

was read by Mr. George C. Thomson on "Smoke," and in the discussions which followed, Mr. W. R. W. Smith, Chairman of the Health Committee of the Glasgow Corporation, urged upon the members present the desirability of doing all in their power to secure that at the forthcoming International Exhibition in Glasgow each of the boilers be supplied with a separate chimney, so that a series of exhaustive trials may be made with mechanical stokers, &c., and other means for the purpose of showing what might be done in the way of smoke prevention.

With reference to the subject of testing, the Committee are of opinion that arrangements should be made as soon as possible for obtaining the use of three testing-rooms for testing stoves, grates, and ranges, the rooms being conveniently accessible for such articles, and having gas connections under command. The tests made in these rooms, under the same conditions of chimney and cubic capacity, would then become of greater comparative value than tests made in independent rooms.

Arrangements will be made as soon as practicable for procuring such accommodation for testing, and also for providing the necessary instruments used for testing; and as the system develops, attention will be given to the establishment of a chemical laboratory, the analysis of gases, and testing-rooms for testing-apparatus incidental to the work of the Institution.

### SCIENTIFIC SERIALS.

*American Journal of Science*, December 1887.—On the destruction of the passivity of iron in nitric acid by magnetization, by Edward L. Nichols and W. S. Franklin. From the experiments described in this paper, which was originally read before the Kansas Academy of Science, November 1885, it appears that the action of the magnet tends to lower the temperature of transition to the active state, and that the intensity of the magnetic field necessary to convert passive into active iron at a given temperature increases rapidly with the concentration of the acid. An account is promised of further researches offering a satisfactory explanation of the manner in which the chemical behaviour of iron is modified, and its passivity destroyed in the magnetic field.—On a method of making the wave-length of sodium light the actual and practical standard of length, by Albert A. Michelson and Edward W. Morley. The preliminary experiments recently carried out according to the method here proposed seem to confirm the anticipation that it would furnish results more accurate than any of those hitherto suggested. The apparatus for observing the interference phenomena is the same as that used in the experiments on the relative motion of the earth and the luminiferous ether.—The work of the International Congress of Geologists, by G. K. Gilbert. This is a reprint of an address delivered before the Section of Geology and Geography of the American Association for the Advancement of Science at the New York meeting, August 10, 1887. It deals largely with a revised system of geological terminology, the substance of which has already been published. The question of geological coloured maps is also considered, and practical suggestions made for their greater efficiency and economy.—On the existence of certain elements together with the discovery of platinum in the sun: contributions from the physical laboratory of Harvard University, by C. C. Hutchins and E. L. Holden. These investigations, carried on with Prof. Rowland's magnificent diffraction grating, deal with cadmium, lead, tin, silver, potassium, and several other elements, including platinum, the presence of which in the solar atmosphere is here for the first time determined. Between 4250 and 4950 were found sixty-four lines of platinum, sixteen of which agree with the solar lines.—The flora of the coast islands of California in relation to recent changes of physical geography, by Joseph Le Conte. A careful study of these insular groups, at present from 20 to 30 miles distant from the coast, shows that they at one time formed part of the mainland, from which they were undoubtedly separated during the Quaternary period. That they still formed part of the continent during later Pliocene times is shown by the remains of the mammoth found on Santa Rosa, one of the largest and furthest off of the whole group.—A new instrument for the measurement of radiation, by C. C. Hutchins. The instrument here described and illustrated presents great advantages over the thermopile as an accurate measurer of radiations. It is much more sensitive and requires

no longer time to return to zero than for the galvanometer needle to come to rest. A lighted match at 6 feet drives the needle round to its stop.—Mineralogical notes, by George F. Kunz. Descriptions with analyses are given of a rhodochrosite from Colorado, of crystals of hollow quartz from Arizona, of hydrophane from Colorado, and of a remarkable silver nugget weighing 606 ounces from the Greenwood mines of Michoacan, Mexico.

January.—The speed of propagation of the Charleston earthquake, by Prof. Simon Newcomb and Captain C. E. Dutton. A careful comparative study of the reports from all parts of the disturbed area shows a general average speed of  $3'214 \pm 0'072$  miles, or  $5171 \pm 116$  metres per second.—History of the changes in the Mount Loa crater, Hawaii; Part 1, Kilauea, by James D. Dana. The first paper embraces the whole period from 1823 to 1886, during which there appear to have been at least eight discharges from Kilauea. The general dynamical conclusions are that the cycle of movement is simply (1) a rising in level of the liquid lavas, and of the bottom of the crater; (2) a discharge of the accumulated lavas down to some level in the conduit determined by the outbreak; (3) a down-plunge of more or less of the floor of the region undetermined by the discharge. It is further shown that Kilauea is a true basalt volcano in its normal state, the rock material being dolerite or basalt, and the heat sufficing for the perfect mobility of the lavas.—The analysis and composition of tourmaline, by R. B. Riggs. The methods of analysis are described, with results for various specimens from different parts of North America and Brazil. The general inference is that there are three types, lithia, iron, and magnesia tourmaline, with an indefinite number of intermediate varieties, iron appearing to be the connecting link between the whole series. The special formulas of the three distinct types are:—

- (1) Lithia :  $12\text{SiO}_2, 3\text{B}_2\text{O}_3, 4\text{H}_2\text{O}, 8\text{Al}_2\text{O}_3, 2(\text{NaLi})_2\text{O}$ .
- (2) Iron :  $12\text{SiO}_2, 3\text{B}_2\text{O}_3, 4\text{H}_2\text{O}, 7\text{Al}_2\text{O}_3, 4\text{FeO}, \text{Na}_2\text{O}$ .
- (3) Magnesia :  $12\text{SiO}_2, 3\text{B}_2\text{O}_3, 4\text{H}_2\text{O}, 5\text{Al}_2\text{O}_3, \frac{2}{3}\text{MgO}, \frac{2}{3}\text{Na}_2\text{O}$ .

—On the different types of the Devonian system in North America, by Henry S. Williams. It is shown that in North America the Devonian system offers at least four distinct types in four corresponding areas, blending somewhat at their borders, but in their central parts presenting marked peculiarities. The four areas are: (1) Eastern Border, mainly in Northern New England; (2) Eastern Continental, including New York, thence southwards to West Virginia and north-westwards to Canada West and Michigan; (3) Interior Continental, chiefly Iowa and Missouri, extending northwards probably to the Mackenzie basin; (4) Western Continental, in Nevada and conterminous States.—On the law of double refraction in Iceland spar, by Charles S. Hastings. The general inference from these researches is that Huyghens' law of double refraction in uniaxial crystals is probably true to less than 1 part in 500,000, and consequently that there is no known method by which any error in it can be detected by observation alone.—In the Appendix, Mr. O. C. Marsh describes a new genus of *Sauropoda* and other new Dinosaurs from the Potomac formation; also a new fossil Sirenian from California.

### SOCIETIES AND ACADEMIES.

#### LONDON.

**Royal Society**, January 19.—"Notes on the Spectrum of the Aurora." By J. Norman Lockyer, F.R.S.

I exhibited to the Society on November 17, 1887, a tabular statement showing the bright lines seen in the spectra of various celestial bodies, and I also gave those recorded in the spectrum of the aurora, showing many remarkable coincidences.

I now find that the connection is closest between the auroral spectrum and that of stars III.a, and, in anticipation of a subsequent communication of details, I send on the accompanying table, showing the origin of Dunér's bands, so far as I have at present made them out, and their connection with the spectrum in question.

The individual observations which I have used in the table are those collected by Mr. Capron and Mr. Backhouse (*NATURE*, vol. vii. pp. 182 and 463).

TABLE OF WAVE-LENGTHS OF AURORAL LINES.

Barker ... ..	431	470	482	502	517				562	623
Smyth ... ..									558	635
Zöllner ... ..										628
A. Clerke ... ..			485					532		
Herschel ... ..								531		
Backhouse ... ..	430			501	516.5			532		606
Lord Crawford ... ..			more ref. than F							
H. R. Proctor ... ..			"							
Vogel ... ..		469								
Ellery ... ..										635
O. Struve ... ..									554	
Ångström ... ..		472						521	556	
Lemström ... ..	426	469						525		
German North Polar Expedition										
Respighi ... ..									557	
Peirce ... ..	431	464	486				520	531	545	557
Probable origin ... ..	CH	C (hot)	C (cold)	Mg	C (hot)	Mg	*	Zn† (1)‡	Mn (1)	Fe (1)
Wave-lengths of probable origin	431	474	483	500	516.5	520.1		546	558	615
			477.485					550.545		616.627
			9					5		2
Dunér's bands ... ..	460-474			495-503	516	521			564-559	
	10			8	7				4	

\* Coronal line.

† Another probable origin for this in the aurora is 540 Mn.

‡ This means brightest fluting.

Addendum.—The following table shows the above figures in another form and includes the bright lines recorded in  $\gamma$  Cassiopeiae:—

Aurora.	Dunér's bands.	Bright lines in $\gamma$ Cassiopeiae.	Probable origin.	Wave-length of probable origin.
431	...	...	CH	431
474	460-474 (10)	...	C (hot)	474
...	...	462.3	Sr	460.7
483	477-485 (9)	...	C (cool)	483
500	495-503 (8)	499	Mg	500
516.5	516-521 (7)	516.7	C (hot)	516.5
520.1	...	...	Mg	520.1
531	...	531	Coronal line	...
...	...	542.2	Mn	540
545	545-550 (5)	...	Zn (1)	546
558	559-564 (4)	555.7	Mn (1)	558
...	585-595 (3)	586	Mn (2)	586
615	616-627 (2)	616	Fe (1)	615
635	...	635.6	*	...

Geological Society, January 25.—Prof. J. W. Judd, F.R.S., President, in the chair.—The following communications were read:—On *Ailurus anglicus*, a new Carnivore from the Red Crag, by Prof. W. Boyd Dawkins, F.R.S. The specimen described is a small fragment of the right lower jaw with the last three molar teeth in position, and belongs to the Crag collection of the Yorkshire Philosophical Society. It differs in a marked degree from all fossil European Carnivores, and presents no important points of difference when compared with a series of jaws of recent *Ailurus*. The author gave a description of the fossil, and comparison of it with *Ailurus fulgens*, and also a table giving the comparative measurements of the teeth and jaws of the fossil and of recent *Ailuri*. The species from the Crag was a more powerful animal than any recent *Ailuri* in the British Museum. The paper concluded with a notice of the range of *Ailurus* in space and time. After the reading of this paper the President remarked that seldom had a fact of greater interest in its bearing upon geographical distribution in past times been brought before the Society. Some comments on the paper were also made by Mr. Lydekker, Prof. Seeley, Mr. Newton, and Mr. Blanford.—A contribution to the geology and physical geography of the Cape Colony, by Prof. A. H.

\* This line is seen as a pretty bright line in the spectrum of the Limerick meteorite, but its origin has not yet been determined, although comparisons have been made with most of the common elements. So far, it has not been observed in any other meteorite.

Green, F.R.S.—On two new Lepidotoid Ganoids from the early Mesozoic deposits of Orange Free State, South Africa, by Mr. A. Smith Woodward. The results presented in Prof. Green's and Mr. Woodward's papers were discussed by the President, Prof. Rupert Jones, Mr. Blanford, Dr. Geikie, Mr. Clement Reid Prof. Hughes, and Mr. Irving.

Royal Microscopical Society, January 11.—Rev. Dr. Dallinger, F.R.S., President, in the chair.—The President referred to the death of Dr. Arthur Farre, a former President of the Society, and one of its earliest Fellows.—Prof. C. Stewart exhibited specimens of *Thecalia concamerata*. In this genus the female shell exhibited a peculiarity which was quite unique. As age advanced the mantle became folded back upon itself in a very curious manner, and simultaneously with this there occurred a similar in-folding of the contiguous portions of the shell by which two depressions were produced, forming a fusiform chamber when the two valves came together. In this cavity the embryonic shells were found.—Edmond's automatic mica stage rotating by clockwork was exhibited and described.—Mr. A. W. Bennett gave a *resumé* of his paper on freshwater Algae of the English Lake District, with a description of a new genus of *Capsulococcus* and five new species, in continuation of his previous communication on the same subject.—Dr. G. Gulliver read a paper on *Pelamyxa palustris*. The large size of this amoeboid organism had enabled it to be cut in *o* sections, and the granulated structure of its exoplasm thus revealed was described. As regarded its classification, it was thought that ultimately it would be found to have a nearer relationship to the true Heliozoa than to the more lowly Amœbæ.—Mr. E. M. Nelson handed round for inspection two photographic positives; one of *Amphipleura pellucida*, and the other of a fungus growth which attacked calcareous sand, as described by Mr. J. G. Waller in the Journal of the Quekett Microscopical Club, l. p. 345. This object presented some photographic difficulty because of its non-actinic colour. With regard to the other he remarked that in resolving diatoms with oblique light it was essential to decide whether they intended to focus upon the real surface or upon the optical image produced in a higher plane, in consequence of the double nature of the structure of the valve. In the latter case they would obtain a result such as he exhibited, which was a photograph of the optical image and not of the real diatom.—Mr. Nelson also called attention to a curious optical effect for which at present he was unable to account. In a flat box he had placed a glass positive of *A. pellucida* which was viewed as a transparency through a piece of tube fitted at right angles to the surface. If this was looked at when held towards a surface of light such as an optical lampshade or a sunlight gas-burner, the black lines appeared to be slightly smaller than the white lines; but if it was turned towards a small light at a distance, then the black lines appeared very

large and the white ones were reduced to mere threads. The scale of the photograph showed that the effect was not due to the operation of the first diffraction spectrum, and it was still more curious to note that in the case of another positive taken from the same negative and upon the same scale this optical illusion was not observed.

**Anthropological Institute,** January 24.—Anniversary Meeting.—Prof. Flower, C.B., F.R.S., Vice-President, in the chair.—The following were elected Officers and Council for the ensuing year:—President: Francis Galton, F.R.S. Vice-Presidents: J. G. Garson, Prof. A. H. Keane, F. G. H. Price. Secretary: F. W. Rudler. Treasurer: A. L. Lewis. Council: G. M. Atkinson, E. W. Brabrook, C. H. E. Carmichael, Hyde Clarke, A. W. Franks, F.R.S., Lt.-Col. H. H. Godwin-Austen, F.R.S., T. V. Holmes, H. H. Howorth, M.P., Prof. A. Macalister, F.R.S., R. Biddulph Martin, M.P., Prof. Meldola, F.R.S., Rt. Hon. the Earl of Northesk, C. Peek, Charles H. Read, Lord Arthur Russell, M.P., Prof. A. H. Sayce, H. Seebohm, Oldfield Thomas, M. J. Walhouse, Lieut.-Gen. Sir C. P. Beauchamp Walker, K.C.B.

PARIS.

**Academy of Sciences,** January 30.—M. Janssen in the chair.—Note on the first volume of the *Annales de l'Institut Pasteur*, presented to the Academy, by M. L. Pasteur. This volume contains the first twelve numbers of a monthly serial established and directed by Prof. Duclaux, of the Sorbonne, and entirely devoted to the progress of the new branch of pathological physiology to which M. Pasteur gives the name of "Microby" or "Microbiology." His remarks were mainly confined to the important memoir by MM. Roux and Chamberland, entitled "Immunité contre la septicémie, conférée par des substances solubles." In this memoir is contained the rigorous demonstration of the far-reaching fact that the septic vibron, a living ferment analogous to the butyric vibron, develops soluble chemical products, which gradually act as an antiseptic on the organism itself. These products, introduced in sufficient quantities into the body of the guinea-pig, confer absolute immunity from the deadly attacks of the virus, to which that animal is specially susceptible.—Note on the total lunar eclipse of January 28, by M. J. Janssen. The observations taken at the Observatory of Meudon were mainly directed towards determining a point of telluric spectroscopy connected with the absorption bands of oxygen. They were necessarily of a somewhat preliminary character, and will be continued during future total eclipses of the moon.—Researches on ruthenium, by MM. H. Debray and A. Joly. The paper deals more especially with hyperruthenic acid, its purification, physical properties, behaviour in the presence of water, and under varying temperatures.—An apparatus adapted for experiments at high temperatures in the presence of gases under high pressure, by M. L. Cailletet. For this apparatus, which the inventor has had in use for some years, it is claimed that it enables experimenters to raise substances to temperatures near the fusion of platinum while keeping them in a gaseous atmosphere, the nature and pressure of which may be varied at pleasure.—On double dielectric refraction; simultaneity of electric and optical phenomena, by M. R. Blondlot. These experiments have been undertaken in order to determine whether the double dielectric refraction of a condenser is produced and ceases simultaneously with the charge, or whether there exists an appreciable interval of time either between the production of the electric phenomenon and that of the luminous phenomenon, or between periods of cessation of both phenomena. The conclusion seems to be that, if there is any difference in point of time between these several manifestations, it cannot exceed  $1/40000$  of a second.—On the laws of chemical equilibrium, by M. H. La Chatelier. It is shown that the numerical laws of chemical equilibrium, such as they are deduced from the two principles of thermodynamics, may be expressed in a very simple way by means of M. Massieu's characteristic function  $H'$ , which may be regarded as the true measure of chemical force.—On cinchonine, by MM. E. Jungfleisch and E. Léger. The authors describe the process of preparation, the chemical properties, and the salts of this substance, whose composition is expressed by the formula  $C_{28}H_{22}N_2O_2$ .—Persistence of the virus of rabies in dead bodies, by M. V. Galtier. These researches show that the virus retains all its virulence in the bodies of dogs that have been dead seven-teen and buried fifteen days. Inoculation from the bulb produces

rabies in ten and kills in fifteen days after trepanation.—On the antiseptic properties of naphthol- $\alpha$ , by M. J. Maximovitch. The experiments here described show that, owing to its feebler toxic and stronger anti-septic properties, this substance is in every way superior as an antiseptic to M. Bouchard's naphthol- $\beta$ .—On the presence of primordial fauna (Paradoxidian) in the neighbourhood of Ferrals-les-Montagnes (southern slope of the Montagne Noire), Hérault: (1) stratigraphic study by M. Jules Bergeron; (2) palæontological study, by MM. Munier-Chalmas and J. Bergeron. Considerable interest attaches to the recent discovery of these organism; by M. Bergeron, for the first time in any part of France. They belong to the earliest forms of the Silurian group, forms which were not known to exist when that group was first established by Murchison in 1835. These first French Trilobites of the primordial fauna, as it was named by Barrande, include some exceptionally fine specimens of the genera *Conocephalites* and *Paradoxides*, the latter closely allied to the *P. rugulosus* of Bohemia, and the *P. Pradoanus* common in the Cambrian of Spain.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Astronomical Observations and Researches made at Dunsink, sixth part (Hodges, Dublin).—A Student's Manual of Psychology, adapted from Kirchner by E. D. Draught (Sonnenschein).—The Cardinal Numbers: M. Hopkins (Low).—Civilization and Progress; new edition: J. B. Crozier (Longmans).—Lessons on Prescriptions and the Art of Prescribing; new edition: W. H. Griffiths (Macmillan).—Lehrbuch der Entwicklungsgeschichte des Menschen und der Wirbelthiere, Zweite Abthg.: Dr. O. Hertwig (Jena).—Practical Forestry: C. E. Curtis.—South African Butterflies; two vols: R. Trimen, assisted by J. H. Bowker (Triebner).—Journal of the Society of Telegraph-Engineers and Electricians, No. 69, vol. xvi. (Spou).—Journal of the Royal Statistical Society, December (Stanford).—Annalen der Physik und Chemie, 1888, No. 2 (Leipzig).—Beiblätter der Physik und Chemie, 1888, No. 1 (Leipzig).—Brain, parts 39 and 40 (Macmillan).

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