press. *Initial Reports of the Deep Sea Drilling Project,* 36. Washington, D.C., U.S. Government Printing Office.
Eisenack, A. 1939. Einige neue Annelidenreste aus dem Silur und dem Jura des Balticums. *Zeitschrift für Geschiebeforschung der Flachlandgeologie,* 15: 153-176.
Forest, J., M. de Saint Laurent, and F. A. Chace. 1976. *Neoglyphea inopinata:* a crustacean "living fossil" from the Philippines. *Science,* 192: 884.
Harris, W. K. In press. Palynology of cores from Deep Sea Drilling Sites 327, 328, and 330, South Atlantic Ocean. In: *Initial Reports of the Deep Sea Drilling Project* (Barker, P. F., I. W. D. Dalziel, *et al.),* 36. Washington, D.C., U.S. Government Printing Office.
Kulicki, C., and H. Szaniawski. 1972. Cephalopod arm hooks from the Jurassic of Poland. *Acta Palaeontologica Polonica:* 17: 379-426.
Szaniawski, H. 1974. Some Mesozoic scolecodonts congeneric with Recent forms. *Acta Palaeontologica Polonica,* 19: 179-200.
Thompson. R. W. In press. Mesozoic sedimentation on the eastern Falkland Plateau. In: *Initial Reports of the Deep Sea Drilling Project* (Barker, P. F., I. W. D. Dalziel, *et al.),* 36. Washington, D.C., U.S. Government Printing Office.
Warnke, D. A., P. Bruchausen, J. LaBrecque, P. Ciesielski, and A. Federman. 1976. ARA *Islas Orcadas* cruise 7. *Antarctic Journal of the U.S.,* XI(2): 70-73.
Wind, F. H., M. G. Dinkelman, and S. W. Wise. In press. Jurassic scolecodont-like microfossils from the Falkland Plateau (Deep Sea Drilling Project Site 330). In: *Initial Reports of the Deep Sea Drilling Project* (Barker, P. F., I. W. D. Dalziel, *et al.),* 36. Washington, D.C., U.S. Government Printing Office.
Wise, S. W., and F. H. Wind. In press. Mesozoic and Cenozoic calcareous nannofossils recovered by DSDP Leg 36 drilling on the Falkland Plateau, Atlantic sector of the Southern Ocean. In: *Initial Reports of the Deep Sea Drilling Project* (Barker, P. F., I. W. D. Dalziel, *et al.),* 36. Washington, D.C., U.S. Government Printing Office.

Jurassic to Holocene calcareous nannofossils from the Falkland (Malvinas) Plateau

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A primary limitation on paleobiogeographic studies of calcareous nannofossils has been the lack of an adequate high-latitude coccolith record in the southern ocean. Although the geographic ranges of most modern coccoliths are limited to areas north of the Polar Front, during earlier geologic times when world climates were more equitable (that is, Jurassic, Cretaceous, Paleogene), coccoliths must have been dispersed farther into the higher polar latitudes than they are at present. Outside of single USNS *Eltanin* piston cores from the Kerguelen Plateau (Kaharoeddin *et al.,* 1973) and Naturaliste Plateau (Constans and Wise, 1974), calcareous Mesozoic pelagic material has been unavailable from the southern ocean. Deep sea drilling on the Campbell Plateau (Kennett *et al.,* 1974) and elsewhere in the Pacific sector of the southern ocean failed to obtain calcareous Mesozoic sediments. For this reason, the recovery of Mesozoic and Cenozoic coccolith-bearing sediments from sites at about 50° on the Falkland (Malvinas) Plateau in the Atlantic sector of the southern ocean by *Glomar Challenger* leg 36 and ARA *Islas Orcadas* cruise 7 is significant.

Glomar Challenger raised over 500 meters of drill core from three closely spaced sites on the Falkland (Malvinas) Plateau. Broader core coverage was provided by 22 *Islas Orcadas* piston cores taken in the area of the *Glomar Challenger* (Deep Sea Drilling Project) drill sites. Taxonomic and biostratigraphic studies of coccoliths recovered have been reported by Wise and Wind (in press) and Ciesielski *et al.* (in preparation), whereas Haq *et al.* (in press) discuss the paleobiogeography of the Cenozoic assemblages.

Due to the more equitable climates that existed during Paleogene and Mesozoic times, the diversity of coccoliths from the Falkland (Malvinas) Plateau is greatest for the older assemblages. This is evident in figure 1, which indicates those assemblages sufficiently diverse to be zoned. Even so, definitions of the Cenozoic zones had to be broadened somewhat to permit workable zones to be established. A number of taxa studied are endemic to or flourished in the cooler high latitudes, and these offer some hope for further refinement of a high-latitude coccolith zonation when more is learned of their ranges. At present, endemic cooler water forms such as *Isthmolithus recurvus* Deflandre and *Nephrolithus frequens* Gorka are commonly used for high latitude zonations of the upper Eocene and Maestrichtian respectively. Other such forms common to abundant in the Falkland (Malvinas) Plateau material that should be useful for Southern Hemisphere correlations are:

Tertiary: *Chiasmolithus altus* Bukry and Percival (Oligocene), *Hornibrookina australis* Edwards and Perch-Nielsen and *Heliolithus universus* Wind and Wise (Paleocene).

Cretaceous: *Biscutum dissimilis* Wind and Wise, *Seribiscutum primitivum* (Thierstein), and *Sollasites falklandensis* Wind and Wise.

A number of the above have been used to establish new zones or subzones for use in the Falkland (Malvinas) Plateau region. Due to limited diversity, however, little in the way of a coccolith zonation could be applied to the Oligocene through Holocene sequences despite rather close sampling of over 400 meters of section in that interval.

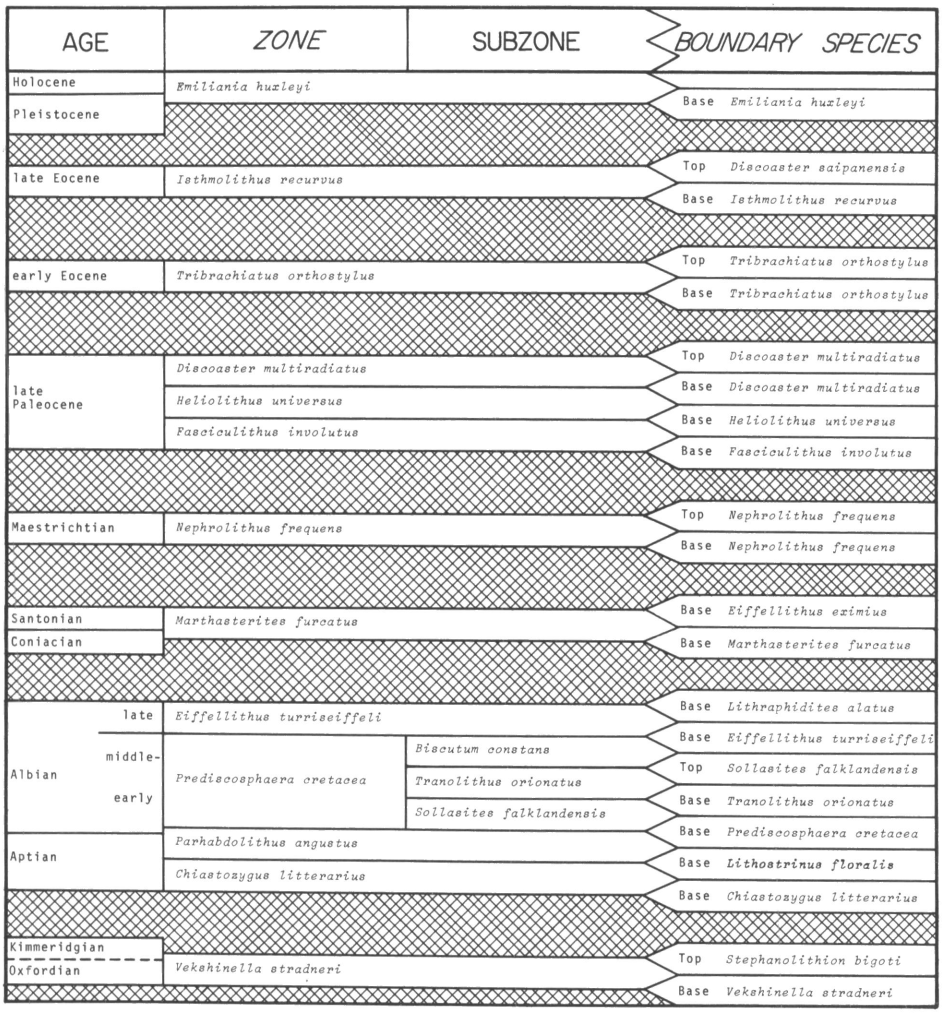

Figure 1. Calcareous nannofossil biostratigraphic zones applied to Falkland (Malvinas) Plateau coccolith assemblages (from Wise and Wind, in press).

Within the Mesozoic, assemblages of Oxfordian, Albian, and Maestrichtian age are diverse and well preserved. Aptian, Cenomanian, and Santonian nannofloras are generally of low diversity and poorly preserved. Most of the latest Jurassic, Neocomian, and Cenomanian-Turonian were not sampled due to hiatuses or to coring gaps. The exceptional preservation of some assemblages, however, particularly those of the Oxfordian, Maestrichtian, and certain levels of the Aptian permitted the identification of 32 new calcareous nannofossil species representing 12 new or existing genera. The majority of these are from the Maestrichtian of Deep Sea Drilling Project hole 327A (50°52.38'S. 46°47.02'W.; water depth, 2,401 meters), where shallow-water deposition, low overburden, and favorable lithology (a moderate biogenic silica and clay content) combined to preserve the nannoflora in a pristine state (figure 2).

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References

Ciesielski, P. F., W. V. Sliter, F. H. Wind, and S. W. Wise. In preparation. Cretaceous *Islas Orcadas* core from the Falkland (Malvinas) Plateau, southwest Atlantic.

Constans, R. E., and S. W. Wise. 1974. Cretaceous *Eltanin* core from south of Naturaliste Plateau. *Antarctic Journal of the U.S.* IX(5): 253-256.

Haq, B. U., G. P. Lohmann, and S. W. Wise. In press. Calcareous nannoplankton biogeography and its paleoclimatic implications. In: *Initial Reports of the Deep Sea Drilling Project* (Barker, P. F., I. W. D. Dalziel, *et al.*), 36. Washington, D.C., U.S. Government Printing Office.

Kaharoeddin, F. A., F. M. Weaver, and S. W. Wise. 1973. Cretaceous and Paleogene cores from the Kerguelen Plateau, southern ocean. *Antarctic Journal of the U.S.*, VIII(5): 297-298.

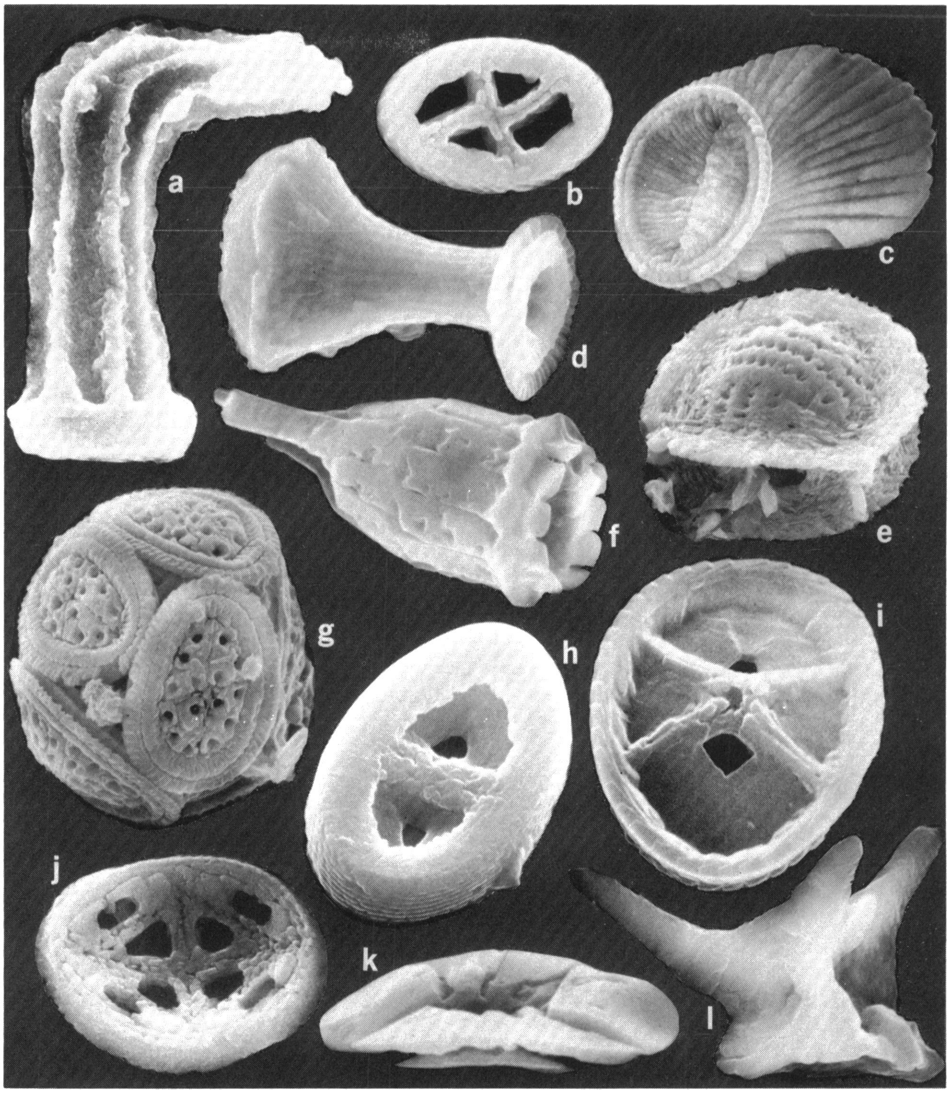

Figure 2. Maestrichtian specimens from Deep Sea Drilling Project leg 36, hole 327A (from Wise and Wind, in press). a. *Lucianorhabdus arcuatus* Forchheimer, X8,500. b. *Chiastozygus propagularia* Bukry, proximal view, X11,000. c. *Kamptnerius magnificus* Deflandre, X7,000. d. *Boletuvelum candens* Wind and Wise, X7,000. e. *Centosphaera barbata* Wind and Wise, X2,000. f. *Lapideacassis mariae* Black emend. Wind and Wise X6,500. g. *Arkhangelskiella cymbiformis* Vekshina, X4,000. h. *Zygodiscus* sp. (*Z. anthophorus* Deflandre?), proximal view, X10,000. i. *Eiffellithus turriseiffeli* (Deflandre and Fert), distal view, X13,500. j. *Monomarginatus quaternarius* Wind and Wise, proximal view, X7,500. k. *Biscutum dissimilis* Wind and Wise, lateral view, X7,400. l. *Micula decussata* Vekshina, X8,500.

Kennett, J. P., R. E. Houtz, *et al.* 1974. *Initial Reports of the Deep Sea Drilling Project,* 29. Washington, D.C., U.S. Government Printing Office. 1197p.

Wise, S. W., and F. H. Wind. In press. Mesozoic and Cenozoic calcareous nannofossils recovered by DSDP Leg 36 drilling on the Falkland Plateau, Atlantic sector of the Southern Ocean. In: *Initial Reports of the Deep Sea Drilling Project* (Barker, P. F., I. W. D. Dalziel, *et al.),* 36. Washington, D.C., U.S. Government Printing Office.

Early Pliocene paleoclimatology and radiolarian biostratigraphy of the southern ocean

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Radiolarian distributions have been studied in a suite of USNS *Eltanin* piston cores and Deep Sea Drilling Sites from the southern ocean (figure). A