

Nova Scotia many of the schools undertake these observations as a form of nature-study. The schedules which have been distributed include the observation of farming operations and a few meteorological phenomena, in addition to the ordinary data connected with the opening of flowers. The annual report contains a series of observations made in Nova Scotia, from which average dates or phenochrons are calculated.

ATTENTION is directed by Mr. O. E. Dunlap to a remarkable diversion in the waters of Niagara which happened on March 22 (*Scientific American*, April 4). On the previous afternoon ice came down the upper river from Lake Erie in such quantities that immense masses lodged on the rocks above Goat Island and diverted the water from the American to the Canadian channel. Thus the river-bed above the American fall between the mainland and Goat Island was left practically dry, and numbers of people were able to walk from Green Island over reefs of rock to the head of Goat Island. Here and there gravelly deposits and loose blocks of limestone were to be seen, amid great patches of ice, and barely enough water fell over the limestone ledge to curtain the rocky cliffs below. It is recorded that a similar incident occurred on March 29, 1848.

THE fossil fruits to which Bowerbank gave the name *Nipadites* have in this country been obtained from the London Clay of Sheppey and the Bracklesham Beds of Sussex. The various forms from the Eocene strata of Belgium have been grouped under one specific name, *Nipadites Burtini*, given by Brongniart in 1828 (as *Cocos Burtini*), and of which the *N. giganteus* of Bowerbank and the *N. Bowerbankii* of Ettingshausen are regarded as synonyms. These conclusions are stated in an essay by Mr. A. C. Seward and Mr. E. A. N. Arber (*Mém. Musée Roy. d'Hist. Nat. de Belgique*, tome ii., 1903). The authors remark on the structural resemblance between the fossil fruits and those of the recent palm, *Nipa*, which flourishes in the East Indies from the Lower Ganges and Ceylon, across the Malay Peninsula and Archipelago, even to Australia.

ON Tuesday evenings during May the following lectures will be given at the Royal Victoria Hall:—Dr. Mill, on "Weather and Weather Prophets"; Dr. Bertram Abrahams, on "Egypt"; Mr. Cunningham, on "Fishes"; and Canon J. W. Horsley, on "Insects."

PROF. N. W. LORD'S "Notes on Metallurgical Analysis" have reached a second edition. In its new form the book is not only suitable for students in technical schools, but also as a book of reference for use in metallurgical laboratories. Methods for the determination of all elements likely to be encountered in ordinary analyses have been included in the new edition, and the subjects of gas analysis and the testing of fuel have been more fully described than in the original issue of the volume. The book is issued from the Metallurgical Laboratory of the Ohio State University.

THE twenty-eighth issue—that for 1903—of the *Aide-Mémoire de Photographie*, edited by M. C. Fabre and published under the auspices of the Toulouse Photographic Society by M. Gauthier-Villars, of Paris, is full of valuable information for photographers. In addition to the lists of the principal photographic societies in Europe and America, the photographic magazines, and books on photography published during 1902, it contains a detailed review, in seven chapters, of photographic developments during last year.

THE additions to the Zoological Society's Gardens during the past week include a Chacma Baboon (*Papio*

*porcarius*), four Black-backed Jackals (*Canis mesomelas*), two Caracals (*Felis caracal*), a Feline Genet (*Genetta felina*), a Dusty Ichneumon (*Herpestes pulverulentus*), four Suricates (*Suricata tetradactyla*), three Levaillant's Cynictis (*Cynictis penicillata*), two Bristly Ground Squirrels (*Xerus capensis*), a Crested Porcupine (*Hystrix cristata*), five Cape Hyraces (*Hyrax capensis*), seven Spotted Eagle Owls (*Bubo maculosa*), a Bearded Falcon (*Falco biarmicus*), five Jackal Buzzards (*Buteo jacob*), a Chanting Hawk (*Melierax musicus*), five South African Kestrels (*Tinnunculus rupicolus*), a Large African Kestrel (*Tinnunculus rupicoloides*), four Leopard Tortoises (*Testudo pardalis*), a Tuberculated Tortoise (*Homopus femoralis*) from South Africa, three Rufous Weaver-birds (*Hyphantornis textor*), a Grenadier Weaver-bird (*Euplectes oryx*), three Triangular-spotted Pigeons (*Columba guinea*), seven Egyptian Geese (*Chenalopex aegyptiacus*) from West Africa, presented by Colonel A. T. Sloggett, C.M.G.; a Sykes's Monkey (*Cercopithecus albigularis*) from West Africa, a Smooth-headed Capuchin (*Cebus monachus*) from South-east Brazil, a Ring-tailed Coati (*Nasua rufa*) from South America, seven Long-nosed Vipers (*Vipera ammodytes*), two Painted Frogs (*Discoglossus pictus*), two Edible Frogs (*Rana esculenta*), a Southern Mud Frog (*Pelobates cultripes*), European; two Pennant's Parrakeets (*Platycercus pennanti*), twelve Golden Tree Frogs (*Hyla aurea*) from Australia, two Seven-banded Snakes (*Tropidonotus septemvittatus*), a Hog-nosed Snake (*Heterodon platyrhinus*) from North America, deposited.

#### OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN MAY:—

- May 1-6. Epoch of Aquarid meteoric shower (Radiant  $337^{\circ} - 2^{\circ}$ ).
10. 2h. Mercury at greatest elongation ( $21^{\circ} 31' E$ ).
- „ Ceres  $\frac{3}{4}^{\circ}$  S. of  $\mu$  Leonis (mag. 4.1).
11. Juno  $\frac{1}{2}^{\circ}$  N. of  $\epsilon$  Ophiuchi (mag. 3.3).
12. 8h. 7m. to 9h. 5m. Moon occults  $\chi$  Ophiuchi (mag. 5.0).
15. Venus. Illuminated portion of disc = 0.738, of Mars = 0.926.
- „ 13h. 5m. to 16h. 27m. Transit of Jupiter's Satellite III. (Ganymede).
19. Neptune in conjunction with  $\eta$  Geminorum, Neptune  $10' S$ .
20. 14h. Venus in conjunction with  $\epsilon$  Geminorum, Venus  $10' N$ .
21. Juno (mag. 8.7) in opposition to the Sun.

NOVA GEMINORUM BEFORE ITS DISCOVERY.—On receiving the Kiel announcement of Prof. Turner's discovery of Nova Geminorum, Prof. Pickering instituted a search for this object on the early photographs of this region taken for the Henry Draper memorial series.

A negative obtained on March 1d. 15h. 3m. (G.M.T.), whilst showing stars of 11.9 magnitude, shows no trace of the Nova, neither could the latter be found on any of the sixty-seven plates of this region taken between March 3, 1890, and February 28, 1903, although most of them show stars of the twelfth magnitude or fainter. A plate obtained on March 2d. 13h. 19m. shows stars of magnitude 9.0, but shows no object in the Nova's position.

On a photograph taken March 6d. 14h. 28m. there is the image of an object occupying the position of the Nova, the photographic magnitude of which is  $5.08 \pm 0.26$ , and negatives taken on several succeeding nights show that the magnitude gradually decreased until on March 25 it was only 8.08.

The photograph obtained on the last-named date was taken with an objective prism, and shows the spectrum of the Nova as a conspicuous object amongst the spectra of the surrounding stars. This spectrum shows six bright

lines, their designations, assumed wave-lengths, and relative intensities being as follows:—

H $\zeta$ , 3889, (1); H $\epsilon$ , 3970, (3); H $\delta$ , 4102, (8); H $\gamma$ , 4341, (10);  
—, 4643, (11); and H $\beta$ , 4862, (9).

No dark lines are shown on the photograph, but this may possibly be due to the small dispersion employed. The same lines, together with the nebula line at  $\lambda$  5003, are shown on spectrograms obtained on March 29 and 31, and April 1, the nebula line appearing as brighter than H $\zeta$  and of intensity 2-3. Later photographs contain lines at the estimated positions  $\lambda$  4176,  $\lambda$  4240 and  $\lambda$  4462.

Prof. Pickering remarks on the utility of such a series of systematic observations as are carried on under the Draper memorial fund, and states that even in the absence of Prof. Turner's discovery and prompt announcement, Nova Geminorum would have been discovered, for its spectrum was a very conspicuous object on the Harvard photograph of March 25 (H.C.O. Circular, No. 70).

RECENTLY DISCOVERED TERRESTRIAL GASES IN THE CHROMOSPHERE.—Owing to their proved relationship to helium, Prof. S. A. Mitchell, of Columbia University, suspected that the recently discovered gases neon, argon, krypton, and xenon might be found to exist in the chromosphere, and in order to test his supposition he compared the wave-lengths of the lines in their respective spectra with the wave-lengths of the chromospheric spectrum obtained by himself during the Sumatra eclipse.

Owing to the low densities of the new gases, it is to be expected that, as is the case with helium, they will not appear in the normal solar spectrum, even though they may appear in the spectrum of the chromosphere; and again, owing to the low atomic weights of neon and argon, Prof. Mitchell expected that these two gases might appear in the spectrum, whilst krypton and xenon, the atomic weights of which are greater, would probably not so appear.

As a result of his comparison Prof. Mitchell comes to the conclusion that lines due to neon and argon are present in the chromospheric spectrum, but the evidence as to the presence of krypton and xenon is, at present, inconclusive. Lines which are due to the more volatile gases of the earth's atmosphere (*i.e.* those which are uncondensed at the temperature of liquid hydrogen), as published by Liveing and Dewar, appear at  $\lambda\lambda$  4047, 4398, 4422, 4431, 4540 and 4844, and the strongest argon lines, *viz.* those at  $\lambda\lambda$  4180.3, 4200.8, 4259.5, 4266.8 and 4430.3, are also represented in the spectrum of the chromosphere.

Prof. Mitchell suggests that these gases may have come to the earth's atmosphere from the sun, as suggested in the theory put forward by Arrhenius, which supposes that ionised particles are constantly being repulsed by the pressure of light, and thus journey from one sun to another (*Astrophysical Journal*, No. 3, vol. xvii.).

CATALOGUE OF MEASURES OF NEW DOUBLE STARS.—In *Bulletin* No. 29 of the Lick Observatory, Prof. R. G. Aitken publishes a further addition of 117 new double stars and their measures to his new catalogue of these objects; the earlier sections of this catalogue have already appeared in previous numbers of the Lick *Bulletins* and in the *Astronomische Nachrichten*.

The present section deals with Nos. 313 to 429 (Aitken) inclusive, and gives the position for 1900, the number in previous catalogues, the magnitude and the dates and figures of the various measures for each star. More than one-half of the pairs in this section are separated by angular distances not exceeding 1", and more than three-fourths are only separated by 2" or less.

The doubles have been discovered with the 12-inch telescope, but nearly all the measures have been made with the 36-inch.

"THE CAMBRIAN NATURAL OBSERVER."—The latest issue of this interesting little volume, which is the official organ of the Astronomical Society of Wales, contains many interesting records of observations, both astronomical and meteorological, made by members of the Society during 1902. In future the "Observer" will only appear annually instead of quarterly as hitherto.

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## SEISMOLOGICAL NOTES.

THE last publication of the Earthquake Investigation Committee of Japan contains five papers illustrated by twenty-six plates, all of which are the work of Dr. F. Ōmori. The first of these refers to a horizontal pendulum tromometer, which is essentially a conical pendulum seismograph carrying a load of 50 kg. and writing indices with a multiplication of 120. In addition to recording earthquakes, it indicates the almost continual existence of "micro tremors," the periods of which are about 0.3 second and the range 0.013 mm. When "pulsatory oscillations," which are a larger form of disturbance than the tremors, are in evidence, it would appear from the illustrations which are given of these movements that they might seriously interfere with the character of an earthquake record.

In a communication on the overturning and sliding of columns, the relationship between the horizontal component of earthquake motion and the displacement of bodies which are not attached to the ground, but simply rest upon the same, is discussed and illustrated with considerable detail. The effects of vertical motion are referred to, and cases are pointed out where gate-posts and buildings have been caused to jump. A paper bearing upon the seismic stability of tall chimneys gives the results of experiments upon the vibration of such structures. The remaining papers respectively refer to the vibration of the piers of railway bridges as caused by traffic, and the vibration of walls at the time of earthquakes.

These excellent publications are undoubtedly of great value, especially to those who have to construct to resist earthquake movements; but if the author could have given more complete references to investigations made by himself and also by others in connection with similar inquiries, their value would have been enhanced.

Other seismological notes are found in the reports of the Physico-Mathematical Society of Tokyo. In one of these, No. 16, Dr. Ōmori gives a summary of analyses he has made of seismograms of distant earthquakes. This is followed by notes relating to the transit velocity of the first preliminary tremor of earthquakes of near origin. We are told that the duration of these early movements has a constant relationship to the distance they have travelled. Therefore, if this distance is known, and the time of arrival of the large waves has been noted, it is an easy matter to determine the time at which the preliminary tremors must have arrived. With this factor and with a knowledge of the time at which they originated, their velocity may be calculated. A mean for this is given at 5 or 6 km. per second, whilst a mean value determined from observations is 8 km. per second. In arriving at these results, it must not be overlooked that in certain cases, at least, there has been an unavoidable want of precision in locating origins; the time of occurrence at an origin has been taken as the mean of times observed at stations regarded as being near to the same, and it has been assumed that the waves followed spherical paths. These and other factors have no doubt contributed to the wide limits assigned to the results of these investigations.

In the tenth number of the new series of publications issued by the Earthquake Commission of the Vienna Academy of Sciences, Dr. E. v. Mojsisovics gives a chronological series of notes relating to 157 earthquakes which in 1901 were recorded in various parts of the Austrian Empire. The first of these catalogues, which consists of observations made for the most part without the aid of instrumental appliances, was issued in 1808.

In addition to these lists of local disturbances, which may be compared to the slight shocks which from time to time are felt in this country, the Academy also publishes registers of disturbances which have originated at great distances and shaken the world throughout its mass. Illustrations of these latter are found in the eleventh and twelfth numbers of the publications, the former referring to Trieste and the latter to Kremsmünster.

At the first of these stations, three Rebeur-Ehler pendulums have been kept at periods of about eight seconds, whilst at the second, similar instruments have periods of from three to four seconds. In 1901, at Trieste, 187 earthquakes were recorded, whilst at Kremsmünster only eighty-one were noted. Although the natural period of the pendulums has