mechanisms that are primary factors in allowing for prolonged diving[5,6].

Many of the deep dives into waters of 7.8° C or colder are feeding forays. The whale is taking food (primarily squid) into its stomach in large quantities. This food is in thermal equilibrium with the seawater and poses an additional heat drain not previously considered.

I thank Mr L. E. McKinley and Professor R. J. Harrison for comments.

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DR CLARKE writes: Dr Ridgway's points will be discussed in detail in an article which will include the observations and calculations on which the original hypothesis rests, but I should like to make a few comments now.

Tursiops is neutrally buoyant at the surface with its lungs full[3]. Compression would cause negative buoyancy. My observations show that *Physeter* is near neutral buoyancy with its lungs empty. Whether its lungs are full or empty at the start of a dive, it would be near neutral buoyancy at depth (ignoring the temperature effect on water density).

An oil-temperature mechanism for balancing the temperature-dependent water density at depth would be better than an air pressure mechanism which cannot operate in the variable conditions encountered by a sperm whale over its geographical and depth range. The whale would need to be neutrally buoyant at the surface, with the volume of air in its lungs required to balance water density at a particular depth and location.

The oil-temperature mechanism depends on energy which would otherwise be lost as heat, so that it is not "expensive" energetically. Also an air-pressure system has no fail-safe relationship between the length of dive and the energy used. Unpublished observations on sixty-four whales show that if food taken at depth reaches equilibrium with body temperature before the whale surfaces, the volume of food is rarely sufficient to absorb more than about a tenth of the heat required to melt the spermaceti. In one case[1] the volume of food taken in one dive would have absorbed 0.4×10^4 kcalories—a quarter of the heat required to melt the spermaceti. However, the thickness and non-vascularity of the first stomach wall together with vasoconstriction during the dive could delay equilibration until the whale was rising or at the surface, when the cooling effect would be useful.

A delay in the onset of vasoconstriction and bradycardia has been observed in *Callorhinus*[2] and this would cool the spermaceti at the start of a dive.

Ridgway requires water to enter the nares; I have detected sulphate, indicative of salt water, in both nares of some sperm whales. In reply to his comment on oxygen conservation, this would be affected at the end of a dive if vasodilation included all tissues, but advantages in utilization of heat energy for controlling buoyancy could compensate for this.

The habits of *Tursiops* differ from those of the sperm whale; normally it swims fast, feeds at much shallower depths and its dives are only about one-tenth the duration of those of the sperm whale.

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Alpha Rhythm in the Blind

THE principal objection to the theory[1,2] that extra-ocular tremor generates alpha rhythm has been the indisputable fact that it is possible to record it in some patients who have had both eyes removed[3].

We have re-examined the eyeless patient described by Shaw, Foley and Blowers[3] and find that there are present, across the empty orbits, standing potentials which behave in a manner similar to the normal corneo-retinal potential. When the patient was asked, "Please look to the left and then to the right", an approximately rectangular waveform, of amplitude about 100 μV peak to peak, appeared between electrodes placed on the inner and outer canthi. This potential was also distributed over the scalp with maximum amplitude anteriorly and minimum amplitude over the occipital region, although it could still be detected there (Fig. 1).

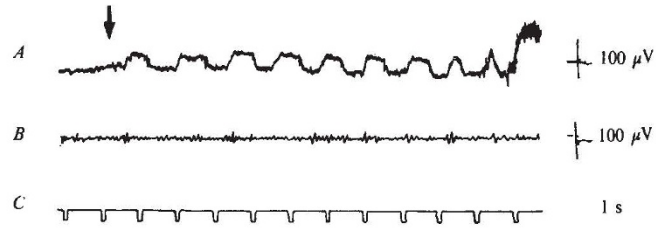

Fig. 1 Sample of EOG record (*A*) and EEG record (*B*) from a young diabetic woman of 27 who had both eyes removed because of complications of bilateral glaucoma at the age of 24. This is the patient described by Shaw, Foley and Blowers[3]. Record (*A*) is taken from electrodes placed on the inner and outer canthi of the left eye. At the arrow, the request was made, "Look left, look right, look left. . . ." Potential changes 50 to 75 μV in amplitude (resembling those found in normal subjects due to the corneo-retinal potential) occur concomitant with the commands. Record (*B*) is taken from leads T_6–O_2 and filtered to select only those frequencies in the range 8 to 12 Hz. There is some degree of correlation between bursts of alpha waves and the excursions in the EOG trace.

The explanation for this phenomenon seems to be that the globe in each orbit has not been removed in its entirety, and that the extra-ocular muscles and a large part of the fundus of the eye remain, including Bruch's membrane which generates the corneo-retinal potential. The magnitude of the potential seemed to be affected only to a small extent, if at all, by alteration in the level of ambient illumination.

Examination of the interior of the orbit showed the lining membrane to be in a state of continual fluttering movement, which was clearly affected by external stimuli such as sounds or light touches on the face. The frequency of many of these movements could well have been within the frequency range of the alpha waves which were concurrently present in the scalp recordings.

It follows, therefore, that the simple, and apparently obvious, fact that an eyeless subject still has alpha waves need not necessarily invalidate the theory that eye muscle tremor produces alpha rhythm.

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