OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN APRIL 1898:—

April 3. Pallas 15′ south of *o* Eridani (mag. 4·1).
5–15. Mercury well visible in the evenings near Venus.
9. Juno (mag. 8·7) in opposition to the sun.
10. 13h. Mercury at greatest elongation (19° 23′ E.).
10. 14h. 38m. to 15h. 8m. A Ophiuchi (mag. 4·7) occulted by the moon.
10. Saturn. Outer minor axis of outer ring = 18″·14.
14. 5h. 51m. to 8h. 26m. Transit of Jupiter's Sat. III.
15. Venus. Illuminated portion of disc = 0·968.
15. Mars ,, ,, ,, = 0·953.
16. 9h. 4m. Minimum of *β* Persei (Algol).
18. Mercury and Venus in conjunction (Mercury 3° 20′ N.).
19–20. Meteoric shower from near *α* Lyra (radiant 270° + 32°).
21. 9h. 11m. to 11h. 49m. Transit of Jupiter's Sat. III.
21. 15h. Mercury in conjunction with moon (Mercury 2° 2′ S.).
27. 6h. 41m. to 7h. 44m. 79 Geminorum (mag. 6·5) occulted by moon.
28. 12h. 34m. to 15h. 15m. Transit of Jupiter's Sat. III.
29. 13h. 1m. to 13h. 15h. *ξ* Leonis (mag. 5·2) occulted by moon.

FAVOURABLE APPARITION OF MERCURY.—The most convenient period in 1898 for observing Mercury will be during the fortnight from April 5 to 18, when the planet will become visible about an hour after sunset above the W. by N. horizon. He will reach his greatest eastern elongation on the morning of April 11, and will set on several evenings at about this time, a little more than two hours after the sun. Fortunately, at this special period, the planet will be situated within a few degrees of Venus, and the latter will form a brilliant guide to the position of Mercury. On April 5 Mercury will be apparently 6 degrees above Venus, and on ensuing nights the interval decreases until on April 18 the two objects will be in conjunction, Mercury being about 3° 20′ N. of Venus. Mercury will then appear on the north-west side of Venus, but is likely to be much fainter than before elongation, as he rapidly loses brightness owing to the crescent-phase which his disc assumes. The following are the times of setting of the sun, Mercury and Venus, and the intervals at which Mercury sets after the sun:—

Date 1898.	Sun sets.	Mercury sets.	Venus sets.	Mercury sets after sun.
	h. m.	h. m.	h. m.	h. m.
April 5	6 38	8 28	7 45	1 50
6	6 40	8 33	7 48	1 53
7	6 41	8 37	7 51	1 56
8	6 43	8 42	7 54	1 59
9	6 44	8 46	7 58	2 2
10	6 45	8 48	8 1	2 3
11	6 46	8 49	8 4	2 3
12	6 48	8 51	8 7	2 3
13	6 50	8 52	8 10	2 2
14 ...	6 51	8 53	8 14	2 2
15	6 53	8 53	8 17	2 0
16	6 55	8 52	8 20	1 57
17	6 57	8 51	8 24	1 54
18	6 59	8 48	8 27	1 49

The conjunction of Mercury and Venus on April 18, at about 5h., does not appear to be mentioned in the *Nautical Almanac*.

COMET PERRINE.—Dr. F. Ristenpart has calculated the elements and ephemeris of this comet from the observations made on March 19, 21 and 22. These, as given in Circular No. 3 from Kiel, are as follows:—

Elements.

T = 1898 March 18·501. Berlin Mean Time.

$$\left.\begin{aligned} \varpi &= 48^\circ\ 47'\cdot 1 \\ \Omega &= 263\ 16\cdot 4 \\ i &= 72\ 44\cdot 7 \end{aligned}\right\} 1898\cdot 0$$

$\log q = 0\cdot 04316$

Ephemeris for 12h. Berlin Mean Time.

1898.	α (h. m. s.)	δ (° ′)	log Δ	Br.
March 31 ...	22 3 0	+28 24·8	0·2019	1·00
April 2 ...	11 30	30 22·0		
4 ...	20 14	32 16·4	0·2054	0·99
6 ...	29 12	34 7·8		
8 ...	22 38 24	+35 55·0	0·2110	0·89

We may mention that the elements calculated by Messrs. Hussey and Perrine are almost identical with those given above.

At the time of this comet's discovery its diameter was 2′, with a strong condensation, and a tail of length equal to 1°. It was then of the 7th magnitude.

TWO NEW VARIABLE STARS OF SHORT PERIOD.—Herren G. Müller and P. Kempf contribute some interesting data to the current number (No. 3483) of the *Astronomische Nachrichten*, relative to the two new variables of short period which were originally discovered during the series of zone observations for the second part of the Potsdam Photometric Durchmusterung. These two stars are BD + 20°·4200 and BD + 28°·3460, or, as they have been named, U Vulpeculæ and ST Cygni respectively.

The first of these stars, whose position for 1900 is R.A. 19h. 32m. 15s., declination + 20° 6′·6, has a period of nearly eight days, the light curve varying from mag. 6·9 or 7·0 at maximum to 7·6 at minimum; the epoch for the calculation of the maxima being 1897 October 2·47 Greenwich mean time. The light curve shows small secondary variations both in the ascending and descending portions, the rise to maximum and fall to minimum occupying equal intervals of time.

The second variable, whose position for 1900 is R.A. 19h. 40m. 49s., declination + 29° 1′·2, has a period of 3·844 days, the magnitudes at maximum and minimum being 6·6 and 7·4 respectively. The dates of maxima can be calculated from the epoch (maximum) 1897 October 4·66 Greenwich mean time + 3·844 E. In the case of this star the curves on either side maximum are not equal, but the rise to maximum comprises less time than the fall to minimum. The former occupies only 0·9 days, while the latter takes 2·9 days. The curve is described as similar to *δ* Cephei. The observations suggest that on the downward side of the curve, 1·75 days after the maximum, the light becomes stationary for a short period of time, afterwards decreasing to the next minimum.

VARIABLES AND THEIR COMPARISON STARS.—Variable star observers may be glad to know that Prof. E. C. Pickering is able to furnish the photometric magnitudes of a great many comparison stars for long-period variables, and that he will communicate the information in advance of publication should any one require it (*Harvard College Observatory Circular*, No. 27). Sequences of comparison stars have been selected for about one hundred variables, stars brighter than the tenth magnitude having been measured on at least three nights with the meridian photometer, and those from the eleventh to the thirteenth magnitude on two nights with the photometer having achromatic prisms. Observations are already completed for the following stars:—T Andromedæ, T Cassiopeiæ, R Andromedæ, S Ceti, S Cassiopeiæ, R Piscium, R Arietis, T Persei, *o* Ceti, S Persei, R Ceti, U Ceti, R Tauri, S Tauri, R Aurigæ, U Orionis, R Lyncis, R Geminorum, S Canis Minoris, R Cancri, S Hydræ, T Hydræ, R Ursæ Majoris, X Virginis, R Comæ, T Virginis, Y Virginis, T Ursæ Majoris, R Virginis, S Ursæ Majoris, U Virginis, R Hydræ, S Böotis, R Camelopardali, U Herculis, W Herculis, R Ursæ Minoris, R Draconis, *χ* Cygni, S Cygni, R Delphini, U Cygni, V Cygni, T Aquarii, T Cephei, S Cephei, SS Cygni, S Aquarii, R Pegasi, S Pegasi, R Aquarii, and R Cassiopeiæ.

Prof. Pickering adds that the brightness of each of these variables is being determined monthly by Argelander's method, and it would be a good thing if other observers would reduce their observations to the same scale of magnitudes, as then the desired uniformity in results would be obtained.

The variability of the star in Aquila, R.A. 19h. 33·3m., Decl. + 11° 29′ (1900), announced recently by the Rev. T. D. Anderson, has been corroborated by an examination of the Harvard photographs. Measures of fifty-seven negatives gave the maximum brightness 9·2, and minimum less than 12·9. The variations can be closely represented by the formula J.D. 2411550 + 330 E.

CONCAVE GRATINGS FOR STELLAR PHOTOGRAPHY.—Some experiments have been carried on quite recently at the Johns Hopkins University to investigate the value of the use of concave gratings for stellar spectroscopy, and the results obtained bid fair for further trials (*Astrophysical Journal*, vol. vii. No. 3, March). The methods originally suggested by Prof. Rowland have been developed; Dr. Poor has derived the formulæ, and directed the construction of the apparatus, while Mr. Alfred Mitchell has made the experiments and photographs. The method finally adopted was the direct one, the grating being the objective and spectroscope combined; the light from the star was thus reflected directly from the grating to the photographic plate. The best position for general work was found to be that in which the centre of the photographic plate falls on the axis of the grating. From the simplified general equation

$$r = \frac{\rho}{1 + \cos \nu}$$

in which ρ is the radius of curvature of the grating, R and v the spherical coordinates of the light source, and r and μ those of the curve on which the spectra are brought to a focus (R being ∞ and $\mu = 0$), it was found that those parts of the spectra where $\cos \mu$ could be assumed equal to unity, were brought to a focus on a circle whose radius is given by the above equation. The equation really represents a parabola, but within certain limits the spectrum may be considered normal. For a grating of medium dispersion, the entire spectrum will be practically normal; but with one giving larger dispersion, as a Rowland 21-foot, the scales of the middle and end differ by one and one-half parts in a thousand at a distance of 3° from the axis. It is necessary, therefore, that parabolic curved photographic plates must be used, but within certain limits they may be circular. In the experiments a small Rowland concave grating, of 15,000 lines to the inch, radius of curvature one metre, and ruled surface 1 × 2 inches, was employed, the photographic plates being bent to the proper radius. The spectra of Sirius, Capella, and Rigel obtained were 5 cm. long, and from 0·1 mm. to 1·5 mm. broad, and showed many lines.

Thus with an exposure of forty minutes, the spectrum of Sirius showed "16 hydrogen, H and K lines, and 15 other distinct fine lines." Capella, with forty minutes' exposure, gave F.G.h.H.K., and about fifty fine lines. It may be mentioned that these experiments were made on the fifth floor of the Physical Laboratory, "subject to the jar of street-cars and city traffic, as well as to dust and to the glare of electric lights," so that the results were not obtained under the *best* conditions.

A CATALOGUE OF 636 STARS.—No. 4 of the *Mittheilungen der Hamburger Sternwarte* contains a catalogue of stars observed by Herr W. Luther in the years 1885–92 with the meridian circle of the Hamburg Observatory. The observations in R.A. were made after the eye and ear method: those for declination by bringing the stars between two horizontal wires. The positions have all been reduced to the year 1885, and a comparison is made with the catalogue of the Astronomische Gessellschaft Zonen.

THE PREPARATION OF MARINE ANIMALS AND PLANTS AS TRANSPARENT LANTERN-SLIDES.

AT the request of the editor of NATURE, I give an abridged account of my essay in the volume of original researches published to commemorate the establishment of the Sheffield University College by Royal Charter in 1897. I shall confine myself mainly to the animals shown in the reproductions from four of the series of photographs taken by Mr. J. E. Atkinson, of our College, from some of my slides. Though on the whole these reproductions show the general facts fairly well, much of the minute detail is unavoidably lost, which is quite distinct when the mounted animals or photographs are somewhat magnified.

It is about eleven years ago that I first attempted to prepare lantern-slides with marine animals. At first I did not mount them in balsam, but very soon found that this is in almost every case not only desirable but even essential, since they so readily become mouldy, sometimes are attacked by mites, and are often far too opaque. Some also scale off from the glass and break to pieces, unless mounted. The success of the preparations depends almost as much on the proper mounting with balsam as on anything else, and sometimes the only way to get excellent results is to mount several, and pick out the best, which perhaps cannot be known until the specimens are finally mounted in balsam.

The methods necessary in mounting vary greatly in the case of different animals. Often little else is wanted than to arrange them properly on a lantern-glass, so that they touch it more or less completely all over their under surface, and then to drain and dry them. Many readily adhere round the drying edges, before the central parts are dry; and being thus fixed, they do not shrink laterally on further drying, but merely become thinner. On finally drying completely they may partially scale off, and it may be desirable to gum them down in one or more places, lest they should become loose when mounted in the balsam. There are a few animals that will not adhere at all to the glass, and yet shrink greatly. This circumstance has so far prevented me from making satisfactory slides of *Actiniæ*. I have succeeded with every other group.

Few animals are more easy to prepare than small flat fish like soles and dabs, 2 or 2½ inches long. These are killed by putting them into dilute alcohol, and arranged on the glass as soon as dead, whilst still limp. The chief matter is to arrange out the fins neatly. These soon dry, and adhere well; but in order that the side near the glass may keep flat, it is desirable on further drying to adopt a plan which I find most useful in many other cases. Very few, if any, animals will adhere in an objectionable manner to thin paper soaked with bees-wax, and, having laid such over the animal, pressure can be applied. What is wanted is that this pressure should be fairly uniform, and not merely on the thick parts. This is easily done by having a stout lantern glass covered by two or three thicknesses

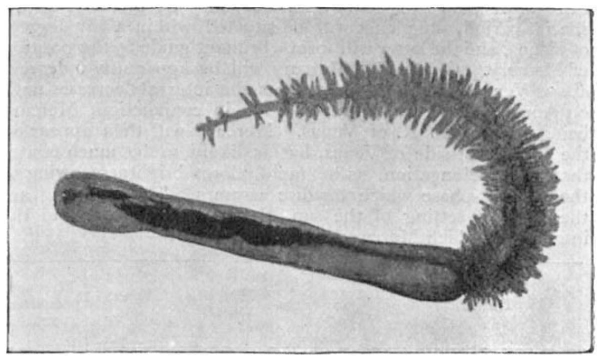

FIG. 1.—*Priapulus* in natural state.

of fine thin flannel, which is pressed down by a smaller or larger weight, so regulated as not to crush or distort the animal, but rather to retain as much as possible the natural shape and show the internal structure. The animal then dries through this flannel, and at the same time keeps sufficiently flat on the glass. Finally, any specially high parts can be pressed down by using a flat glass without flannel and a heavier weight.

A considerable variety of marine worms can be made into most excellent transparent slides, showing not only their general shape and colour, but also much of their internal structure. *Sabella* may be named as a specially good example. Such animals should be killed by keeping them for a short time in dilute alcohol. The aim should be to dry them before partial decomposition sets in and destroys the small blood-vessels. If all goes on well it is possible to dry and permanently preserve such worms as *Nereis*, so as to show not only the chief blood-vessels but even the smallest branches, and the blood may retain its red colour for years without any apparent change.

As an example of an animal mounted without staining, I give in Fig. 1 a reproduction from *Priapulus*. It should be killed by putting it into fresh water, and left in it so long that the body just begins to get limp. It can then be easily arranged on the glass, and adheres fairly well without lateral contraction. If mounted at once or previously kept in alcohol the body is too hard and will not adhere to the glass, and on drying contracts so much laterally as to become very unlike the living animal. The internal anatomy and general structure are best seen by cutting the animal open from end to end, and staining the whole with Beale's carmine or Kleinberg's hæmatoxylin. When thus