the candidates. Application forms may be obtained from the secretary of the Technical Education Board, 116, St. Martin's Place, W.C., to whom they should be returned not later than May 14. The board is also offering scholarships for the encouragement of horticulture and gardening. Two of these, tenable at the Swanley Horticultural College, Kent, give free board and tuition for two years, and may be reckoned as of the value of 60*l.* a year. They are open to candidates between the ages of sixteen and twenty, and one will be awarded to a young man and the other to a young woman as the result of a competitive examination. No candidate is eligible whose parents are in receipt of more than 400*l.* a year.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society.—Ordinary meeting held by the invitation of Sir Norman Lockyer, F.R.S., in the Solar Physics Observatory, South Kensington, on April 27.—Mr. T. H. Blakesley, Vice-President, in the chair.—Sir Norman Lockyer gave a short account of the physical problems now being investigated at the Solar Physics Observatory, and their astronomical applications. The chief work carried on at the observatory is the comparison of stellar spectra with spectra obtained from lights emitted by laboratory sources. The light from a star (or the sun) and from an arc (or a spark) are focussed alternately upon the slit of a spectroscope, and the two spectra are photographed side by side upon the same plate. The number of lines in the arc spectrum depends upon which part of the arc is focussed on the slit. The image of the centre is rich in lines, the image of the edge gives a few single lines. Changes in spectra are also dealt with. The thickening and thinning of lines depends upon several things. In the first place, it depends upon the density of the substance, and thus the hydrogen lines in the spectrum of Sirius are much broader than those in α Cygni, the hydrogen being denser in the former star. Changes may also be produced by variations in quantity. A reduction in the quantity of a substance generally simplifies its spectrum, the longest line disappearing last. The motion of a luminous body to or from the spectroscope alters the wave-length of the light emitted and produces a shift in the lines of the spectrum. The amount of deviation is a measure of the velocity in the line of sight. In the case of Nova Aurigæ, we have dark and bright lines of the same substance side by side. This shows that there are two bodies involved, moving with different velocities, the one giving a radiation and the other an absorption spectrum. Another change in the lines depends upon temperature. In general an increase in temperature produces a greater number of lines, a notable exception being sodium, which gives its full number of lines at the temperature of an ordinary Bunsen flame. The spectra of metals obtained from the arc, and by sparking, are often quite different. Those lines which make their appearance, or are intensified in passing from the arc to the higher temperature of the spark, are known as enhanced lines. The comparison of stellar spectra with laboratory spectra is often easy. For instance, the presence of iron in the sun and hydrogen in Sirius is easily seen. Several lines in the spectrum of Bellatrix have been shown to be due to helium, the position of the lines being exactly the same as those due to the gases from clevite. In many cases it is possible to build up the spectrum of a star from the spectra of its constituents taken at the proper temperatures. For instance, the spectrum of γ Orionis can be closely imitated by means of oxygen, nitrogen, and carbon together with the well-marked lines of hydrogen and helium. We can roughly estimate by the character of the spectra of stars, the temperatures of those stars, and thus arrive at a stellar thermometry. Starting with a hot star like Bellatrix, and passing through β Persei, γ Lyræ, Sirius, Castor, Procyon to Arcturus, a cold star, we have a gradual change in the character of the lines which appear in the spectrum of any constituent. The widening of the lines in the case of spectra of sun spots enables us to trace changes in temperature of the sun, and we can compare these temperature changes with a variety of terrestrial phenomena, such as variation in latitude. The extraordinary number of lines exhibited by many metals suggests that what we are accustomed to call chemical elements are really complex bodies which are made up of simpler ones. Attempts have been made to build up the spectra of metals by superimposing simple sets of lines upon one another. In many cases a great number of series would be required to represent things completely. In the case of hydrogen it would be necessary to have at least twenty-seven series to give the structure spectrum only Taking the atomic weight of hydrogen as unity, the atomic weight of the little masses which might give rise to any one of these series would be about 0019. This is of the order of magnitude of the small bodies, of which the existence has been suggested by Prof. J. J. Thomson from his work on ions.

PARIS.

Academy of Sciences.—M. Maurice Lévy in the chair.—The President announced to the Academy the death of M. Alphonse Milne-Edwards, and gave an account of his work.—On linear partial differential equations of the second order, and on the generalisation of the problem of Dirichlet, by M. Emile Picard.—On the heats of combustion and formation of some iodine compounds, by M. Berthelot. A redetermination of the heats of combustion of fourteen typical iodine derivatives. In spite of preconceived notions to the contrary derived from the incomplete combustion of such compounds as iodoform in air, no difficulty was experienced in completely burning any of the substances in the calorimetric bomb.—On rifling in cannon, by M. Vallier. A discussion on the best form of curve for the rifling of cannon, and an extension of the work of M. Zaboudski upon the same subject.—On the upright trunks, stems and roots of Sigillaria, by M. Grand'Eury. A study of the Sigillaria existing in a quarry in the neighbourhood of St. Étienne. From the fact that the stems (*Syringodendron*) found in a vertical position are not distributed at random, but are usually found in groups near each other forming well marked colonies, and from other characters of their growth, the author concludes that the hypothesis of R. P. Schmitt that they have been transported by water and deposited in the position found, is untenable. The view of Dawson that they have grown upon unsubmerged soil is also held to be untenable, all the facts noted by the author pointing to the Sigillaria have grown in the place in which they are found in marshy soil; under water varying from 1 metre to 7 or 8 metres in exceptional cases.—Reply to a reclamation of priority of M. Curie, by M. Gustave le Bon.—Reply by M. Th. Tommasina to a reclamation of priority, by MM. Ducretet and Popof.—Note by M. L. M. Bullier replying to M. Geelmuyden on a question of priority.—On the complementary terms in the criterium of Tisserand, by M. Gruey.—On differential equations of any order whatever with fixed critical points, by M. Paul Painlevé.—On the generalisation of analytical prolongation, by M. Émile Borel.—The theoretical cycle of gas engines, by M. A. Witz. A discussion of the remarks and criticism of M. Marchis.—On the dielectric constant and the dispersion of ice for electromagnetic radiations, by M. C. Gutton. The value of the refractive index for electromagnetic waves was found to vary with the wave-length from 1·76 for a wave-length of 14 cm. to 1·50 for 2088 cm., ice thus presenting normal dispersion for electromagnetic waves.—Two applications of Govi's camera lucida, by M. A. Lafay.—On the maximum sensitiveness practically employed in coherers for wireless telegraphy, by MM. A. Blondel and G. Dobkevitch. The increase of sensibility observed by M. Tissot to occur when the coherer is placed in a magnetic field, is ascribed by the authors to purely mechanical causes, the increase of contact between the powder and the electrodes produced by their mutual attraction.—On the radiations of radium, by M. E. Dorn. The author draws attention to the fact that he published a note on the deviation of the rays emitted by radio-active barium bromide in an electric field on March 11, independently of M. Becquerel.—On a new thermo-calorimeter, by M. G. Massol. Two improvements on Regnault's thermo-calorimeter are suggested, the replacement of alcohol by sulphuric acid, giving a large increase in the range of the instrument, and the use of a reservoir at the upper end of the instrument as in Walferdin's maximum thermometer by which the sensitiveness of the thermo-calorimeter is increased without undue lengthening of the stem. The instrument thus modified has been of especial service in the study of superfused liquids.—A new indicator in acidimetry, and its application to the estimation of boric acid, by M. Jules Wolff. The indicator proposed is a solution of ferric salicylate in sodium salicylate, which passes from violet to orange when the solutions become alkaline. Data are given showing the results obtainable with borates.—On the selenides and chloroselenides of lead, by M. Fonzes-Diacon.—Crystallised lead selenide, PbSe, is obtained by

reduction of a selenate by hydrogen or by carbon, by the action of hydrogen selenide upon the vapours of lead chloride, and by the direct fusion in the electric furnace of precipitated lead selenide.—On the alkaline selenio-antimonites, by M. Pouget. Selenio-antimonites can be obtained of analogous composition to the sulpho-antimonites already known; mixed sulphur and selenium compounds, thioantimonites in which the sulphur is only partially replaced by selenium have also been prepared.—Micro-chemical researches on yttrium, erbium and didymium, by MM. M. E. Pozzi-Escot and H. C. Couquet.—Mechanism of the senility and death of nerve cells, by M. G. Marinesco. As the result of a study of nerve cells from the brain and spinal column of individuals of ages ranging from 60 to 110, it was found that the modifications constituting the old age of the nerve cell do not only consist of the diminution, more or less marked, of this body, but include other more interesting changes, some of which, tangible to the microscope, are described.—Heteroplastism, by M. Nicolas-Alberto Barbieri.—A determination of the conditions under which tissue from one mammal can be grafted on to another, to replace similar tissue. The results of experiments are given on the grafting of muscular, vascular, and nervous tissue.

DIARY OF SOCIETIES.

THURSDAY, MAY 3.

ROYAL INSTITUTION, at 3.—A Century of Chemistry in the Royal Institution: Prof. J. Dewar, F.R.S.

LINNEAN SOCIETY, at 8.—Note on the Movements in Fishes: Prof. R. J. Anderson.—On New Species of *Halimeda*, from Funafuti: Miss E. S. Barton.—On West Indian Fungi: Miss A. L. Smith.

CHEMICAL SOCIETY, at 8.—Brazilin, Part IV.: A. W. Gilbody, W. H. Perkin, jun., and J. Yates.—Hæmatoxylin, Part V.: W. H. Perkin, jun., and J. Yates.—The Substituted Nitrogen Chlorides and Bromides derived from *o*- and *p*-acet-toluide and their Relation to the Substitution of Halogens in Toluides and Toluidines: F. D. Chattaway and K. R. P. Orton.

RÖNTGEN SOCIETY, at 8.—Demonstration and Exhibition of New Methods and Results.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—If the discussion on Prof. Forbes's Paper, read on April 26, is concluded, the following Paper will be read:—The Calculations of Distributing Systems of Electric Traction under British Conditions: H. M. Sayers.

FRIDAY, MAY 4.

ROYAL INSTITUTION, at 9.—Pottery and Plumbism: Prof. T. E. Thorpe, F.R.S.

GEOLOGISTS' ASSOCIATION, at 8.—Some Features of the Recent Geology of Western Norway: Horace W. Monckton.

COLD STORAGE AND ICE ASSOCIATION (Examination Hall, Victoria Embankment), at 11.30.—Recent Researches in Refrigeration: G. Halliday.—Insulation and Insulators: W. D. A. Bost.—At 3.—Electric Lighting of Cold Stores: W. B. Esson.—The Design and Construction of Buildings for Ice Factories and Cold Storage: P. Gaskell.

SATURDAY, MAY 5.

ROYAL INSTITUTION, at 3.—Egypt in the Middle Ages: Prof. Stanley Lane-Poole.

MONDAY, MAY 7.

SOCIETY OF ARTS, at 8.—The Incandescent Gas Mantle and its Use: Prof. Vivian B. Lewes.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Production of Nitrate of Soda in Chili: Dr. W. Newton.

TUESDAY, MAY 8.

ROYAL INSTITUTION, at 3.—A Corner of Sussex: Dr. H. R. Mill.

SOCIETY OF ARTS, at 8.—Art Metal Work: Nelson Dawson.

ZOOLOGICAL SOCIETY, at 8.30.—A List of the Batrachians and Reptiles of the Gaboon (French Congo), with Descriptions of New Genera and Species: G. A. Boulenger, F.R.S.—On the Birds of Hainan: W. R. Ogilvie Grant.—On the Rhopalocera collected by the late Mr. John Whitehead in the Interior of the Island of Hainan: Philip Crowley.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—The Effect of Colour on Gradation: Chapman Jones.

WEDNESDAY, MAY 9.

SOCIETY OF ARTS, at 8.—Improvement of our Roads: A. Moresby White.

GEOLOGICAL SOCIETY, at 8.—The Pliocene Deposits of the East of England. Part II. The Crag of Essex (Waltonian) and its Relation to that of Norfolk and Suffolk: F. W. Harmer. With a Report on the Inorganic Constituents of the Crag by Joseph Lomas.—The Salt Lake of Larnaca (Cyprus): C. V. Bellamy.

IRON AND STEEL INSTITUTE, at 10.30.—General Meeting.—On Blowing-Engines driven by Crude Blast-Furnace Gas: Adolphe Greiner.—The Solution Theory of Iron: Baron H. von Jüptner.—The Use of Fluid Metal in the Open-Hearth Furnace: James Riley.—Iron and Phosphorus: J. E. Stead.—The Continuous Working of the Open-Hearth Furnace: Benjamin Talbot.

THURSDAY, MAY 10.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: On the Diffusion of Gold in Solid Lead at the Ordinary Temperature: Sir W. Roberts-Austen, F.R.S.—On Certain Properties of the Alloys of the Copper-Gold Series: Sir W. Roberts-Austen, F.R.S., and Dr. T. K. Rose.—Experiments on Supposed Vascular and Visceral Factors in the Genesis of Emotion: Prof. Sherrington, F.R.S.—On the Brightness of the Corona of April 16, 1893. Preliminary Note: Prof. H. H. Turner, F.R.S.

ROYAL INSTITUTION, at 3.—A Century of Chemistry in the Royal Institution: Prof. J. Dewar, F.R.S.

MATHEMATICAL SOCIETY, at 5.30.—Special Meeting.—The Differential Equation whose solution is the Ratio of Two Solutions of a Linear Differential Equation: M. W. J. Fry.—A Congruence Theorem relating to Eulerian Numbers and other Coefficients: Dr. Glaisher, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—A Frictionless Motor Meter: S. Evershed.

IRON AND STEEL INSTITUTE, at 10.30.—Ingots for Gun Tubes and Propeller Shafts: F. J. R. Carrulla.—The Manufacture and Application of Water-Gas: Carl Dellwik.—The Equalisation of the Temperature of Hot Blast: Lawrence Gjers and Joseph H. Harrison.—The Manganese Ores of Brazil: H. Kilburn Scott.—The Utilisation of Blast-furnace Slag: Ritter Cecil von Schwarz (Liége).

FRIDAY, MAY 11.

ROYAL INSTITUTION, at 9.—Shakespeare and True Patriotism: Sidney Lee.

ROYAL ASTRONOMICAL SOCIETY, at 8.

SATURDAY, MAY 12.

ROYAL INSTITUTION, at 3.—South Africa; Past and Future: Dr. Alfred P. Hillier.

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