

finding that such rats have an elevated metabolism<sup>6</sup>, seems to indicate that heat-loss is counteracted both by reducing the blood flow through the tail and by a greater heat production. This would be in good agreement with our findings.

Work on the problem of ringtail is being continued. It was, however, thought to be of some value to publish this preliminary communication before next winter, in case other laboratories have experienced similar troubles to those related here.

LEIF REIN NJAA  
FINN UTNE  
OLAF R. BRÆKKAN

Governmental Vitamin Laboratory,  
Norwegian Fisheries Research Institute,  
Bergen. April 13.

<sup>1</sup> Farris, E. J., and Griffith, J. Q., "The Rat in Laboratory Investigation" (Philadelphia, 1949).

<sup>2</sup> Evans, H. M., Lepkovsky, S., and Murphy, E. A., *J. Biol. Chem.*, **106**, 431 (1934).

<sup>3</sup> Guggenheim, M., and Jürgens, R., *Helv. Physiol. et Pharmacol. Acta*, **2**, 417 (1944). Burr, G. O., and Burr, M. M., *J. Biol. Chem.*, **82**, 345 (1929). Hegsted, D. M., Vitale, J. J., and McGrath, H., *J. Nutr.*, **58**, 175 (1956). Nishimura, H., *ibid.*, **49**, 79 (1953).

<sup>4</sup> Gordon, D. B., Flasher, J., and Drury, D. R., *Amer. J. Physiol.*, **173**, 275 (1953).

<sup>5</sup> Brown, W. R., and Burr, G. O., *J. Biol. Chem.*, **114**, xvi (1936). Hume, E. M., Nunn, L. C. A., Maclean, I. S., and Smith, H. H., *Biochem. J.*, **32**, 2162 (1938).

<sup>6</sup> Wesson, L. G., and Burr, G. O., *J. Biol. Chem.*, **91**, 525 (1931). Burr, G. O., and Beber, A. J., *J. Nutr.*, **14**, 553 (1937).

### Underwater Sounds heard from Sperm Whales

WHILE the sperm whale (*Physeter catodon*) is one of the more conspicuous cetaceans, it has not figured among the relatively few that have been demonstrated to make underwater sounds, although they have occasionally been suspected of doing so. We have now obtained reliable evidence that they, too, are soniferous.

On March 28, 1957, off the North Carolina coast, our vessel *Atlantis* encountered five sperm whales which permitted the ship to approach as close as 15 metres. During the hour spent with the whales, the engines were frequently shut off to permit listening by means of the echo-sounding receiver. Unfortunately phonographic equipment was not available.

Three types of sound were distinguished. The first, heard before the whales were sighted, was a muffled, smashing noise, with impulses about half a second apart, increasing in intensity to the end of the series. At first it was supposed to be hammering somewhere in the ship, but it was determined that the sound was not made on board. Later, when the whales were in plain sight most of the time, this sound was less conspicuous. A second sound was a grating sort of groan, very low in pitch, which reminded some of a rusty hinge creaking. This lasted as long as five seconds at a time. By far the most common sounds were series of sharp clicks, which were loud enough to blacken the sounding recorder paper, and which usually occurred at intervals of about half a second, but occasionally as rapidly as about five clicks per second. As many as 73 successive clicks were counted. They usually came in groups of 20 or so. Different individuals chimed in from time to time, and there was no period of more than a few seconds without clicks.

The echo-sounding receiver was used for listening on at least thirty different occasions before and after this encounter, and no similar noises were heard.

These observations on *Atlantis* were made by Worthington. It is to be hoped that they will be repeated by others fortunate enough to meet sperm whales, and that they will be supported by phonographic recordings. Although relatively few ships carry broad-band listening and recording gear, many nowadays have echo-sounding equipment. Ordinarily, this can be used for listening, with the transmitter silenced. It is true that most such devices will convey an imperfect version of the sounds heard, since they are designed for a very narrow frequency band centred on the transmitting frequency, and are then often heterodyned well down the spectrum. This, for example, applies to the sounds reported by Worthington, whose equipment selected and emphasized frequencies between 10–17 kc./s. and delivered them to him near 4 kc./s. Nevertheless, at this early stage in our study of marine sounds, such a phonograph record may still be of value, especially if the characteristics of the listening and recording system are known.

While the absence of adequate records makes the matter speculative, it seems likely that the clicks heard by *Atlantis* may correspond to the familiar clicks employed in echo-location by the smaller odontocetes<sup>1</sup>; the 'groan' reported by Worthington may turn out to be a rapid succession of clicks.

Occasionally, in the accounts of the nineteenth-century open-boat sperm whalers, there are allusions to comparable sounds made by the quarry. Thus Bennett's creaking<sup>2</sup> reminds one of Worthington's groan. One of the last of the New Bedford whalers, the late Mr. Henry Mandly, jun., has told Schevill of hearing, in calm weather, impulsive noises from below while waiting in the boats for sperm whales to reappear; these he said were believed to be the whale "snapping his spouters". In spite of the allusions of Davis<sup>3</sup>, which describe this act as occurring in air at the surface, it seems improbable that the blowhole as such is involved. Possibly this 'snapping' and Worthington's loud clicks are the same. It is quite likely that the whalers, undisturbed by engine noises, could at times have heard these abrupt under-water sounds.

*Note added in proof.* On June 4 and 27, R. H. Backus, in our vessel *Bear*, succeeded in making phonographic recordings of sperm whales some 200 miles south of Cape Cod. These recordings closely resemble Worthington's description.

L. V. WORTHINGTON  
WILLIAM E. SCHEVILL

Woods Hole Oceanographic Institution,  
Woods Hole, Massachusetts. April 24.

<sup>1</sup> Schevill, W. E., and Lawrence, B., *Breviora*, Mus. Comp. Zool. Harvard, No. 53, 5 (1956).

<sup>2</sup> Bennett, F. D., "Narrative of a Whaling Voyage round the Globe", 2, 206 (London, 1840).

<sup>3</sup> Davis, W. M., "Nimrod of the Sea", pp. 236, 355 (New York, 1874).

### Precision Determination of Cell Dimensions by the Back-Reflexion Weissenberg Method

ALTHOUGH it provides an elegant and accurate means of determining crystal lattice parameters, the back-reflexion Weissenberg method has not been widely used since it was first proposed in 1937<sup>1,2</sup>. Originally a special camera was built for taking back-reflexion Weissenberg photographs, and it is presumably the lack of this instrument in most crystallographic laboratories that accounts for the neglect