Mass and Inertia.

PROF. WORTHINGTON is perfectly right in saying that in my little book on mechanics I did not carefully and solely use the term inertia in the precise sense I suggested for it in my last letter. The fact that *m* is really only the coefficient of inertia had not been seized by me when I wrote that book. The idea of calling mass-acceleration inertia simply, was suggested, I believe, by a discussion on Newton's third law of motion in the pages of the *Engineer* some few years back. It is a suggestion which has gradually commended itself to me, and I am calling the attention of the British Association Committee on Mechanical Units and Nomenclature to it.

With regard to the other matter referred to by Prof. Worthington, it scarcely strikes one as a satisfactory plan to have one system of units for teaching and another for actual use. Is it not better to get students to tackle difficulties rather than evade them? OLIVER J. LODGE.

The Crystallization of Lake Ice.

THE percussion figures that Mr. Holland has discovered both are interesting in themselves and seem to be a very handy means of marking off one crystal from another in thin lake ice. Their symmetry about a vertical axis is evidence that the optic axes of the crystals were vertical. The small amount of snow here this winter has afforded unusual opportunities for examining the ice on the Davos lake, and I have found crystals, not indeed equal to those on the Welsh lakes, but still very large. A striking feature in the ice, about a week after it was strong enough to bear skaters, was the presence of a number of hexagonal disks, of all sizes up to a quarter of an inch diameter, with their planes apparently horizontal. Some were regular hexagons, but generally the sides were unequal, though the angles were always 120°. I concluded that within a single crystal all the hexagons would be similarly oriented, and that an interface of two crystals could be distinguished by a sudden twist in the direction of the sides. Judged by this test some of the crystals were at least a foot broad, and in depth no doubt equal to the thickness of the ice, at that time about a foot. To verify this conclusion Mr. Kidd hacked out a piece with the axe, and we prepared a rough plate six inches long and three thick, which we examined in the polariscope. The rings and cross were easily seen, and the plate proved to be all one crystal with the optic axis vertical *in situ*.

These hexagons are not identical with the figures observed by Prof. Tyndall in the path of a sunbeam through ice (described in "Forms of Water"), for at the time I saw them the ice was so cold that water froze rapidly in any hole that was made. A friend describes them as looking more like bits of cover-slip glass than anything else. They were formed, I was told, on a day when the warm Föhn wind was blowing, and the ice, no doubt, was at a thawing temperature. But the puzzle is, why they did not vanish when the temperature fell. They reflected light strongly, far more than Tyndall figures, and in some cases showed the colours of thin plates. I noticed that those that gleamed with reflected sunlight often lay considerably to right or left of the vertical plane through the sun. This showed that their planes were (allowing for refraction) inclined sometimes as much as 10° or 15° to the horizontal, and inferentially that the optic axes of the crystals were tilted an equal amount from the vertical. I hunted about all over the lake for signs of the columnar structure that I described in my article on "The Plasticity of Ice," but only succeeded in detecting it in one place close to the shore. We cut out a piece there and verified the existence of the columns with the polariscope. There were no hexagons in that part of the ice.

Of the St. Moritz lake last winter I can only give a very imperfect account. For at the time I began observations the great depth of snow had sunk the ice, and water had oozed into the snow and there frozen, so that the clear ice was covered with some eighteen inches of hard snow ice. The only part easy of access was where a supply of ice was being cut for the hotels. The process adopted was, after clearing the ice from a certain space, to leave that for a week or two, till the new ice had reached the thickness of a foot, and then cut it again. Both the new ice and the old ice in its neighbourhood was columnar. In one place, however, at some distance from the shore, where we got out a lump of clear ice, we found crystals with the optic axis vertical, and one, at least, three or four inches across.

Davos Platz, January 29. JAMES C. MCCONNEL.

Falls of Rock at Niagara.

THE following passages, which will interest geologists, I copy from the *Montreal Daily Star* of the dates given :—

"Niagara Falls, Ontario, January 7.—Last Friday evening, about 9 o'clock, a large mass of rock fell from the precipice of the Horse-shoe or Canadian Falls, and on Saturday night, at 10 o'clock, another mass broke away. In both cases the noise made alarmed the residents in the vicinity. In the Table Rock House, a stone building, doors were thrown open, and the occupants jumped out of bed greatly excited by the unusual noise and vibration, resembling severe shocks of an earthquake. The same sensation was experienced at the residence of the gate-keeper on Cedar Island, and also half a mile up the river. The effect of these falls on the contour of the cataract is quite marked, the change being from that of an angle at the vertex to the original horse-shoe shape."

"Niagara Falls, Ontario, January 15.—Another piece of rock broke away from the crest of the Horse-shoe on Sunday night. Although the jar was comparatively slight, the shock was distinctly felt at the Table Rock House. The cataract now presents the extraordinary shape of a double horse-shoe, the smaller one caused by the recent displacement being in advance and to the right of the great horse-shoe. Visitors familiar with the shape of the Canadian Falls during recent years will be able to appreciate the change at a glance.

"Thousands of people visited the Falls yesterday and to-day to view the relics of the bridge torn down by the late gale,—this is the upper suspension bridge, close to the Falls, destroyed by the storm of last week,—and also to enjoy the magnificent scenery which Niagara always presents when arrayed in her winter apparel. The contract for a new bridge to replace the one destroyed has already been let, and the work will be completed in ninety days."

Additional facts are here furnished in favour of the opinion that the recession of the great cataract is going on at a rate much more rapid than some have maintained, and more rapid than was estimated by Sir C. Lyell in 1842. Indeed, the rate given by Mr. Bakewell in his work on geology seems to have been nearer to the truth, 3 feet per annum instead of the 1 foot assumed by the author of the "Principles of Geology."

Akron, Ohio. E. W. CLAYPOLE.

Origin of the Radiolarian Earth of Barbados.

THE Barbados infusorial earth is well known for the beautiful specimens of Polycystina which it contains, but concerning the rock itself, its geological position, and probable mode of formation, little has been written.

Schomburgk, in his history of Barbados, gave a general description of it and indicated some of the localities where it had been found, but he did not separate it geologically from the group which he designated the "Scotland formation." One of us having resided in the island for some years has had opportunities of studying the lie of the deposit, and has found that it always overlies the rest of the Scotland beds, and that it generally, although not invariably, intervenes between them and the raised coral reefs which form the surface of the greater portion of the island. It has been found below the coral in certain borings recently made by the Barbados Water-supply Company, and there can be little doubt that it originally formed a sheet of considerable thickness extending beyond the present limits of the island.

The rock itself varies much in composition: in some places it is almost purely siliceous, consisting mainly of Radiolaria and Diatomaceæ, whilst in others it is largely calcareous (one sample having yielded as much as 79·9 per cent. of calcium carbonate), containing in places many Foraminifera. The more siliceous specimens agree closely with the descriptions given of those deep-sea oozes which contain Radiolaria and are more or less destitute of Foraminifera. We intend to pursue our investigation of the deposit, and to compare it, if possible, with samples of modern Radiolarian ooze, but the facts already known to us render it highly probable that the deposit is part of a raised ocean bed. If this conclusion be confirmed, it will correct the prevalent belief that oceanic deposits are not to be found amongst the rocks which form continents and continental islands, and will at the same time form a strong and well-nigh invincible argument against the theory of the permanence of oceans, a theory which has recently been discussed and rejected by one of us. J. B. HARRISON.

A. J. JUKES BROWNE.