irregular way, with a tendency very often toward the tangential direction at the lower parts of the rifts. The photographs extend about a diameter and a half from the sun's limb, and a comet appears on the plates about a solar diameter and a half from the sun's centre. It must have been very bright, as it appears clearly in the photographs. Measurements seem to indicate a small shift in its position during the interval between the first photograph and the last.

Turning now to the photographs taken with the camera and prism in front, — an instrument which gives an image of the prominences as oft repeated as there are rays in the prominence, — the plates employed were sensible to the infra-red as well as violet rays. One prominence gave a great number of lines in the ultra-violet. The fact was brought out in this eclipse, that the brightest lines in the prominences are due, not to hydrogen, but to calcium. Besides these and the hydrogen lines, there is the line D_3 in the yellow, and the C line of hydrogen in the red, and also a photograph of two prominence-lines in the ultra-red. In addition to the prominences, there are visible in the photographs certain short rings round the moon, which mean that at these places the light sent out by the gaseous part surrounding the moon is not confined to the prominences. It is, as would be expected, the green coronal line which chiefly corresponds to one of those rings. This green line, K 1474, is a true coronal line, and is only very faintly traceable in one of the prominences.

In considering the results obtained with the complete spectroscope, it is a striking fact that some of the lines cross the moon's disk, and especially the two lines H and K. This proves that the calcium-lines, H and K, were so strong in the prominences that the light was scattered in our atmosphere, and reflected right in front of the moon.

The prominence-lines are very numerous: thirty such lines appear in the photograph. The hydrogen-lines are there, including those in the ultra-violet photographed by Dr. Huggins; also H and K, and other calcium-lines; and still others, chiefly unknown.

Close to the sun's limb we can only trace a continuous spectrum, a very strong one, going up to about a quarter of a solar diameter. The photographs bear out the distinction between the inner and the outer corona, the former being much stronger in light. The boundary at which this continuous spectrum ends corresponds to the extension of the inner corona. The continuous spectrum is stronger on the side where the prominences are weaker. In the corona we first of all see a very faint continuous spectrum, and in that continuous spectrum one can trace at G the reversal of the dark Fraunhofer lines. In addition, a series of faint true coronal lines can be traced in the outer regions of the corona. We have not traced any known substances in the solar corona. The greater number of the prominence-lines in the ultra-violet are also unknown, but they seem to be present in Dr. Huggins's photograph of the spectrum of α Aquilae.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The relative ages of planets, comets, and meteors.

The theory that the sun was once a gaseous mass extending beyond the most distant planet, and that it has contracted to its present dimensions by the continuous action of gravity, and is still so contracting, is now very generally accepted by astronomers. It is well known, moreover, that the condensation of a gaseous body produces heat, and that the impact of solar matter in consequence of its motion towards the centre of gravity is one cause, at least, — perhaps the principal one, — of the sun's high temperature. The modern law of the conservation of energy affords data for determining the amount of heat produced by the condensation of the sun's mass from one volume to another. It is thus found that the contraction to its present dimensions, from a primitive volume extending indefinitely beyond the orbit of Neptune, would have kept up a uniform supply of heat equal to the present for twenty millions of years.[1] The age of the solar system, however, may be greater or less than this, as the sun's radiation may not have been constant.

In any form of the nebular hypothesis, Neptune is the oldest planet known, and the innermost of the number has had the most recent origin.

A majority of comets probably move in hyperbolas, and visit the solar system but once. Some orbits have been changed into ellipses by planetary perturbation.

For any thing we can know to the contrary, cometary matter has been falling towards the centre of our system in all ages of its existence. Whenever the perihelion distance has been less than the radius of the solar spheroid, the comet's orbital motion must have been arrested, and transformed into heat.

As the limits of geological dates are determined by the strata of the earth's crust, so the superior limits of the age of periodic comets are fixed by the planetary orbits next exterior to their perihelia. Of the comets known to be periodic, the perihelion distances of thirteen are less than the earth's distance from the sun. The ages of all these must therefore be less than that of the earth. In like manner the ages of others are shown to be less than that of Venus, while those of a few are found to be less than the age of Mercury. We may conclude, then, in general, that the ages of comets, as members of the solar system, are less than those of planets.

But as meteoroids, partly at least, are derived from comets, their origin as separate bodies in connection with our system must be still more recent: in fact, meteoric matter is being constantly detached from comets at each successive return to perihelion. The indications of this process were unmistakable in the case of the great comet of 1882, and many meteoroids of the Biela group have been separated from the comet in our own day. Daniel Kirkwood.

Bloomington, Ind.

First use of wire in sounding.

Professor Verrill is quite right in supposing that I was unaware that any report of the sounding expedition of Walsh had been published. A casual reference to Walsh in the 'Depths of the sea' led me to inquire,

[1] A contraction of the radius equal to a hundred and twenty-nine feet per annum would yield the present supply of heat. See Monthly notices of the R. A. S., April, 1872.

through a naval friend, of an officer in the Navy department, unofficially, whether any report had been published. This gentleman was kind enough to make inquiries, and finally replied that he could not find out that any thing had been printed, but that the log-books were at the department. On this account I made no further search for printed data; but later, on Commander Bartlett's installation at the Hydrographic office, I mentioned it to him, and he had the goodness to search the log-books, and to send me copies of *all* references to the work with wire, contained in them, from which my note was compiled. Doubtless other note-books might have been used also. In regard to the breaking of the wire, it is specifically stated in the log-book that it parted 'owing to some of the links catching at times on others,' as the line was *paid out* in one or two cases, and in others as it was being hauled in. In another instance it parted 'owing to one of the joints catching upon another joint on the reel.' It is nowhere in the *original log* referred to the heaving of the vessel; and the last entry repeats, 'entirely owing to the short nip of the catch upon the reel.' Having had some experience in sounding in great depths of water with a small sailing-vessel, I have come to the opinion, in which I think most practised hydrographers would concur, that it is impossible that a plumb sound should be obtained from such a vessel under any circumstances likely to occur in actual work. The words quoted by Professor Verrill from Walsh's report show that the latter officer deceived himself; for it is evident, that, if the wire 'served as an anchor to keep the vessel steady,' it could not have been plumb; and, even if it appeared to be so at the surface, what it was below the surface no man could state with confidence, except that it was *not* plumb. A steamer may be kept over the wire, and, with wire properly spliced and heavily weighted, a plumb sound can be had, but not otherwise; and it may be confidently said that *accurate* sounding in deep water dates from the combination of these two factors. I may say, also, that in my note I did not, nor do I now, consider that successful trial of a sounding apparatus has been arrived at, until bottom has been reached, and the signs of it brought up. WM. H. DALL.

Washington, June 23, 1883.

False claims.

It is to be regretted that the pages of a popular magazine of high standing should be made the vehicle of such an advertisement as appears in the *Century* for July, entitled 'Cheap food for the million,' reprinted in the publisher's department of SCIENCE for June 22. Of the merits or demerits of a new food-preservative, of which so many have been brought forward within the last few years, I have nothing to say: the testimony of Prof. S. W. Johnson, cited in its favor, is certainly entitled to respectful consideration. But I wish to call attention to the claim of the inventor of the new nostrum to public confidence on the ground that he is "a fellow of the Chemical society of London, and also of the Geological society, being elected after unusually severe examinations. President Huxley, of the latter society, said that 'no American should boast of an election without a severe struggle.' In evidence of this prejudice towards Americans, the fact that Professor Humiston was given two hundred and fifty questions (five times the usual number) may be cited. He is now superintendent of the company's works," etc.

It is not clear what meaning is to be attached to the words put into Huxley's mouth; but it is a well-known fact that neither in the societies named, nor any others with which I am acquainted, is there any examination whatever required, or are any questions asked. A nomination by three members, one of whom must have personal knowledge of the candidate, and the payment of fees, are the only conditions necessary to membership of the Geological society of London, which has several hundred members upon its lists, including many Americans. In the complete catalogue of all scientific papers published in Europe and America up to 1877 (*Roy. soc. cat.*) we search in vain for the name of the 'superintendent of the company's works.' It is not creditable to the advertisers that the names of illustrious men of science and of learned societies, coupled with erroneous statements and absurd appeals to national prejudices, should be invoked, even indirectly, to recommend their wares. T. STERRY HUNT.

Montreal, June 25, 1883.

MACLOSKIE'S ELEMENTARY BOTANY.

Elementary botany, with students' guide to the examination and description of plants. By GEORGE MACLOSKIE, D Sc, LL D., professor of natural history in the J. G. Green school of science, Princeton, N J., etc. New York, *Holt*, 1883. 370 p. 12°.

SCIENCE is ready to welcome a new text-book, asking only for some particular line of excellence as a warrant of its reason to be. Considering that "this volume aims to supply a readable sketch of botany," and so to treat the subject "as to meet the wants of a large class of readers who wish to know something of the fundamental principles and philosophical bearings of the science without being distracted by technicalities," we think that its readable character and the comparatively sparing use of unnecessary technical terms are among its commendable features. The style is easy, sometimes a little odd in its concatenations, as where "it is said that a monkey first introduced tea to the notice of the Chinese; the English government started its cultivation in Assam, whence the best teas now come;" and in the following paragraph it becomes even sensational.

"Their power of increasing in thickness imparts to roots their capacity for mischief. Their vigor is somewhat surprising. They make their way through dense soil, loosening it so that it becomes soft and spongy. They can split rocks, overturn walls and buildings, stop up sewers, and root up our street-pavements. They effect more injury to man's handiwork than tempest, fire, and war combined. . . . We possess a root hugging an old bottle in irredeemable captivity."

In a well-known passage at the close of one of his books, Darwin likened the tip of a root to the brain of one of the lower animals; and brains, we know, are capable of mischief, and