and (C) the posterior molar, all of the left ramus of the mandible. In (B) and (C) can be seen the isthmus joining the roots of the molars and the traces of the original third root. The peculiar cusp-like pattern on the face of the teeth is also well shown.

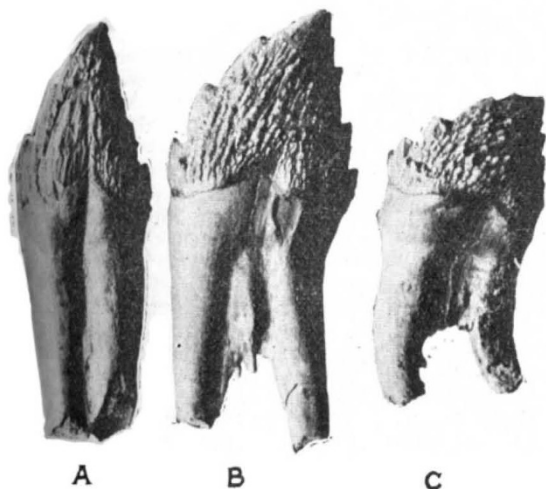It should be mentioned that the knob which is

FIG. 2.

apparent in front of the nasal region of the skull in Fig. 1 is merely a concretion difficult to remove without damage to the skull.

T. THOMSON FLYNN,
Ralston Professor of Biology.
University of Tasmania, Hobart, September 9.

The Energy of Cyclones.

I DO not find that people in general are aware of an important source of energy for the maintenance and intensification of cyclones, nor am I acquainted with a clear exposition by a meteorologist that the condensation of aqueous vapour will suffice.

Atmospheric pressure being a ton weight per square foot, the disappearance or collapse of a cubic foot of ordinary air would yield a foot-ton of work. The disappearance, by complete condensation, of the aqueous vapour in $760/12.7$, say 60, cubic feet of atmosphere would yield the same amount.

If, then, the temperature of saturated air fell from 18° to 12° C. by reason of condensation and rainfall, so that the vapour-pressure diminished from 15.36 to 10.46 mm. of mercury, a foot-ton would be generated in each 155 cubic feet of that region of the atmosphere. Incidentally, the corresponding deposit of liquid would be 5 grams per cubic metre, or a rainfall of $\frac{1}{8}$ in. from a vertical mile of air.

Assuming that the above fall of temperature in the central region of a travelling cyclone is not excessive, the energy available in each cubic mile of it would be nearly a thousand million foot-tons.

OLIVER LODGE.

WITH reference to Mr. R. M. Deeley's letter on the above subject in NATURE of November 11, may I suggest that the energy of a cyclone is derived from the heat-energy of the earth's surface? If we assume that the air which ascends in the centre of the vortex is less dense on the whole than the air which is at the same temperature outside the vortex, then, since the ascending current must be compensated by a descending current elsewhere, the air will go through a thermodynamic cycle in which positive work will be done at the expense of the heat communicated at the earth's surface.

The process may be compared roughly to a Carnot's cycle, in which the inflowing air at the earth's surface is isothermally raised in temperature, expands adiabatically as it ascends, cools isothermally by radiation at the higher levels as it flows outwards, and contracts adiabatically in descending again. The work done would appear as increased vortical motion if the conditions were favourable, and the mechanical forces causing the motion would be due to the differences of hydrostatic pressure within and without the cyclone.

J. R. COTTER.

Trinity College, Dublin, November 13.

Molecular and Cosmical Magnetism.

RECENT researches on magnetism tend to suggest that the negative electron may be a magneton or unitary electromagnet as well as a unitary electric charge, consisting, that is, of an anchor-ring of negative electricity in rotation about its axis of symmetry. Such a magneton would behave mechanically like a gyroscope; magneto-gyroscopic effects have been previously considered and observed in relation to ferromagnetic bodies on the assumption that the ferromagnetism is due to electrons in orbital motion as a whole. Wider conclusions can be drawn, however, if the magneton hypothesis is adopted, and the deductions are of importance, not only in the theory of atomic and crystal structure, but also in relation to cosmical magnetism. The following notes describe a few of the more important consequences; a detailed account of the theory and of some experiments designed to test its validity will be published shortly.

A magneton rotating with any kind of matter will tend to align its axis parallel with the axis of rotation. Since the electricity of the magneton is negative, the direction of magnetisation will be related to that of rotation, as is the direction of translation to that of rotation in a left-handed screw. This is the right direction in order to account for the general magnetic fields of the earth and sun as due simply to their rotation. The explanation of the observed magnitudes of these fields seems to present no difficulty; numerical details will be given in the forthcoming paper, where also a theory will be suggested to account for the rapid radial diminution of intensity in the sun's general magnetic field.

Mr. S. J. Barnett has shown by delicate experiments on ferro-magnetic bodies that they become magnetised slightly on being rapidly rotated, and has propounded a theory according to which such bodies should acquire magnetisation of amount proportional to the angular velocity, the factor being a universal constant depending on the ratio (mass/charge) for an electron. The fields observed and calculated (on this theory) agree as to order of magnitude, but are quite inadequate to account for solar and terrestrial magnetism. The theory, however, apart from the fact that it is based on the hypothesis of electrons in orbital motion, seems to require serious modification.

On the present theory, magnetisation by rotation should be shown by dia- and para-magnetic bodies as well as by ferro-magnetic substances, and the intensity should be proportional to the angular velocity only when the substance is in such a state that the constraints exerted on the magneton by neighbouring nuclei and electrons are strictly elastic. In this case, moreover, the factor of proportionality will not be a universal constant, but will vary with the nature of the constraints, and in particular with temperature; in hot bodies the intensity of magnetisation should