seen in all specimens of distal glabrous skin of all species studied. They were most prominent in the digits of the hands, but the contrast between the number of endings in the hands and feet was not as apparent as the corresponding difference between the number seen in the hands and feet of man. (The human foot contains only widely spaced endings, except on the digital surfaces.) These end organs consisted of neurofibrils layered and wound upon one another (Fig. 1a). Such nerve endings were found in all three types of primates. Only on rare occasions were end organs found with more than one simple lobe. No expanded or netlike terminations were seen.

At mucocutaneous junctions, end organs with a looser structure and more spheroidal shape were noted. They consisted of unencapsulated, rolled neurofibrils. They were supplied with heavily myelinated fibers. In some instances a degree of layering of the neurofibrils was apparent (Fig. 1b), but this was not universal. A more common structure is shown in Fig. 1c. No expanded nerve terminations or multilobular end organs were seen.

The nerve tissue of the hairy skin of