

MESSRS. A. GALLENKAMP AND CO., makers of chemical apparatus, wish it to be known that, in the new premises to which they have just removed, they propose to exhibit in their show-room examples of new instruments described in scientific periodicals, and of apparatus kept in stock.

A BIOGRAPHY and an account of the botanical labours of the late Prof. Julius Sachs, by Prof. Goebel, appears in the pages of *Flora*; and one of the late Fritz Müller, by Prof. Ludwig, in the *Botanisches Centralblatt*. Each memoir is accompanied by a copious bibliography.

ANOTHER new botanical journal is announced from America, the first number to appear on October 1. It is to be named *The Plant World*, and will be an illustrated monthly journal of popular botany. "It will," says the *Botanical Gazette*, "present the facts of plant-life in simple popular language, and aim to interest those who have no inclination for a systematic course of study. The purpose is to be scientific, but not technical." The editor will be Dr. J. F. Knowlton, of the U.S. National Museum.

AMONG papers on physiological botany recently received from America are "The Curvature of Roots" by Mr. D. T. McDougal, and "The Rôle of Water in Growth" by Mr. C. B. Davenport. In the former the author points out that the curvatures of stems are not due to the same causes as those of tendrils or of many roots. The curvature of roots is due to the excessive elongation of the internal layers of the cortex of the side which becomes convex. The development and organisation of irritability in roots has been widely different from that in stems. The organs of the irritable mechanism of roots exhibit a physiological rather than a morphological differentiation.

THE additions to the Zoological Society's Gardens during the past week include a Badger (*Meles taxus*) from Worcestershire, presented by Mrs. Cheape; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mrs. B. Hudson; a Red and Yellow Macaw (*Ara chloroptera*) from South America, presented by Mr. J. W. Drysdale; a Peregrine Falcon (*Falco peregrinus*), British, presented by Major Hawkins Fisher; a Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*) from Moluccas, presented by Mr. John Paget; a Crowned Lemur (*Lemur coronatus*) from Madagascar, two Korin Gazelles (*Gazella rufifrons*, ♂ ♀) from Senegal, an Alexandrine Parrakeet (*Palaeornis alexandri*) from India, deposited; two Common Sandpipers (*Tringoides hypoleucus*), European, purchased.

OUR ASTRONOMICAL COLUMN.

BOND'S COLLECTED WORKS.—It is stated in *Science* that, at the request of the daughters of George Bond, Prof. Holden, Director of the Lick Observatory, has undertaken to arrange the manuscript material in their hands in an orderly form. The work will be entitled "Memorials of William Cranch Bond, Director of the Harvard College Observatory, 1840-59, and of his Son, George Phillips Bond, Director of the Harvard College Observatory, 1859-65," and will be published by Messrs. C. A. Murdock and Co., San Francisco, and by Messrs. Lemcke and Büchner, New York City. The book will be well illustrated. It is hoped, by the kindness of Prof. E. C. Pickering, to reproduce two fine steel engravings of the Great Comet of 1858 and of the nebula of Orion, from the plates of the *Annals* of the Harvard College Observatory.

ECLIPSE EXPEDITION OF THE LICK OBSERVATORY.—We learn from the Publications of the Astronomical Society of the Pacific, that the Lick Observatory expedition to observe the forthcoming solar eclipse will consist of Prof. Campbell and volunteer assistants. The expenses of the expedition will be met from a fund provided by the late Colonel C. F. Crocker.

NO. 1457, VOL. 56]

The programme will include spectroscopic and photographic work, and an equipment will be taken to obtain the following results, among others:—Photographs of the spectrum of the reversing layer; spectrum photographs having for their special object the determination of the velocity of rotation of the corona; photographs of the corona on a large scale (40 feet long), on the plan employed by Prof. Schaeberle in Chile; photographs of the corona with a portrait lens; photographic photometry of the corona.

A REMARKABLE BINARY STAR.—Recent observations leave practically no room for doubt that the close double star β 883 = Lalande 9091 (R.A. = 4h. 44m. 33s., Decl. + 10° 52', Mags. 7.8 and 8), has the shortest period of any known binary. The star was discovered by Mr. Burnham in 1879, and Schiaparelli made a number of measures of it between 1887 and 1895, and upon combining these observations with other measures, Dr. T. J. J. See was forced to the conclusion that the period was only a few years. Further considerations give support to this view, and now Dr. See (*Monthly Notices*, R.A.S., June 1897), from a discussion of the whole of the facts of observation, concludes that the period is only 5.5 years.

The elements of the orbit are given as follows:—

$$\begin{aligned} P &= 5.5 \text{ years} & a &= 0''.621 \\ T &= 1896.40 & \Omega &= 20^\circ.6 \\ \epsilon &= 0.760 & i &= 82^\circ.52 \\ & & \lambda &= 273^\circ.83 \end{aligned}$$

Apparent orbit:—

$$\begin{aligned} \text{Length of major axis} &= 0''.67 \\ \text{Length of minor axis} &= 0''.16 \\ \text{Angle of major axis} &= 19^\circ.5 \\ \text{Angle of periastron} &= 318^\circ.0 \\ \text{Distance of star from centre} &= 0''.07 \end{aligned}$$

Referring to this remarkable object, Dr. See says:—

"The discovery of an object revolving in a period of 5.5 years is an achievement of some philosophic significance in the history of double-star astronomy. In the time of Sir John Herschel the most rapid of known binaries was ζ Herculis, with a period of 35 years. Twenty years ago the remarkable object 42 Comae Berenices had reduced the shortest period to about 25 years, and in 1887 δ Equulei brought it down to 11.5 years. κ Pegasi (β 989) has since been shown to revolve in a similar period.

In β 883 we have for the first time a visible binary with a period fairly approaching those of the spectroscopic binaries recently discovered, and we seem assured that at last a link has been found connecting the two classes of objects. It is probable that other stars will disclose even shorter periods, for there is no reason why there should not be close doubles with periods of a single year or less. It will be an interesting object of future research to fill in the intervening steps between visible binaries with periods of a few years and the spectroscopic binaries revolving in a few days or months.

"The more critical inquiry into the motion of close doubles will commend itself to the attention of double-star observers with great telescopes, and, on the other hand, it may be hoped that the study of the relative motion in line of sight of the components of binaries like β 883 will be taken up by some of our great observatories equipped with powerful spectroscopic appliances."

FORTHCOMING BOOKS OF SCIENCE.

MR. EDWARD ARNOLD'S list contains:—"Higher Algebra," by Dr. R. Lachlan; "The Elements of Trigonometry," by Dr. R. Lachlan; "Analytical Geometry," by Dr. R. Lachlan; "The Elements of Euclid," Books III., IV. and VI., by Dr. R. Lachlan; "Dynamics for Engineering Students," by Prof. W. E. Dalby; "Elementary Natural Philosophy," by Alfred Earl; "An Elementary Chemistry," by W. A. Shentstone; "Physical Chemistry," by Dr. Alexander Scott; "Practical Chemistry," by Dr. E. H. Cook; "A Manual of Physiology," by Dr. Leonard Hill; "A Manual of Botany," by David Houston; Arnold's Practical Science Manuals: "Steam Boilers," by George Halliday; "Agricultural Chemistry," by T. S. Dymond; "Electric Traction," by Ernest Wilson; "Lectures on Sound, Light, and Heat," by Dr. Richard Wormell, new edition.

Messrs. Baillière, Tindall, and Cox's forthcoming books in-

clude:—Hand-Atlas Series: "Essentials of Bacteriology," by Profs. Lehmann and Neumann (illustrated); "Atlas of Fractures and Dislocations," by Prof. H. Helferich; "A Manual on Diseases of the Heart," by Sir Wm. Broadbent, Bart., F.R.S.; "The Röntgen Rays in Medicine and Surgery: a Manual for Practitioners and Students," by Dr. David Walsh, illustrated.

Messrs. Bliss, Sands, and Co. promise:—The Progressive Science Series: "Earth Structure," by Prof. Geikie, F.R.S.; "Volcanoes," by Prof. Bonney, F.R.S.; "The Groundwork of Science," by Dr. St. George Mivart, F.R.S.; "Vertebrate Palæontology," by Prof. Cope; "Science and Ethics," by M. Berthelot; "The Country Month by Month," by J. A. Owen and Prof. G. S. Boulger, a re-issue, in four quarterly volumes: Spring, Summer, Autumn, Winter, illustrated.

In Messrs. William Blackwood and Sons' list we find:—"A Sketch of the Natural History (Vertebrates) of the British Islands, with a bibliography of over two hundred works relating to the British Fauna, and a List of Field Clubs and Natural History Societies at present existing in the United Kingdom," by F. G. Aflalo, illustrated; "Wild Traits in Tame Animals: being some familiar Studies in Evolution," by Dr. Louis Robinson, illustrated; "A Manual of Agricultural Botany," from the German of Dr. A. B. Frank, translated by Dr. John W. Paterson, illustrated; "Things of Everyday: a Popular Science Reader on some Common Things," illustrated; "Introductory Text-Book of Meteorology," by Dr. Alexander Buchan, new edition, illustrated; "Dr. Mackay's Elements of Physiology," rewritten and enlarged, illustrated; "Page's Introductory Text-Book of Geology," new edition, revised and enlarged by Prof. Lapworth, F.R.S.; "Page's Advanced Text-Book of Geology, Descriptive and Industrial," with engravings and glossary of scientific terms, new edition, revised and enlarged by Prof. Lapworth, F.R.S.; "Introductory Text-Book of Zoology, for the Use of Junior Students," by Prof. Henry Alleyne Nicholson, F.R.S., new edition, revised and enlarged, illustrated.

The Cambridge University Press announces:—"The Collected Mathematical Papers of the late Arthur Cayley, F.R.S." (to be completed in thirteen volumes), vols. xii. and xiii.; "The Scientific Papers of John Couch Adams, F.R.S.," vol. ii., edited by Prof. W. G. Adams, F.R.S., and R. A. Sampson; "The Theory of Groups of a Finite Order," by Prof. W. Burnside, F.R.S.; "A Treatise on Universal Algebra, with some applications," by A. N. Whitehead. Vol. i. contains the general principles of algebraic symbolism, the algebra of symbolic logic, the calculus of extension (*i.e.* the algebra of Graffmann's Ausdehnungslehre), with applications to projective geometry, to non-Euclidean geometry, and to mathematical physics; "A Treatise on Octonions: a development of Clifford's Bi-Quaternions," by Prof. Alexander McAulay; "A Treatise on Spherical Astronomy," by Prof. Sir Robert S. Ball, F.R.S.; "A Treatise on Geometrical Optics," by R. A. Herman; "An Elementary Course of Infinitesimal Calculus, for the use of Students of Physics and Engineering," by Prof. Horace Lamb, F.R.S.; "Theoretical Mechanics: an introductory Treatise on the Principles of Dynamics, with numerous applications and examples," by A. E. H. Love, F.R.S.; "The Works of Archimedes," edited in modern notation, with introductory chapters, by Dr. T. L. Heath; "The Steam Engine and other Heat Engines," by Prof. J. A. Ewing, F.R.S.; "Collected Mathematical Papers," by Prof. P. G. Tait; "Crystallography," by Prof. W. J. Lewis; "Geology," by J. E. Marr, F.R.S.; Cambridge Natural Science Manuals, Biological Series—"Fossil Plants: a Manual for Students of Botany and Geology," by A. C. Seward, in two volumes; "Vertebrate Palæontology," by A. S. Woodward; "Handbook to the Geology of Cambridgeshire," by F. R. Cowper Reed; Physical Series—"Electricity and Magnetism," by R. T. Glazebrook, F.R.S.; "Sound," by J. W. Capstick.

The list of Messrs. Georges Carré et C. Naud, of Paris, includes:—"Leçons de Physiologie," by Prof. R. Dubois, illustrated; "Les Cancers épithéliaux," by Dr. Fabre-Domergue, illustrated; "Manuel d'Analyse chimique appliquée à l'examen des produits industriels et commerciaux," by Prof. E. Fleurent, illustrated; "Manuel de Chirurgie orthopédique," by A. Hoffa, traduit de la 2^e édition allemande, par M. Barrozzi, illustrated; "Leçons de thérapeutique et matière médicale: Sérothérapie, Ophothérapie," by Prof. L. Landouzy, illustrated; "Traité d'Anatomie comparée et de Zoologie, 1891-92, Ouvrage traduit de l'allemand par Prof. G. Curtel, by Prof. Lang, tome ii. (1^{re} fascicule: Mollusques; (2^e fascicule): Echinodermes; "Le

torticolis et son traitement," by M. Redard, illustrated; "Leçons d'optique physiologique," by M. Tscherning, illustrated.

The list of Messrs. Cassell and Co., Ltd., contains:—"Cassell's Family Doctor," by a Medical Man, illustrated; "With Nature and a Camera, being the Adventures and Observations of a Field Naturalist and an Animal Photographer," by Richard Kearton, illustrated by a special frontispiece, and about 150 pictures from photographs taken direct from nature, by Cherry Kearton; "Applied Mechanics," by Prof. John Perry, F.R.S., illustrated; "Familiar Wild Flowers," by F. E. Hulme, coloured plates, popular edition, complete in five vols.; "Familiar Garden Flowers," by F. E. Hulme, coloured plates and descriptive text by Shirley Hibberd, popular edition, complete in five vols. (new edition); "The Story of the Heavens," by Prof. Sir Robert S. Ball, F.R.S., illustrated, popular edition; "The Story of the Sun," by Prof. Sir Robert S. Ball, F.R.S., illustrated, cheap edition; "The Year-Book of Treatment (1898)"; "Science for All," edited by Dr. Robert Brown, assisted by eminent scientific writers, illustrated, complete in five vols., cheap edition; new volume of "Work" Handbooks: "Cycle Building and Repairing," illustrated; "Electricity in the Service of Man," revised by Dr. R. Mullineux Walmsley, illustrated, new and cheaper edition; "Cassell's Natural History," edited by P. Martin Duncan, F.R.S., illustrated, cheap edition, complete in three double vols.; "Cassell's New Technical Educator," cheap edition, complete in six vols.

Messrs. Chapman and Hall, Ltd., announce:—"What is life? or, Where are we? What are we? From whence did we come? And whither do we go?" by Frederick Hovenden, illustrated; "Physics, experimental and theoretical, an elementary treatise, mechanics, hydrostatics, pneumatics, heat, and acoustics," by Dr. R. H. Jude and H. Gossin, illustrated.

Among Messrs. J. & A. Churchill's announcements we find:—"A Manual of Diseases and Injuries of the Eye," by W. H. H. Jessop; "The Means by which the Temperature of the Body is maintained in Health and Disease, being the Croonian Lectures for 1897," by Dr. Hale White; "Economics, Anaesthetics, and Antiseptics in the Practice of Midwifery," by Haydn Brown; the second edition, enlarged, of Dr. Thin's "Treatise on Psoriasis, or 'Sprue'"; the second edition of "The Analyst's Laboratory Companion," by Alfred E. Johnson; the third edition of Mr. Hartridge's "Manual for Students on the Ophthalmoscope"; the third edition of Dr. Starling's "Elements of Human Physiology"; the sixth edition of "The Theory and Practice of Surgery," by W. J. Walsham; the eighth edition of Dr. Fenwick's "Student's Guide to Medical Diagnosis"; the eleventh edition of McHeath's "Manual of Minor Surgery and Bandaging."

The Clarendon Press will publish:—G. Claridge Druce's "Flora of Berkshire," dedicated by permission to Her Majesty the Queen; "An Account of the Herbarium of the University of Oxford"; and "A Book for Beginners in Geometry," by Prof. G. M. Minchin, F.R.S.

The list of Mr. Engelmann, of Leipzig, comprises:—"Arbeiten des physikalisch-chemischen Instituts der Universität Leipzig aus den Jahren 1887 bis 1896," gesammelt und herausgegeben von Prof. Wilhelm Ostwald, Vier Bände, Erster Band: (1) Allgemeines, (2) Die elektrische Leitfähigkeit gelöster Stoffe, (3) Die Dissociation der Säuren, (4) Die Dissociation der Basen, Zweiter Band: (5) Bestimmung von Molekulargewichten, (6) Das homogene Gleichgewicht, (7) Das heterogene Gleichgewicht, (8) Reaktionsgeschwindigkeit, Dritter Band: (9) Kontaktpotentiale, (10) Theorie der Kette, (11) Anwendung der Theorie der Kette, (12) Polarisation, Vierter Band: (13) Innere Reibung und Diffusion, (14) Optische Verhältnisse, (15) Thermische- u. Volumverhältnisse, (16) Physikochemische Untersuchung einzelner Stoffgruppen, Verschiedenes; "Betrachtungen über die Farbenpracht der Insekten," by Brunner v. Wattenwyl, illustrated; "Das Wachstum des Menschen, Anthropologische Studie," by Dr. Franz Daffner; "Tafeln und Tabellen zur Darstellung der Ergebnisse spektroskopischer u. spektrophotometrischer Beobachtungen," by Prof. Th. W. Engelmann; "Kollektivmasslehre," by Gustav Theodor Fechner, Im Auftrage der Königl. Sächsischen Gesellschaft der Wissenschaften herausg. von Gottl. Friedr. Lipps; "Das Verhältnis der experimentellen Bakteriologie zur Chirurgie, Antrittsvorlesung, gehalten am 10 Juli 1897 in der Aula der Universität Leipzig," by Paul Leopold Friedrich; "Die Begriffe Phänomenon und

Noumenon in ihrem Verhältniss zu einander bei Kant. Ein Beitrag zur Auslegung und Kritik der Transcendental-philosophie," by Dr. George Dawes Hicks; "Der tägliche Wärmeumsatz im Boden und die Wärmestrahlung zwischen Himmel und Erde," by Theodor Homén; "Ein Beitrag zu einer sicheren Behandlung von Rachen-Diphtherie und Scharlach ohne Serum," by Dr. F. Lueddeckens; "Die wissenschaftlichen Grundlagen der analytischen Chemie, Elementar dargestellt," by Prof. W. Ostwald, Zweite vermehrte Auflage; "Pflanzenphysiologie, Ein Handbuch des Stoffwechsels und Kraftwechsels in der Pflanze," by Prof. W. Pfeffer, Zweite ganz umgearbeitete Auflage, Erster Band: Stoffwechsel; "Darwin und nach Darwin, Eine Darstellung der Darwinischen Theorie und Erörterung Darwinischer Streitfragen," by Dr. George John Romanes, F.R.S., iii. Band: Darwinische Streitfragen, Isolation und Physiologische Auslese. Mit Bewilligung des Herausgebers aus dem Englischen übersetzt von Dr. B. Nöldeke, Mit d. Bildniss v. Rev. J. Gulick; "Zur Psychologie des Erkennens, Eine biologische Studie," by Dr. Gustav Wolff.

Messrs. R. Friedländer and Sohn, of Berlin, promise:—"Supplement to the International Zoologist's Directory," edited by the German Zoological Society; "The Microtome's Vademecum," a handbook of microscopic anatomy, by Arthur Bolles Lee; "The Birds of Celebes and the Neighbouring Islands (Sangi, Talaut, Sula, Togian, &c.)," by A. B. Meyer and L. W. Wiglesworth, two vols. with coloured plates and maps; "Gerberti (Papae Silvestri II.) Opera Mathematica," primum collegit et edidit, by N. M. Bubnow; "Beschreibung der Hauptmethoden, welche bei der Bestimmung der Verbrennungswärme üblich sind," by Prof. W. Louguinine, illustrated; "Catalogus Mammalium tum viventium quam fossilium," by Dr. E. L. Trouessart, nova editio (prima completa), Fasciculus iii. Rodentia (ii.).

Messrs. Gauthier-Villars et Fils, of Paris, promise: "Thermochimie," by Berthelot; "Rayons cathodiques et rayons de Röntgen," by Perrin; "Les méthodes nouvelles de la Mécanique celeste," by Poincaré, T. iii.; "Traité encyclopédique de Photographie," by Fabre; "Œuvres," by Cauchy, S. ii. T. iii.; "Théorie des fonctions algébriques de deux variables indépendantes," by Picard et Simart; "Journal de l'École Polytechnique," ii. S. ii. Cahier; "Introduction à la géométrie différentielle, suivant la méthode de H. Grassmann," by Burali-Forti; "La pratique du Teinturier," by J. Garçon; "Leçons sur l'Electricité," by Eric Gérard; "Atlas photographique de la Lune."

Mr. Upcott Gill's forthcoming books are:—"The Photographic Printing Processes," "Poultry Farming," "Realities of Sea Life," "Workshop Makeshifts," "Scientific Whist," "Popular Dog Management," and "Hardy Perennials" (new edition).

Messrs. Ginn and Co., of Boston, give notice of:—"Physical Experiments: a Manual and Note Book," by Alfred P. Gage; "A Text-Book of Physics," by G. A. Wentworth and G. A. Hill; "An Introductory Course in Quantitative Analysis," by Prof. Percy N. Evans; "Famous Problems of Elementary Geometry, an authorised translation of F. Klein's 'Vorträge über ausgewählte Fragen der Elementargeometrie ausgearbeitet von F. Täger,'" by Prof. Wooster Woodruff Beman and Prof. David Eugene Smith.

Messrs. Charles Griffin and Co., Limited, hope to issue:—"Brewing (the Principles and Practice of): a Text-Book for the use of Students and Practical Men," by Dr. Walter J. Sykes, with plate and illustrations; "Micro-Organisms (the Utilisation of) in the Arts and Manufactures: a Practical Handbook on Fermentation and Fermentative Processes for the use of Brewers and Distillers, Analysts, Technical and Agricultural Chemists, and all interested in the Industries dependent on Fermentation," by Dr. Franz Lafar, translated by Charles T. C. Salter, in two volumes, each complete in itself, and sold separately, illustrated; "Mine Accounts and Mining Book-keeping: a Manual for the Use of Managers of Metalliferous Mines and Collieries, Students, and others interested in Mining," by Prof. James G. Lawn; "The Art of the Goldsmith and Jeweller: a Manual for Students and Practical Men," by Thos. B. Wigley, assisted by J. H. Stansbie, illustrated; "Painting and Decorating: a Complete Practical Manual for House Painters and Decorators, embracing the Use of Materials, Tools, and Appliances; the Practical Processes involved; and the General Principles of Decoration, Colour and Ornament," by Walter John Pearce, illustrated; "Colour Theory and its Practical Application to

Painting, Dyeing, and the Textile Industries," by Geo. H. Hurst, illustrated; "Applied Mechanics (an Advanced Text-Book on)," by Prof. Andrew Jamieson. Vol. ii.—Comprising Parts iii. to vi.: Motion and Energy; Graphic Statics; Strength of Materials; Hydraulics and Hydraulic Machinery, with numerous illustrations and examination papers; "The Heat Efficiency of Steam Boilers: Land and Marine; many Experiments on many Types, showing Results as to Evaporation, Heating Value of Fuel, Analysis of Gases, &c.," by Bryan Donkin, illustrated; "Algebra," by R. C. Buck; "Ocean Meteorology: for Officers of the Merchant Navy," by William Allingham. New editions of:—"Introduction to the Study of Metallurgy," by Prof. W. C. Roberts-Austen, C.B., F.R.S., with additional illustrations and Micro-Photographic plates of Different Varieties of Steel; "Mine-Surveying (a Text-Book of), for the use of Managers of Mines and Collieries, Students at the Royal School of Mines, &c.," by Bennett H. Brough, illustrated; "The Steam Engine and other Prime Movers," by Dr. W. J. Macquorn Rankine, with a Section on Gas, Oil, and Air Engines, by Bryan Donkin; "Clinical Diagnosis: the Chemical, Microscopical, and Bacteriological Evidence of Disease," by Prof. von Jaksch, translated by Dr. Jas. Cagney, from the fourth German edition, revised and partly re-written, with additional illustrations; "Mental Diseases: with special reference to the Pathological Aspects of Insanity," by W. Bevan Lewis, illustrated; "Forensic Medicine and Toxicology," by Dr. J. Dixon Mann; "A Surgical Hand-Book: for Practitioners, Students, House Surgeons, and Dressers," by F. M. Caird and C. W. Cathcart; "Practical Sanitation: a Handbook for Sanitary Inspectors and others," by Dr. George Reid; "A Manual of Ambulance," by J. Scott Riddell, illustrated.

Messrs. Henry Holt and Co., New York, announce:—"The Elements of Comparative Zoology," by Prof. J. Sterling Kingsley; "Laboratory Directions in General Biology," by Harriet Randolph; "An Outline Introductory to Kant's Critique of Pure Reason," by Prof. R. M. Wenley; and a new and enlarged edition of "Hall and Bergen's Text-Book of Physics."

Messrs. Crosby Lockwood and Son's announcements include:—"Submarine Telegraphs," by C. Bright; "The Gas Engineer's Pocket-Book," by H. O'Connor; "Hydraulic Machinery," by G. C. Marks; "Iron and Steel Bridges and Viaducts," by F. Campin; "Practical Forestry," by Prof. C. E. Curtis.

Messrs. Longmans and Co. promise:—"The Fur, Feather, and Fin Series—"The Trout," by the Marquis of Granby, &c., illustrated; "The Rabbit," by J. E. Harting; "Birds in London," by W. H. Hudson, illustrated; "Darwin, and after Darwin: an Exposition of the Darwinian Theory and a Discussion of Post-Darwinian Questions," by the late Dr. George John Romanes, F.R.S. Part iii. Post-Darwinian Questions: Isolation and Physiological Selection; "The Diseases and Injuries of the Lungs and Pleura," by Dr. James Kingston Fowler and Dr. Rickman J. Godlee, illustrated; "Surgical Pathology and Principles," by Dr. J. Jackson Clarke, illustrated; "A Manual of Midwifery, by Dr. William Radford Dakin, illustrated; "Essentials of Practical Bacteriology," by Dr. Henry J. Curtis, illustrated; "The Essentials of Experimental Physiology," for the use of Students, by Dr. T. G. Brodie; "The Dwelling House in Country and Suburban Places," by Dr. George Vivian Poore, illustrated; "The Arrangement of Atoms in Space," by Prof. J. H. van 't Hoff, second, revised and enlarged edition, with an Appendix, "Stereochemistry among Inorganic Substances, by Prof. Alfred Werner, translated and edited by Arnold Eiloart; "Mechanical Engineer's Pocket-book," by Prof. David Allan Low; "The Origin and Growth of the Moral Instinct," by Alexander Sutherland.

The announcements of Messrs. Macmillan and Co., Ltd., include:—"West African Studies," by Mary Kingsley; "The Ruins and Excavations of Ancient Rome," a companion book for Students and Travellers, by Prof. Rodolfo Lanciani, with numerous illustrations and maps; "The Scientific Papers of Henry T. Huxley," reprinted from the Journals of Scientific Societies, edited by Prof. Michael Foster, Sec. R.S., and Prof. E. Ray Lankester, F.R.S., in four volumes, vol. i.; "A Text-Book of Zoology," by Prof. T. Jeffery Parker, F.R.S., and Prof. William A. Haswell, illustrated, two volumes; "A Text-Book of Botany," by Dr. E. Strasburger, Dr. Fritz Noll, Dr. H. Schenck, Dr. A. F. W. Schimper, translated from the German by Dr. H. C. Porter, illustrated, in part coloured; "A Text-Book of Metallurgy," by Carl Schnabel, translated and edited by Prof. Henry Louis,

illustrated, two volumes; "Elements of Palæontology," by Prof. Karl A. von Zittel, translated and edited by Dr. Charles R. Eastman, vol. i. (this English edition is revised and enlarged by the author and editor in collaboration with numerous specialists); "Light, Visible and Invisible," lectures delivered at the Royal Institution, by Prof. Silvanus P. Thompson, F.R.S., illustrated; "The Founders of Geology," a series of lectures, by Sir Archibald Geikie, F.R.S.; "A System of Medicine," by Many Writers, edited by Dr. Thomas Clifford Allbutt, F.R.S., vol. iv., containing diseases of the liver, of the pancreas, of the kidney, and of lymphatic and ductless glands, obesity, and diseases of the respiratory organs; "Electro-Physiology," by Prof. H. Biedermann, translated by Frances A. Welby, vol. ii.; "Infinitesimal Analysis," by Prof. William Benjamin Smith, vol. i. Elementary; "On Laboratory Arts," by Prof. Richard Threlfall; "Recent and Coming Eclipses," by Sir Norman Lockyer, K.C.B., F.R.S., illustrated; "The Sun's Place in Nature," by Sir Norman Lockyer, K.C.B., F.R.S., illustrated; "Physiography for Advanced Students," by A. T. Simmons, illustrated; "The Pruning Book," by L. H. Bailey (Garden Craft Series); "Constipation," by Dr. H. Illoway; "Entomology," by Dr. A. S. Packard; "A Primer of Elementary Psychology," by Prof. E. B. Titchener; "American Insects, Weed: Wild Neighbours," by E. Ingersoll; "Travels in West Africa," by Mary Kingsley, new and popular abridged edition; "The Practitioner's Handbook," by Dr. J. Milner Fothergill, new edition, revised by Dr. W. Murrell.

Messrs. Methuen and Co. announce:—"Primæval Scenes," by Rev. H. N. Hutchinson, illustrated.

The Rebman Publishing Co. Ltd., announce:—"The Diseases of Women: a Handbook for Students and Practitioners of Medicine," by J. Bland Sutton and Dr. Arthur E. Giles, illustrated; "Injuries and Diseases of the Ear: being various papers on Otolology," by Macleod Yearsley.

Messrs. L. Reeve and Co. have in preparation for serial issue:—A new illustrated work on the "Potamogetons of the British Isles," by Alfred Fryer, illustrated; an illustrated "Monograph of the Genus *Teracolus*," by Miss E. M. Bowdler Sharpe; also the final part and concluding volume of the "Flora of British India," by Sir Joseph Hooker, F.R.S.; new parts of the "Flora Capensis" and the "Flora of Tropical Africa"; and the fourth volume of C. G. Barrett's "Lepidoptera of the British Isles."

In Mr. Grant Richard's list we notice:—"The Evolution of the Idea of God: Researches in the Origins of Religion," by Grant Allen; "The Subconscious Self in its Relation to Education and Health," by Dr. Louis Waldstein.

Messrs. Walter Scott, Ltd., will add to the Contemporary Science Series:—"Sleep: its Physiology, Pathology, Hygiene, and Psychology," by Dr. Marie de Manacéine, with diagrams.

Messrs. Swan Sonnenschein & Co., Ltd., promise:—"Ethics," by Prof. W. Wundt, translated with the author's permission from the second German edition, 3 vols., vol. i. Introduction: the Facts of the Moral Life, translated by Prof. Julia Gulliver and Prof. E. B. Titchener, vol. ii. Ethical Systems, translated by Prof. Margaret Floy Washburn, vol. iii. The Principles of Morality and the Sphere of their Validity, translated by Prof. E. B. Titchener; "Physiological Psychology," by Prof. W. Wundt, translated by Prof. E. B. Titchener, illustrated, 2 vols.; "Practical Ethics," by Prof. Henry Sidgwick; "A History of Contemporary Philosophy," by Prof. Friedrich Ueberweg, edited by Prof. Max Heinze, translated by William A. Hammond (forms a supplement to Erdmann's "History of Philosophy"); "A Student's Text-book of Zoology," by Adam Sedgwick, F.R.S., illustrated, 2 vols.; "Text-Book of Palæontology for Zoological Students," by Theodore T. Groom, illustrated; "Text-Book of Embryology: Invertebrates," by Drs. Korschelt and Heider, vol. ii. Crustacea and Arachnoids, translated by Mrs. Bernard with the assistance of Mrs. Woodward, illustrated; "Practical Plant Physiology," by Prof. Wilhelm Detmer, translated by Prof. S. A. Moor; "Handbook of Practical Botany, for the Botanical Laboratory and Private Student," by Prof. E. Strasburger, edited by Prof. W. Hillhouse, new and revised edition, illustrated; "Introduction to the Study of Organic Chemistry," by John Wade, illustrated; "Radiation," by H. H. F. Hyndman; "The Elements of Number," Part v. Compound Rules applied to Weights and Measures, Length, Weight, Capacity, Time, Divisors and Multipliers not exceeding 99, by Edith A. Sonnen-

schein; Young Collector Series: "Fishes," by the Rev. H. A. Macpherson; "Handbook of Grasses," by W. Hutchinson, illustrated; "Mammalia," by the Rev. H. A. Macpherson; "Birds' Eggs and Nests," by W. C. J. Ruskin Butterfield; "The Science and Art of Arithmetic," by A. Sonnenschein and H. A. Nesbit, new edition; "The Dynamo: how made and how used," by S. R. Bottone, a new edition, illustrated, and an Appendix on the Construction of a Six-Unit Dynamo.

Messrs. Thacker and Co.'s list includes:—"Infective Diseases of Animals," by Captain M. H. Hayes, being Part i. of the translation of Friedberger and Frœhner's "Pathology of Domestic Animals," translated and annotated by Captain M. H. Hayes, Dr. Newman, and others, in 2 vols. (sold separately).

Mr. Fisher Unwin announces:—"Masters of Medicine," edited by Dr. Ernest Hart, each with photogravure frontispiece; vol. i. John Hunter, by Stephen Paget, vol. ii. William Harvey, by D'Arcy Power.

Messrs. Warne and Co.'s forthcoming scientific books are:—"Favourite Flowers of Garden and Greenhouse," and a new edition of Armatage's "Cattle Doctor."

Messrs. Whittaker and Co.'s announcements include:—"Central Station Electricity Supply," by A. Gay and C. H. Yeaman; "Alternating Currents of Electricity: a Practical Treatise upon their application to industries," authorised translation from the French of Loppé and Bouquet, by T. J. Moffett; Prof. Reychler's "Les Théories Physico-Chimiques," translated by Dr. Ferdinand Hurter; "The Theory and Practice of Analytical Electrolysis of Metals," translated from the German of Dr. Bernard Neumann by J. B. C. Kershaw; "Whittaker's Mechanical Engineer's Pocket-Book," by Philip J. Bjorling; "The Inspection of Railway Material," by G. R. Bodmer; "The Elements of Geography," by Charles Bird; "Electric Lighting and Power Distribution," by W. Perren Maycock, third edition, re-written, vol. ii.

LONG RANGE TEMPERATURE AND PRESSURE VARIABLES IN PHYSICS.¹

METHODS OF PYROMETRY.

THE endeavour to provide suitable apparatus for high temperature measurement is one of long standing. The student of the subject is fairly overwhelmed with the variety of devices which have been proposed. There are few phenomena in physics which have not in some way or other been impressed into pyrometric service, often indeed by methods of exquisite physical torture. I cannot, of course, even advert to many of these this afternoon, as my purpose will have to be restricted to such devices as have usefully survived. Thus a whole group of "intrinsic thermoscopes," as Lord Kelvin calls them—apparatus in which some property of the substance is singled out for measurement—will be overlooked. Pyrometry will some day receive substantial aid from the phenomena of solid thermal expansion, dear to the hearts of old Wedgwood, of Prof. Daniells, of the citizen Guyton-Morveau, and recently to Prof. Nichols, Dr. Joly and others; but even the "meldometer," which has received Ramsay's encouragement, and recent heroic attempts to measure the expansion of platinum, have not yet entered the arena to stay.² The same may be said of vapour pressure, ebullition and certain dissociations, of which the former is entirely too liberal in dispensing pressure, and the latter too negligent in readjusting it. Little has been done with heat conduction regarded as subservient to the measurement of high temperatures; little with colour and the spectrum, even though Draper and Langley in America, and many others elsewhere have paid tribute; little with polarisation. The wave-length of sound has told Cagniard Latour and our own A. M. Mayer much about high temperature, but it did not tell them enough.

Throughout the history of pyrometry, *fusion* seems to have come forward for journeyman duty. What is more convenient than to find whether the degree of red heat is too low or too high from the fusion of prepared alloys. As far back as 1828 Prinspe, aware of the golden opportunity, with his air thermometer, determined the melting point of some equally specious alloys of

¹ An address delivered by Prof. Carl Barus, before the Section of Physics, at the Detroit Meeting of the American Association for the Advancement of Science, August 1897.

² Noteworthy attempts to replace mercury by a liquid potassio-sodium alloy in glass thermometers are among the novelties.