

angle of rotation (of the second lens) round the line of sight. It is not very easy to give an exact estimate of the accuracy of the angles measured in practice; it would seem to vary from about 1° with high powers (5 to 7 diopters²) to about 5° with low powers ($\frac{1}{4}$ to $\frac{1}{2}$ diopter). As an *average*, we may perhaps assume that the apparatus admits of about 80 to 100 distinctive positions for the cylindrical lens; then the oculist has at his disposal the equivalent of

$$60 \times 40 \times 80 = 192,000$$

or $60 \times 40 \times 100 = 240,000$

separate astigmatic lenses. In round figures, we may take the outfit as providing 200,000 lenses; and plainly, if each lens had to be ground separately, the cost of such an equipment would be prohibitive. Even at 1s. each, the cost would be of the order of £10,000; the actual cost of 100 lenses (at the same rate) would be £5, and we may perhaps add £5 to £10 to represent the cost of the instruments for measuring the angles of rotation. Further, the labour involved in choosing the lens best suited to a given eye would be increased very considerably; and much care would be required in storing the lenses, so as to be readily accessible when testing a patient's eyesight.

It was stated recently that more than a million pairs of astigmatic lenses are prescribed in Great Britain every year; but (without the discovery made by Stokes) it is doubtful if even a thousand pairs of eyes could be tested in the same time.

T. J. FA BROMWICH.

Cambridge, April 7.

Science and Nature.

RETURNING last week from attending an International Moral Education Conference at the Paris Sorbonne, where the ambiguity of philosophical and scientific terms in current use was considered as being a serious bar to true international understanding, it was with especial pleasure that I read Dr. J. E. Turner's letter in NATURE of April 21. We did not, on this occasion, at the Sorbonne deal specifically with the word Nature, although we might well have done so in view of its notorious ambiguity. Dogmatism and ambiguity are generally contrasted, but they are nevertheless often allied.

May I direct readers' attention to John Stuart Mill's essay on Nature, which was published after his death. In this essay Mill contends that it would be difficult to find a word that is responsible for "more bad morality and bad law." He points out that a critical examination of all the confused uses to which this word has been put, reveals two main definitions:

1. That held by the early Greek and Roman philosophers, who enjoined, as a fundamental principle, that we should "follow Nature"; implying by Nature the entire system of things, including not only the blind physical and biological forces acting spontaneously, but also all human intelligence, belief, perception, understanding, and action. Mill argues that an injunction to follow Nature, thus comprehensively expressed, is obviously superfluous, seeing that no one could in any circumstances by any possibility do otherwise. He says, however, that to endeavour to understand Nature in that sense is another and indeed quite profitable task.

2. The popular definition, Nature considered as opposed to art: That is to say, Nature signifying the spontaneous course of blind physical and biological forces acting presumably in complete independence

² The diopter is the power of a lens the focal length of which is 1 metre; thus, when the centimetre is the unit of length, the diopter is represented by $\frac{100}{f}$.

of human intelligence. Mill then argues that to follow this kind of Nature is clearly immoral, in that all the noblest human endeavours throughout the ages have invariably been directed towards stemming and counteracting its ruthless depredations. Mill makes this proposition clear by means of a large number of cogent and striking illustrations.

We must conclude, therefore, that Nature is often employed euphemistically as an evasive term, either to cover our ignorance or to express some passing feeling or predilection misconceived as a fundamental principle. When, more than fifty years ago, I was one of his devoted students, the great Thomas Huxley went to remind us that words and phrases were instruments of thought, not substitutes for clear thinking.

ST. G. LANE FOX PRIT.

47 Chester Terrace,

London, S.W.1, April 24.

The Buoyancy of Whales.

IN letters recently published in NATURE (Mar. 17, p. 421; May 5, p. 710) Mr. R. W. Gray records the interesting fact that whales dying 'at a depth' invariably sink, while those (of certain species) which die at the surface always remain floating. He suggests that the failure to rise after death may be due to the escape of air from the lungs, and in his second letter he attributes this to the water-pressure, which at a certain depth becomes sufficient to overcome the resistance of the valves of the blow-holes.

It does not seem probable that these statements are based on actual observation of the escape of air, and I think the explanation should not be accepted unless Mr. Gray can bring forward definite evidence that his suggestion is correct. He has informed us that a Greenland Whale barely floats after death at the surface, and it follows that its specific gravity does not differ greatly from that of sea-water. At considerable depths, whether the animal be dead or alive, the volume of its thorax must be appreciably reduced by the pressure of the water. The diminution of size involves an alteration of the specific gravity, which might well become greater than that of the water, in which case the dead whale would remain at the bottom. The fact that the carcass may rise to the surface later, after gases of decomposition have generated in the tissues, does not seem to preclude this suggestion.

The statement (p. 710) that when a whale wishes to sink it compresses its lungs is also open to criticism. I think it descends by swimming downwards, and it seems unnecessary to assume that it must deliberately alter the size of its thorax before it can leave the surface.

In another issue (April 14, p. 576) Mr. T. H. Taylor suggests that the filling of the lungs of whales may be due to the elastic recoil of the thoracic wall and not to a muscular effort. Is this not also improbable? The diaphragm is highly developed in the Cetacea, and definite evidence is surely required before it can be concluded that its function is not the same in these and other mammals. The extent of its projection into the cavity of the thorax (in the dolphins at least) should make it specially efficient in enlarging the chest by its contraction. The ribs of a large whale are, moreover, so heavy and massive that it is difficult to imagine an elastic recoil of sufficient force to expand the cavity of the thorax fully. There is no difficulty in supposing that the movement of the ribs during the act of inspiration is due to muscular action, as in other mammals.

SIDNEY F. HARMER.

Melbourn, Cambs.