

THE third volume of the *Photographic Recorder* is completed by the June number. The volume is admirably illustrated, and contains a valuable record of all that has been done in connection with photography during the past year.

MESSRS. W. F. BROWN AND CO., Montreal, are printing for the Government of Canada "Contributions to Canadian Palæontology," by J. F. Whiteaves, Palæontologist and Zoologist to the Canadian Survey. Part iii. of vol. i. has just been issued. It deals with the fossils of the Devonian rocks of the Mackenzie River basin.

A NOTE by M. Moissan upon the action of fluorine upon phosphorus trifluoride is communicated to the current number of the *Bulletin de la Société Chimique*. A short time ago M. Moissan described a mode of preparing the gaseous trifluoride of phosphorus. The method consisted in gradually adding phosphorus tribromide to warm zinc fluoride, washing the gas first through water, in which it is sparingly soluble, and afterwards drying by means of pumice moistened with sulphuric acid and collecting over mercury. In order to study the action of free fluorine gas upon phosphorus trifluoride as thus prepared, a special piece of apparatus was devised, constructed entirely of platinum and fluor-spar. It consisted of a platinum tube fifteen centimetres long, closed at each end by transparent plates of fluor-spar, through which the phenomena attending the reaction could be observed. The platinum tube was fitted with three side tubes, two of which were placed opposite each other about the centre of the tube, and served for the admission of the fluorine and phosphorus trifluoride respectively; the third or exit tube was of somewhat wider diameter than the entrance tubes, and was bent so as to serve as a delivery tube over a mercury trough. The whole apparatus was first filled with phosphorus trifluoride, and then the fluorine entrance tube was connected with M. Moissan's now well-known apparatus for the preparation of fluorine. As soon as the fluorine came in contact with the phosphorus trifluoride a yellow flame was produced and intense action occurred, with the production of phosphorus pentafluoride. The flame appears to be a comparatively low temperature one. On collecting the gaseous product over mercury, it was found to consist very largely of phosphorus pentafluoride, readily capable of absorption by water, and a small proportion of unaltered trifluoride which could be absorbed by potash. This reaction of fluorine with trifluoride of phosphorus is thus analogous to the conversion of phosphorus trichloride into pentachloride by the action of gaseous chlorine. An interesting reaction has also been observed by M. Moissan to occur between spongy platinum and these gaseous fluorides of phosphorus. When pentafluoride of phosphorus was passed over spongy platinum gently heated in a platinum tube, a partial decomposition was found to occur, and the issuing gas was admixed with trifluoride, and also with free fluorine. The existence of the latter in the free state was abundantly shown by its action upon crystallized silicon. When, however, the temperature of the tube was raised to dull redness, a volatile compound, containing platinum, phosphorus, and fluorine, was obtained, which was carried forward by the gaseous current and deposited in crystals in the cooler portion of the tube. When this crystalline substance is heated, it melts to a viscous liquid, which decomposes at a bright red heat. Analyses show that it is a fluophosphide of platinum, probably of the composition  $2PF_3 \cdot PtF_4$ , analogous to one of the similar chlorine compounds discovered by Schutzenberger,  $2PCl_3 \cdot PtCl_4$ . M. Moissan expresses the hope that by employing some such dissociating compound as this a purely chemical isolation of fluorine may some day be achieved.

THE additions to the Zoological Society's Gardens during the past week include three Stoats (*Mustela erminea*), European, presented by Mr. J. S. B. Borough; an Ocelot (*Felis pardalis* ♂) from South America, a Red-tailed Buzzard (*Buteo borealis*), a

Laughing Gull (*Larus atricilla*) from North America, presented by Sir Henry Blake, K.C.M.G.; a Tawny Eagle (*Aquila nevioides*) from Africa, presented by Mr. K. G. Hay; a Blue-fronted Amazon (*Chrysotis astiva*) from South America, presented by Mrs. A. G. Mussey; a Grey-breasted Parrakeet (*Bolborhynchus monachus*) from Monte Video, presented by Mr. J. R. George; four Common Quails (*Coturnix communis*), British, presented by Mr. J. C. Gie; two Chinese Geese (*Anser cygnoides*) from China, presented by Captain Creaghe; an Egyptian Gazelle (*Gazella dorcas*) from Egypt, two Abyssinian Guinea Fowls (*Numida ptilorhyncha*) from Abyssinia, two Blossom-headed Parrakeets (*Palæornis cyanocephalus*) from India, a Meyer's Parrot (*Psephenops meyeri*) from East Africa, three Tibetan Crossoptilons (*Crossoptilon tibetanicum*) from Tibet, a Temminck's Tragopan (*Cerionis temminckii* ♂) from China, deposited; a Vinaceous Amazon (*Chrysotis vinacea*), from Brazil, purchased; two Heloderms (*Heloderma suspectum*) from Arizona, U.S.A., received in exchange; a Burrhel Wild Sheep (*Ovis burrhel*), two Mule Deer (*Cariacus macrotis* ♂ & ♀), a Bennett's Wallaby (*Halmaturus bennetti* ♂), two Impeyan Pheasants (*Lophophorus impeyanus*), bred in the Gardens.

#### OUR ASTRONOMICAL COLUMN.

TRANSIT OF MERCURY.—The Government Astronomer at Sydney (Mr. C. Todd, C.M.G.) writes as follows regarding the transit of Mercury:—Good observations of the transit of Mercury were secured at the Observatory, on Sunday the 10th. At the ingress the conditions were extremely favourable, the sun's limb and the planet when projected on the sun's disk being exceedingly well and sharply defined, but at the egress the sun's limb was boiling and the planet was somewhat woolly, rendering it difficult to fix the exact time of internal contact. I observed with the 8-inch equatorial refractor, assisted by Mr. Cooke; and Mr. Sells observed with an 8-inch reflector.

The observations were as follow:—

Observer—C. Todd. Power 125.

INGRESS.—*External Contact.*

	h.	m.	s.
A. About one-third on ... ..	9	10	11

*Internal Contact.*

B. Contact tangential ... ..	9	13	6.5
C. Black drop still clinging to limb ... ..	9	13	22.0
D. Rupture of black drop; planet clear of limb	9	13	49.5

EGRESS.—Power 80. *Internal Contact.*

E. Formation of black drop touching limb ...	2	0	14.1
F. Tangential contact ... ..	2	0	43.8

*External Contact.*

Indentation still visible ... ..	2	4	14.8
„ „ barely noticeable ... ..	2	4	25.8
Sun's limb complete ... ..	2	4	31.8

Observer—Mr. Sells.

INGRESS.—*Internal Contact.*

a. Planet nearly on disk, but not quite ...	9	12	51.3
b. True contact, momentarily seen ... ..	9	13	13.2
c. Planet pear-shaped; point of pear touching sun's limb ... ..	9	13	50.7

EGRESS.—*Internal Contact.*

a. Pear-shaped contact ... ..	2	0	34.6
b. True contact ... ..	2	1	28.6

*External Contact.*

c. Last seen; or sun's limb judged to be complete... ..	2	4	48.6
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OBSERVATIONS OF TELLURIC LINES.—The May number of the *Memorie della Società degli Spettroscopisti Italiani* contains a paper by G. B. Rizzo on the telluric lines in the solar spectrum. Signor Rizzo has compared the intensities of the lines A, B, and α at Bosco Nero and on the Rocciamelone Mountain. In order to express the variation in the mass of air (ε) traversed, calculations have been made of the values at the different altitudes of P sec ζ, where P is the atmospheric pressure, and ζ is the sun's zenith distance. The following is a comparison of the

values of  $\epsilon$  and the mean intensities of the lines at the two stations. The scale of intensity is such that the C line = 10, and the line at 651.55 is unity.

Place of observation.	Altitude.	$\epsilon$ .	Intensities of the lines		
			A.	B.	$\alpha$ .
Bosco Nero ...	1623 metres ...	1046.2 ...	50	28	3.2
Rocciamelone ...	3538 ,, ...	846.2 ...	40	20	2.2

A comprehensive bibliography of the subject accompanies the paper.

**SIMILARITY OF THE ORBITS OF CERTAIN ASTEROIDS.**—In the *Publications of the Astronomical Society of the Pacific*, No. 15, 1891, Prof. Daniel Kirkwood gives a list of twenty-four asteroids arranged in ten groups, according to the similarity of their orbits. The following are the groups:—

I.	84 Clio.	VI.	3 Juno.
	115 Thyra.		97 Clotho.
	249 Ilse.		203 Pompeia.
II.	19 Fortuna.	VII.	200 Dynamene.
	79 Eurynome.		278 Pauline.
III.	134 Sophrosyne.	VIII.	116 Sirona.
	193 Ambrosia.		1 Ceres.
IV.	37 Fides.	IX.	245 Vera.
	66 Maia.		86 Semeele.
V.	218 Bianca.	X.	106 Dione.
	204 Callisto.		121 Hermione.
	246 Asporina.		87 Sylvia.

Jupiter is held responsible for the perturbations necessary for the development of these groups of asteroid orbits from the primitive solar nebula.

**ASTRONOMICAL AND PHYSICAL SOCIETY OF TORONTO.**—The first number of the Transactions of this Society (1890-91), with which is also included the first Annual Report, has recently been issued. It contains abstracts of several interesting papers read at the meetings, among which is one on the disappearance of Saturn's rings, by Dr. Morrison, two by Mr. Shearman on coronal photography, and two by Mr. A. F. Miller on the spectroscope. A drawing of a sun-spot observed on November 30, and a hydrogen prominence measured on August 3, forms the frontispiece of the number.

**A NEW ASTEROID (311).**—On June 11 M. Charlois discovered the 311th asteroid. Its magnitude was 13.

### THE ROYAL SOCIETY CONVERSAZIONE.

**THE Ladies' Soirée** of the Royal Society was held on the 17th instant, and was very numerously attended. The following were among the chief objects exhibited:—

Finger-prints as a means of identification, exhibited by Mr. Francis Galton, F.R.S. (1) Specimens showing the nature and character of the patterns that are formed by the papillary ridges on the bulbs of the fingers, as well as on the rest of the inner surfaces of the hands and feet. (2) Evidence of the persistence of the patterns in their essential details, however minute, from infancy to age. (3) Method of indexing a collection of finger-prints so that a determination may be quickly arrived at, whether the duplicate of a given specimen is contained in it or not. (4) Process of making finger-prints, exhibited in operation.

Registration of colours in numbers, and apparatus to show the greater sensitiveness of the eye to different colours, exhibited by Captain Abney, C.B., F.R.S., and General Festing, F.R.S. The registration consists in referring any mixed colour to a single wave-length, and a percentage of white light. With the apparatus to show the greater sensitiveness to the eye of different colours, a comparison is made by placing two colours side by side, which are at ordinary intensity of equal luminosity, and by then diminishing the intensity of each equally.

An optical illusion, exhibited by Prof. Silvanus P. Thompson, F.R.S. On two rotating disks, A and B, are spiral patterns in black and white, which seem to move radially inwards and outwards respectively. Let the observer gaze fixedly for about one minute at the centre of A, and then suddenly transfer his gaze to any object—say the face of a friend—he will see that object apparently enlarging from the middle outwards. After similarly gazing for a minute at B, and then looking at any object, he will see it apparently diminishing.

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Discharge without electrodes through gases, exhibited by Prof. J. J. Thomson, F.R.S. The discharge tube in these experiments is made to form the secondary of what is essentially an induction coil, and the discharge passes round a closed current in the gas. Experiments *a, b, c, d* show various forms of the discharge in tubes and bulbs. *e* shows the residual glow produced when the discharge passes through oxygen. *f* shows the action of a magnetic field on the discharge; along the lines of force the discharge is facilitated, while at right angles to them it is retarded. When the magnetic field is "off," the discharge takes place in the bulb, and not in the tube; when the field is "on," in the tube, and not in the bulb. *g* illustrates the stoppage of the discharge when a gas electrically weaker than that in the discharge tube is placed in the neighbourhood of the latter.

A nickel pendulum, illustrating the effect of heat upon the magnetic susceptibility of nickel, exhibited by Mr. Shelford Bidwell, F.R.S. Nickel, which at ordinary temperatures is a magnetic metal, becomes non-magnetizable at about 300° C. A copper disk, to which a projecting tongue of nickel is attached, hangs like the bob of a pendulum from a double thread, and is deflected to one side by a magnet which attracts the nickel tongue. The heat of a spirit-lamp placed beneath the tongue quickly destroys the magnetic quality of the nickel, so that the magnet can no longer hold it; the bob accordingly falls back and performs an oscillation. On its return to the neighbourhood of the magnet, however, the tongue has cooled sufficiently to be once more attracted, but after a momentary contact it is again released, and the process is repeated. Thus the bob can be kept swinging like the pendulum of a clock.

The maldometer, exhibited by Mr. J. Joly. This instrument is for determining the melting-points of minute quantities of substances, by comparison with bodies of known melting-point. The method consists in measuring the thermal expansion of a ribbon of pure platinum when a minute quantity of a substance, dusted on its surface (and observed through a microscope), is melting. The platinum is heated by a current, and the thermal value in degrees Centigrade of its expansion found by preliminary observations, using bodies of known melting-point. The expansion of the ribbon is read by an electric-contact method. The instrument shown reads a change of 2° C. Range up to 1600° C. about. Quartz may be melted on the maldometer, and most or all of the silicated minerals.

Facsimile drawings of paintings from tombs at Beni Hasan, Upper Egypt, exhibited by Mr. Percy E. Newberry (of the Egypt Exploration Fund). A series of facsimile drawings in colour, executed by Mr. M. W. Blackden, of some of the most interesting paintings on the walls of the tombs of Ameni and Khnumhotep (XII. Dynasty, circa 2500 B.C.), at Beni Hasan, in Upper Egypt. These drawings are the property of the Egypt Exploration Fund.

Instrument for examining the strains in bent glass beams, exhibited by Prof. C. A. Carus-Wilson. There is a steel straining frame in which the beam to be examined is placed; this frame can be moved in any direction in its own plane between two Nicol prisms. The Nicol prisms can be rotated through any required angle. When the beam has been supported in any given manner, load is applied by a screw, and the action of the strained glass on the polarized light enables the precise state of strain all over the beam to be ascertained. The instrument has been used to determine the action of "surface loading," and to show to what extent this action affects the state of strain in beams supposed to obey the Bernoulli-Eulerian theory of flexure.

Cup-micrometer, an instrument for measuring the rate of growth of a plant, exhibited by Mr. Francis Darwin, F.R.S. A thread is attached to the upper end of the plant, passes over a pulley, and is fastened to a weight. The descent of the weight (which is a measure of the growth of the plant) is estimated by adjusting a micrometer screw carrying a small cup of oil, until a needle point on the weight touches the surface of the fluid. The method, a modification of that used by physicists to measure the rise or fall of a fluid surface, was designed by Mr. H. Darwin, of the Cambridge Scientific Instrument Company.

Electrical volatilization of metals, exhibited by Mr. W. Crookes, F.R.S.

Living animals from the aquarium of the Marine Biological Association at Plymouth, exhibited by the Marine Biological Association.

Art metal work, from the factories of Messrs. Tiffany and Co.,