

New South Wales, November 30, 1887). The New South Wales species is, I think, identical with that found in Queensland, and I should be inclined to doubt the distinctness of the Victorian species recorded by Mr. Dendy in NATURE (p. 366), and previously by Mr. Fletcher.

Mr. Dendy appears to lay some stress on the differences of colour as between his specimen and the specimens of *P. leuckarti* hitherto described, but it must be remembered that in some species of *Peripatus*—e.g. *capensis* and *novae-zealandiae*—the range of individual colour-variation is very considerable.

All the species that I have seen are very beautiful when alive; but the beauty, which is partly due to the texture of the skin, is very hard to reproduce in a drawing.

It is a remarkable fact that a creature which lives so entirely in the dark as does *Peripatus* should present such rich coloration and such complicated markings.

The egg of *Peripatus leuckarti* is heavily yolked and of a fair size, but smaller apparently than that of the New Zealand species. Its development cannot fail to be of the greatest interest, and it is sincerely to be hoped that the Australian zoologists will lose no time in working it out.

A. SEDGWICK.

Trinity College, Cambridge, February 18.

Anthelia.

I HAVE been following with much interest your notices of anthelia, and was about to add my mite to the information given, when, by the mail just in, I have your issue of October 25 last, wherein is a notice of the phenomenon as observed in Ceylon. I have witnessed it there scores and scores of times in my early tramps bird collecting, and I have also seen it at the Cape, in Brazil, on the Amazon, in Fiji, and in this island. On turning up my dear old friend Sir E. Tennant's book on Ceylon, I find that at p. 73, vol. i., he gives a very fair figure of the effect produced. It may be, as he says, that the Buddhists took from it the idea of a "halo" or "flame" for the head of Buddha, but there is one peculiarity about these flames that always struck me. In whatever position you find the Buddha, the flame is invariably in a straight line with the body even if the figure is recumbent. In form it always resembles the "tongues of fire" depicted by old painters as falling on the apostles on the Day of Pentecost.

I have seen many instances of what I suppose may be called "anthelia" in calm water, but the appearance is usually more *rayed*. I have an exquisite engraving in my print collection of the "Madonna and Dead Christ" by Aldegrevier (1502-58). It has often occurred to me, in looking at it, that the artist has taken his idea of the halo round the Virgin's head from the appearance presented by the "anthelia" in water. There is the same luminous centre, and then the divergent rays. The halo round the head of the dead Christ in her lap is a four-cornered luminous star, issuing rays, of which three points only are visible—like nothing in nature with which I am acquainted.

E. L. LAYARD.

British Consulate, Noumea, January 3.

Mass and Inertia.

I AM pleased to see that Dr. Lodge has adopted my suggestion made in the *Engineer* about four years ago of using the term inertia for the quantity mass-acceleration. In making the suggestion I considered that I merely asked a return to the meaning implied by Newton in the phrase "*vis inertiae*."

Unless this is the meaning of the term, the reason why Σmr^2 is called moment of inertia is almost incomprehensible. With it the connection is obvious; for, if ψ is the angular acceleration of a body about an axis, and r the distance of any particle, its linear acceleration is ψr , its inertia $m\psi r$, and its moment of inertia $rm\psi r$, or $m\psi r^2$. As the angular acceleration is the same for all particles of the body, the moment of inertia of the body is $\psi \Sigma mr^2$.

As Dr. Lodge mentions that he is bringing the matter before the British Association Committee on Units and Nomenclature, might I suggest that in future Σmr^2 should be called the *moment of inertia constant*, thereby implying the existence of the *variable factor* ψ , the angular acceleration, in the expression for moment of inertia.

E. LOUSLEY.

Royal College of Science, Dublin, February 16.

To find the Factors of any Proposed Number.

It has long been a desideratum of mathematicians to discover a formula or method for ascertaining the factors of any proposed number, and also determining whether it be a prime or not. Their endeavours during the twenty centuries that have elapsed since Eratosthenes (B.C. 276-196) made the first recorded attempt to produce a practical rule for the purpose have not been attended with success.

As it may interest many readers of NATURE, and others, I propose, with a few preliminary remarks, to make known a simple arithmetical method by which this desideratum can now be attained.

Factors of an even number can readily be found, as 2 is always one of them, but it is not always so easy to find the factors of an odd number, especially if it be a high one, and, if the number be the product of two primes, the difficulty in this respect is still greater, because they are its only factors. Hitherto they could be ascertained only by trying in succession, as divisors, the prime numbers of less magnitude than its square root.

To find by such process the factors of 8616460799 (the square root of which is between 92824 and 92825), it might, possibly, be necessary to try 8967 prime numbers as divisors (out of the 8969 that there are) before they could be ascertained. By my process, division sums are altogether avoided. This high number occurs in a chapter on "Induction as an Inverse Operation," in "Principles of Science," by Stanley Jevons, second edition. His emphatic remarks as to the difficulties attending on inverse operations in general, and particularly those with reference to finding the factors of this number, were the incentive to my endeavouring to discover some process for ascertaining them which might possibly have escaped being previously tried. He states:—"The inverse process in mathematics is far more difficult than the direct process. . . . In an infinite majority of cases it surpasses the resources of mathematicians. . . . There are no infallible rules for its accomplishment. . . . It must be done by trial, . . . by guess-work. . . . This difficulty occurs in many scientific processes. . . . Can any reader say what two numbers multiplied together will produce 8616460799? I think it unlikely that anyone but myself will ever know. They are two prime numbers, and can only be discovered by trying in succession a long series of prime divisors, until the right one be fallen upon. The work would probably occupy a good computer many weeks. It occupied only a few minutes to multiply them together."

Mr. Jevons adds: "There is no direct process known for discovering whether any number be a prime or not, except by the process known as the 'sieve of Eratosthenes,' the results being registered in tables of prime numbers."

In the article on prime numbers in "Rees's Cyclopædia" (ed. 1819), the writer states: "It is in fact demonstrable that no such formula" (for discovering whether a number be a prime or not) "can be found, though some formulæ of this kind are remarkable for the number of primes included in them."

The difficulty of finding the factors of numbers is also referred to by the eminent writer (at that time President of the Mathematical Society)—under the initials C. W. M.—of an interesting review of "Glaisher's Factor Tables," in NATURE, vol. xxi. p. 462. In course of his remarks he mentions the number 3979769, and respecting it says: "It would require hundreds of division sums to ascertain by trial that it had 1979 for a divisor, and that consequently it was the product of 1979 × 2011;" and he adds, ". . . there is no general mathematical principle which enables us to dispense with the trial, or even to shorten it, so as to bring it within practical limits."

These extracts afford conclusive evidence that no direct rule or method has hitherto been known, by which the factors of a number could be ascertained, and also that it is considered it would be a task of almost insuperable difficulty to devise one. Yet it seemed to me not unreasonable to think that, as two factors multiplied together formed a product, it ought to be possible to unmultiply or split up (as "C. W. M." expresses it) that product into its factors again, "without the enormous labour of trying for its divisors."

Strongly impressed with this idea, I attempted to realize it, and before long succeeded in discovering a simple arithmetical process for the purpose, and different from any previously tried. When applied to find the factors of 8616460799, instead of "many weeks being occupied" in the task, it showed, within a very reasonable time, that they were 96079 × 89681. When