

a higher voltage than that usually employed in the Poulsen system—400 to 500 volts—may be found necessary, but otherwise the apparatus installed does not differ very considerably from that at other stations. A great many improvements have been made in the different parts of the apparatus since Mr. Poulsen gave a demonstration of his system at the Queen's Hall, a full account of which appeared in these columns at the time (*NATURE*, vol. lxxv., pp. 105, 106), and the transmitter at Knockroe station has been designed to transmit waves 3000 to 5000 metres long, and capable of giving the desired wave-length without any variation. The company has also a new thermo-electric detector with which it expects to print Transatlantic messages, and in consequence to be independent of telephonic reception. The Poulsen-Pedersen "ticker" method of reception also has been adapted to working a relay and a Morse inker. This "ticker" receiver has been greatly improved upon, and the latest form recently established a long-distance record, receiving a ship signal at a distance of 2060 miles.

THE theory of the formation of the rainbow has been worked out more completely than hitherto by Prof. T. Tanakadate in the August number of the Proceedings of the Tokyo Mathematico-Physical Society. Taking account of the loss of light on reflection and refraction, and of the effect of polarisation, the author follows Airy's treatment, and obtains an expression for the intensity of light of each of the four bows due to drops of a particular size, in a form suitable for numerical calculation.

IN the *Physical Review* for October Prof. W. S. Franklin and Mr. L. A. Freudenberger describe an arrangement they have found very satisfactory for measuring the resistance of electrolytes without the use of electrodes. The electrolyte is placed in an annular glass tank which encircles the iron of a small transformer the primary of which forms one arm of a resistance bridge. In the corresponding arm of the bridge a similar transformer is placed, and the resistance of its secondary adjusted until the bridge is balanced, when an alternating current is supplied to it. The apparatus is so simple and the results are so good that electrodeless methods should replace some of those at present in use.

THE *Physikalische Zeitschrift* for October 24 contains abstracts of many of the papers read at the Versammlung deutscher Naturforscher und Aerzte in Dresden in September. The meeting, owing largely to the exertions of Prof. Hallwachs, was very successful. Of many papers of great interest, two may be mentioned. Drs. E. Gehrcke and O. Reichenheim have measured the change of wave-length of the light of the anode rays when they are seen end on, and have shown that when the anode is of sodium, lithium, or strontium the rays consist of molecules of these metals thrown off from the anode. Drs. Scheel and Heuse have measured the expansion of platinum between  $-183^{\circ}$  C. and  $+16^{\circ}$  C., and find as the mean result of three determinations by the two-microscope method and by Fizeau's method  $1602 \times 10^{-4}$  cm. per centimetre.

ARRANGEMENTS are being made by which the Proceedings of the London Mathematical Society may be subscribed for by the public at a uniform price per volume, the volumes to be supplied either in parts, as issued, or in volumes at the option of the subscriber. The arrangement will begin to take effect with the next volume, the first part of which will probably be published early in January, 1908.

THE *Anglo-German Courier* of November 23, published by the *African World*, is entirely devoted to an illustrated description in German and English of the recent visit of

the German Emperor and Empress to London. This is the final number of that periodical, which was started to promote friendly feelings between the people of Great Britain and Germany—a mission that may now be regarded as accomplished.

Two well-illustrated and conveniently arranged catalogues have been received from Messrs. Casella and Co. One deals with self-recording instruments for scientific, engineering, and industrial purposes, and the other provides descriptions of anemometers, air meters, and wind-direction instruments. The catalogues deserve the attention of meteorologists, teachers of geography, and other observers.

A SECOND English edition, which has been re-written, of Prof. A. F. Hollemann's "Text-book of Organic Chemistry," has been published in this country by Messrs. Chapman and Hall, Ltd., and by Messrs. John Wiley and Sons in New York. The first English edition was reviewed in *NATURE* of June 18, 1903 (vol. lxxviii., p. 149), and it will suffice to say that the present volume is, like the former, the translation of Dr. A. Jamieson Walker, and is from the third Dutch edition. The translator has had the cooperation of the author and the assistance of Dr. Owen E. Mott.

MESSRS. J. M. DENT AND CO. have published the first number of the *New Quarterly*, a review of science and literature, edited by Mr. Desmond MacCarthy. The price of each issue is 2s. 6d. net. If science is to receive the same amount of attention in subsequent numbers, the review should become popular in the scientific world. Of the nine articles included in the present issue, four deal with various departments of scientific work. Lord Rayleigh, P.R.S., discusses the question, "How do we perceive the direction of sound?" The Hon. Bertrand Russell writes on the study of mathematics; the Hon. R. J. Strutt, F.R.S., deals with the question, Can we detect our drift through space? and Mr. G. A. Paley contributes an article on biology and politics.

#### OUR ASTRONOMICAL COLUMN.

##### ASTRONOMICAL OCCURRENCES IN DECEMBER:—

- Dec. 1. 2h. Mercury at greatest western elongation ( $20^{\circ} 20'$ ).  
 3. 18h. 30m. Mercury  $4^{\circ}$  W. from the Moon.  
 7. 11h. 42m. Minimum of Algol ( $\beta$  Persei).  
 10-13. Epoch of the Geminid meteoric shower.  
 10. 17h. Mars in conjunction with Moon. (Mars  $3^{\circ} 25' S.$ ).  
 10. 8h. 31m. Minimum of Algol ( $\beta$  Persei).  
 11. 22h. Venus in conjunction with Uranus (Venus  $0^{\circ} 59' S.$ ).  
 12. 3h. 35m. to 4h. 28m. Moon occults 30 Piscium (mag. 4.7).  
 „ 5h. 28m. to 6h. 42m. Moon occults 33 Piscium (mag. 4.6).  
 13. 5h. 20m. Minimum of Algol ( $\beta$  Persei).  
 „ 3h. 54m. to 4h. 44m. Moon occults 20 Ceti (mag. 4.9).  
 15. 2h. 55m. to 3h. 47m. Moon occults  $\xi^2$  Ceti (mag. 4.3).  
 17. 12h. 53m. to 13h. 18m. Moon occults  $\delta^1$  Tauri (mag. 3.9).  
 „ 14h. 9m. to 15h. 18m. Moon occults  $\delta^3$  Tauri (mag. 4.2).  
 20. 22h. Vesta in conjunction with the Moon. (Vesta  $0^{\circ} 59' S.$ ).  
 22. 12h. Sun enters Capricornus. Winter commences.  
 23. 2h. 6m. Jupiter in conjunction with Moon (Jupiter  $1^{\circ} 53' S.$ ).  
 30. 10h. 14m. Minimum of Algol ( $\beta$  Persei).  
 31. 3h. Mars in conjunction with Saturn. (Mars  $1^{\circ} 50' N.$ ).

**SATURN'S RINGS.**—Further observations of the invisibility of Saturn's rings during the recent passage of the earth through the plane containing them are recorded in No. 4215 (p. 249, November 17) of the *Astronomische Nachrichten*. According to the calculations of Prof. B. Peter, of Leipzig, the second disappearance should have taken place on October 4. M. Schaer, of Geneva, saw the rings as a luminous line without any difficulty on October 2, using a reflector of 140 mm. aperture. On October 3 the weather was unfavourable, but the rings were still visible, with a reflector of 160 mm. aperture, at 6h. 45m. on October 4. At 7h. 30m., however, the last trace of the bright line had disappeared. Continuing the observations with a refractor of 34 cm. aperture, at 7h. 45m. the rings could be seen momentarily, but were totally invisible at 8h. Bands of a brownish tint were several times seen on each side of the trace of the rings.

Dr. Hassenstein made observations with the 13-inch refractor at Königsberg on October 1 and 3. At 8h. (G.M.T.) on the former date the rings were undoubtedly visible, but at 5h. (G.M.T.) on October 3 they were invisible; at 10h. the rings could not be seen, but dark streaks and the shadow of the rings were visible. Dr. Hassenstein concludes that the passage of the earth through the plane of the rings took place at oh. (G.M.T.) on October 3.

**PHOTOGRAPHS OF JUPITER.**—The November number of the *Bulletin de la Société astronomique de France* (p. 481) contains a reproduction from a photograph of Jupiter taken by M. Quéniisset at the Juvisy Observatory on March 2. The instrument employed was the Viennet objective of 0.16 m. (6.3 inches) aperture and 2.9 m. (114 inches) focal length, and about 100 exposures were made. The resulting images show many details, and some of them are remarkably well defined, presenting nearly all the details seen with the 240 mm. equatorial at the same time. On some of the photographs the Great Red Spot is even more apparent than in the visual observation. A reproduction from a drawing made forty minutes earlier shows how well the details are registered on the photograph.

The same journal contains reproductions from Prof. Lowell's photographs of Mars taken on July 11 and 28 respectively.

**FINAL DESIGNATIONS OF RECENTLY DISCOVERED VARIABLES.**—No. 4212 of the *Astronomische Nachrichten* (p. 181, November 7) contains a table giving the final designations of recently discovered variable stars allotted by the commission of the A.G. catalogue for variable stars. The list gives the provisional and final designations, the position for 1900, the precession, the chart place, and the range of magnitude for each variable, and includes twenty-four variable stars of long period, eleven irregular and twenty-five short-period objects, and thirteen variables of the Algol type.

**A LARGE ERUPTIVE PROMINENCE.**—Four excellent photographs of a large eruptive prominence, taken by Mr. Fox on May 21 with the Rumford spectroheliograph of the Yerkes Observatory, are reproduced in No. 3, vol. xxvi., of the *Astrophysical Journal* (October, p. 155). On the first photograph the prominence was seen strongly attached to the sun's limb, but on the succeeding plates it is shown as greatly altered in form and considerably weakened in its lower parts. Thirteen plates were exposed, using the H line, between 4h. 2m. and 5h. 59m., and during that period the height of the prominence, as measured on the photographs, varied as shown in the following table:—

G. M. T.		Height			G. M. T.		Height		
h.	m.	"	kms.	miles	h.	m.	"	kms.	miles
4	2	228.6	167,800	103,200	5	44	370.4	271,900	168,850
5	1	280.5	205,800	126,800	5	55	423.3	310,700	192,950
5	43	431.8	316,900	196,800	5	59	412.7	303,000	188,150

**SURVEYS OF NEBULÆ.**—Future workers on the possible changes in nebulae or in the stars involved in such masses will find the exhaustive surveys of the Andromeda, the  $\xi$  Persei, and the 12 Monocerotis nebulae, recently carried

out at the Astrophysical Institute, Königstuhl-Heidelberg, of invaluable assistance.

The results of these surveys are published at length in the *Publikationen* of the institute, No. 1, vol. iii., containing those obtained by Herr P. Gotz from his researches on the Andromeda nebula, and No. 11, vol. ii., embodying Herr Lohnert's results concerning the star-densities of the nebulae near  $\xi$  Persei and 12 Monocerotis respectively. The former treats of 1259 stars involved in the great spiral nebulae, and gives the position and magnitude of each star for the equinox of 1900; then follows a catalogue of fifty-four recognisable points in the nebula which have been measured, and of which the positions (1900) are given. The treatise concludes with a detailed description of the nebula, a discussion of the relation of the star-density to the form and brightness of the gaseous mass in various parts, and the results of a statistical investigation of the distribution of the stars. Among other results, Herr Gotz finds that all the stars concerned are fainter than the ninth, whilst sixty-four are fainter than the sixteenth, magnitude. The greatest number, taken in magnitudes, are between magnitude 14.0 and 15.0, there being 316 of this class.

Herr Lohnert's work deals similarly with the distribution of the stars in the other two nebulae named, the results being given in tables and also shown diagrammatically, as are those appertaining to the Andromeda research.

#### NEW GEOLOGICAL SURVEY MAPS AND MEMOIRS.<sup>1</sup>

(1) **THE** Geological Survey is making rapid progress in the publication of its re-survey of Cornwall; the memoir on the geology of Falmouth and Truro (Sheet 352) has already been reviewed in *NATURE*, and that on the Newquay district was described in the issue for May 16. Now we have the Penzance sheet of the map (adjoining that of Falmouth), and an explanation thereof.

This area includes not only the "Land's End district," including Penzance and St. Ives, but also the neck of land which unites it to the rest of Cornwall. The district possesses several interesting physical features, for the granite areas up to a height of about 420 feet above the sea exhibit smooth and undulating contours, the ground forming a dissected plateau and rising gently to the foot of a well-marked bluff, which is an ancient sea-cliff. The age of this plateau cannot be fixed for certain, and though Mr. Reid seems inclined to refer it to early Pliocene time, he admits that it may be much older (? Eocene), and may only have been re-modelled and graded in Pliocene times. The low-lying neck of land which lies between Mounts Bay and St. Ives Bay has also an interesting history; originally it may have been part of an Eocene river-valley, but in Pliocene times it was a strait, and the Land's End district was then an island.

The most important rock-masses delineated on the colour-printed map and described in the memoir are:—(1) the three members of the Lower Palæozoic system, which are probably of Ordovician age, but have received local names in Cornwall—the Mylor series, the Falmouth series, and the Portsatho series; (2) the masses of intrusive igneous rock—granite and greenstone—which have been thrust through these ancient strata.

The contact-alterations produced by these successive intrusions are fully explained. The greenstones (diabasic rocks) are earlier than the granite, and their effects are different from those produced by the latter. Each area of granite is surrounded by an aureole or belt of altered rock, and the border of the granite itself has been converted into schorl-rock (quartz and tourmaline). It is in these altered belts and in the adjacent parts of the granite that the principal mineral wealth of the country has been found.

There is a chapter on the elvans or dykes of quartz-

<sup>1</sup> (1) "The Geology of the Lands End District." By Clement Reid, F.R.S., and Dr. J. S. Flett, with contributions by Messrs. Wilkinson, Dixon, Pollard, and MacAlister. Pp. viii+158; with six plates. (London: H.M. Stationery Office, 1907.) Price of memoir 3s. 6d., of map 2s. 6d.

(2) "The Geology of the Country around Hungerford and Newbury." By H. J. O'borne White. Pp. iv+150; illustrated. (London: H.M. Stationery Office, 1907.) Price of memoir 2s. 6d., of map 1s. 6d.