of inertia of the electronic system in the metal atom. Assuming that the electronic system partakes fully in the rotation and vibration of the molecule, that is, suppose there is no lag of the inner shells in aluminium, a rough estimation of this correction on the basis of classical theory with electronic orbits leads to $\rho^2 = 0{\cdot}5190$, in good agreement with the spectroscopic value. A more refined calculation of the electronic effect, using methods given by Thomas[2] and Hartree[3], leads to $\rho^2 = 0{\cdot}51892$. As a matter of fact, this value is in surprising agreement with our latest value, $\rho^2 = 0{\cdot}51889$, obtained from recalculation of the spectrum, based on improved measurements.

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[1] NATURE, **133**, 496, March 31, 1934.
[2] *Proc. Camb. Phil. Soc.*, **23**, 542; 1927.
[3] *ibid.*, **24**, 89; 1928.

Enzyme Catalysis of the Ionisation of Hydrogen

THE well-known analogy between the colloidal metallic catalysts and certain enzymes early suggested to us the inclusion of the latter in our survey of catalysts for the ionisation of hydrogen[1], and the work of Stephenson and Stickland on "hydrogenase"[2] indicated the most promising material for investigation. Work has now been in progress for some time on several strains of *Bact. Coli* and on *Bact. Acidi Lactici*, and we wish to make a preliminary report of our results—the more so as the announcement of a forthcoming paper by Hughes, Yudkin, Kemp and Rideal includes a brief reference to work which may be following parallel lines.

We have found that these bacteria are able, like platinum black, to catalyse the reaction:

$$HD + H_2O \rightarrow H_2 + HDO,$$

and in the case of *B. Acidi Lactici* we have measured the first-order velocity constant ($K = \frac{1}{t} \ln \frac{C_0}{C}$) at 37° for a known number of organisms:

Number of Organisms		Partial Pressure of Hydrogen	Initial Atomic per cent Diplogen	K in min.$^{-1}$
Total 5×10^{11}	Living $2{\cdot}2 \times 10^{11}$	360 mm.	1·08	0·0065

The 'total' number of organisms was estimated by comparison with standard (killed) suspensions, the number living by dilution and agar-plate-count. The bacteria, which in each case were washed three times in 0·85 per cent saline (with centrifuging) and finally aerated before use, were presumably in the 'resting' state (so far as the living are concerned). Partially 'heavy' hydrogen and the (de-aerated) saline suspension of the bacteria were the only materials present in the (sealed) reaction vessel, which was vigorously shaken.

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[1] NATURE, **132**, 819, Nov. 25, 1933, *et alia*.
[2] *Biochem. J.*, **25**, 204, *et alia*.

Breathing Movements of Whales

WHALES, when breathing, usually keep on the move; the purpose of this letter is to explain why. All aquatic air-breathing creatures have to contend with the risk of water entering their lungs. Although the blow-holes of whales are valvular and situated on the highest part of the head, these animals, usually, can only breathe with safety when their blow-holes are at some height above the surface of the sea.

Owing to their shape, whales, usually, can only bring their blow-holes into a favourable position for breathing by coming up to the surface obliquely at some speed, and as they only get time to take a single breath, they have to repeat the performance again and again. The following extract from a paper by Racovitza[1] shows that this, in fact, is their usual behaviour.

"The whale, having returned to the surface, after a long immersion, emits a prolonged expiration, makes a short inspiration, dives a little, re-appears to breathe, dives again, and then many times in succession; then it makes a long inspiration and plunges into the depths for a considerable time." Again, he says, "the number of these intermediate immersions before sounding varies according to the species. In general, whale-bone whales execute but a few, the toothed whales very many. In all cetaceans, however, they are characterised by the following . . . (2) the interval between the re-appearances is very short; (3) the animal dives only to a slight depth; . . . (5) the whale, during the time it is under water, progresses quite rapidly, usually in a straight line."

The effort that whales require to make on these occasions seems to depend on the roughness of the sea; and the height of the animal's crown, on which the blow-holes are situated, above the water. The Greenland whale, or Bow-head, is well off in this respect, owing to its high crown. It is able to lie motionless with its blow-holes a foot or two above the surface.

Exceptionally, whales sometimes breathe while lying motionless at the surface. This generally occurs where the sea is very smooth and applies more particularly to the Greenland whale and narwhal—whales that habitually frequent the ice.

The Greenland whale frequently breathes while motionless or nearly so. Indeed, in narrow situations it is difficult to see how it can do otherwise. Scoresby[2] says, "Several (Greenland) whales being astir and the weather fine, we . . . sent all our boats in pursuit. These whales were rather numerous, four or five being sometimes seen at a time. The usual stay of a whale at the surface for breathing is about two minutes, seldom much longer, but it was a remarkable circumstance in the conduct of these whales, that they remained regularly from five to fifteen minutes at a time, and some, nearly half-an-hour before descending out of sight. During this long interval they were generally quite motionless."

Greenland whales, when there is no ice, probably behave in the usual way. This in fact seems to be the case. Sutherland[3], referring to Davis Strait and the 'fall' of the year when there is no ice, says, "Whales are very numerous and, at the same time, they are so wild that it is almost impossible to approach them."

Narwhals are sometimes seen breathing while motionless, particularly in very fine weather and in narrow situations. These animals are provided with