

The commonly accepted version of Carnot's method is therefore an injustice to the celebrated author of "The Motive Power of Heat."

PARIS.

Academy of Sciences, May 29.—M. de Lacaze-Duthiers in the chair.—Studies on diffraction gratings; focal anomalies, by M. A. Cornu. Gratings, although trustworthy enough to be used for determining wave-lengths of light, yet present various anomalies which might cast some doubt upon the rigour of the optical principles upon which their construction is based. In order to study these perturbations in detail and to eliminate the attendant errors, M. Cornu constructed a machine for the automatic ruling of lines spaced according to fixed laws, so as to produce and exaggerate at will the anomalies whose origin was to be verified. Thus the systematic error in the position of the focus of spectrum images was reduced to two distinct and purely geometrical causes: In plane gratings, to the existence of a feeble curvature of the ruled surface; in a plain or curved grating, to the existence of a regular variation in the distance apart of the lines. In most cases these two causes co-exist, which makes the laws of the optical phenomenon highly complex.—On the volatilisation of silica and zirconia, and the reduction of these compounds by carbon, by M. Henri Moissan (see Notes).—Preparation in the electric furnace of some refractory metals: tungsten, molybdenum, vanadium, by M. Henri Moissan (see Notes).—On the preparation of zirconium and thorium, by M. L. Troost. An intimate mixture of zirconia and finely comminuted sugar charcoal, the former being in excess, is strongly compressed into small discs and placed in a carbon retort. It is then subjected to the action of the voltaic arc supplied by a current of 35 ampères and 70 volts, the retort being placed in a closed chamber traversed by a slow current of carbonic acid, so as to prevent the air from burning and retransforming the metal into zirconia. The reduction is immediate, and gives rise to small metallic masses which are not pure zirconium, but a true carburet of zirconium, corresponding to the formula ZrC_2 . If the carbon retort is lined with zirconia the ingot is gradually freed from carbon, and leaves the pure metal behind. This has a steel-grey colour and is extremely hard. It scratches glass deeply, and is untouched by the best files. In air it is unaltered at ordinary temperatures. At a red heat it oxidises at the surface if containing little carbon, but burns brightly if containing much. It is not attacked by acids except by hydrofluoric acid, which acts even if greatly diluted. Thorium is prepared in an exactly similar way from the chloride. The reduction takes place more readily, giving rise to a carburet, ThC_2 . The metal is very brittle, and less hard than zirconium. It decomposes water in the cold, evolving hydrogen and a hydrocarbon of pungent odour. In contact with air it gradually swells up and forms a powder which burns with greater rapidity and brightness than zirconium.—Observations on the volatilisation of silica, *à propos* of M. Moissan's communication.—On the phenacite of Saint-Christophe en Oisans, by MM. A. Des Cloizeaux and A. Lacroix.—On ordinary differential equations which possess fundamental systems of integrals, by M. Sophus Lie.—The total solar eclipse observed at Fundium (Senegal) on April 16, 1893, by M. N. Coculesco.—On geometrical properties which only depend upon spherical representation, by M. C. Guichard.—On surfaces with lines of curvature plane in both systems and isothermals, by M. Th. Caronnet.—Theorems relating to analytical functions of n dimensions, by M. G. Scheffers.—On a general property of fields admitting of a potential, by M. Vaschy.—On the densities of some gases and the composition of water, by M. A. Leduc.—On the rigidity of liquids, by M. J. Colin.—Action of acetic anhydride upon linalol; transformation into geraniol, by M. G. Bouchardat.—A general method for the analysis of butters, by M. Raoul Brullé.—On the physiology of the crayfish, by M. L. Cuénot.—Mechanism of the hyperplastic process in epithelial tumours; applications, by M. Fabre-Domergue.—Researches on the modifications of the excretion of urea in the course of certain surgical maladies, and especially after great operations; consequences from the point of view of therapeutics and treatment after operations, by M. Just Championnière.

BERLIN.

Physical Society, May 12.—Presidents, at first Prof. Kundt, and later Prof. du Bois Reymond.—Dr. E. Pringsheim gave an account of his further researches on the

cause of the emission of light by heated gases. By the method already employed for sodium (see NATURE, vol. xlv., p. 312) he had recently tested the vapours of lithium, thallium, and potassium. At the highest temperature, at which nickel was fused, the vapours of these metals similarly gave an emission-spectrum following on the absorption spectrum as long as reduction processes were excluded. They at once showed their characteristic spectral lines as soon as the salt used, or the silicate formed from the metal in contact with the surface of the porcelain tube, was reduced either by hydrogen, by the metal itself, or by iron. The experiment of Dewar and Liveing, in which, by heating lithium with potassium and sodium in an atmosphere of hydrogen in an iron tube, they obtained the lithium-line, was explained by the speaker as due to the above-named cause, viz., a compound is formed of iron and lithium, which is then reduced and exhibits both emission and absorption. Dr. Pringsheim concluded from his experiments in support of his views that the four elements—lithium, sodium, thallium, and potassium—are not luminous when simply heated above the temperature of the flame in which they ordinarily exhibit their characteristic spectra. He believed rather that they only show emission and absorption spectra when they are in the nascent state resulting from processes of chemical reduction.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—A Treatise on Elementary Dynamics, 2nd edition: S. L. Loney (Cambridge University Press).—An Introduction to Practical Bacteriology: Dr. W. Migula, translated by M. Campbell (Sonnenschein).—Some Hints on Learning to Draw: G. W. C. Hutchinson (Macmillan).—The Hawks and Owls of the United States in their Relation to Agriculture (Washington).—The Geological and Natural History Survey of Minnesota, 20th Annual Report (Minn.).—Missouri Botanical Garden, Fourth Annual Report (St. Louis, Mo.).—Modern Microscopy: M. I. Cross and M. J. Cole (Baillière).—Geological and Solar Climates: M. Manson (Dulau).—British Forest Trees: J. Nisbet (Macmillan).—Darwin and Hegel: D. G. Ritchie (Sonnenschein).—Lectures on Sanitary Law: A. W. Blyth (Macmillan).—Fragments of Earth Lore: Prof. J. Geikie (Edinburgh, Bartholomew).—The Lepidoptera of the British Islands, vol. 1, Rhopalocera: C. J. Barrett (L. Reeve).—Hypnotism, Mesmerism, and the New Witchcraft: E. Hart (Smith, Elder).

PAMPHLETS.—Die Klimate der Geologischen Vergangenheit: E. Dubois (Nijmegen, Thieme).—Notes on the Gasteropoda of the Trenton Limestone of Manitoba, with a Description of One New Species: J. F. Whiteaves.—Sulla Dissipazione di Energia in un Campo Elettrico Rotante e Sulla Isteresi Electrostatica: R. Arnò (Roma).

SERIALS.—Brain, Parts 61 and 62 (Macmillan).—Engineering Magazine, June (New York).

CONTENTS.

	PAGE
The Royal Society Election. By W. T. Thiselton-Dyer, C.M.G., F.R.S.	121
Vertebrates of Argyll and the Inner Hebrides	123
Our Book Shelf:—	
Bryden: "Gun and Camera in Southern Africa" . .	125
Letters to the Editor:—	
Mr. H. O. Forbes's Discoveries in the Chatham Islands.—Henry O. Forbes	126
The Fundamental Axioms of Dynamics.—Prof. A. W. Rücker, F.R.S.; Prof. Oliver Lodge, F.R.S.; Prof. J. G. MacGregor	126
The Word Eudimeter.—Philip J. Hartog	127
Singular Swarms of Flies.—Prof. F. Jeffrey Bell; Henry Cecil	127
The Annual Visitation of the Greenwich Observatory. By W. J. S. L.	127
Rev. Charles Pritchard, D.D., F.R.S. By W. E. P.	130
Notes	131
Our Astronomical Column:—	
The Total Solar Eclipse (April 1893)	135
Meteor Observations	135
Washburn Observations	135
Finlay's Comet (1886 VII.)	135
Geographical Notes	135
Seismology in Japan. By Prof. John Perry, F.R.S. . .	136
On Light and other High Frequency Phenomena. By Nikola Tesla	136
University and Educational Intelligence	140
Scientific Serials	140
Societies and Academies	141
Books, Pamphlets, and Serials Received	144