Jackson; and the Development, Structure, and Affinities of the Genus *Equisetum*, by Mr. E. C. Jeffrey. The former paper is occupied by illustrations of the law laid down by the author, that throughout the life of an individual stages may be found in localised parts which are similar to stages found in the young, and the equivalents of which are to be sought in the adults of ancestral groups. The investigations of Mr. Jeffrey lead him to the conclusion that the Equisetales are nearly allied to the Lycopodiales, and that they are descended from the Sphenophyllales, with which they agree closely in all important particulars except the structure of the stele.

MR. MURRAY has in preparation, and will publish as soon as possible, Sir William Crookes' reply to the many criticisms evoked by his address to the British Association last year.

THE monthly meeting of the Edinburgh Mathematical Society was held on Friday, May 12, when "The Treatment of Proportion in Elementary Mathematics" was discussed. Dr. Morgan, President, occupied the chair.

THE 143rd meeting of the Yorkshire Naturalists' Union will be held at Dent, on Whit-Monday, May 22, for the investigation of the valley of the Dee, the northern slopes of Whernside, Gragreth, Holme Fell, and the neighbourhood.

MESSRS. MARION AND CO. have just introduced a new hand camera—the Cut-film Swallow Camera—which has several commendable points. The camera takes thirty flat films, without notches, the size being the ¼-plate–4¼ × 3¼. Its weight loaded with thirty films is only 4 lbs. The lens is a single achromatic lens of the fixed focus type and good covering power.

A NEW section of the second edition of Prof. Ostwald's "Lehrbuch der allgemeinen Chemie" has been published by Mr. Wilhelm Engelmann, Leipzig. The pages included in this Lieferung extend from 605 to 828, dealing with chemical equivalents of the second order. Another section on the same subject will bring the second part of the second volume to an end. The third part of the second volume, which will conclude the work, will be concerned chiefly with special chemical dynamics. A supplement will be published dealing with advances made while the work has been passing through the press.

PROF. GATTERMANN, of Heidelberg, has added another to the list of silicon acids. The new compound, which he terms silicomesoxalic acid, is obtained by leaving the chloride Si_3Cl_8 in a platinum dish exposed to the air. Hydrochloric acid is evolved and the octochloride is slowly transformed into a white amorphous mass of silicomesoxalic acid to which the formula $HO.OSi-Si(OH)_2-SiO.OH$ is ascribed. It is very unstable, and on heating decomposes with a flash. When quite pure and dry, a touch is sufficient to effect this change.

THE additions to the Zoological Society's Gardens during the past week include a Ring-tailed Lemur (*Lemur catta*, ♀) from Madagascar, presented by Mrs. Penn Curzon; a Common Badger (*Meles taxus*, ♀), British, presented by Mr. John N. Docwra; an Angolan Vulture (*Gypohierax angolensis*) from North-west Africa, presented by Staff-Sergeant Patten; a Hoary Snake (*Pseudaspis cana*), a Rough-keeled Snake (*Dasypeltis scabra*), two Rhomb-marked Snakes (*Trimenorhinus rhombeatus*), two Crossed Snakes (*Psammophis crucifer*) from South Africa, presented by Mr. J. E. Matcham; a Common Snake (*Tropidonotus natrix*), British, presented by Mr. E. C. Brook; two Common Marmosets (*Hapale jacchus*) from South-east Brazil, a Reticulated Python (*Python reticulatus*) from the East Indies, a Spiny-tailed Iguana (*Ctenosaura acanthura*) from Central America, a South Albemarle Tortoise (*Testudo vicina*) from the Galapagos Islands, deposited; two Crowned Lemurs (*Lemur coronatus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

PARTIAL ECLIPSE OF THE SUN, JUNE 7.—This eclipse will be visible at Greenwich and throughout Northern Europe and Northern Asia. The Greatest Eclipse will be visible in latitude 67° 18′ N., and longitude 99° 5′ W. of Greenwich, on June 7d. 18h. 34·0m.; the magnitude being 0·611 (sun's diameter = 1). The following table gives the details for British stations, Greenwich mean time being used in all cases except that of Dublin, where local mean time is taken.

Station	Begins	Greatest Eclipse	Ends	Magnitude
	h. m.	h. m.	h. m.	
Greenwich	16 42·8	17 17·4	17 53·4	0·188
Cambridge	16 43·2	17 18·6	17 55·5	0·197
Oxford...	16 42·8	17 18·2	17 55·1	0·200
Liverpool	16 43·8	17 21·5	18 0·9	0·233
Edinburgh	16 45·7	17 25·9	18 7·8	0·263
Dublin...	16 18·6	16 57·3	17 37·6	0·253

At Greenwich and approximately throughout the British Isles the contacts are as follows:—

Angle from North Point	First contact	42°	towards the	West	For *direct* image.
	Last	29°	,,	East	
Angle from Vertex	First	6°	,,	West	
	Last	70°	,,	East	

COMET 1898 *a* (SWIFT).—The following ephemeris is by Herr H. Kreutz, in *Astr. Nach.*, No. 3556:—

Ephemeris for 12h. Berlin Mean Time.

1899.	R.A. h. m. s.	Decl. ° ′	Br.
May 18	22 34 21	+43 42·9	
19	23 37	45 23·1	1·77
20	22 11 40	47 4·2	
21	21 58 20	48 44·5	1·79
22	43 29	50 22·7	
23	26 59	51 56·5	1·79
24	21 8 40	53 23·9	
25	20 48 31	+54 41·8	1·77

During the week the comet passes through Lacerta without being near any conspicuous stars. On the 21st it enters Cygnus, being about 10° north-east of α Cygni on the 24th.

TEMPEL'S COMET (1873 II.).—M. L. Schulhof gives the following ephemeris for this comet in *Astr. Nach.*, No. 3554):—

Ephemeris for 12h. Paris Mean Time.

1899.	R.A. h. m. s.	Decl. ° ′ ″	Br.
May 18	19 12 16·1	− 3 55 17	
19	13 53·1	3 53 15	
20	15 29·7	3 51 28	0·764
21	17 6·0	3 49 55	
22	18 41·8	3 48 38	
23	20 17·3	3 47 37	
24	21 52·3	3 46 53	0·869
25	19 23 27·0	− 3 46 27	

The comet is moving slowly in a north-easterly direction through the constellation Aquila.

RETURN OF HOLMES' COMET (1892, III.).—The following ephemeris is by Mr. H. J. Zwiers in *Astr. Nach.*, No. 3553.

Ephemeris for 12h. Greenwich Mean Time.

1899.	R.A. h. m. s.	Decl. ° ′ ″	Br.
May 18	0 34 53·2	+ 10 12 50	0·0298
20	38 22·5	10 50 0	·0301
22	41 51·1	11 27 8	·0304
24	45 19·1	12 4 13	·0306
26	48 46·2	12 41 15	·0309
28	52 13·1	13 18 14	·0312
30	55 39·1	13 55 8	·0315
June 1	0 59 4·4	+ 14 31 58	·0318

No information as to any observations of this comet has yet been received. The positions given above would indicate it to be moving to the north-east through Pisces; at the end of the month it will be about half-way between γ Pegasi and β Arietis, but after this it will probably be lost owing to its nearing the sun.

ROTATION PERIOD OF MARS.—Mr. W. F. Denning has recently secured some measures of the times of transit of the Syrtis Major (Kayser Sea), which in conjunction with observations made by him in 1884 and 1869 give a critical value for the period (*Observatory*, May 1899, p. 195). On February 4, 1869, the Syrtis Major was in mid-transit at 11h., while on February 14, 1884, when Mars was similarly situated with reference to the Earth, the transit occurred at 5h. 55m. Other transits were taken as February 15, 6h. 35m.; February 19, 9h. 5m.; February 22, 11h. 4m. Now, after another interval of fifteen years, the transit on March 7, 1899, occurred at 8h. 31m. The whole period between 1869 February 4, 11h. and 1899 March 7, 8h. 31m., comprises 10,987 days, 21 hours, 31 minutes, during which Mars has performed 10,710 rotations. The mean period during this interval thus becomes

24h. 37m. 22·70s.

This value is intermediate between those of Proctor and Bakhuyzen.

AN IMPROVED RESISTANCE-BOX.

MESSRS. GAMBRELL BROS. have recently introduced a resistance-box of improved design, which gives promise of eliminating several of the disadvantages of the usual post-office pattern. Fig. 1 shows the appearance of the box with the cover removed to show the working parts. The coils, which hang vertically in the lower part of the box, are brought up to

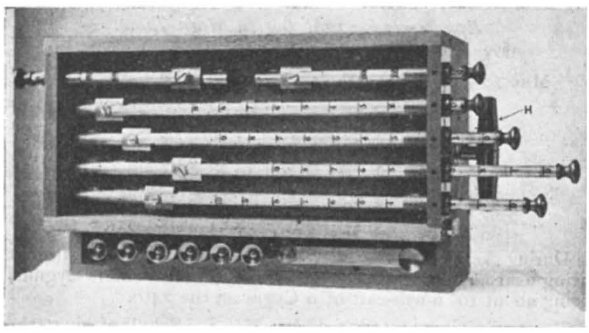

FIG. 1.—General view of the box, from above, showing the numbered slide rods, the contact shoes and the terminal studs of the coils. The handle (H) at the right is for clamping all the contact shoes simultaneously.

terminal studs (T) seen in Fig. 2, arranged in five rows, one of which, in two sections, forms the "ratios" used as two arms of the bridge. The upper surfaces of these studs are semi-circular, fitting the concave surfaces of the sliding contact shoes (S). The four rows other than the "ratios" provided for thousands, hundreds, tens and units, reckoned from the side nearest the terminals and key. Each of these contact shoes slides with slight friction on a brass bar running the length of the box, and supported at each end by metal pillars held down by springs inside the box. To move the shoes from one stud to another other

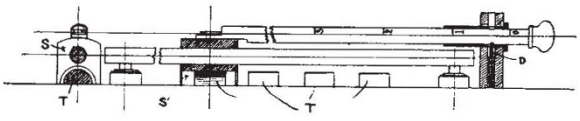

FIG. 2.—Showing construction of slider, spring contact bar, &c.

brass rods are attached, which slide through ebonite bushes on the end of the box. On these rods are engraved the figures giving the amount of resistance in use, the value of any particular resistance in circuit being indicated by the number showing just outside the ebonite bush. To ensure the contact shoe being properly fixed on the studs, a spring detent (D, Fig. 2) is provided under each bar, so that the resistances may be changed without the experimenter needing to watch the bar. All the bars being arranged to give the resistance required, it will be evident that its total amount can be read straight off at the end of the box, being given by the row of figures close to the four ebonite bushes. For example, the reading of the resistance in circuit, as shown in Fig. 1, is 2310. This is itself a great convenience, and will prevent any chance error in adding. As an additional help to maintaining the contacts as constant and perfect as possible, when the proper resistance has been found, all the four shoes are drawn tightly down on to the terminal studs by turning the handle H, seen under the ends of the rods in Fig. 1. This actuates a cam inside, which moves the small pillars at each end of the brass bars passing through the contact shoes. At the same time, the arrangement acts as a clamp, so that while the handle is turned the resistances cannot be changed. All the pillars are held down by springs, so that when not clamped by the handle H the sliding to and fro is accompanied by sufficient friction to keep the contact surfaces clean.

In consequence of the ingenious method adopted for reading off the figures, rendering access to the contacts themselves quite unnecessary, the whole of the system of studs and sliding bars is covered in permanently, so that they and the ebonite insulating block are kept free from dust and corrosion. The studs, being a considerable distance apart, should permit of a very high insulation resistance, while at the same time allowing a large surface contact between the shoe and the stud.

It will be seen that this new form of box has many advantages to recommend it to notice. The simplicity and rapidity of reading, its compactness, and its non-liability to deterioration, should cause it to find favour both in laboratory and testing-room experience.

TRANSPARENCY AND OPACITY.[1]

ONE kind of opacity is due to absorption; but the lecture dealt rather with that deficiency of transparency which depends upon irregular reflections and refractions. One of the best examples is that met with in Christiansen's experiment. Powdered glass, all from one piece and free from dirt, is placed in a bottle with parallel flat sides. In this state it is quite opaque; but if the interstices between the fragments are filled up with a liquid mixture of bisulphide of carbon and benzole, carefully adjusted so as to be of equal refractivity with the glass, the mass becomes optically homogeneous, and therefore transparent. In consequence, however, of the different dispersive powers of the two substances, the adjustment is good for one part only of the spectrum, other parts being scattered in transmission much as if no liquid were employed, though, of course, in a less degree. The consequence is that a small source of light, backed preferably by a dark ground, is seen in its natural outlines but strongly coloured. The colour depends upon the precise composition of the liquid, and further varies with the temperature, a few degrees of warmth sufficing to cause a transition from red through yellow to green.

The lecturer had long been aware that the light regularly transmitted through a stratum from 15 to 20 mm. thick was of a high degree of purity, but it was only recently that he found to his astonishment, as the result of a more particular observation, that the range of refrangibility included was but two and a half times that embraced by the two D-lines. The poverty of general effect, when the darkness of the background is not attended to, was thus explained, for the highly monochromatic and accordingly attenuated light from the special source is then overlaid by diffused light of other colours.

More precise determinations of the range of light transmitted were subsequently effected with thinner strata of glass powder contained in cells formed of parallel glass. The cell may be placed between the prisms of the spectroscope and the object-glass of the collimator. With the above-mentioned liquids a stratum 5 mm. thick transmitted, without appreciable disturbance, a range of the spectrum measured by 11·3 times the interval of the D's. In another cell of the same thickness an effort was made to reduce the difference of dispersive powers. To this end the powder was of plate glass and the liquid oil of cedar-wood adjusted with a little bisulphide of carbon. The general transparency of this cell was the highest yet observed. When it was tested upon the spectrum, the range of refrangibility transmitted was estimated at thirty-four times the interval of the D's.

As regards the substitution of other transparent solid material

[1] A discourse delivered at the Royal Institution on Friday, March 24, by the Right Hon. Lord Rayleigh, F.R.S.