utilization factor groups, namely, less than 100, 100 to 1000, 1000 to 3000, and more than 3000. Eight of the fungi, including species of *Fusarium, Syncephalastrum, Pestalotia, Stachybotrys,* and *Nigrospora,* fell within the first two groups, while the remaining species had utilization factors above 1000. Of the various fungi tested, two widespread marine species, *Z. xylestrix* and *H. mediosetigera,* showed the highest utilization factor, occasionally as great as 5000.

Nematodes represent (*11*) the most diversified and most abundant group of metazoans living at the bottom of the sea. While the rearing of terrestrial representatives of *Aphelenchoides* on fungal cultures has been reported (*12*), this relationship has not been noted in the marine environment. Other workers (*13*), observing an association between a terrestrial species of nematode, *Ditylenchus destructor,* and various species of fungi, postulated that a wide variety of fungi may play an important role in the survival of this nematode in nature. A similar pattern may exist between the marine-occurring *Aphelenchoides* sp. and representatives of the marine mycota (*14*).

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Palynological Investigation of a Core from the Biscay Abyssal Plain

Abstract. *An investigation of Quaternary, Tertiary, Mesozoic, and Paleozoic pollen and spores found in sediments of the Biscay Abyssal Plain provides data leading to the interpretation of the provenance of the lutite in which reworked plant microfossils occur. Owing to the difficulty of distinguishing between Quaternary and reworked Tertiary pollen grains belonging to extant genera, caution is necessary in interpreting the pollen record in terms of Quaternary climatic changes.*

Pollen analysis of bog and other continental deposits has been perhaps the most potent method in studying climatic changes during the Quaternary, but one difficulty is inherent in such work: the records that such deposits can furnish are always discontinuous in time.

A beginning was made with a palynological investigation of the sediments of the continental shelf off the east coast of North America, and, later, with a few cores from the deeper parts of the Atlantic Ocean. The lutites occurring on the shelf are usually quite fossiliferous, but in some areas long cores are necessary to reach Wisconsin or older deposits. In other shelf areas deposition may be interrupted due to lowered sea level during glacial stages, resulting in a discontinuous pollen record.

In the deeper parts of the ocean, farther away from the continents, sediment accumulation is likely to be continuous and relatively slow as compared with that on the shelf, and, consequently, climatic fluctuations might be represented in the pollen spectrum even in rather short cores. In order to test this hypothesis, cores from three locations were processed; most of the samples proved to be fossiliferous. This report is concerned with core SP 3-33, located in the Biscay Abyssal Plain, 47°10.8′N and 11°25.5′W, at a depth of 4610 m.

The core consists of brown-gray lutite to a depth of 400 cm; at this depth a change occurs to a gray sandy lutite to 417 cm. Between 417 and 477 cm a gray lutite is found, and below this depth occurs brown-gray lutite, similar to that of the upper part of the core. The carbonate content is about 25 percent in the upper 50 cm, and between 400 and 417 cm; in the remainder of the core it is 10 to 15 percent.

A preliminary examination of the material revealed that, although many Cenozoic pollen grains and spores are present, a significant number of reworked Mesozoic and Paleozoic forms occur in all samples. The Cenozoic pollen forms an assemblage which may well have been produced during the last several thousand years, except for a few grains of *Anacolosidites* and *Pterocarya,* which were reworked from Tertiary desposits. It is, however, difficult, if not impossible, to differentiate between, for instance, modern and Tertiary *Pinus* grains, and the same can be stated for pollen and spores of many other extant genera. Therefore, the Cenozoic pollen assemblage can be used only with great caution in the study of climatic fluctuations during the Quaternary Period, unless supporting data can be obtained from the study of foraminifera, or from oxygen isotope investigations.

In addition to pollen and spores, a few dinoflagellates, hystrichosphaerids, and other acid-insoluble microfossils were found. The latter are probably planktonic organisms, but I could not identify them.

In most of the samples, less than half of the Cenozoic grains are winged conifer pollen, nearly all belonging to the genus *Pinus,* except in the samples from 297 to 302 cm, 352 to 358 cm, and 413 to 417 cm. These samples, and particularly the last mentioned, contain some *Picea* and *Abies* (?) pollen, suggesting, if they are not reworked from older deposits, a slight cooling of the climate at the time of their deposition. The occurrence of *Picea* and *Abies* (?) is accompanied by rather high percentages of *Pinus* and lower than average percentages of angiosperm pollen. It is interesting to note that Ericson (*1*) also suspects some climatic deterioration on the basis of his study of foraminifera in a sample from 350 cm. However, since the number of *Picea* and *Abies* (?) pollen grains is small, and the foraminiferal data indicate a minor rather than a drastic climatic change, it would be unwise to conclude that the sediments between 297 and 417 cm were deposited during the last glacial period. Rather, it appears probable that both the foraminifera and the plant microfossils present at this depth reflect a minor change during post-glacial time.

Among the Cenozoic angiosperm pollen, that of *Alnus* and the Ericaceae are most common. Cenozoic spores are

represented primarily by numerous well-preserved *Sphagnum* specimens; in the lower part of the core, grains of *Polypodium vulgare* occur. This fern species is frequently found in European late Quaternary deposits (*2*).

The genera occurring most frequently in the Mesozoic are *Classopollis, Cicatricosisporites, Gleicheniidites, Klukisporites*, and *Leptolepidites*. Nearly all Mesozoic genera found in the core have been reported from Jurassic and Lower Cretaceous beds in England (*3*). The genus that is represented by the greatest number of specimens is *Classopollis*, which is extremely abundant in the Purbeck beds (uppermost Jurassic). The specimens of *Cicatricosisporites* belong mostly to *C. dorogensis*, reported from Purbeck, Wealden, and Aptian deposits; *Gleicheniidites* was found in the Middle and Upper Jurassic and the Wealden; *Klukisporites*, represented mostly by *K. pseudoreticulatus*, occurs in the Purbeck and Wealden, and *Leptolepidites* in the Middle Jurassic of Great Britain (*3*). A few specimens of genera occurring in Upper Cretaceous deposits were also found. They are *Trudopollis* and *Plicapollis*. However, it is clear that nearly all reworked Mesozoic plant microfossils were derived from Jurassic and Lower Cretaceous sediments.

Pollen- and spore-bearing beds of this age occur in southern England, and are well exposed along the Channel coast. The Wealden crops out along the southwest coast of the Isle of Wight and in the Hastings area (the Fairlight Clay), and covers an area of many square miles around Tunbridge Wells. Jurassic sediments known to contain abundant *Classopollis* grains occur at Portland near Weymouth, Dorset; other Jurassic fossiliferous outcrops are found further to the northeast, in Northhamptonshire and Yorkshire.

Aptian and Albian sediments containing abundant *Classopollis* occur also along the coast of Portugal, in the vicinity of Obidos and to the west of Lisbon (*4*). This genus has also been reported from the Jurassic of continental Europe (*5*).

Among the most common of the Paleozoic spores in the core are *Anulatisporites* and *Densosporites*, known from European Namurian and Westphalian deposits (*6, 7*). *Granulatisporites, Punctatisporites*, and *Triquitrites* occur through most of Late Carboniferous time (*6*). Of interest also is the presence of the genus *Vittatina* which has been reported, for instance, from the Permian of the Urals (*8*) and from Oklahoma (*9*). Since many Permian pollen genera have a wide geographic distribution (*9*), *Vittatina* may occur in the Permian of England or France, although it has not been reported so far.

Now some consideration should be given to the possible source areas of the reworked fossils. Two possibilities come to mind:

1) Outcrop areas along or adjacent to the English Channel and the Bristol Channel. In these areas Upper Carboniferous, Permian, Jurassic, and Wealden sedimentary rocks occur, capable of delivering large numbers of plant microfossils. Paleozoic and younger rocks are known to occur also on the bottom of the English Channel and the Western Approaches (*10*).

2) If Paleozoic and Mesozoic rocks crop out on the continental slope, as suggested by Day *et al.* (*11*), and if these rocks were of such facies as to contain numerous pollen and spores, they would be the closest possible source of reworked fossils. So far, only Eocene and younger rocks have been dredged from the upper part of the slope, near the shelf-break (*10*), but it is quite possible that older rocks are present at greater depth.

The first possibility requires westward currents, which do not occur at the surface. However, bottom currents may differ in direction, and in this respect it is interesting to note that Cooper and Vaux (*12*) described "cascading" of cold and relatively dense water over the continental slope west of the entrance to the English Channel and the Irish Sea. Such water movement might well be capable of carrying plant microfossils, which can be as easily transported as fine silt and clay particles, to the Biscay Abyssal Plain.

The second possibility is attractive because of the short distance of transportation involved, and because slumping could deliver large quantities of sediment and their contained fossils to the abyssal plain. However, the core does not contain turbidity deposits and even if Mesozoic and Paleozoic rocks crop out on the slope we would need a mechanism for the transport of reworked pollen and spores (*13*).

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Ice Movement of Valley Glaciers Flowing into the Ross Ice Shelf, Antarctica

Abstract. *Seven glaciers from 9 to 26 kilometers in width move 0.3 to 2.3 meters per day. Byrd Glacier is the fastest moving of the known valley glaciers in Antarctica.*

The Ross Ice Shelf is the largest floating ice sheet in the world. Into it flow valley glaciers of unparalleled size (Fig. 1). Surface movement measurements were made during the years 1960–62 to assess the contribution made by valley glaciers to the overall regime of the ice shelf. A line of survey markers was erected across seven of the principal glaciers. Each marker consisted of a 3-m length of 0.1-m aluminum pipe drilled 1 m into the

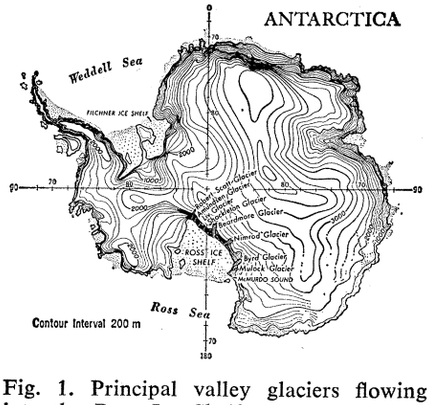

Fig. 1. Principal valley glaciers flowing into the Ross Ice Shelf.