distributed along the complete ellipse forming the cometary orbit. They are therefore always worth careful notice, and will seldom be found to fall below reasonable expectation.

Bristol, November 4. W. F. DENNING.

THE result of calculations made by the writer indicates that the Leonid epoch will fall a little later this year than might have been expected. There will be little, if any, meteoric activity during the period November 10–16, reckoning from noon to noon, but during the remainder of the month it is likely that shooting stars will be much in evidence. The following are the principal meteor showers that fall during the period November 16–30, the dates of the occurrences being expressed in Greenwich astronomical time:—

Epoch November 16; this shower is of the ninth order of magnitude, and has the following maxima:—November 16, 11h. 20m.; November 17, 4h. 25m., 8h. 20m., and 16h. 15m.

Epoch November 17, 20h., of eleventh order of magnitude. The following maxima occur after the epoch:—November 18, 0h. 50m., 10h. 14m.; November 19, 0h. 40m., 5h. 5m., and 16h. 50m.

Epoch November 20, 5h., of fifth order of magnitude, and preceded by the following maxima:—November 18, 7h. 50m., 21h. 5m.; November 19, 5h. 55m.; November 20, 3h. 15m.

Epoch November 24, of seventh order of magnitude, which has the following maxima:—November 24, 8h. 55m., 12h. 10m.; November 25, 6h. 20m., 18h. 24m.

Epoch November 30, 5h., of fifteenth order of magnitude, and preceded by the maxima:—November 28, 14h. 30m., 20h. 30m.; November 29, 0h. and 3h., 20h. 45m.

It seems from the foregoing that the first maximum takes place on November 16 during the hour preceding midnight. This maximum, which is the only one occurring on this night, will probably furnish some Leonids, which may also be observed on the following night.

131 Rathgar Road, Dublin. JOHN R. HENRY.

The Keeping of Young Herring Alive in Captivity.

ON p. 305 of the new number of the Journal of the Marine Biological Association reference is made to the difficulty of keeping young herring alive. On September 14 last I captured a number of young herring; some, which I put under circulation in salt water, were dead next morning. To kill the others I turned on a fresh-water tap into the bucket containing them. Half an hour or so later I found that, instead of being dead, they were very lively, and some which had been lying on their backs had recovered.

I then placed seven under a circulation of half salt water and half fresh water. They lived for a week, then some of them died off. There is still (November 6) one lively specimen living, and apparently healthy. The only source of food is a little plankton added (twice), and such plankton as comes through the salt-water pipes.

During the first few days of this experiment sometimes the salt-water tap and at other times the fresh-water tap was shut off for an hour or so.

RICHARD ELMHIRST.

Marine Biological Station, Millport, N.B.

Lime Light.

I VENTURE to direct your attention to a simple device which I have found very useful for increasing the light from a demonstrating lantern. It is usual, on account of their long life, to use so-called artificial lime cylinders, even though they give somewhat less light than pure lime ones. An ordinary Welsbach gas-mantle happens to fit all these cylinders, and should be slipped on before the jet is lighted. The increase in brightness of the light due to this addition is astonishing. The mantle is only slightly damaged by the jet, and by turning occasionally so that the flame impinges upon a fresh place, the intense illumination may be maintained for two hours or so.

Shooters Hill, Kent. CHARLES E. S. PHILLIPS.

ALBRECHT VON HALLER.

ALBRECHT VON HALLER, anatomist, physiologist, botanist, and poet, was born in Berne on October 16, 1708. He has been termed "Berne's greatest son," and his intellectual eminence was conspicuous even in an age which was singularly productive of great men. It was, indeed, early manifest, for the child Haller was what the Germans term a "Wunderkind"—one of the few such children whose subsequent career has borne out the promise of their youth. As early as his ninth year he began the preparation of lexicons of all the Hebrew and Greek words in the Old and New Testaments, with notes regarding their derivations and different applications. He also prepared a Chaldaic grammar. Whilst still a boy he wrote biographies of no fewer than two thousand celebrities and turned out innumerable verses (which he afterwards burned) on all conceivable subjects, including a satire in Latin verse on his somewhat harsh and pedantic preceptor. Before he was fifteen he was deeply immersed in philosophy and mathematics, and already showed that inclination towards the natural sciences which eventually evidenced itself in the remarkable works which appeared from his pen.

At fifteen he entered the University of Tübingen and pursued the study of anatomy and philosophy during two years. At this time Boenhaave, a man of similar almost universal genius, then at the zenith of his fame, was attracting to Leyden earnest students from all parts of the civilised world. The youthful Haller was also drawn into the vortex, and came under the influence both of that great physician and of the anatomists Ruysch and Albinus. After graduating there at the age of nineteen, Haller visited England, and in London made the acquaintance, amongst others, of Sir Hans Sloane, Douglas, Cheselden, and John Hunter. He then proceeded to Paris, where he spent six months studying anatomy and botany under Winslow and Jussieu. After leaving Paris, he passed a year in Bâle, pursuing mathematical studies under Bernouilli, and preparing himself for the active practice of medicine in his native city, where he intended to settle down. At the age of twenty-two we accordingly find him in practice in Berne. His patients do not appear to have been numerous; indeed, it was currently reported that he was "too good a writer and poet to understand much of medicine," and he found abundance of time for working at anatomy and for expeditions to the neighbouring Alps, the flora of which especially excited his interest. The poem entitled "Die Alpen," which was composed by Haller about this time, is probably the one by which he is best known; the following two verses from it, set to music as a cantata by Dr. Munzinger, were sung at the unveiling of the Haller statue on October 16:—

Wohl dir, vergnügtes Volk! o danke dem Geschicke,
Das dir der Laster Quell, den Ueberfluss, versagt;
Dem, den sein Stand vergnügt, dient Armut selbst zum Glücke,
Da Pracht und Ueppigkeit der Länder Stütze nagt.

Zwar die Natur bedeckt dein hartes Land mit Steinen,
Allein dein Pflug geht durch, und deine Saat errint;
Sie warf die Alpen auf, dich von der Welt zu zäunen,
Weil sich die Menschen selbst die grössten Plagen sind.

In 1735 Haller had begun to lecture in public on anatomy, and was physician to the city hospital in Berne. We also find him fulfilling the function of keeper of the public library and collection of coins. In the short year occupied with these multifarious duties he found time to prepare a "catalogue raisonné" of all the books in the library, and to differentiate and arrange in their chronological order 5000 ancient coins. In the following year George II.

of England, who was establishing a university at Göttingen, induced Haller to accept the chair of medicine, surgery, anatomy, and botany. He there gave himself up entirely to professorial duties and to work in natural science. He was instrumental in founding, in 1737, the Royal Society of Sciences in Göttingen, of which he became secretary and president, and the first meetings of which were held in his house. After seventeen years in Göttingen he accepted the invitation of his fellow-citizens to return to Berne, where already, in his absence, he had been elected a member of the Supreme Council, and he now (1753) devoted himself to administrative duties with the same energy that he had put into literary and scientific studies. These studies were not, however, arrested, for every moment of his time unoccupied by public affairs continued to be filled in by them, and his activity in this respect ended only with his death in 1777. He even sent a detailed account of his last illness to the Royal Society of Göttingen, and is said to have remarked to his physician at the approach of death that his pulse was no longer perceptible:—"Es schlägt nicht mehr!"

Haller is justly celebrated as a botanist, and had he not been a contemporary of Linnæus, whose great reputation eclipsed that of all his fellow-workers, he might have attained as high a position in that science as he reached in anatomy and physiology. He prepared a complete flora of Switzerland, and propounded a system of classification—artificial, it is true (as was that of Linnæus), but one which might have served a useful purpose in the absence of the Linnæan system. He published several important botanical works, the chief being the "Historia stirpium indigenarum Helvetiæ," which appeared in 1768 in three folio volumes with one volume of plates; the "Bibliotheca botanica," 1771–2, in two quarto volumes; the "Histoire des Plantes vénéneuses de la Suisse," 1776, and several descriptive monographs.

As an anatomist Haller was still more eminent. Already in 1733 he published at Berne a "Dissertatio anatomica de musculis diaphragmatis," followed in 1738, at Göttingen, by another, "De Valvula Eustachii." In 1743 he began the publication of his great work, the "Icones anatomicæ," which appeared in eight successive folio parts, the last in 1756. This was the first anatomical work in which the organs of the body are shown as much as possible in relation to one another, a principle which has been followed by all subsequent authors. As accessory to his anatomical writings may be mentioned his contributions to development and pathology.

But it is as a physiologist that Haller unquestionably ranks highest—indeed, modern physiology may be said to date from the appearance of his great work, "Elementa physiologiæ corporis humani," which came out from 1757–1766 in eight quarto volumes.[1] Into this book he collected all the physiological knowledge of his time, and the clearness with which he narrates the facts of physiology and the logical manner in which he draws deductions from them may serve as a model for modern text-books. His manner of pursuing a theme and clinching his conclusions is shown even by the mere titles of his chapters. Thus, in the section of the book in which he deals with the history of the discovery of the circulation and the attempts which had been made to detract from the claims of Harvey to the merit of the discovery, these titles read in succession as follows:—

XXIV. "Harveio laus circuitus inventi vindicatur." XXV. "Non exstat apud Hippocratem." XXVI. "Neque apud Salomonem, Platonem, veteres alios." XXVII. "Neque apud Servetum, Jacobum Reeff (longe minus)." XXVIII. "Quid Cæsalpinus viderit (non penitus tamen verum vidit, Harveio reservatum)." XXIX. "Non est inventum Pauli Sarpi." XXX. "Neque aliorum nuperorum." XXXI. "Neque Sinensium aut Persarum." XXXII. "Sed Harvei." For every statement the authority is given. Wherever possible, an observation is confirmed by himself. The descriptions of physiological phenomena are concise and clear. The deductions are not always those which we are now in the habit of drawing, but the exceptions are singularly rare.

It was only the dawning of chemistry, and many branches of physics were unknown; physiology,

Albrecht von Haller.

therefore, in those days had to be based mainly upon the study of anatomy. "Physiologiæ est animata anatome," says Haller in his "Primæ lineæ physiologiæ in usum prælectionum academicorum," a little handbook for medical students, published at Göttingen in 1748, which went through eleven editions. In the same work (p. 41) he recognises the value of animal experiments in advancing the knowledge of human physiology:—"Accuratiora sunt quæ in vivis animalibus facta sunt experimenta," and he is even more emphatic on this point in the introduction to his "Elementa."

When it is stated that Haller published nearly 200 works, it must be admitted that few or none have possessed a more fertile literary ability, especially when the scope of many of these works is taken into consideration. For, besides the great tomes on botany, physiology, and anatomy already mentioned,

[1] "The year 1757 may be regarded . . . as indicating the dividing line between modern physiology and all that went before. It was the year in which the 'Elementa Physiologiæ of Haller was published." Michael Foster, "History of Physiology," p. 204.

he prepared and published no fewer than four large biographical works, one on botany, one on anatomy, one on surgery, one on practical medicine—the first of these in two quarto volumes, and the last occupying as many as four. These "Bibliothecæ" contain not only lists of scientific works, but also short analyses and criticisms of their contents, along with biographical notices of the authors—a titanic labour of vast utility to subsequent workers. Nor were his writings confined to the natural sciences. As we have already seen, he early attained considerable fame as a poet; later we find him publishing historical novels —"Usong, an Oriental Story," 1771; "Alfred, King of the Anglo-Saxons," 1773; "Fabricius and Cato, a Fragment of Roman History," 1774. His "Journal," which was published ten years after his death, contains his opinions on other literary men and on things in general, and especially philosophy and religion. Both this and his correspondence manifest strong conservative and anti-democratic views, with a tendency to intolerance towards those who held different opinions.

Haller was loaded with honours during his lifetime. He was an honorary member of almost all the learned societies of Europe. Frederick the Great in vain attempted to induce him to settle in Berlin, and the endeavours of Oxford and Utrecht to obtain his services were equally futile. The King of England appointed him his physician, and the Emperor of Germany granted him a title of nobility. But he was himself content to live and die a simple citizen of Berne, a prophet not without honour in his own country.

Haller's bicentenary was celebrated at Berne with great ceremony in October by the inauguration of a statue erected in front of the university on a height overlooking the town. On the day preceding the inauguration a joint session of the Historical, Medico-chirurgical, and Scientific Societies of Berne was held in the hall of the university, which was occupied by a large audience, including many ladies. Interesting accounts of Haller's life and work were given by Prof. Steck (history), Prof. Fischer (botany), and Prof. Kronecker (physiology). Addresses were also received from various societies with which Haller had been connected, as well as from universities and other learned bodies. The societies were represented by Prof. Leo, who appeared for the Royal Society of Sciences in Göttingen; Prof. Waldeyer, for that of Berlin; Prof. Heger, Brussels; Prof. Bohr, Copenhagen; Prof. Rückert, Munich: Prof. Wangerin, Halle; Prof. Gamgee, London (presenting a Latin address from the Royal Society); Prof. Schäfer, Edinburgh: whilst the universities were represented by Prof. von Grützner, of Tübingen; Prof. Merkel, of Göttingen; Prof. Kollmann, of Bâle; Prof. Ewald, of Strassburg, and others. In the evening a reception was held in honour of the foreign delegates by the president of the memorial committee, Prof. Tschirch.

The actual day of the inauguration (October 16) was kept as a public holiday. A procession of all those who were to take part in the ceremonial, including the Swiss and foreign delegates, the university authorities, and the students—the latter with the banners and in the uniforms of their respective corps —was marshalled in front of the Parliament buildings, and marched through the principal streets of the old city to the site of the memorial. There, orations were pronounced by the rector of the university, Prof. Tschirch, and by State Councillor Dr. Gobat, representing the Education Department of the Canton. A fine choir of men's voices rendered a selection of appropriate music, and in glorious sunshine, to the accompaniment of the booming of cannon and the sound of the Swiss national anthem, the covering which had concealed the monument was removed, and the representation of Haller, by Siegwart, of Lucerne, was displayed to the view of the assembled multitude.

The statue represents Haller as he might have appeared to his contemporaries in about his fiftieth year. No contemporary picture or bust of this period of his life is extant, although his appearance in earlier and in later life is not unfamiliar. The sculptor had, therefore, to imagine him at the period chosen—which was that of his greatest scientific activity—a circumstance which has certainly not detracted from the artistic merit of the statue.

The unveiling ceremony was followed by a banquet to the delegates and others who had been invited to the celebration. Not the least interesting of the guests were some of the direct descendants of Haller. Indeed, the reply of M. Albert de Haller, of Lausanne, to the toast of the Haller family showed that some at least of the literary ability of his ancestor has descended to his generation.

The festivities were wound up by a torchlight procession of students, followed by a "Kommers" in the Kornhaus-keller.

A bronze plaque, exhibiting the bust of Haller in profile, designed by the sculptor of the memorial, was struck to commemorate the bicentenary, and a copy was presented to each of the foreign delegates—an artistic memento of a memorable ceremony.

E. A. S.

CAISSON DISEASE.[1]

MEN who have been working in compressed air, either under water in diving dresses or diving bells, in caissons used in preparing foundations for bridges, &c., or in making shafts or tunnels through watery ground, are liable to a variety of symptoms known generally as "caisson disease." These symptoms, which come on only at or shortly after the return to atmospheric pressure, vary in severity from pains in the muscles and joints, known as "bends" or "screws," to paralysis and even death. Paul Bert showed experimentally thirty years ago that these attacks are due to the fact that air (chiefly nitrogen) which has been dissolved in the fluids and tissues of the body while under pressure may, on decompression, be liberated in the form of bubbles, which produce local or general blocking of the circulation or other injuries. He also showed that if decompression were effected sufficiently slowly, the excess of air which had been taken up could escape by diffusion through the lungs, and thus bubbling and symptoms could be avoided. The phenomenon is, in fact, that of decompressing soda-water by pushing in the stopper; the problem of the prevention of caisson disease is how to push it in so slowly that the gas can escape without forming bubbles, and without the loss of so much time that the primary object of the manœuvre is frustrated.

Practical experience has shown clearly that the incidence of caisson disease varies with the height of the pressure and the duration of exposure to that pressure. Cases of illness are much more frequent in caissons where the pressure required to keep out the water approximates to 45 lb., or 3 atmospheres in excess of atmospheric pressure, than in those which are worked at about 20 lb. or 25 lb. Yet far higher pressures may be experienced with impunity

1 "The Prevention of Compressed-air Illness." By A. E. Boycott, G. C. C. Damant, and J. S. Haldane (*Journal of Hygiene*, vol. viii., 1908, p. 342).