I laid the theory before the late Prebendary Webb a few years ago, and some selections from it were published in the *Journal* of the Liverpool Astronomical Society, and, being necessarily incomplete, the extracts were not very intelligible. I have never attempted the settlement of the lunar surface temperature, which is quite beyond me, leaving the same in the hands of Prof. Langley, and have confined myself to the solution of the peculiar and unearthly surfacing we see. This I find best explained by glaciation, under conditions of intense cold, say $-60°$ or $80°$ C., and absence of all gaseous atmosphere.

I quite indorse Capt. Ericsson's conclusions as to the extreme unlikelihood of such a small globe being finally surfaced by igneous agencies, after it had seas of water, atmosphere, and probably *polar caps*.

Neison, in his "Moon," page 41, line 7, distinctly implies that this took place, *i.e.* "that this high temperature could only arise after the practical disappearance of bodies of water from the lunar surface," the rise in lunar temperature being due to solar heat.

I cannot follow Neison in this, and, on the contrary, believe that the temperature has steadily, if slowly, declined, from a period when there was erosion, with air and water. Polar caps then formed, as on our earth and Mars, and extended as the temperature fell, until at last the entire globe was cased in ice, the last portions to glaciate being what we call the equatorial seas.

Like Capt. Ericsson, I look on the craters and walled plains as having been lagoons of water, left here and there as glaciation extended, at places of greater depth, or more likely as submarine volcanic vents, for we see their sites as craterlets and cones after final glaciation.

The aqueous vapour given off from these lagoons would form a local dome-shaped atmosphere that would retard explosive ebullition, and on its reaching the outer limit of critical temperature, would condense and fall as snow; what fell beyond the lagoon margin would pile to form the ring, and the lagoon surface or flow be gradually lowered by its removal.

But I cannot follow Capt. Ericsson in supposing that the water had a centrifugal motion, and acted as a gigantic carving-tool, that sculptured the enormous terraces in Tycho, Theophilus, &c. On the contrary, I look on it as a quiet process, and that all the circular forms, from small craterlets to even such forms as Mare Crisium or Imbrium, with its huge maritime ranges, are due to one cause. The series is complete.

I quite agree with Mr. Darwin that a layer of water vapour would exist (and be visible) over the ice on the moon if only the temperature be high enough; but, at very low temperatures, ice practically does not vaporise even *in vacuo* (see Ganot's "Physics"). Aqueous vapour not being seen, I conclude the temperature is below (say) $-80°$ C. But the most potent argument in favour of my theory is that it reasonably and consistently explains *all* the peculiar features of lunar surfacing, *i.e.*:—

The absence of distinct Polar caps;
The absence of water and aqueous vapour (now);
The absence of distinct colour in details;
The brightness of all raised, rugged surfaces, mountains, cliffs, peaks;
The relative darkness of levels whereon meteoric dust can lie;
The extraordinary circularity of forms, large and small, incomplete, or overlapped;
The cones, whether central or isolated;
The clefts or rills, also strings of craterlets;
The maritime zones, ridges, and banks;
The haze or cloud, and nimbus or rayed brightness;
The dark points seen by Dr. Klein;
Lastly, if not least, the long bright rays.

I do not think I overstate the case when I say that selenographers will find these features consistently solved by the one hypothesis, and no enigmas left.

I cannot ask for space to go into details here, but will forward a short synopsis of the leading features, in case they may be required, arranging them as nearly as may be as in the preceding list.

S. E. PEAL

Sibsagar, Assam, October 13

The Astronomical Theory of the Great Ice Age

THE lecture and the letter of Sir Robert Ball, however lucid, do not appear to carry this question further than where Dr. Croll left it. It is easy to understand that when the shape of the earth's orbit was different, winter days might be colder and summer days hotter than now. What the theory at present wants is an exposition of the successive series of effects by which this state of climates would transform the Emerald Isle into a mere Greenland. It is scarcely an explanation to say that "vast fluctuations like these must correspond to vast climatic changes of the kind postulated." We desire to be shown that they will correspond, and that the correspondence will be of the kind required. Taking Sir Robert Ball's own illustration, I am quite ready to admit that his horse alternately starved and crammed will not run a dead heat with one uniformly fed; but in default of experience I should not feel certain that his animal would die of accumulated fat.

We know that there have been past periods of heat-supply more uniform than at present, and periods of wider fluctuation. We see also in geological records ages of vast snow accumulation and ages of rich vegetation near the Pole. We need a demonstration that such wider fluctuations do tend to the one and not to the other; towards snow-accumulation and not towards snow-dissipation. Attempts in this direction have been made, but much seems needed yet.

E. HILL

St. John's College, Cambridge, November 23

Meteor

THE large meteor described in NATURE by Mr. P. L. Sclater, was observed here as follows:—

Nov. 17, 7h. 18m.—Fireball many times brighter than Venus. Path from $32\frac{1}{2}° + 45°$ to $158° + 55°$. Motion very slow, duration 7 seconds. Train, but no enduring streak. The fireball, as it gradually descended to the northern horizon, varied greatly in brilliancy, and gave a series of flashes lighting up the sky with great effect. I have occasionally seen larger fireballs, but never observed one more satisfactorily. This meteor was observed at Handsworth, Birmingham; at Crawshaw Booth, Lancashire; and at many other parts of the country. Its unusual brightness seems to have attracted wide notice.

Fireballs from Taurus are often seen at about this epoch; but that of November 17 appears to have belonged to a radiant-point in Aries.

W. F. DENNING

Bristol

Freshwater Diatoms in the Bagshot Beds

WILL you kindly favour me with space to ask any of your numerous readers, who may be specially interested, if they can furnish me with any references to published records of freshwater Diatoms being observed in the carbonaceous earthy sands of the Middle and Lower Bagshot Beds of the London Basin? In conjunction with one of my pupils, I have lately subjected many of these green and dark-grey sands and earths to microscopic examination; and our labours have been rewarded by the discovery of a rather extensive unicellular flora, particulars of which will be shortly laid before the Geological Society. Meanwhile, I shall be happy to have the co-operation of other workers in the same field.

A. IRVING

Wellington College, Berks, November 28

THE MATHEMATICAL TRIPOS[1]

I.

IT is with the greatest pleasure that I avail myself this evening of the already well-established custom which permits one of our members, once in two years, to address to his colleagues a few general remarks connected with the science that forms our common bond of union. It is not often that a mathematician has an opportunity of laying before his fellow workers, by word of mouth, any views of his except such as relate to the actual mathematical investigations upon which he is engaged, which, from their very nature, can appeal directly only to the few who have laboured in the same field; and I feel it to be a high privilege to be permitted, in this room, and surrounded by familiar faces, to give expression to my thoughts and hopes upon subjects that are of common interest to us all as mathematicians.

[1] Address delivered before the London Mathematical Society by the President, Mr. J. W. L. Glaisher, M.A., F.R.S., on vacating the chair November 11, 1886.