micropaleontological evidence for glacial-interglacial temperature variation in low latitudes. Temperature variations based upon planktonic foraminifera indicated amplitudes of 4° to 5°C for the equatorial Atlantic. Emiliani's estimates of temperature from planktonic foraminiferal data were based on the frequency of selected species, whereas our estimate was based upon all species having a depth preference within the upper 150 m of the water column. A selective use of a few species could be responsible for shifts in the amplitude of temperature variation between glacial and nonglacial stages. Inspection of Table 1 also indicates that the early glacial stage had a mean temperature 0.7°C warmer than the late glacial stage. This reflects the sawtooth pattern of the glacial cycle indicated by Broecker and Van Donk (*2*).

Most paleotemperature studies have been carried out on piston cores from areas with relatively low sedimentation rates in an attempt to obtain as complete a Pleistocene record as possible. Our study and that of Imbrie and Broecker (*13*) indicate that investigation of regions with relatively high rates of sedimentation gives a more detailed history of the Late Pleistocene. Our results and those presented by Imbrie and Broecker (*13*) indicate a maximum variation between glacial and nonglacial stages of 3° to 4°C for the western equatorial Atlantic Ocean during the Late Pleistocene. This value is intermediate between the 5° to 6°C value of Emiliani (*1*) and the 2°C value of Shackleton (*3*) and Dansgaard and Tauber (*4*). It would therefore appear that variation in the ocean isotopic composition between Late Pleistocene glacial and nonglacial stages was more than 0.5 but less than 1.2 to 1.6 per mil.

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Fossil Penguin from the Late Cenozoic of South Africa

Abstract. Spheniscus predemersus, *new species, from the late Pliocene of Langebaanweg, Cape Province, is the first fossil penguin to be described from Africa. It is closely related and possibly ancestral to the living species,* Spheniscus demersus, *of southern and southwestern Africa.*

Penguins now occur on all continents and many islands south of the equator. Fossils ranging from late Eocene to Pleistocene in age have been found at various localities in southern Australia, New Zealand, and Argentina, and on Seymour Island, north of the Antarctic Circle off the northeast end of the Antarctic Peninsula. Although Recent penguins are numerous along the coasts of southern and southwestern Africa, no fossil penguins have previously been reported from that continent. Several late Cenozoic specimens have now been found in excavations carried out for the South African Museum near Langebaanweg in southwestern Cape Province, and these have kindly been submitted to me for study by Q. B. Hendey. Details as to locality, horizon, and dating have been given by Hendey (*1, 2*).

The specimens, all in the South African Museum, Cape Town, are as follows:

L6510. Left humerus complete except small portion, probably less than 1 mm, of extreme distal tip. From "E" quarry (*1*), horizon uncertain but probably horizon 1.

L12887A. Left humerus lacking proximal end. From "E" quarry, horizon 1.

———. Right humerus, shaft, lacking both ends. From site 1/1968, "E" quarry, horizon 3 or 4.

L6507. Right tibiotarsus, approximately proximal half. From "E" quarry, horizon unknown but probably horizon 1.

L3656. Left femur, from "E" quarry, horizon uncertain but probably horizon 1.

L13154. Right femur. From "E" quarry, horizon 1.

———. Proximal pedal phalanx, from "E" quarry, horizon 3 or 4.

The fossils from "E" quarry were at first (*1*) considered early middle or, at oldest, perhaps early Pleistocene in age, but later study (*2*) indicates that horizons 1 and 2 are Pliocene and horizons 3 and 4 are Pleistocene. The fossils from the latter horizons may have been derived from the older levels, and the

Table 1. Measurements, in millimeters, of femora of *Spheniscus* sp. from Langebaanweg.

Specimen	Width			
	Length	Proximal	Medial	Distal
L3656	84.7	19.5	8.6	16.8
L13154	80.1	19.3	7.7	16.6

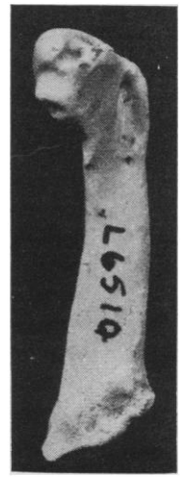

Fig. 1. *Spheniscus predemersus,* new species, holotype, South African Museum specimen L6510. This specimen is the left humerus shown in ventral view at natural size.

specimens listed are probably all Pliocene in age.

All the specimens resemble Recent species of *Spheniscus*, and reference to that genus is sufficiently probable. It is improbable that all belong to a single species, because the available bones of the hind limb are distinctly larger, relative to the humeri, than in Recent species or in the few fossil species in which these bones are known in association. The femur, tibiotarsus, and phalanges are not readily identifiable to species in penguins and are especially poor for comparisons with fossils as no fossil species have them as holotypes. Those bones in the present collection could all belong to one species, which can best be designated as *Spheniscus* sp. indet. at present (see measurements of femora in Table 1).

Humeri are usually characteristic in penguins, and most of the taxonomy of fossil penguins is based on these bones, the tarsometatarsi (not available in the present case), or both. Specimen L6510 is smaller than any of the specimens of *S. demersus* with which it was compared: about 14 percent shorter than their mean and about 10 percent shorter than the smallest of them. It also has a slightly more sigmoid shaft and lacks the preaxial angulation, small but visible on all of five compared specimens of *S. demersus*. On specimen L12887A the length cannot be measured definitely, but it was probably about the length of specimen L6510 and was shorter than the compared specimens of *S. demersus*. The shaft is also somewhat sigmoid and without a preaxial angulation. However, the shaft is stouter than that of specimen L6510 and within the *S. demersus* range in this respect. The other humerus cannot be precisely measured except for distal width of shaft, but the preserved parts are virtually identical with specimen L12887A and also differ from specimen L6510 only in having a somewhat stouter shaft.

The fossil humeri differ from available *S. demersus* in three characters that are rather constant in penguins (*3*). The difference in length is significant ($P = < .05$, t-test) in spite of the small available sample of the Recent species (d.f. = 4). Although the distinction cannot be considered certain, it seems probable that the fossils should be distinguished specifically from the living penguins of the same region. There is nothing in the available data to preclude a directly ancestral relationship.

Table 2. Measurements, in millimeters, of humeri of fossil penguins from Langebaanweg and Recent *Spheniscus demersus*. A, Width of shaft, proximal, below internal tuberosity; B, width of shaft, distal, above distal expansion; C, maximum length; D, proximo-distal distance from most proximal part of head to below internal tuberosity.

Specimen	A	B	C	D	C/D	B/A
			Spheniscus predemersus			
L6510	9.5	10.8	~ 59¼	13.4	~ 4.4	1.14
L12887A	10.3	11.7				1.14
1/1968		12.0				
			Spheniscus demersus			
Range (4 specimens)	10.2–11.5	11.8–14.1	65.5–73.5	15.0–16.1	4.23–4.66	1.16–1.23
Mean (4 specimens)	10.80	12.80	69.10	15.60	4.43	1.18

Spheniscus predemersus, new species

Etymology: *Pre*, before, *demersus*, specific name of the living South African penguins, to indicate the earlier occurrence and probable relationship of the fossil species.

Holotype: South African Museum specimen L6510, as above.

Hypodigm: The type, L12887A, and humerus from site 1/1968, as above.

Known distribution. "E" quarry, Langebaanweg, late Pliocene of South Africa.

Diagnosis: Humerus shorter than in *S. demersus*, shaft more sigmoid and without preaxial angulation. The measurements are given in Table 2.

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DNA Synthesis in Differentiating Skeletal Muscle Cells: Initiation by Ultraviolet Light

Abstract. *As skeletal muscle cells differentiate, they fail to initiate DNA synthesis. This rigid regulation, which persists even after cells are fully developed, does not extend to "repair" DNA synthesis, in that ultraviolet light initiates DNA synthesis in 99 percent of the muscle nuclei exposed. The rate of "repair" DNA synthesis in these nuclei, however, drops over 50 percent at the time of cell differentiation.*

The nuclei of multinucleated skeletal muscle cells have been shown never to enter the DNA synthetic phase of the cell cycle. These syncytial cells form in embryonic life by the fusion of many mononucleated cells which, until the time of fusion, are quite capable of DNA synthesis. Numerous attempts by autoradiography have failed to demonstrate incorporation of tritiated thymidine into nuclei of multinucleated skeletal muscle cells (*1*). The basis of the abrupt change from a proliferative to a nonproliferative cell at the time of cell fusion is not known.

Recent studies demonstrate both in vitro and in vivo that, as mononucleated cells fuse during muscle differentiation, they loose some 80 to 90 percent of their replicative DNA polymerase activity (*2*). Although, in eukaryotic cells, it is not known whether this particular DNA polymerase is involved, it is thought that the "repair" or "unscheduled" synthesis of DNA after damage by ultraviolet light does require a DNA polymerase (*3*). If the polymerizing enzyme involved in repair DNA synthesis is the replicative polymerase found in soluble fractions of eukaryotic cells, then one might expect to find either no repair synthesis or a deficiency in repair DNA synthesis in skeletal muscle cells as they go from the mononucleated to the multinucleated state of differentiation. The experiments reported here were performed to determine whether the controls of semiconservative DNA replication in