

Biblioteka Główna i OINT
Politechniki Wrocławskiej



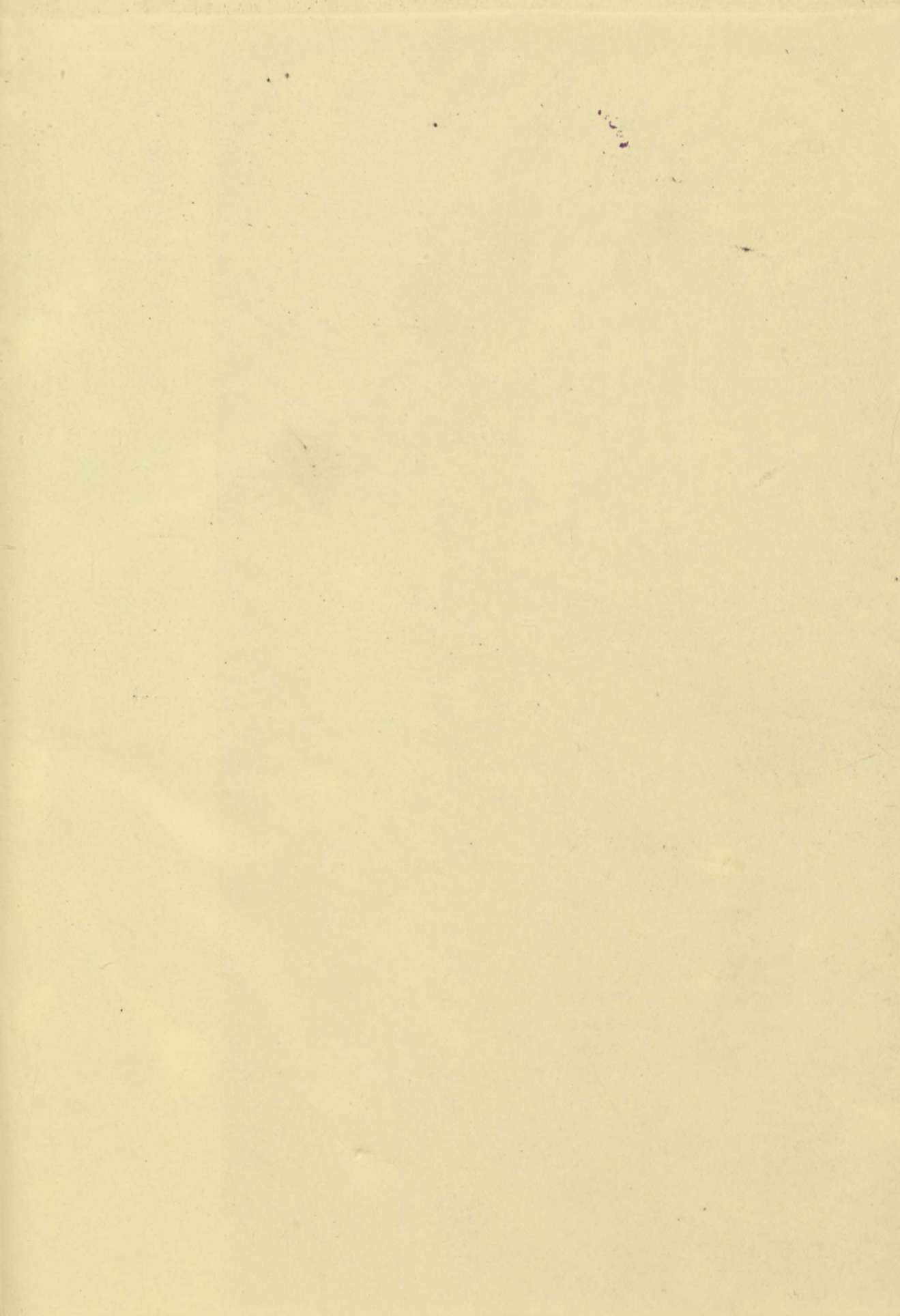
100100234281

A 610 II

m



Cytl. Ngob
18. II. 13



Supplement to Nature,
December 1, 1892.

[Printed at the University
of Cambridge Press]

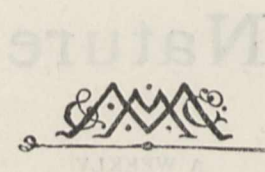
Nature

A WEEKLY

Nature

A WEEKLY

ILLUSTRATED JOURNAL OF SCIENCE



ILLUSTRATED JOURNAL OF SCIENCE

Supplement to Nature,
December 1, 1892

Nature

A WEEKLY

ILLUSTRATED JOURNAL OF SCIENCE

VOLUME XLVI

MAY 1892 to OCTOBER 1892



"To the solid ground

Of Nature trusts the mind which builds for aye."—WORDSWORTH

1912. 1942.

London and New York

MACMILLAN AND CO.

Nature

A WEEKLY

ILLUSTRATED JOURNAL OF SCIENCE

RICHARD CLAY AND SONS, LIMITED
LONDON AND BUNGAY



INDEX

- ABBADIE (M. ANTOINE D'), the Variation of Terrestrial Latitudes, 65
- Abbe (Prof. Cleveland), Atmospheric Radiation of Heat, and its Importance in Meteorology, 67
- Abbe's (Prof.) Improved Spherometer, 472
- Abbot (Dr. W. L.), on the Climate of Kilima-Njaro, 160
- Abel's (Sir F.) Presidential Address to the Iron and Steel Institute, 111
- Aberration, Determination of the Constant of, Prof. G. C. Comstock, 41
- Aberration Problems, Dr. Oliver J. Lodge, F.R.S., 497
- Abney (Capt., F.R.S.), Star Magnitudes, 41; Transmission of Sunlight through Earth's Atmosphere, ii. Scattering at different Altitudes, 69
- Abraham (H.), Electro-magnetic and Electrostatic C.G.S. Units, 168
- Absorption, Experimental Proof that the Co-efficient of, is not affected by Density of Illumination, Dr. W. Peddie, 385
- Absorption and Filtration of Sewage, R. F. Grantham, 429
- Acorn-eating Birds in Michigan, Dr. Morris Gibbs, 495
- Acoustics: An Acoustic Method whereby the Depth of Water in a River may be Measured at a Distance, Frederick J. Smith, 246; Musical Sands, C. Carus Wilson, 44; T. S. Hall, 279; Influence of Acoustic Clouds, David Cunningham, 430
- Acquired Characters, the Bearing of Pathology upon the Doctrine of the Transmission of, Henry J. Tylden, 302
- Acquired Characters, the Transmission of, through Heredity, Prof. C. V. Riley, 504
- Active Lunar Volcanoes? Prof. Pickering, 134
- Adams (Prof.), Proposed Memorial to, in Westminster Abbey, 208
- Addenbrooke (G. L.), the Use and Application of Aluminium, 63
- Aden Survey, Completion of, 212
- Aeronautics: Modern Aërial Navigation, Capt. J. D. Fullerton, 63; Flying Machine Work, L. Hargrave, 556
- Africa: Tanganyika, Eleven Years in Central Africa, Edward Coode Hore, 6; Emin Pasha's Return Expedition to the Equatorial Lakes, Dr. Stuhlmann, 110, 302; Lieut. Mizon's Explorations, 110; Two Pillars erected by Diogo Cão, the First Portuguese Explorer, on West Coast of Africa, brought back to Lisbon, 111; the Pigmies of Africa, Dr. H. Schlichter, 135; Immunity of the African Negro from Yellow Fever, Dr. C. Creighton, 200, 222; Meteorological Observatories at Banana, Dr. Etienne, 255; the Uganda Question, 280; Dr. O. Baumann's Survey of Road to Victoria Nyanza, 280; Discovery of a New Great Lake (Lake Eiassi), 280; Diamond Robbery from a South African Museum, 332; Geodetic Survey of South Africa, 362; African Travels, 407; Industrial Resources of Nyasaland, John Buchanan, 407; African Meteorology, 407; the Mombasa-Victoria-Nyanza Survey, 453; Railways in Tropical Africa and Native Passengers, 453; Founding of Robinson Commemoration Association for Study of Hausa Language and People, 572; Camels in German South-West Africa, 598; the Dra Dwarfs, E. G. Dönnenberg, 616; Mr. Joseph Thomson's Journey to the Lake Bangweola Region, 620
- Agriculture: Egyptian Agriculture, Prof. Robert Wallace, 15; Report on the Relations of Fruit Production in New South Wales to the English Market, F. W. Ward, 39; Agriculture in United States; Official Denial of the reported intention of the Government to introduce Mongoose to exterminate troublesome Rodents in the West, 39; Live Stock, Prof. Wrightson, 76; Appearance of the Diamond-back Moth in Yorkshire and Northumberland, 108; Soils and Manures, John M. H. Munro, 125; A New Method of Rabbit Destruction in New South Wales, 161; Perfume-flower Farming in New South Wales, 161; The Carob-bean Tree in New South Wales-F. Turner, 210; Royal Agricultural Society's Journal, 262; Vermin of the Farm, J. E. Harting, 262; Yorkshire College, Leeds: The County Lectures to Farmers, 300; Coffee, Cacao and Rubber Cultivation in Ceylon, J. Ferguson, 300; Utilization of Stripped Autumn Plants as Green Manure, P. P. Dehérain, 364; The Vole Plague in the Border Districts, 395; Copper Sulphate Spray as Fungicide, 422; Agricultural Education at University College of North Wales, Bangor, 474; the Manufacture of Iron in its Relations with Agriculture, Sir Lowthian Bell, 525; Contagious Foot Rot in Sheep, Prof. G. T. Brown, 560; A Text-book of Agricultural Entomology, Eleanor A. Ormerod, 561; Allotments and Small Holdings, Sir J. B. Lawes and Dr. Gilbert, 602; Dr. Leather's Method of Detecting and Estimating Castor-oil Seeds in Cattle Foods, 602; The Improvement of the Potato in Australia, 617; Birds versus Insects in Malta, 618
- Aikman (C. M.) Farmyard Manure, 100
- Ainos of Japan, the, Mrs. Isabella Bishop, 119; R. Hitchcock, 421; Arrow Poisons used by, Romyon Hitchcock, 475
- Air, Radiation of Atmospheric, C. C. Hutchins, 67
- Air Leyden, A New Form of, Lord Kelvin, F.R.S., 212
- Aitken (John, F.R.S.), on Some Phenomena connected with Cloudy Condensation, 90
- Akroyd (William), the Law of Colour in relation to Chemical Constitution, 23
- Alaska, Acclimatization of Reindeer in, by Dr. Sheldon Jackson, 109
- Alaskan Grave, Ancient Chinese Coins discovered in an, Lieut. Dix Bolles, 574
- Albino Animals in Japan, Importance attached to, Herr J. L. Janson, 493
- Albumen in Plants, the Active, O. Loew, 491
- Alcock (Dr. A.), the Marine Survey of India, 549; The Red Oeypode Crab, 549; the Little Estuarine Crab Gelasimus, 574
- Aldabra Island, Seychelles, the Gigantic Land Tortoise of, Riseley Griffiths, 398
- Algeria, Miocene Formations of Western, Jules Welsch, 628
- Alheilg (M.) Recette, Conservation et Travail des Bois, 246
- Alloys, the Microscopic Structure of, Behrens, 72
- Alloys, on Certain Ternary, Aluminium, &c., C. R. A. Wright, F.R.S., 188
- Alloys of Iron and Chromium, the, R. A. Hadfield, 526
- Alluaud's (Charles), Researches in the Island of Mahé (Seychelles), 230
- Alpine Glaciers, the Present Extension of; the Glacier des Boisons, 370
- Alpine Glaciers, the Periodic Variations of, F. A. Forel, 386
- Alpine Trias, Brachiopods of the, A. Bittner, F. A. Bather, 25
- Alterations of Personality, Alfred Binet, 219
- Alternative Hypothesis, Natural Selection and, F. E. Beddard, F.R.S., Edward B. Poulton, F.R.S., 533

- Aluminium, the Uses and Applications of, G. L. Addenbrooke, 63
- Aluminium, Specific Heat and Latent Heat of Fusion of, J. Pionchon, 312
- Amagat (E. H.), Elements of Critical Point of Carbonic Acid, 96
- Amber Mines of Upper Burma, Dr. Noetling, 549
- Ambronn (Dr. L.), the Trapezium in the Orion Nebula, 334
- America: Discovery of Australian-like Mammals in South America, R. Lydekker, 11; Palæonictis in the American Lower Eocene, Henry F. Osborn, 30; Revision of the Species of *Rumex* occurring North of Mexico, W. Trelease, 40; American Journal of Science, 67, 310, 627; American Journal of Mathematics, 68, 627; the Development of American Armour-plate, F. L. Garrison, 86; Science in America, the Walker Prize awarded to Prof. J. D. Dana, 158; Alleged Discovery by Cyrus Thomas of the Key to the Central American Inscriptions, 160; Projected Marine Biological Laboratory in Jamaica in commemoration of Quater-Centenary of Discovery of America, 176; Discovery of America to be Celebrated in Hamburg, October 11-12, 230; American Meteorological Journal, 235, 435, 483, 555; Locusts in America, C. V. Riley, 256; the Tertiary Rhynchophora of North America, S. H. Scudder, 256; Proposed American Psychological Association, 419; American Association for the Advancement of Science, President's Address, 408; Rochester Meeting, 453; Section A, some Problems in the Old Astronomy, J. R. Eastman, 424; Annual Convention of American Association of State Weather Services, 493; Science in the United States, W. Kent, 494; the First Chart of America, Juan de la Cosa's, 453
- Amsterdam Royal Academy of Sciences, 72, 216, 263, 628
- Analytical Statics, a Treatise on, Edward J. Routh, F.R.S., Prof. A. G. Greenhill, F.R.S., 145
- Anatomy, Quain's Elements of, 6
- Anatomy Museum at Pennsylvania University, Endowment by General Wister of, 38
- Anatomy, Physiology, Morphology, and Development of the Blow-fly (*Calliphora erythrocephala*), B. Thompson Lowne, 267
- Anchor Ring, the Potential of an, F. W. Dyson, 92
- Anderson (Ernest), Some Victorian Lepidoptera, 595
- Anderson (Dr. W., F.R.S.), Inaugural Address as President of Institution of Mechanical Engineers, 42
- Andes, Collections from the, Edward Whymper, H. J. Elwes, 147
- Andrew (Captain Edgar H.), Ice in the South Atlantic, 173
- Andrussoff (Dr.), Results of the Recent Russian Investigations on the Black Sea, 408
- Anemometer, Timchenko's, Prof. Klossovsky, 594
- Angell (John), Elements of Magnetism and Electricity, 610
- Animal Coloration: an Account of the Principal Facts and Theories Relating to the Colours and Markings of Animals, F. E. Beddard, F.R.S., Edward B. Poulton, F.R.S., 533
- Animal Heat and Physiological Calorimetry, Prof. Rosenthal, 403
- Animal Intelligence, the Limits of, Edward T. Dixon, 392; C. Lloyd Morgan, 417; Dr. St. George Mivart, F.R.S., 466
- Animal Life Past and Present, Phases of, R. Lydekker, 74
- Animals, Land, the Origin of; a Biological Research, W. J. Sollas, 271
- Animals in Captivity in Lower Bengal, a Handbook on the Management of, Ram Bramha Sanyal, 314
- Annelid, the Protective Device of an, A. T. Watson, 7
- Annuaire Géologique Universel, L', 109
- Anniversary Meeting of the Royal Geographical Society, President's Address, 87
- Ant-bear in Cape Colony, the Extermination of the, A. C. Macdonald, 522
- Antarctic Expedition, Abandonment of the Proposed, 230
- Antarctic Whaling Expedition; Sailing of the Dundee, 477
- Ants in Ceylon, W. F. Liesching, 15
- Ants and Saccharine, H. Devaux, 573
- Ants, Habits of Parasol, J. E. Tanner, 595
- Anthropology: the Religious and Social Ideas of the Chinese, as illustrated in the Ideographic Characters of the Language, Prof. R. K. Douglas, 23; Anthropological Institute, 23, 119, 238; Anthropology as a branch of University Education, Dr. D. G. Brinton, 39; the Ainos of Japan, Isabella Bishop, 119; R. Hitchcock, 421, 475; the British Association's Notes and Queries on Anthropology, 160; the Todas, 160; the Acceleration of Mortality in France, M. Delauney, 168; the True Basis of Anthropology, Horatio Hale, 206; Immunity of the African Negro from Yellow Fever, Dr. C. Creighton, 200, 222; an Ethnological Enquiry into the Basis of our Musical System, Dr. Wallaschek, 238; Easter Island, W. J. Thomson, 258; Opening Address in Section H, by Prof. Alexander Macalister, F.R.S., at the British Association, 378; on the Organization of Local Anthropological Research, E. W. Brabrook, 432; on the Discovery of the Common Occurrence of Palæolithic Weapons in Scotland, Rev. Frederick Smith, 432; Weapons and Articles of Clothing used by the Toba Indians of the "Gran Chaco," J. Graham Kerr, 432; "Pre-Palæolithic" Flints, J. Montgomerie Bell, 432; on the Present Inhabitants of Mashonaland and their Origin, J. Theodore Bent, 432; the Value of Art in Ethnology, Prof. A. C. Haddon, 432; on the Similarity of certain Ancient Necropoleis in the Pyrenees and in North Britain, Dr. J. S. Phené, 432; Anthropometric Identification, Dr. Manouvrier, 432; Criminal Anthropology, Dr. T. S. Clouston, 432, Dr. Benedikt, 433; Coiffure of a Kanaka Labourer, Sir William Turner, 433; Prehensile Power of Infants, Dr. Louis Robinson, 433; on the Contemporaneity of the Maori and the Moa, H. O. Forbes, 433; Human Osteometry, Dr. Garson, Sir William Turner, 433; Observations as to the Physical Deviations from the Normal as seen among 50,000 Children, Dr. Francis Warner, 433; on some Facial Characters of the Ancient Egyptians, Prof. A. Macalister, 433; Ancient Skeletons from Medum, Egypt, Dr. Garson, 433; German Anthropological Congress, 420; Copper Implements and Ornaments in Ohio Mounds, Prof. F. W. Putnam, 455; the Ulu or Woman's Knife of the Eskimo, O. T. Mason, 550; the Dra Dwarfs, E. G. Dün-
nenberg, 616
- Anthropometric Identification, Dr. Manouvrier, 432
- Anticyclone over British Islands and Atlantic, 38
- Anti-Friction Material for Bearings used without Lubrication, Killingworth Hedges, 430
- Aphanapteryx and other Remains in the Chatham Islands, Henry O. Forbes, 252
- Apiculture: Amount of Honey needed to enable Bees to secrete one pound of Wax, A. J. Cook, 255
- Aplysiidae, Physiology of the Glands of Bohadsch in the, G. F. Mazzarelli, 163
- Apodidae, the: a Morphological Study, H. M. Bernard, Prof. E. Ray Lankester, F.R.S., 267
- Apodidae, the: a Reply, Henry M. Bernard, 366
- Archæan History, Subdivisions in, Prof. James D. Dana, 152
- Archæology: the Tell el-Amarna Tablets in the British Museum, 49; the Coming Moscow International Congress of Prehistoric Archaeology, 108; Proposed Testimonial to Signor G. Fiorelli on his Retirement, 176; Discovery of Buddhist Antiquities at Bhatuprolu, A. Rea, 178; Herr K. Flegel's Discoveries in Kalymnos, 521; the Recent Discovery of an Ancient Lake-Village in Somersetshire, Dr. A. Munro, 617
- Archipelago, Eastern, the Deep-Sea Deposits of the, P. W. Bassett-Smith, 69
- Archoplasmic Body, on the Relationships and Role of the, during Mitosis in the Larval Salamander, J. E. S. Moore, 404
- Arctic Expedition, the *Manche*, 397
- Arctic Exploration: the Relief of the Peary Expedition, 476
- Arctic Regions; Prof. Pouchet's Visit to Jan Mayen and Spitzbergen, 453
- Arenig Age, on the Radiolarian Chert of, Messrs. Peach and Horne, 428
- Arithmetic, Mental, G. Daehne, 247
- Arithmetic for Beginners, Key to, J. and E. J. Brooksmith, 441
- Arithmetical Chemistry, C. J. Woodward, 610
- Arloing (M.), the Phylacogenic Substance in Ordinary Liquid Cultivations of *Bacillus anthracis*, 240
- Armour-plate, American, the Development of, F. L. Garrison, 86
- Armstrong (Prof. H. E., F.R.S.), the International Conference on Chemical Nomenclature, 56; the Origin of Colour, ii., the Constitution of Coloured Nitro-compounds; iii. Colour as an Evidence of Isodynamic Change, 142; British Association Procedure, 291

- Arrow Poisons used by the Ainos of Japan, Romyn Hitchcock, 475
- Arsonval (A. d'), Physiological Effects of Alternating Currents with Sinusoidal Variations, 240
- Art : the Black and White Handbook to the Academy and New Gallery Pictures, 84
- Art in Ethnology, the Value of, Prof. A. C. Haddon, 432
- Aryan Race, Omalius d'Halley the author of the Theory of the European Origin of the, Dr. Brinton, 278
- Ascidian, a Functional Hermaphrodite, Prof. W. A. Herdman, F.R.S., 561
- Ascidians, on the Geographical Distribution of, Prof. W. A. Herdman, F.R.S., 405
- Asia, Central, Brick Manufacture in, Edouard Blanc, 604
- Assmann's (Dr. R.) Aspiration Apparatus, 361; Treatment of Persons Struck by Lightning, 521
- Asteroids, Numeration of, 372
- Asters and Perennial Sunflowers, J. G. Baker, 14
- Aston (Miss), Atomic Weight of Boron, 403
- Astronomy : Astronomical Column, 16, 41, 64, 86, 110, 134, 161, 179, 211, 229, 257, 279, 304, 334, 362, 371, 400, 423, 452, 476, 496, 524, 551, 575, 597, 619; Prof. Tacchini on Sun-spots, 16; Photographs of Sun-spots, 258; the Influence of Sun-spots on Terrestrial Magnetic Conditions, 278; Atmospheric Depressions and their Analogy with the Movements of Sun-spots, M. Camille Flammarion, 280; Sun-spot Observations at the Lyons Observatory, E. Marchand, 340; Eclipse of the Moon, May 11, 17; Comet Swift (March 6), 1892, 17, 65, 87, 230, 258, 423, 453; Spectrum of Swift's Comet (α 1892) W. W. Campbell, Prof. Konkoly, 17; Nova Aurigae, Prof. Konkoly, 17, "L'Astronomie," 161, Rev. A. Freeman, 453, H. F. Newall, 489, Herr Belopolsky, 552, 576, Dr. J. Holetschek, 576; Nebular Spectrum of, R. Copeland, 464; Spectrum of, Herr E. von Gothard, 620; Increase of, 400; Photographic Magnitudes of, J. M. Schaeberle, 423; Brightness of, 476, 496; a New Variable, T. E. Espin, 17; a New Variable Star, Prof. Schaeberle, 620; New Variable Stars, Prof. Pickering, 334; Variable Star T Cassiopeie, Cuthbert E. Peek, 443; Aurora, Dr. M. A. Veeder, 29, H. Geelmuyden, 55; Photographic and Visual Magnitudes of Stars, Prof. J. C. Kapteyn, 41; Photographs of the Lyra Ring Nebula, Prof. Denza, 41; Determination of the Constant of Aberration, Prof. G. C. Comstock, 41; Star Magnitudes, Captain Abney, 41; Captain Weir's Azimuth Diagram, 44; Latitude Observations at Waikiki, Mr. Preston, 64; Motion in the Line of Sight, W. W. Campbell, 64; Declinations of Stars for Reduction of Variations in Latitude, 65; Comet 1892, Denning (March 18), 65; Lunar Eclipse, May 11, 1892, 64, 372; Observations of the Moon, 179; Bright Streaks on the Full Moon, Prof. Pickering, 476; the Variation of Terrestrial Latitudes, M. Antoine d'Abbadie, 65; the Radiants of the Andromedides, Th. Bredikhine, 68; the Libration of Hyperion, H. Struve, 68; Distribution of Stars in Space, Kapteyn, 72; Paris Observatory Report, 86; Stars with Remarkable Spectra, 86; Light Variations of γ Cygni, Prof. Dunér, 87, 134, Mr. Yendell, 134; Nebulae, Mr. Burnham, 87; Catalogue of Nebulae, 135; Variable Nebulae, E. E. Barnard, 211; Winnecke's Periodic Comet, 1892, 110; Saturn's Rings, M. Bigourdan, 110, Rev. A. Freeman, 150; Stone Circles, the Sun and the Stars, A. L. Lewis, 127; Active Lunar Volcanoes, Prof. Pickering, 134; Photographic Measures of the Pleiades, 161; the Planet Mars, 162; Colours on the Surface of Mars, Prof. Pickering, 179; Opposition of Mars, 258, 400, J. Norman Lockyer, F.R.S., 443; Observations of Mars, M. Perrotin, 482; Measures of the Diameter of Mars, Camille Flammarion, 460; Earth-fractures and Mars "Canals," Prof. G. A. Lebour, 611; Death of Narasinga Row, 176; a New Planisphere, 177; a Planet beyond Neptune, Prof. Forbes, Mr. Roberts, 179; Total Solar Eclipse, April 15-16, 1893, 201; Variation of Latitude, Mr. Chandler, 211; Comparative Spectra of High and Low Sun, 211; Coronoidal Discharges, M. I. Pupin, 211; the Red Spot on Jupiter, J. J. Landerer, 229, W. F. Denning, 391; Position of Jupiter, 453; Discovery of a New Satellite to Jupiter, 476, 592; Discovery of a Fifth Satellite to Jupiter, W. F. Denning, 492; Jupiter's Fifth Satellite, Prof. Barnard, 620; Jupiter and his System, Miss E. M. Clarke, 620; a Mean Time Sun-dial, Major-General Oliver, 230; Stars' Proper Motions, J. G. Porter, 230; Determination of Angle of Polarization of Venus, J. J. Landerer, 240; Lunar Photography, Dr. L. Weinek, Prof. Holden, 257; Remarkable Prominences, M. Trouvelot, 258; Influence of Place of External Thermometer in Observations of Zenith Distances, M. Perigaud, 263; a New Nebulous Star, E. E. Barnard, 279; Yale College Observatory Report, Mr. Brown, Dr. Elkin, 280; Madras Observatory, 301; Oxford University Observatory, 301; Natal Observatory, 362; In Starry Realms, Sir Robt. S. Ball, F.R.S., 315; Solar Observations at the R. Osservatorio del Collegio, Romano, Prof. Tacchini, 334; a Remarkable Prominence, J. Fényi, 334; the Trapezium in the Orion Nebula, Dr. L. Ambronn, 334; New Results with Regard to Hydrogen obtained by Spectroscopic Study of Sun, M. Deslandres, 340; Geodetic Survey of South Africa, 362; the Perseids, W. F. Denning, 371, J. Edmund Clark, 442; Himmel und Erde, 371; Astronomy at the Columbian Exposition, 372; Numeration of Asteroids, 372; Thermal Absorption in the Solar Atmosphere, E. B. Frost, 400; Hydrogen Spectrum in the Solar Atmosphere, M. Deslandres, 401; Refraction in Micrometric and Photographic Measures, Dr. S. C. Chandler, 401; Comparison Stars of the Planet Victoria, Dr. Gill, 423; International Time, Major the Hon. E. Noel, 423; Some Problems in the Old Astronomy, J. R. Eastman, 424; the Staff at the Lick Observatory, 452; the Observations of Klinkerfues Reduced, Prof. William Schur, 452; Photographs of Solar Phenomena, Prof. G. E. Hale, 452; A Meteorite, H. L. Preston, 452; Mounting of Objectives, Prof. Hale, 452; Discovery of a New Comet by Mr. Brooks, 453; Observations of New Planet M. Wolf, G. Bigourdan, 460; the Planet Venus, E. L. Trouvelot, 468; Variation of Latitude, Dr. Chandler, 476; the Variation of Latitude at Pulkova, B. Wanach, S. Kostinsky, 524; Double Star Observations, Prof. Asaph Hall, 524; New Observatories, 476; Solar Observations at Rome, Prof. Tacchini, 476, 524; Proposed School of Practical Astronomy, H. C. Russell, 496; Double Star Measures, S. W. Burnham, 496; Comet Brooks (1882, August 27), 496; Comets of Brorsen (1846 VII.) and Brooks (1892 "d"), W. F. Denning, 514; Comet Brooks (August 27, 1892), F. Ristenpert, 551; Comet II. 1892 (Denning, March 18), 541, 551; Astronomische Nachrichten, 552; Appeal by Harvard Observatory for Donation to construct Refracting Telescope, E. C. Pickering, 548; the Present Comets, T. W. Backhouse, 561; Total Eclipse of the Sun, 1893, John King, William M. Martin, 561; Luminous Night Clouds, W. Foerster and O. Jesse, 575; Minor Planets, 576; Report of Mr. Tebbutt's Observatory, 576; Photographic Chart of the Heavens, H. C. Russell, 576; Dr. Rambaut, the New Royal Astronomer for Ireland, 615; A New Comet discovered by Prof. Barnard, 597; our Sun's History, Lord Kelvin, 597; Silvering Glass Mirrors, Mr. Common, 597; Himmel und Erde, 598; Researches in Stellar Parallax by the aid of Photography, Prof. Chas. Pritchard, F.R.S., 612; Comet Barnard (October 12), 619; Discovery of Three New Planets by Photography, 619; Rutherford Measures of Stars about δ Cygni, Harold Jacoby, 619
- Atlantic, Icebergs in the, 160
- Atlantic, North, Pilot Chart of, for April, 38
- Atlantic, North, the Crinoids and Echinoids of the, Dr. Danielssen, 333
- Atlantic, South, Ice in the, Robert H. Scott, F.R.S., 173; Capt. Edgar H. Andrew, 173
- Atlas of Clinical Medicine, Dr. Byrom Bramwell, 389
- Atomic Weight of Boron, Prof. Ramsay and Miss Aston, 403
- Atomic Weight of Oxygen, Robert Leffeldt, 151
- Atmosphere, the General Circulation of the, J. Carrick Moore, F.R.S., 7
- Atmospheric Depressions and their Analogy with the Movements of Sun-Spots, M. Camille Flammarion, 280; F. Howard Collins, 489
- Auriga, the Late New Star in, 161
- Aurora, Dr. M. A. Veeder, 29, H. Geelmuyden, 55, James Porter, 151; Remarkable Aurora Borealis over Moscow, 39; Aurora in Canada, 361; Aurora Borealis, Warrington Stock, 79, A. Butcher, 368, Rev. Edmund McClure, 368, J. Lloyd Boyward, 368, Henry Harries, 391; Aurora Australis, William White, 368, H. S. Dove and G. W. Easton, 368

- Austen (Prof. Roberts), Effect of Small Quantities of Foreign Matter on the Properties of Metals, 402
- Australia: Discovery of Australian-like Mammals in South America, R. Lydekker, 11; the Spread of Foxes in Australia, 15; F. W. Ward's Report on the relations of Fruit Production in New South Wales to the English Market, 39; Photographs of Coral Reefs and Marine Fauna of Great Barrier District of, W. Saville-Kent, 45; Excursion of Victoria Field Naturalists' Club to the Grampians, 63; the Sanderling in Australasia, Prof. Alfred Newton, F.R.S., 177; Australian Crustacea: a Tube-dwelling Amphipod (*Cerapus flindersi*) from Port Jackson, Charles Chilton, 178; Australian Mud Springs, Prof. Edgeworth David, 256; Fruit Culture in Australia, 494; the Great Barrier Reef of Australia, W. Saville-Kent, 523; the Improvement of the Potato in Australia, 617
- Ayrton (Prof. W. E., F.R.S.), Workshop Ballistic and other shielded Galvanometers, 214
- Azomide, N_3H , Inorganic Synthesis of, A. E. Tutton, 286
- Babes (V.), Carceag, an Enzootic Disease of the Sheep in Roumania, 436
- Backhouse (T. W.), Numbering the Hours of the Day, 392; the Present Comets, 561
- Bacteriology: Structure of Bacterial Cells, W. K. Wahrlich, 39; a New Bacterium (*Neusikia ramosa*), A. Famintzin, 68; Micro-organisms in their Relation to Chemical Change, Prof. Percy F. Frankland, F.R.S., 135; the Nitric Organisms, R. Warrington, F.R.S., 151; Prof. Percy F. Frankland, F.R.S., 200; Bacteriologisches Practicum zur Einführung in die practischwichtigen bacteriologischen Untersuchungsmethoden für Aerzte, Apotheker, Studierende, Dr. W. Migula, Mrs. Grace C. Frankland, 198; the Phylacogenic Substance in Ordinary Liquid Cultivations of *Bacillus anthracis*, M. Arloing, 240; Action of Heat on Tuberculous Matter, Prof. T. Forster, 263; Development of Bacteria in a temperature of Melting Ice, Prof. T. Forster, 264; Culture of Nitrification Organisms, M. Beyerinck, 264; Fermentation of Arabinose by *Bacillus ethaceticus*, P. F. Frankland and J. Macgregor, 311; Bacterian Origin and Bilious Fever of Hot Countries, Domingos Freire, 460; Ptomaine obtained from Cultivation of *Micrococcus tetragenus*, A. B. Griffiths, 508; a New Chemical Function of the Comma-Bacillus of Asiatic Cholera, 436
- Baddeleyite and Geikielite, two New Mineral Species, L. Fletcher, F.R.S., 620
- Bailey (Dr. G. H.), Impurities of Town Air, 402
- Bailey (Alderman W. H.), Paris Free Libraries, 617
- Baily (Walter), the Construction of a Colour Map, 23
- Baker (H. B.), Action of Light on Silver Chloride, 189; Investigation of the Phenomena which accompany the burning of Carbon and Phosphorus in Oxygen, 431
- Baker (J. G.), Asters and Perennial Sunflowers, 14
- Baker (J. L.), Studies on Isomeric Change, iv.: Halogen Derivatives of Quinone, ii., 142
- Baldwin (James Mark), Hand-book of Psychology: Feeling and Will, 1
- Ball (E. J.), the Elimination of Sulphur from Iron, 115
- Ball (Sir Robt. S., F.R.S.), In Starry Realms, 315
- Ball (W. W. Rouse), a Newtonian Fragment on Centripetal Forces, 71; Mathematical Recreations and Problems of Past and Present Times, 123
- Ballou (S. M.), the Eye of the Storm, 435
- Baltic, the Storms of the, B. von Nasackin, 521
- Baltic, Hydrography of the Kattegat and, Prof. Pettersson, 408
- Baltimore, Report of Peabody Institute, 398
- Bangor, University College of, North Wales, Agricultural Education at, 474
- Baoussé Roussé Caves, the Marquis de Nadaillay, 574
- Bar of Iron, Propagation of Magnetic Impulses along a, V. A. Julius, 392
- Barbados, the Geology of, A. J. Jukes Brown and J. B. Harrison, 59
- Barnard (E. E.), Variable Nebulæ, 211; a New Nebulous Star, 279; Nova Aurigæ, 496; a new Comet discovered by, 597; Barnard Comet (October 12), 619; Jupiter's Fifth Satellite, 620
- Barometer, a New Mercury-Glycerine, Dr. J. Joly, 71
- Barometer, a High, Rain with, Robt. M. W. Swan, 442
- Barrows (A. E.), Estimation of Slag in Wrought Iron, 189
- Barter (S.), Manual Instruction; Wood work; the English Slöyd, 244
- Barus (C.), Change of Heat Conductivity on passing Isothermally from Solid to Liquid, 310
- Basalt Cavern at Mont Dore, Curious, M. Martel, 400
- Bashforth (Rev. F.), Calculation of Trajectories of Elongated Projectiles, 366
- Bassett (A. B., F.R.S.), Reflection and Refraction of Light from a Magnetized Transparent Medium, 191; A Treatise on Physical Optics, Arthur Schuster, 267; Bassett's Physical Optics, 315; Modern Dynamical Methods, 516
- Basset (Lieut. W. B.), Ingenious Coin-counting Machine in the Royal Mint, 430
- Bassett-Smith (P. W.), the Deep Sea Deposits of the Eastern Archipelago, 69
- Batalin (Dr. A. F.), Appointed Director of Botanic Garden at St. Petersburg, 107
- Bateson (William), the Alleged "Aggressive Mimicry" of *Volucella*, 585
- Bather (F. A.), an International Zoological Record, 417; Brachiopoden der Alpenen Trias, A. Bittner, 25
- Bayard (F. C.), English Climatology, 1881-90, 191
- Bayley (C. C.), a Fireball, 62
- Bear, an Albino, caught in Yezo, 493
- Beard (Dr. J.), on Larvæ and their Relations to Adult Forms, 404
- Bearings, Anti-Friction Material for, used without Lubrication, Killingworth Hedges, 430
- Beck (C. R.), Platinous Chloride as a Source of Chlorine, 22
- Beddard (F. E., F.R.S.), a New Branchiate Oligochaete (*Branchiura sowerbyi*), 338; Animal Coloration: an Account of the Principal Facts and Theories Relating to the Colours and Markings of Animals, Edward B. Poulton, F.R.S., 533
- Bees: Amount of Honey needed to enable them to secrete a Pound of Wax, A. J. Cook, 255
- Bees for Pleasure and Profit, G. Gordon Samson, W. Tuckwell, 510
- Behrens (Mr.), the Microscopic Structure of Alloys, 72; Prof. W. Spring's Brass made by Compression, 216
- Belgium, the Telephone System in, 399
- Belgium, the Royal Belgian Society of Geography and the Local Geography of, 301
- Bell (Sir Lowthian), the Manufacture of Iron in its Relations with Agriculture, 525
- Bell (Mr.), Glacial Papers, 428
- Bell (J. Montgomerie), Pre-Palæolithic Flints, 432
- Bellew (H. W.), Death of, 331.
- Belopolsky (A.), Nova Aurigæ, 552, 576
- Bemmelen (M. van), the Existence of the Crystalline Hydrate of Fe_2O_3 , 628
- Benedikt (Dr.), Criminal Anthropology, 433
- Bengal, Lower, a Handbook on the Management of Animals in Captivity in, Ram Bramha Sányál, 314
- Benham (W. Blaxland), Note on the Occurrence of a Freshwater Nemertine in England, 611
- Bennett (Alfred W.), Protection against Rain in the Elder, 201
- Bent (J. Theodore), on the Present Inhabitants of Mashonaland and their Origin, 432
- Bergbohm (Dr. Julius), Neue Rechnungsmethoden der Höheren Mathematik, 199; Neue Integrationsmethoden auf Grund der Potenzial-, Logarithmal- und Numeralrechnung, 199
- Bergen, New Marine Biological Station at, 548
- Bérillon (Dr.), Hysterical Amaurosis, 363; Hypnotism in Education, 364
- Berlin Geographical Society, 369
- Berlin Meteorological Society, 120
- Berlin Physical Society, 263
- Berlin Physiological Society, 96, 168, 263, 340
- Bernard (Henry), Are the Solpugidae Poisonous? 223; The Apodidae: a Morphological Study, Prof. E. Ray Lankester, F.R.S., 267; the Apodidae—a Reply, 366
- Bernheim (Prof.), Hysterical Amaurosis, 363
- Berthelot (M.), Employment of Calorimetric Shell, 339; Heat of Production by some Chlorine Compounds, 430; Persulphuric Acid and the Persulphates, 575
- Bertrand-Geslin (Baron), Tanning with Chestnut Wood, 617
- Besant (W. H., F.R.S.), Elementary Hydrostatics, 172
- Beyerinck (M.), Culture of Nitrification Organisms, 264

- Bezdol (Prof. von), Thermodynamics of the Atmosphere, 450
Bibliothek des Professors der Zoologie und Vergl. Anatomie, Dr. Ludwig von Graff, 54
Bickerton (A. J.), an Obvious Demonstration of the 47th Proposition of Euclid, 315
Bidwell (Shelford, F.R.S.), on the Changes produced by Magnetization in the Length of Wires Carrying Currents, 140
Bigourdan (G.), Saturn's Rings, 110; Observations of New Planet M. Wolf, 460
Binet (Alfred), Les Altérations de la Personnalité, 219
Biology: The Protective Device of an Annelid, A. J. Watson, 7; the Surface-Film of Water, and its Relation to the Life of Plants and Animals, Prof. L. C. Miall, 7; Structure of Bacterial Cells, W. K. Wahrlich, 39; the Echinoderm Fauna of Kingston Harbour, Jamaica, 40; Photographs of Marine Fauna of Great Barrier District of Australia, W. Saville-Kent, 45; the Deep Sea Deposits of the Eastern Archipelago, F. W. Bassett-Smith, 69; Change of Liverpool Marine Biological Station to Port Erin, Isle of Man, 83; the Puffin Island Biological Station, 83; Enlargement of the Wood's Holl Marine Biological Laboratory (Mass.), 83, 493; Mr. Walter Garstang appointed to Naturalist's Post at Plymouth, 83; opening of the Liverpool Marine Biological Station at Port Erin, 155; Mr. E. W. L. Holt's Investigations, 158; the Plymouth Laboratory Specimen Supply, 159; Physiology of the Glands of Bohadsch in the Aplysiidae, G. F. Mazzarelli, 163; Projected Marine Biological Laboratory in Jamaica, 176; the Origin of Land Animals: a Biological Research, W. J. Sollas, 271; the Crinoids and Echinoids of the North Atlantic, Dr. Danielssen, 333; opening address by Prof. William Rutherford, F.R.S., in section D of the British Association, 342; Endowment by Mr. C. H. Gatty of Marine Biological Laboratory at St. Andrews, 369; Method of Recording Curves of Muscular Contraction, Prof. McKendrick, 404; Prof. G. Fritsch on the Origin of the Electric Nerves in the *Torpedo*, *Gymnotus*, *Mormyrus*, and *Malapterurus*, 404; Dr. J. Musgrave, the Blood-vessels and Lymphatics of the Retina, 404; H. O. Forbes, Sub-fossil Bones of Extinct Birds of New Zealand and the Chatham Islands, 404; Dr. J. Clark on the Natural Relations between Temperature and Protoplasmic Movements and the Functions of the Nucleus in the Vegetable Cell, 404; Dr. Francis Warner, Co-ordination of Cellular Growth and Action by Physical Forces, 404; M. Louis Olivier, La Canalisation des Cellules et la Continuité de la Matière vivante chez les Végétaux et les Animaux, 404; a Sketch of the Scotch Fisheries, chiefly in their scientific aspects, during the past decade 1882-92, Prof. McIntosh, F.R.S., 404; Prof. Ewart on our Sea Fisheries, 404; E. W. L. Holt on the Destruction of Immature Fish, 404; Dr. W. Ramsay Smith, the Food of Fishes, 405; A. P. Swan, the Effect of Sea-water on the Vitality of the Salmon Fungus, 405; Prof. E. G. Prince on the Formation of Argenteous Matter in the Integument of Teleosts, 405; Prof. E. E. Prince, the Development of the Pharyngeal Teeth in the Labridæ, 405; Dr. Carlier on the Skin of the Hedgehog, 405; the *Albatross* Voyage: a Remarkable Stalked Crinoid, 421; Fertilization of the Fig and Caprifigation, C. V. Riley, 455; Beiträge zur Biologie der Pflanzen, Dr. Ferdinand Cohn, 461; Lichen Hyphæ growing on Shells of Marine Mollusca, 475; new Biological Laboratory to be established in Calcutta Zoological Gardens, 493; the Hopkins Seaside Laboratory, 493; the Transmission of Acquired Characters through Heredity, Prof. C. V. Riley, 504; new Marine Biological Station at Bergen, 548; the Problem of Marine Biology, George W. Field, 623
Birds in Victoria, Movement for Prevention of Wanton Destruction of, 495
Birds, Native New Zealand, Earl of Onslow, 502
Birds of Lancashire, F. S. Mitchell, 540
Birds' Eggs, Wild, the Question of Legislative Protection for, E. P. Knubley, 595
Bishop (Mrs. Isabella), the Ainos of Japan, 119; Journey to Little Tibet, 135; Lesser Tibet, 406
Bite, a "Viper," W. A. Rudge, 270
Bittner (A.), Brachiopoden der Alpenen Trias, F. A. Bather, 25
Bjerknes (V.), the Individual Properties of Metals in Absorbing the Energy of Electric Waves, 573
Black Sea, Results of the Recent Russian Investigations on the, Dr. Andrussoff, 408
Black and White Handbook to the Academy and New Gallery Pictures, the, 84
Blaikie (James) and W. Thomson, Geometrical Deductions, 291
Blanc (Edouard), Brick Manufacture in Central Asia, 604
Blanford (W. T., F.R.S.), the Fauna of British India, including Ceylon and Burma, 5
Blandford (Mr.), Sugar-cane Borers in the West Indies, 531
Blondlot (R.), Velocity of Propagation of Electro-magnetic Undulations in Insulating Media, 340
Blood, the Germicide and Antitoxic Properties of the Serum of, Herr Buchner, 495
Blood-vessels and Lymphatics of the Retina, Dr. J. Musgrave, 404
Blow-fly (*Calliphora erythrocephala*), Anatomy, Physiology, Morphology and Development of the, B. Thompson Lowne, 267
Blue Sharks, Pilchards and, Matthias Dunn, 368
Boar, Cheetah killed by Wild, C. Meares, 178
Boden (I. S.), Pigment Cells of Retina, 339
Bois, Travail des, M. Alheilig, 246
Bois (H. E. J. G. du), Reflection and Transmission of Light in certain Æolotropic Structures, 483
Bois (Dr. du), on Leaky Magnetic Circuits, 384; on Polarizing Gratings, 385; on a Magnetic Balance and its Practical Use, 385
Bolles (Lieut. Dix), Ancient Chinese Coins discovered in an Alaskan Grave, 574
Bolletino della Società Botanica Italiana, 90
Bones, Sub-fossil, of Extinct Birds of New Zealand and the Chatham Islands, H. O. Forbes, 404
Bonn, Kekulé Festival at, J. E. Marsh, 205
Bonney (Prof. T. G., F.R.S.), the So-called Gneiss of Carboniferous Age at Guttannen, 95; the Microscope's Contributions to the Earth's Physical History, 180; Palæozoic Rocks, 428
Bonnier (Gaston), Influence of Electric Light on Tree-structure, 532; Effect of Electric Light on Herbaceous Plants, 580
Bordage (Edmond), Prehistoric Epochs, 418
Borneo: its Geology and Mineral Resources, Theodore Posewitz, 540
Bornet (Dr.) Lichen Hyphæ growing on Shells of Marine Mollusca, 475
Bornmüller's (M. J.) Botanical Exploring Expedition in Persia, 523
Boron, Atomic Weight of, Prof. Ramsay and Miss Aston, 403
Boruttau (Dr.), Experiments to Determine Cause of Difference in Latent Period during Direct or Indirect Stimulation of Muscles, 96
Bose (K. R.), the Student's Manual of Deductive Logic, Theory and Practice, 561
Boston Society of Natural History; the Walker Prize awarded to Prof. J. D. Dana, 158
Botanical Papers at the British Association, 554
Botany: Projected Exhibition of "Worst Weeds" from all States and Territories of the Union at Chicago, 14; Catalogue of the Hanbury Herbarium, 14; Dr. Bretschneider's Botanicon Sinicum, Part II., 14; Asters and Perennial Sunflowers, J. G. Baker, 14; Vegetable Physiology in United States (in connection with the University Extension movement), 15; Revision of the American Species of Rumex occurring north of Mexico, W. Trelease, 40; the Culture of Sisal Grass in Mexico, 63; Mr. Pratt's Collections in Western China, W. B. Hemsley, F.R.S., 69; Physiological Memoirs, 75; Viticulture in the Punjab, 86; Botanical Gazette, 90, 214, 436; Movements of Leaves of *Portulaca hygrometrica* G. Paoletti, 90; the Embryology of *Angiopteris erecta*, J. B. Farmer, 92; the Question of Nomenclature, 159; German Proposition for Revision of Botanical Nomenclature, 257; the Nomenclature Negotiations, 549; Dr. A. F. Batalin appointed Director of Botanic Garden at St. Petersburg, 107; Yorkshire Naturalists' Union, 107; Botanical Society of France, 107; Annals of the Royal Botanic Garden, Calcutta, W. Botting Hemsley, F.R.S., 122; Chrysanthemum growing in Jamaica, 161; Gynodioecism in the Labiata, J. C. Willis, 167; the Limits of Tree-Vegetation in the Kola Peninsula, 178; Damage to Plants from London Fog, Prof. F. W. Oliver, 185; A Double Cocoanut, 185; English Botany, N

- E. Brown, James Britten, 197; the Coming International Botanical Congress at Genoa, 208; the Nebraska Sugar School, 210; Journal of Botany, 214, 436; Alleged Remarkable Epiphyte Orchids in Southern Formosa, D. J. Macgowan, 228; the Mustard Beetle, F. Enock, 238; Linnean Society, 238; Presentation by Mr. Thomas Hanbury to Genoa Institute of late Prof. Willkomm's Collection of Vascular Plants, 254; Iron in Plants, Dr. H. Molisch, 255; the Kew Bulletin, 277-8; Somali-land Sansevieria Hemp Fibre, 277; New Bamboo Garden at Kew, 278; Specialization of Teaching at Zurich, 300; Arbeiten aus dem K. Botanischen Garten zu Breslau, 300; the Orchids of Grenada, R. V. Sherring's Collections, 300; Marine Floras of the Warm Atlantic and Indian Ocean, G. Murray, 405; on the Structure of *Cystopus candidus*, Harold Wager, 405; on the Affinity of Nuclein for Iron and other Substances, and a Method of Staining Nuclei by Chemical Means, Prof. G. Gilson, 405; Nuovo Giornale Botanico Italiano, 436; Bulletino della Società Botanica Italiana, 436; Opening of the Hanbury Institute at Genoa, 448; Fertilization of the Fig and Caprifigation, C. V. Riley, 455; Comparative Assimilation of Plants developed in Sun and in Shade, L. G. de Lamarlière, 460; Kew Bulletin, 473; the Cork Oak, 473; Lichen Hyphæ growing in Shells of Marine Mollusca, Dr. Bornet, 475; Report of Calcutta Botanic Garden for 1891-2, 494; Sugar-cane Borers in the West Indies, 531; M. J. Bornmüller's Exploring Expedition in Persia, 523; Death of Henri Douliot, 548; Botanical Papers at the British Association, 554; Observations on Secondary Tissues in Monocotyledons, Dr. Scott and Mr. Brebner, 554; on the Simplest Form of Moss, Prof. Goebel, 554; on the Cause of Physiological Action at a Distance, Prof. L. Errera, 555; Notes on the Morphology of the Spore-bearing Members in the Vascular Cryptogams, Prof. F. O. Bower, 555; on the arrangement of Buds in Lemna Minor, Miss Nina F. Layard, 555; Tubercles on the Thallus of *Cystoclonium purpurascens*, Prof. F. Schmitz, 555; Calamostachys Binneyana Schimp., T. Hick, 555; Myeloxylon from the Millstone Grit and Coal-Measures, A. C. Seward, 555; Death of Robert Bullen, 572; Death of R. D. Fitzgerald, 572; Fourcroya in Flower in Royal Botanic Society's Gardens, 573; Fungous Diseases and their Remedies, Prof. J. E. Humphrey, 574; Lao Tea, 593; Lehrbuch der Botanik Nach dem Gegenwärtigen Stand der Wissenschaft, Dr. A. B. Frank, 610
- Bottomley (Dr.), Vacuum Tubes without Electrodes, 44
- Bottomley (Dr. J. T., F.R.S.), Thermal Radiation in Absolute Measure, 603
- Bottone (S. R.), a Guide to Electric Lighting, 221
- Boulonnais, Bas, Geology of the, E. Rigaux, 109
- Bourgade la Dardye (Dr. E. de), Paraguay: the Land and the People, Natural Wealth and Commercial Capabilities, 488
- Bournemouth Drift, Lava in the; Musical Sand, Cecil Carus-Wilson, 316
- Boussinesq (J.), Sea-gauges; Necessary Additive Correction for Sea-swell, 288; for Choppy Sea, 312
- Bower (Prof. F. O.), Notes on the Morphology of the Spore-bearing Members in the Vascular Cryptogams, 555
- Bower (John A.), How to Make Common Things, 561
- Bower (Lieut.), Discovery of an ancient Birch-bark Sanscrit Manuscript by, Dr. Hoernle, 370
- Boys (Mr.), Photographs of Flying Bullets, 45
- Boyward (J. Lloyd), Aurora Borealis, 368
- Brabrook (E. W.), on the Organization of Local Anthropological Research, 432
- Brachiopods of the Alpine Trias, A. Bittner, F. A. Eather, 25
- Brain, the Temperature of the, Prof. Angelo Mosso, 17
- Brain and Spinal Cord, the Structure and Functions of the, Victor Horsley, F.R.S., 606
- Bramwell (Dr.), Hypnotism in Yorkshire Medical Practice, 363
- Bramwell (Dr. Byrom), Atlas of Clinical Medicine, 389
- Brass made by Compression, Prof. W. Spring's, M. Behrens, 216
- Braun (Prof. F.), Absolute Electrometer for Lecture Purposes, 150
- Bread, the Dietetic Value of, John Goodfellow, 54
- Bread, White, and Tooth Culture, Sir James Crichton Browne, 229
- Bread, Impure Water in, 514
- Breath Figures, W. B. Croft, Rev. F. J. Smith, and Prof. S. P. Thompson, 236
- Brebner (Mr.), Observations on Secondary Tissues in Monocotyledons, 554
- Bredikhine (Th.), the Radiants of the Andromedides, 68
- Brennan (William), Photometric Observations of the Sun and Sky, 284
- Bretschneider's (Dr.) Botanicon Sinicum, part ii., 14
- Brick Manufacture in Central Asia, Edouard Blanc, 604
- Bright Streaks on the Full Moon, Prof. Pickering, 476
- Brinton (Dr. D. G.), Anthropology as a Branch of University Education, 39; Omalius d'Halloy the Author of the European Origin of the Aryan Race, 278; Fuegian Languages, 278
- BRITISH ASSOCIATION: Meeting at Edinburgh, 298, 316, 341; F. Grant Ogilvie, 270; British Association Procedure, Henry Armstrong, 291; Inaugural Address at Edinburgh by Sir Archibald Geikie, LL.D., For. Sec. R.S., 317; British Association Committee on Electrical Standards, Prof. Oliver J. Lodge, F.R.S., 334, 368
- Section A (Mathematics and Physics)—Opening Address by Prof. Arthur Schuster, F.R.S., President of the Section, 323; Discussion on a National Physical Laboratory, Prof. Oliver J. Lodge, F.R.S., 382; R. T. Glazebrook, F.R.S., 383; Prof. von Helmholtz, F.R.S., 383; Lord Kelvin, F.R.S., 383; Prof. Rücker, F.R.S., 383; Prof. Fitzgerald, F.R.S., 383; Discussion on Nomenclature of Units, 383; Report on Underground Temperature, 383; Report on the Discharge of Electricity from Points, 383; Report on Electrical Standards, 383; Wire Standards of Electric Resistance, Dr. Lindeck, 383; Dr. Kahle on the Clark Cell, 383; Preliminary Account of Oceanic Circulation based on the Challenger Observations by Dr. A. Buchan, 383; Physical Condition of the Waters of the English Channel, H. V. Dickson, 384; on Primary and Secondary Cells in which the Electrolyte is a Gas, Prof. Schuster, F.R.S., 384; on Leaky Magnetic Circuits, Dr. du Bois, 384; Experiments on the Electric Resistance of Metallic Powders, Dr. Dawson Turner, 384; on the Stability of Periodic Motions, Lord Kelvin, F.R.S., 384; on the Specific Conductivity of Thin Films, Profs. Reinold and Rücker, 384; a Contribution to the Theory of the Perfect Influence Machines, J. Gray, 384; Experiments with a Ruhmkorff Coil, Magnus Maclean and A. Galt, 384; the Application of Interference Methods to Spectroscopic Measurement, Prof. A. Michelson, 385; on a Periodic Effect which the Size of Bubbles has on their Speed of Ascent in Vertical Tubes containing Liquid, Dr. F. T. Trouton, 385; on a Method of Determining Thermal Conductivities, C. H. Lees, 385; a Magnetic Curve Tracer, Prof. Ewing, 385; on a Magnetic Balance and its Practical Use, Prof. du Bois, 385; on Earth Current Storms in 1892, W. H. Preece, 385; on the Dielectric of Condensers, W. H. Preece, 385; on Polarizing Gratings, Prof. du Bois, 385; the Volume Effects of Magnetism, Dr. C. G. Knott, 385; an Estimate of the Rate of Propagation of Magnetization in Iron, Prof. Fitzgerald, 385; Experimental Proof that the Co-efficient of Absorption is not Affected by Density of Illumination, Dr. W. Peddie, 385; on Dispersion in Double Refraction due to Electric Stress, Dr. John Kerr, 385; on a Delicate Calorimeter, J. A. Harker and P. J. Hartog, 385; on Graphic Solutions of Dynamical Problems, Lord Kelvin, 385; Reduction of Every Problem of Two Freedoms in Conservative Dynamics to the Drawing of Geodetic Lines on a Surface of given Specific Curvature, Lord Kelvin, 386
- Section B (Chemistry)—Opening Address by Prof. Herbert McLeod, F.R.S., President of the Section, 327; Prof. Crum Brown on Electrolytic Synthesis, 401; Prof. Ramsay on the Impurities in Chloroform, 401; Prof. Lewes on the Luminosity of Hydrocarbon Flames, 401; Experiments on Flame, Prof. Smithells, 402; the Reaction of Hydrogen with Mixtures of Hydrogen and Chlorine, Dr. J. A. Harker, 402; Prof. Clowes on a New Safety Lamp, 402; Prof. Roberts Austen on the Effect of Small Quantities of Foreign Matter on the Properties of Metals, 402; Dr. Gladstone on the Molecular Refraction and Dispersion of Metallic Carbonyls and of Indium Gallium and Sulphur, 402; Dr. G. H. Bailey on Impurities of Town Air, 402; Prof. Ramsay and Miss Aston on the Atomic Weight of Boron, 403
- Section C (Geology)—Opening Address by Prof. C. Lapworth,

F.R.S., President of the Section, 372; Messrs. Peach and Horne on the Radiolarian Chert of Arenig Age, 428; Palæozoic Rocks, Prof. Sollas, Prof. Bonney, 428; Glacial Papers, Dr. Crosskey, Mr. Lomas, Mr. Bell, Messrs. Peach and Horne, 428; Palæontological Papers, E. T. Newton, M. Laurie, 428; Petrological Papers, Mr. Ussher, Mr. Goodchild, Mr. Harker, Mr. Teall, Mr. Somervail, 428; Landships in the South Tyrol, Miss Ogilvie, 428

Section D (Biology)—Opening Address by Prof. William Rutherford, F.R.S., President of the Section, 342; Prof. Waymouth Reid on Vital Absorption, 403; Prof. Rosenthal on Animal Heat and Physiological Calorimetry, 403; Dr. Lockhart Gillespie on Proteid-hydrochlorides, 403; Dr. E. W. Carlier on the Hibernating Gland of the Hedgehog, 403; Dr. G. Mann on the Functions, Staining and Structures of Nuclei, 403; Dr. Henry C. McCook on the Social Habits of Spiders, 403; Prof. A. Crum Brown on a Use of the External Ear, 404; Prof. Lloyd Morgan, the Method of Comparative Psychology, 404; J. E. S. Moore on the Relationships and Role of the Archoplasmic Body during Mitosis in the Larval Salamander, 404; Dr. G. Mann on the Origin of Sex, 404; Dr. J. Beard on Larvæ and their Relations to Adult Forms, 404; Method of Recording Curves of Muscular Contraction, Prof. McKendrick, 404; Prof. G. Fritsch on the Origin of the Electric Nerves in the *Torpedo*, *Gymnotus*, *Mormyrus* and *Malapterurus*, 404; Dr. J. Musgrave, the Blood-vessels and Lymphatics of the Retina, 404; H. O. Forbes, Sub-fossil Bones of Extinct Birds of New Zealand and the Chatham Islands, 404; Dr. J. Clark on the Natural Relations between Temperature and Protoplasmic Movements, 404; Dr. J. Clark, Experimental Observations on the Functions of the Nucleus in the Vegetable Cell, 404; Dr. Francis Warner, Co-ordination of Cellular Growth and Action by Physical Forces, 404; M. Louis Olivier, La Canalisation des Cellules et la continuité de la Matière Vivante chez les Végétaux et les Animaux, 404; Dr. John H. Wilson, some Albuca and their Hybrids, 404; Prof. McIntosh, F.R.S., a Sketch of the Scotch Fisheries, chiefly in their Scientific Aspects, during the Decade 1882-92, 404; Prof. Ewart on our Sea Fisheries, 404; E. W. L. Holt on the De-struction of Immature Fish, 404; Dr. W. Ramsay Smith, the Food of Fishes, 405; A. P. Swan, the Effect of Sea Water on the Vitality of the Salmon Fungus, 405; Prof. E. G. Prince on the Formation of Argenteous Matter in the Integument of Teleosteans, 405; Prof. E. E. Prince, the Development of the Pharyngeal Teeth in the Labridæ, 405; Dr. Carlier on the Skin of the Hedgehog, 405; G. Murray, Comparison of the Marine Floras of the Warm Atlantic and Indian Ocean, 405; Mr. Harold Wager on the Structure of *Cystopus candidus*, 405; Prof. G. Gilson on the Affinity of Nuclein for Iron and other Substances, 405; Dr. Arthur Robinson's Observations on the Development of the Posterior Cranial and Anterior Spinal Nerves in Mammals, 405; Prof. W. A. Herdman, F.R.S., on the Geographical Distribution of Ascidiæ, and on the Presence of Atrial Tentacles in various Genera of Tunicata, with a Suggestion as to their Function, 405; Dr. J. Symington on the Cerebral Commissures in the Marsupialia and Monotremata, 405; Prof. J. Playfair McMurrich, the Early Development of the Isopods, 486; Prof. G. B. Howes and J. Harrison on the Skeleton and Teeth of the Australian Dugong, 406; Dr. H. G. McCook, Can Spiders Prognosticate Weather Changes? 406; Observations on Secondary Tissues in Monocotyledons, Dr. Scott and Mr. Brebner, 554; on the Simplest Form of Moss, Prof. Goebel, 554; on the Cause of Physiological Action at a Distance, Prof. L. Errera, 555; Notes on the Morphology of the Spore-bearing Members in the Vascular Cryptogams, Prof. F. O. Bower, 555; on the Arrangement of Buds in Lemna Minor, Miss Nina F. Layard, 555; on Tubercles on the Thallus of *Cystoclonium purpurascens*, Prof. F. Schmitz, 555; *Calamostachys Binneyana*, Schimp, T. Hick, 555; Myeloxylon from the Millstone Grit and Coal Measures, A. C. Seward, 555

Section E (Geography)—Opening Address by Prof. James Geikie, F.R.S., President of the Section, 348; The First Ascent of Oraefa Jökull, F. W. W. Howell, 406; Dr. J. Burgess on Place Names, 406; Effect of Rainfall in Formosa, John Thomson, 406; Lesser Tibet, Mrs. Bishop,

406; the North Atlantic, the Prince of Monaco, 406; Detailed Oceanography and Meteorology, 406; the Desert of Atacama, Mrs. Lilly Grove, 406; Photography and Surveying, Colonel Tanner, 407; Determination of Longitude by Photography, Dr. H. Schlichter, 407; African Travels, 407; Industrial Resources of Nyasaland, John Buchanan, 407; African Meteorology, 407; Prof. Penck's Proposed New Map of the Globe, 407; Recent Travels, Walker Harris, 408; H. O. Forbes's Visit to the Chatham Islands, 408; Sub-section on Chemical Oceanography, J. Y. Buchanan, 408; Prof. Pettersson on the Hydrography of the Kattegat and Baltic, 408; Results of the Recent Investigations on the Black Sea, Dr. Andrussoff, Russian, 408

Section G (Mechanical Science)—Opening Address by W. Cawthorne Unwin, F.R.S., President of the Section, 355; Electrical Lighting of Edinburgh, Prof. George Forbes, 429; Disposal of Town Refuse, Prof. George Forbes, 429; the Refuse-destructor Question, G. Watson, 429; Absorption and Filtration of Sewage, R. F. Grantham, 429; Shield Tunneling in Loose Ground, G. F. Deacon, 429; Proposed Ship Canal between the Forth and the Clyde, D. A. Stevenson, 429; Mechanical System for the Distribution of Parcels, D. Cunningham, 429; Electric Locomotives, Alexander Siemens, 429; a Tide-Motor, F. Purdon and H. E. Walters, 429; Marine Machinery at Glasgow, 430; Necessity for Connection between Stack Pipes and Earth, W. H. Preece, F.R.S., 430; Power Transmission by Alternating Current, Gisbert Kapp, 430; New Design of Electric Locomotive, E. H. Woods, 430; Ingenious Coin-counting Machine in the Royal Mint, Lieut. W. B. Basset, 430; Anti-Friction Material for Bearings used without Lubrication, Killingworth Hedges, 430; Petroleum Engines for Fog Signalling, D. A. Stevenson, 430; Influence of Acoustic Clouds, David Cunningham, 430; Sound-carrying Power of Water, A. R. Sennett, 430; on the Progress of the Dioptric Lens as used in Lighthouse Illumination, C. A. Stevenson, 431; Smoke Prevention, A. R. Sennett, 431; Col. E. Dulier, 431; Investigation of the Phenomena which accompany the Burning of Carbon and Phosphorus in Oxygen, H. Brereton Baker, 431; Fire Extinction on board Ship, H. C. Carver, 432

Section H (Anthropology)—Opening Address by Alexander Macalister, F.R.S., President of the Section, 378; E. W. Brabook on the Organization of Local Anthropological Research, 432; Rev. Frederick Smith on the Discovery of the Common Occurrence of Palæolithic Weapons in Scotland, 432; J. Graham Kerr, Weapons and Articles of Clothing used by the Toba Indians of the "Gran Chaco," 432; J. Montgomerie Bell, "Pre-palæolithic" Flints, 432; J. Theodore Bent on the Present Inhabitants of Mashonaland and their Origin, 432; Prof. A. C. Haddon on the Value of Art in Ethnology, 432; Dr. J. S. Phené on the Similarity of certain Ancient Necropoleis in the Pyrenees and in North Britain, 432; Dr. Manouvrier on Anthropometric Identification, 432; Criminal Anthropology, Dr. J. S. Clouston, 432; Dr. Benedikt, 433; Coiffure of a Kanaka Labourer, Sir William Turner, 433; Prehensile Power of Infants, Dr. Louis Robinson, 433; on the Contemporaneity of the Maori and the Moa, H. O. Forbes, 433; Human Osteometry, Dr. Garson, Sir William Turner, 433; Observations as to the Physical Deviations from the Normal as seen among 50,000 children, Dr. Francis Warner, 433; on some Facial Characters of the Ancient Egyptians, Prof. A. Macalister, 433; Ancient Skeletons from Medum, Egypt, Dr. Garson, 433

British Colonies, Elementary Geography of the, Geo. M. Dawson, F.R.S., and Alexander Sutherland, 100

British Earthworms, New, Rev. Hilderic Friend, 621

British Guiana, North-western District of, Everard im Thurn, 234

British Insects, Sketches of, Rev. W. Houghton, 540

British Isles, Land and Freshwater Shells peculiar to the, T. D. A. Cockerell, 76; R. F. Scharff, 173

British Medical Association, Sixtieth Annual Meeting, 298

British Museum, the Tell el-Amarna Tablets in the, with Auto-type Facsimiles, 49

British Museum, Improvements in Natural History Collection, 473

- British Ornithologists' Union, 572
 Britten (James), English Botany, N. E. Brown, 197
 Bromley, Flora and Fauna of, J. French, 316
 Brooks (W.), Discovery of a new Comet by, 453
 Brooks, Comet (1882, August 27), 496
 Brooks (1892 "d"), Comets of Brorsen (1846 VII.) and, W. F. Denning, 514
 Brooksmith (J. and E. J.), Key to Arithmetic for Beginners, 441
 Brorsen (1846 VII.), Comets of, and Brooks (1892 "d"), W. F. Denning, 514
 Brown (Mr.), Yale College Observatory Report, 280
 Brunton (Prof. A. Crum, F.R.S.), on Electrolytic Synthesis, 401; on a use of the External Ear, 404
 Brown (Prof. G. T.), Contagious Foot Rot in Sheep, 560
 Brown (N. E.), English Botany, James Britten, 197
 Brown-Séguard (M.), Treatment of Cancer and Cholera by Testicular Liquid, 484; Physiology of Epilepsy, 507
 Browne (A. J. Jukes) and J. B. Harrison, the Geology of Barbadoes, 59
 Brugsch Pasha (Henry), La'te Moeris, 15
 Brunton (T. Lauder, M.D.), an Introduction to Modern Therapeutics, 172
 Buchan (Dr.), Diurnal Variations of Summer Barometric readings in Polar Regions, 262; Preliminary Account of Oceanic Circulation based on the *Challenger* Observations, 383
 Buchanan (John), Industrial Resources of Nyasaland, 407
 Buchner (Herr), Germicide and Antitoxical properties of the Serum of Blood, 495
 Buckley (T. E.), the Birds of Sutherland and Caithness, 279
 Buddhist Antiquities at Bhatuprolu, Discovery of, A. Rea, 178
 Bullen (Robert), Death of, 572
 Bulletino della Società Botanica Italiana, 436
 Bumping in the Lane Fox Mercurial Pump, 394
 Burbury (S. H., F.R.S.), and Rev. H. W. Watson, F.R.S., Maxwell's Law of Distribution of Energy, 100
 Burgess (Dr. J.), Place Names, 406
 Burma, the Tin District in, H. Warth, 522
 Burma, Upper, the Amber and Jade Mines of, Dr. Noetling, 549, 550
 Burmeister (Hermann), Death and Obituary Notice of, 176
 Burnham (S. W.), Nebulæ, 87; Double Star Measures, 496
 Burton (W. K.), the Great Earthquake in Japan, 1891, 34
 Butcher (A.), Aurora Borealis, 368
 Buti (Prof. J.), Variations of Temperature and Rainfall at different heights, 299
 Butler (G. W.), the Lithophyses in Obsidian of Rocche Rosse, Lipari, 95; Eruption of Vulcano (August 3, 1888, to March 22, 1890), 117
 Butterflies: a *Colias edusa* in London, H. Rowland-Brown, 228
 Buxton, the Deep Dale Bone Cave near, J. J. Fitzpatrick, 521
 Byssus Silk Manufacture at Malta, late Rev. H. Seddall, 229
 Cables, Electric Light, 290
 Cailliet (L.), Experiments at the Eiffel Tower on Falling Bodies and Air Resistance, 262
 Calamostachys Binneyana Schimp, T. Hick, 555
 Calculus, an Introduction to the Study of the Elements of the Differential and Integral, Axel Harnack, G. L. Cathcart, Prof. A. G. Greenhill, F.R.S., 218
 Calcutta: Annals of the Royal Botanic Garden, W. Botting Hemsley, F.R.S., 122; Report of Calcutta Botanic Garden, 1891-2, 494; Proposed Systematic Enquiry into Snake Poison at the Calcutta Zoological Gardens, 14; New Biological Laboratory to be established in the Calcutta Zoological Gardens, 493
 Caldwell (Prof. E. C.), Oleomargarin, 522
 Calendar, Change in Samoan, 552
 California, Climate and Meteorology of Death Valley, 255
 California, Pearl Fishery of the Gulf of, C. H. Townsend, 333
 Callendar (H. L.), Platinum Pyrometers, 115
 Calliphora erythrocephala, Anatomy, Physiology, Morphology, and Development of the Blowfly, B. Thompson Lowne, 267
 Calorimeter, on a Delicate, J. A. Harker and P. J. Hartog, 385
 Calorimetric Shell, Employment of, M. Berthelot, 339
 Calorimetry, Physiological, Animal Heat and, Prof. Rosenthal, 403
 Cambridge Philosophical Society, 143, 156
 Camels in German S. W. Africa, 598
 Cameroon, the Development of the Resources of, 40
 Campania, Cunard s.s., Launch of, 472
 Campbell (W. W.), Spectrum of Swift's Comet (a 1892), 17; Motion in the Line of Sight, 64
 Canada, Meteorological Service of: Reports from Oct. 1, 1890, to Oct. 31, 1891, 62
 Canada, Aurora in, 361
 Canadian Guide Book, Charles G. D. Roberts, 54
 Canalisation des Cellules et la Continuité de la Matière Vivante chez les Végétaux et les Animaux, La, Louis Olivier, 404
 Canals, Mars, Earth Fractures and, G. A. Lebour, 611
 Cancer by Testicular Liquid, Treatment of, M. Brown-Séguard, 484
 Cao (Diogo), the First Portuguese Explorer, Two Pillars Erected on West Coast of Africa by, brought back to Lisbon, 111
 Cape Colony, Meteorological Commission, Report of, 493
 Cape Colony, the Extermination of the Antbear in, A. C. Macdonald, 522
 Captivity, Animals in, a Handbook on the Management of, in Lower Bengal, 314
 Carbon and Phosphorus in Oxygen, Investigation of the Phenomena which accompany the Burning of, H. Brereton Baker, 431
 Carbonic Acid in France, the Industrial Preparation of, 399
 Carbonyls, Metallic, Ludwig Mond, F.R.S., 230
 Carbonyls, Molecular Refraction and Dispersion of Metallic, and of Indian Gallium and Sulphur, Dr. Gladstone, 402
 Carburization of Iron, on the, John Parry, 283
 Carbutt (John), on Results achieved by Mr. F. E. Ives in Colour Photography, 13
 Carceag, an Enzootic Disease of the Sheep in Roumania, Etiology of, V. Babes, 436
 Carlier (Dr. E. W.), on the Hibernating Gland of the Hedgehog, 403; on the Skin of the Hedgehog, 405
 Carnivorous Caterpillars, Juliet N. Williams, 128; R. McLachlan, F.R.S., 151
 Carnot (Adolphe), Occurrence of Fluorine in Different Varieties of Natural Phosphates, 48; Application of Chemical Analysis for Fixing Age of Prehistoric Human Remains, 412
 Carob-bean Tree in New South Wales, the, F. Turner, 210
 Carroll (Dr. A.), Alleged Decipherment of the Eastern Island Inscriptions, 494
 Carter (Brudenell), Apparatus for Measuring Colour-blindness, 44
 Carter's (G. T.) Journey into Interior of Lagos, 55
 Carus-Wilson (Cecil), Musical Sands, 44, 316; Lava in the Bournemouth Drift, 316
 Carver (H. C.), Fire Extinction on Board Ship, 432
 Cash (Dr. J. T., F.R.S.), Action of Paraffin Nitrites on Muscular Tissue, 339
 Caspian, Formation of a New Islet in the, 212
 Cassiopeia, Variable Star, Cuthbert E. Peek, 443
 Castell-Evans (John), a New Course of Experimental Chemistry, with Key, 511
 Catalogue of the Specimens Illustrating the Osteology of Vertebrated Animals, Recent and Extinct, contained in the Museum of the Royal College of Surgeons of England, B. Bowdler Sharpe, 125
 Caterpillars, Carnivorous, Juliet N. Williams, 128; R. McLachlan, F.R.S., 151
 Cathcart (G. L.), an Introduction to the Study of the Elements of the Differential and Integral Calculus, Axel Harnack, Prof. A. G. Greenhill, F.R.S., 218
 Caucasus Petroleum Trade, the, 333
 Cellular Growth and Action by Physical Forces, Co-ordination of, Dr. Francis Warner, 404
 Century of Scientific Work, a, 504
 Ceratodus, the, Prof. Baldwin Spencer, 161; a Trip to Queensland in Search of, Prof. W. Baldwin Spencer, 305
 Cerebral Commissures in the Marsupialia and Monotremata, Dr. J. Symington on the, 405
 Ceylon, Ants in, W. F. Liesching, 15
 Ceylon, Coffee, Cacao and Rubber Cultivation in, J. Ferguson, 300
 Ceylon, Wild Strawberries in, Mr. Nock, 494
 Chain-making Machine (the "Triumph"), A. New, 527

Challenger Observations, Preliminary Account of Oceanic Circulation based on the, Dr. A. Buchan, 383
Chambers's Encyclopædia, 221
Chandler (Dr.), Variation of Latitude, 211, 476; Refraction in Micrometric and Photographic Measures, 401
Chapman (C. H.), An Elementary Course in Theory of Equations, 199
Chapman (Dr. H. C.), the Brain of the Gorilla, 229
Characters, Acquired, the Bearing of Pathology upon the Doctrine of the Transmission of, Henry J. Tylden, 302
Characters Acquired, the Transmission of, through Heredity, Prof. C. V. Riley, 504
Charcot and Darboux (MM.), the Calculator Inaudi, 167
Charcot (Dr.), A Shaking Cure for Nervous Complaints, 451
Charpentier (Aug.), the Retardation in the Perception of the different Ways of the Spectrum, 192
Chart of the Heavens, Photographic, H. C. Russell, 576
Chassy (A.), on the Laws of Electrolysis, 47
Chatham Islands, Aphanapteryx and other Remains in the, Henry O. Forbes, 252
Chatham Islands, Discovery of the Bones of a Flightless Bird in the, H. O. Forbes, 408
Cheetah Killed by Wild Boar, C. Meares, 178
Chemistry: Prof. Emil Fischer on the Constitution of the Dulcitol Group, 16; Chemical Society, 22, 94, 141, 189, 311; Turacin, Prof. A. H. Church, F.R.S., 22; the Separation of Arsenic, Antimony, and Tin, J. Clark, 22; Platinous Chloride as a Source of Chlorine, Shenstone and Beck, 22; Decomposition of Mannitol and Dextrose by *Bacillus ethaceticus*, Frankland and Lumsden, 22; Adhesion of Mercury to Glass in presence of Halogens, W. A. Shenstone, 22; the Preparation of Glycollic Acid, H. G. Colman, 22; Action of Silicon Tetrachloride on substituted Phenylamines, J. E. Reynolds, 22; Chemistry of Compounds of Thiourea and Miocarbimides with Aldehyde-Ammonia, A. E. Dixon, 23; Atomic Weight of Boron, J. L. Hoskyns-Abraham, 23; Prof. Ramsay and Miss Aston on the Atomic Weight of Boron, 403; Boron Trisulphide, H. Moissan, 340; Boron Pentasulphide, H. Moissan, 364; Death and Obituary Notice of Prof. A. W. Hofmann, 37; Proposed Institute in Memory of Prof. von Hofmann, 449; Acetyl Fluoride, prepared by M. Maurice Meslans, 40; the Nature and Chemical Behaviour of Acetyl Fluoride, Meslans, 63; a New Case of Abnormal Solution, Decrease of Solubility of Ethyl Bromide in Ether with increase of Temperature, F. Parmentier, 48; Occurrence of Fluorine in different varieties of Natural Phosphates, Ad. Carnot, 48; Fossil Wood containing Fluorine, T. L. Phipson, 580; Thermal Value of Replacement of Hydrogen in Phenolic Hydroxyl, M. de Forcand, 48; the International Conference on Chemical Nomenclature, Prof. H. E. Armstrong, F.R.S., 56; Molecular Masses of Dextrine and Gum Arabic, as determined by their Osmotic Pressures, C. E. Linebarger, 67; Action of Potassium Cyanide on Ammoniacal Copper Chloride, E. Fleurent, 71; Sodium Trimethylcarbinol, De Forcand, 71; the New Element, Masrium, A. E. Tutton, 79; Masrite and Masrium, H. D. Richmond and Hussein Off, 94; the Existence of two Acetaldoxines, Dunstan and Dymond, 94 312; Sulphonic Acids derived from Anisoils (i.), G. T. Moody, 94; Formation of Trithionate by Action of Iodine of mixture of Sulphite and Thiosulphate, W. Spring, 94; Determination of Temperature of Steam from boiling Salt Solutions, J. Sakurai, 94; Note on an Observation by Gerlach, of the Boiling-point of a Solution of Glauber's Salt, J. Sakurai, 94; Contribution to the History of Silico-Carbon Compounds, P. Schutzenberger, 96; Elements of Critical Points of Carbonic Acid, E. H. Amagat, 96; Odoriferous Properties of Fatty Alcohols, Jacques Passy, 96; Laboratory Practice, a Series of Experiments on the Fundamental Principles of Chemistry, Josiah Parsons Cooke, 99; on the Relative Densities of Hydrogen and Oxygen, Lord Rayleigh, F.R.S., 101; Density of Nitrogen, Lord Rayleigh, F.R.S., 512; Cyanide of Arsenic, M. Guenez, 109; Dibromomalononic Acid, G. Massol, 119; Agricultural Chemistry: Soils and Manures, John M. H. Munro, 125; Micro-Organisms of the Soil, Prof. Alfred Springer, 576; Jahrbuch der Chemie, 133; Redetermination of the Atomic Weights of Copper, Dr. Richards, 134; Micro-Organisms in their Relation to Chemical Change, Prof. Percy F. Frankland, F.R.S., 135; the Magnetic Rotation of Compounds supposed to contain

Acetyl or of Ketonic Origin, W. H. Perkin, 141; the Origin of Colour: ii. the Constitution of Coloured Nitro-Compounds; iii. Colour as an Evidence of Isodynamic Change, H. E. Armstrong, 142; Studies on Isomeric Change; iv. Halogen Derivatives of Quinone, I., A. R. Ling, 142; Halogen Derivatives of Quinone, II., A. R. Ling and J. L. Baker, 142; Crystalline Forms of Sodium Salts of Substituted Anilic Acids, W. J. Pope, 142; Formation of a Hydrocarbon ($C_{18}H_{12}$) from Phenylpropionic Acid, F. S. Kipping, 142; Metallic Derivatives of Acetylone, R. J. Plimpton, 142; Note on Diastatic Action, E. R. Moritz and T. A. Glendinning, 142; a Hydrosilicate of Cadmium, G. Rousseau and G. Tite, 144; the Atomic Weight of Oxygen, Robt. Lefheldt, 151; Application of Measurement of Density to Determination of Atomic Weight of Oxygen, A. Leduc, 387; the New Laboratory of the Case School-Cleveland, Ohio, C. F. Mabery, 160; the Crystallography of Certain New Salts (Fluoximolybdates of Copper and Zinc) obtained by Prof. F. Mauro, Prof. E. Scacchi, 162; Conditions of Formation and Decomposition of Nitrous Acid, V. H. Veley, 188; Certain Ternary Alloys, vi. Aluminium, &c., C. R. A. Wright, F.R.S., 188; Ethylene Derivatives of Diazoamide Compounds, R. Meldola and F. W. Streatfield, 189; Action of Light on Silver Chloride, H. B. Baker, 189; Estimation of Slag in Wrought Iron, A. E. Barrows and T. Turner, 189; Corydalone, ii. J. J. Dobbe, and A. Lauder, 190; Action of Bromine on Althylthiocarbimide, A. E. Dixon, 190; Hydrolytic Functions of Yeast, i., J. O'Sullivan, 190; Lapachic Acid and its Derivatives, S. C. Hooker, 190; the Oxidation of Nitrogen by Means of Electric Sparks, Dr. V. Lepel, 210; Metallic Carbonyls, Ludwig Mond, F.R.S., 230; Dr. Gladstone on the Molecular Refraction and Dispersion of Metallic Carbonyls and of Indium, Gallium and Sulphur, 402; Estimation of Uric Acid in Urine, F. G. Hopkins, 236; Watts' Dictionary of Chemistry, Forster Moiley and M. M. Pattison Muir, Sir H. E. Roscoe, F.R.S., 242; the Precise Determination of the Critical Density, E. Mathias, 263; the Composition of Water and Gay-Lussac's Law of Volumes, A. Leduc, 263; on the Carburization of Iron, John Parry, 283; Inorganic Synthesis of Azoinide (N_3H), A. E. Tutton, 286; Determination of Density of Gases, H. Moissan and H. Gautier, 288; Production of Pyridine Derivatives from Lactone of Triacetic Acid, N. Collie and W. S. Myers, 311; Fermentation of Arabinose by *Bacillus ethaceticus*, P. F. Frankland and J. Macgregor, 311; Resolution of Lactic Acid into its Optically Active Components, T. Purdie and J. W. Walker, 311; New Method of Determining Number of NH_4 Groups in certain Organic Bases, R. Meldola and E. M. Hawkins, 311; Preparation of Alkyl Iodides, J. Walker, 312; Products of Dry Distillation of Bran with Lime, W. F. Laycock and F. Klingemann, 312; Proto-iodide of Carbon, H. Moissan, 312; Action of Paraffin Nitrites on Muscular Tissue, Dr. J. T. Cash, F.R.S., and W. R. Dunstan, 339; Sal-Soda manufacture in United States, Prof. C. F. Mabery, 332; Existence in Earth of an Acid Mineral Substance as yet undetermined, P. de Mondesir, 387; the Industrial Preparation of Carbonic Acid in France, 399; Opening Address in Section B by Prof. Herbert McLeod, F.R.S., at the British Association, 327; Prof. Crum Brown on Electrolytic Synthesis, 401; Prof. Ramsay on the Impurities in Chloroform, 401; Prof. Lewes on the Luminosity of Hydrocarbon Flames, 401; Experiments on Flame, Prof. Smithells, 402; the Reaction of Hydrogen with Mixtures of Hydrogen and Chlorine, Dr. J. A. Harker, 402; Prof. Clowes on a proposed new Safety Lamp, 402; Prof. Roberts Austen on the Effect of Small Quantities of Foreign Matter on the Properties of Metals, 402; Dr. G. H. Bailey on Impurities of Town Air, 402; Sub-section on Chemical Oceanography, 408; Application of Chemical Analysis for fixing age of Prehistoric Human Remains, Adolphe Carnot, 412; Heat of Production of some Chloride Compounds, M. Berthelot and Matignon, 436; Quantitative Determination of Peptone, L. A. Halleoteau, 436; Echinochrome, a Respiratory Pigment, A. B. Griffiths, 508; Ptomaine obtained from cultivation of *Micrococcus tetragenus*, A. B. Griffiths, 508; a New Course of Experimental Chemistry, with Key, John Castell-Evans, 511; Fuels and their Use, Dr. J. Emerson Reynolds, F.R.S., 527; Action of Bromine in presence of Aluminium Bromide on

- Cyclic Chain Carbon Compounds, W. Markovnikoff, 532; a New Course of Chemical Instruction, Grace Heath, 540; Silver Salt of Sulphimide obtained by Dr. Wilhelm Traube, 551; the Standard Course of Elementary Chemistry, E. J. Cox, 559; on the Origin of Elementary Substances and on some new Relations of their Atomic Weights, Henry Wilde, F.R.S., Prof. R. Meldola, F.R.S., 568; Laying Foundation Stone of new Chemical Laboratory of St. Petersburg University, 572; Persulphuric Acid and the Persulphates, M. Berthelot, 575; Comparative Evaporation of Solutions of Sodium and Potassium Chloride and Pure Water, Pierre Lesage, 580; a Lecture Course of Elementary Chemistry, H. J. Lilley, 585; Glycol Aldehyde, Fisher and Landsteiner, 596; New Method of Preparation and Photometry of Phosphorescent Sulphide of Zinc, Chas. Henry, 504; Arithmetical Chemistry, C. J. Woodward, 610; a New Method of Preparing Acetylene Gas, M. Maquenne, 619; Certain Points in Interaction of Potassium Permanganate and Sulphuric Acid, G. A. Gooch and E. W. Danner, 627; the existence of the Crystalline Hydrate of Fe_2O_3 , M. van Bemmelen, 628
- Cherski (Prof.), Reported Death of, 576
- Chert, Radiolarian, of Arenig Age, Messrs. Peach and Horne on the, 428
- Chestnut Wood, Tanning with, Baron Bertrand-Geslin, 617
- Chibret (M.), Waste of Nitrogen from Excessive Fatigue, 364
- Chicago Exhibition: Projected Exhibit of "Worst Weeds" from every State and Territory in the Union, 14; Mining at the, 178, 601; Department of American Archaeology and Ethnology, 228; Solid Gold Brick Exhibit at, 256; the Kentucky Tobacco Exhibit at the, 278; Model of Ocean Currents at, 451; Ethnology at the, the Native American Section, Prof. F. W. Putnam, 454
- Chicago University, 594
- Chilton (Charles), a Tube dwelling Amphipod (*Cerapus flindersi*) from Port Jackson, 178
- China: the Religions and Social Ideas of, as Illustrated in the Ideographic Characters of the Language, Prof. R. K. Douglas, 23; Tidal Phenomena at Kiungchow, Hainan, E. H. Parker, 63; To the Snows of Tiber through China, A. E. Pratt, 150; the Non Chinese Dialects of Hainan, Mr. Parker, 179; Persian Ideas in China, Rev. Dr. Edkins, 522; Ancient Chinese Coins Discovered in an Alaskan Grave, Lieut. Dix Bolles, 574
- Chisholm (Geo. G.), Longmans' School Geography for North America, 585
- Chisholm (Grace E.), a Meteor, 490
- Chlorine, the Reaction of Hydrogen with Mixtures of Hydrogen and, Dr. J. A. Harker, 402
- Chloroform, on the Impurities in, Prof. Ramsay, 401; Fall of Blood-pressure under, owing to its Action on Brain, not Heart, Surgeon-Major Laurie, 572
- Cholera: the Sanitary System Adopted by the Venice Conference for the Prevention of Cholera, P. Brouardel, 215; the Life of Cholera-Germs, Dr. Daremberg, 436; Prevention and Vaccination, 466; Treatment of Cholera by Testicular Liquid, M. Brown-Séquard, 484; Places of Origin of Cholera Epidemics, J. D. Tholozan, 555; Asiatic Cholera; a New Chemical Function of the Comma-Bacillus, J. Ferran, 436
- Chromium, the Alloys of Iron and, R. A. Hadfield, 526
- Chronograph for Cape Town Observatory, Sir Howard Grubb's New, 167
- Chronophotography, Movements of Minute Organisms Analysed by Means of, M. Marey, 47; the Movements of the Heart Studied by Chronophotography, M. Marey, 604
- Church (Prof. A. H., F.R.S.), Turacin, 22
- Church Congress, Vivisection at the, 557
- Cirro-stratus, J. Porter, 541
- Civil Engineers, Institution of, 131
- Civil List Pensions for Year ending June 20, 1892, 254
- Cladonema, a New Habitat for, Henry Scherren, 541
- Clark (J.), the Separation of Arsenic, Antimony, and Tin, 22
- Clark (Dr. J.), on the Natural Relations between Temperature and Protoplasmic Movements, 404; Experimental Observations on the Functions of the Nucleus in the Vegetable Cell, 404
- Clark (J. Edmund), the Height of the Nacreous Cloud of January 30, 127; a Solar Halo, 222; the Perseids, 442; Reflection on Valley Fog, 514
- Clark Cell, Dr. Dahle on the, 8
- Clayton (Helen), Tornado of July 26, 1890, at St. Lawrence, Mass., 420
- Clayton (H. H.), Recent Efforts towards Improvement of Daily Weather Forecasts, 435
- Clerke (Miss E. M.), Jupiter and His System, 620
- Climates, Mountain, Physiological Effects of, M. Sialut, 240
- Clinical Medicine, Atlas of, Dr. Byrom Bramwell, 389
- Clouds, Luminous, W. Clement Ley, 294
- Clouds, Luminous Night, W. Foerster, O. Jesse, 575
- Clouds, Invitation to observe the Luminous Night, W. Foerster and Prof. O. Jesse, 589
- Clouston (Dr. T. S.), Criminal Anthropology, 432
- Clowes (Prof.), Miners' Safety Lamp converted into instrument for detecting coal damp, 44; Investigations of a proposed Safety Lamp, 402
- Clutt (J. A.), Innervation of Cerata of some Nudibranchiata, 339
- Coal-Tar Colouring Matters, Gustav Schultz und Paul Julius, R. Meldola, 313
- Coast Lines, the Geographical Development of, Prof. James Geikie, 348
- Cockerell (T. D. A.), Land and Freshwater Shells peculiar to the British Isles, 76; a Suggestion for the Indexing of Zoological Literature, 442; the West Indian Fauna in South Florida, 458; Peripatus Re-discovered in Jamaica, 514
- Cocoon, a Double, 185
- Cohn (Dr. Ferdinand) Beiträge zur Biologie der Pflanzen, 461
- Coffure of a Kanaka Labourer, Sir William Turner, 433
- Coin-counting Machine in the Royal Mint, Ingenious, Lieut. W. B. Basset, 430
- Cole (Prof. G. A. J.), the Lithophyses in Obsidian of Rocche Rosse, Lipari, 95
- Colliè (N.), Production of Pyridine Derivatives from Lactone of Triacetic Acid, 311
- Collins (F. Howard), Atmospheric Depressions and their Analogy with the Movements of Sunspots, 489
- Colman (H. G.), the Preparation of Glycollic Acid, 22
- Colorado, Polybasite and Tennantite from, Penfield and Pearce, 310
- Coloration, Animal, an account of the Principal Facts and Theories relating to the Colours and Markings of Animals, F. E. Beddard, F.R.S., Edward B. Poulton, 533
- Colardeau (E.), Experiments at Eiffel Tower on Falling Bodies and Air-Resistance, 262
- Colour: the Constitution of a Colour Map, Walter Bailey, 23; the Law of Colour in relation to Chemical Constitution, William Akroyd, 23
- Colour-blindness, Apparatus for Measuring, Brudenell Carter, 44
- Colour Phenomena connected with Cloudy Condensation, John Aitken, F.R.S., 91
- Colour Sense, Current Theories regarding, Prof. William Rutherford, F.R.S., 342
- Colour Vision, E. Hunt, 485
- Colour Vision, Report of the Royal Society's Committee on, 33
- Colour and Light, our Unit of Measurement of, J. W. Lovibond, 93
- Colouring Matters, Coal Tar, Gustav Schultz und Paul Julius, R. Meldola, 313
- Colours, Photography in, 12
- Colours, the Photography of, E. Lippmann, 24
- Colours on the Surface of Mars, Prof. Pickering, 179
- Columbian Exposition, Astronomy at the, 372
- Columbus, the Fourth Centenary of, 185
- Columbus Celebration, Projected publication by Berlin Geographical Society of Atlas of unpublished early maps as memento of, 424
- Columbus Exhibition, the: Juan de la Cosa's (the first) Chart of America, 453
- Comets: a New Comet discovered by Prof. Barnard, 597; Comet Barnard (October 12), 619; Comet Brooks (August 27, 1882), 496; Comet Brooks (August 27, 1892), F. Ristenpert, 551; Comets of Brorsen (1846 VII.) and Brooks (1892 "d"), W. F. Denning, 514; Comet, 1892, Denning (March 18), 65; Comet II., 1892 (Denning, March 18), W. F. Denning, 541, 551; Swift's Comet, 1892, 17; Spectrum of Swift's Comet (a 1892), W. W. Campbell, 17, Prof. Konkoly, 17; Comet Swift (March 6, 1892), 65, 87, 230, 258; Comet Swift (March 6, 1892), 423, 453; Winnecke's Periodic

- Comet, 1892, 110; Discovery of a new Comet by Mr. Brooks, 453; the Present Comets, T. W. Backhouse, 561
- Common (Mr.), Silvering Glass Mirrors, 597
- Common Things, How to make, John A. Bower, 561
- Comparative Spectra of High and Low Sun, 211
- Complexly Continuous Closed Surface, To Draw a Mercator Chart on One Sheet Representing the whole of any, Lord Kelvin, P.R.S., 541
- Compton (Theodore), a Mendip Valley: its Inhabitants and Surroundings, 268
- Comstock (Prof. G. C.), Determination of the Constant of Aberration, 41
- Conchology: Land and Fresh-water Shells Peculiar to the British Isles, T. D. A. Cockerell, 76; R. F. Scharff, 173
- Conference of Delegates of Corresponding Societies, 443; Geological Photography, 434; Destruction of Wild Birds' Eggs, Rev. E. P. Knubley, 434
- Congo Free State: Reported Death of M. Hodister, 424
- Congress of Experimental Psychology, International, 362; F. W. H. Myers and James Sully, 261
- Congress at Genoa, the Coming International Botanical, 208
- Congress, German Anthropological, 420
- Congress of Orientalists, International, 107, 472
- Congresses of Prehistoric Archaeology and Zoology, the Coming Moscow International, 108
- Congress of the Sanitary Institute, the Thirteenth, 449
- Congress of Physiologists, International, 449
- Connection, the Former, of Southern Continents, T. Mellard Reade, 77; Prof. J. P. O'Reilly, 101
- Conservatories, Electric Heating for, M. Olivet, 522
- Constant of Aberration, Determination of the, Prof. G. C. Comstock, 41
- Constant, Gravitative, Direct Determination of the, by means of a Tuning-fork: a Lecture Experiment, A. M. Worthington, 490
- Contagious Foot Rot in Sheep, Prof. G. T. Brown, 560
- Contamination, Relative, of the Water-Surface by Equal Quantities of Different Substances, Miss Agnes Pockels, 418
- Contemporaneity of the Maori and the Moa, H. O. Forbes, 433
- Continents, Southern, the Former connection of, T. Mellard Reade, 77; Prof. J. P. O'Reilly, 101
- Conway's (Mr.) Mountaineering Expedition to the Himalayas, 212, 525; Explorations in the Hindu-Kush, 370
- Cook (A. J.), Amount of Honey Needed to Enable Bees to Secrete One Pound of Wax, 255
- Cook (Thomas), Death of, 276
- Cooke (Rev. A. H.), Geographical Distribution of the Land-Mollusca of the Philippine Islands, 142
- Cooke (Josiah Parsons), Laboratory Practice: a Series of Experiments on the Fundamental Principles of Chemistry, 99
- Cooley's Cyclopædia of Practical Receipts, W. North, 463
- Copeland (Ralph), Nebular Spectrum of Nova Aurigæ, 464
- Copper, Redetermination of the Atomic Weight of, Dr. Richards, 134
- Copper Implements and Ornaments in Ohio Mounds, Prof. F. W. Putnam, 455
- Coral Reefs: the Great Barrier Reef of Australia, W. Saville-Kent, 523
- Cornell University, the Microscope and Histology for the Use of Laboratory Students in the Anatomical Department of the, Simson Henry Gage, W. H. Dallinger, 440
- Corner (J. H.), Sifting and Hauling Appliances in Portsmouth Dockyard, 338
- Cornwall (West), Earthquake in, 61
- Coronoidal Discharges, the, M. J. Papin, 211
- Corsica, Application of Conventional System of Rectangular Coordinates to Triangulation of Coasts of, M. Hatt, 556
- Cosa's (Juan de la) First Chart of America, 453
- Country Thoughts for Town Readers, K. B. Baghot de la Bere, 246
- Cox (E. J.), the Standard Course of Elementary Chemistry, 559
- Crab (*Gelasimus*), the Little Estuarine, Dr. A. Alcock, 574
- Cranial Ganglia, the, Prof. J. C. Ewart, 405
- Crater-like Depressions in Glaciers, R. Von. Lendenfeld, 466; André Delebecque, 490
- Creighton (Dr. Charles), a History of Epidemics in Great Britain from A.D. 664 to the Extinction of Plague, 148; Immunity of the African Negro from Yellow Fever, 200, 222
- Crew (Henry), an Unusual Sunset, 391; Daytime Seeing at the Lick Observatory, 465
- Crichton-Browne (Sir James), Sex in Education, 13; Tooth Culture and White Bread, 229
- Criminal Anthropology, Dr. J. S. Clouston, 432; Dr. Benedikt, 433
- Cristiani (H.), Removal of the Thyroid in the White Rat, 484
- Croft (W. B.), Breath Figures, 236
- Crompton (Mr.), the Backward State of Electrical Appliances in the Navy, 338
- Crookes (W., F.R.S.), Experiments of Electric Currents of High Potential and Extreme Frequency à la Tesla, 44; Burning Nitrogen, 185; London Water Supply for September, 1892, 617
- Cross (Whitman), Post-Laramie Deposits of Colorado, 311
- Crosskey (Dr.), Glacial Papers, 428
- Crustacea: a Tube-dwelling Amphipod (*Cerapus flindersi*) from Port Jackson, Charles Chilton, 178; the Red Ocypode Crab of India, Dr. A. Alcock, 549; the Little Etuarine Crab, *Gelasimus*, Dr. A. Alcock, 574
- Crystal Palace, Magic Lantern Illuminated by Arc Light at, 39
- Crystal Palace, the National Electrical Exhibition at the, 176
- Crystals, the Optical Indicatrix and the Transmission of Light in, L. Fletcher, 581
- Cuckoo in the East, F. C. Constable, 151
- Culverwell (Edward B.), Lord Kelvin's Test Case on the Maxwell-Boltzmann Law, 76
- Cumming (L.), the Temperature of the Human Body, 541
- Cuneiform Writing: the Tell el-Amarna Tablets in the British Museum, 49
- Cunningham (D.), Mechanical System for the Distribution of Parcels, 429
- Cunningham (David), Influence of Acoustic Clouds, 430
- Curves of Muscular Contraction, Method of Recording, Prof. McKendrick, F.R.S., 404
- Cyclone in Kansas, Destructive, 108
- Cyclones, Another Blow to the Ascent Theory of M. Faye, 144
- Cyclones, Tropical, Maxwell Hall, 393
- Cygni, Y., Light Variations of, Prof. Dunér, 87, 134; Mr. Vendell, 134
- β Cygni, Ruth erfurd Measures of Stars about, Harold Jacoby, 619
- Cystoclonium purpurascens*, Tubercles on the Thallus of, Prof. F. Schmitz, 555
- Cystopus candidus*, on the Structure of, Harold Wager, 405
- Daehne (G.), Mental Arithmetic, 247
- Dale (C. W.), Effects of the Weather (during April, 1892) upon Insect Life in Dorsetshire, 109
- Dallas (W. L.), Appearance and Progressive Motion of Cyclones in Indian Regions, 435
- Dallinger (W. H.), the Microscope and Histology for the use of Laboratory Students in the Anatomical Department of the Cornell University, Simson Henry Gage, 440
- Dana (Edward Salisbury), the System of Mineralogy of James Dwight Dana, 1837-68, Descriptive Mineralogy, 217
- Dana (Prof. James D.), Subdivisions in Archæan History, 152; the Walker Prize (Boston Natural History Society) awarded to, 158
- Danielssen (Dr.), the Crinoids and Echinoids of the North Atlantic, 333
- Danner (E. W.), Certain Points in Interaction of Potassium Permanganate and Sulphuric Acid, 627
- Darboux and Charcot (MM.), the Calculator Inaudi, 167
- Daremborg (Dr.), the Life of Cholera-germs, 436
- Darton (N. H.), Fossils in Archæan Rocks of Central Piedmont, Virginia, 311
- Darwin (Major L.), Methods of Examination of Photographic Objectives at Kew Observatory, 188
- Dauvergne's (M.), Pamir Journey, Geographical Results of, 302
- David (Prof. Edgeworth), Australian Mud Springs, 256
- Davis (Prof. W. M.), Winter Thunderstorms, 483
- Davison (Chas.), the Recent Earthquakes, 401
- Dawkins (Prof. Boyd, F.R.S.), the Museum Question, 280
- Dawson (Geo. M., F.R.S.) and Alexander Sutherland, Elementary Geography of the British Colonies, 100

- Dawson (Sir J. W., F.R.S.), Fossil Entomology of Nova Scotia, 236
- Day, Numbering the Hours of the, T. W. Backhouse, 392
- Daytime Seeing at the Lick Observatory, Henry Crew, 455
- De la Rive (M.), Production of Hertz Oscillator Spark in Liquid Dielectric instead of Air, 532
- Deacon (G. F.), Shield Tunneling in Loose Ground, 429
- Deadman (H. E.), Electricity in Navy, 337
- Death from Paraffin and Members of Parliament, 223
- Debatable Land, a; Plants or Animals? George Massee, 365
- Declination, the Discovery of Line of No, W. de Fonvielle, 532
- Declinations of Stars for Reduction of Variations in Latitude, 65
- Deduction, Induction and, E. E. Constance Jones, 293, 586; Francis C. Russell, 586
- Deforges (G.), Measurement of Absolute Intensity of Gravity at Breteuil, 288
- Deformation of the Earth's Crust, on the Causes of the, Prof. E. Reyer, 224; T. Mellard Reade, 315
- Dehérain (P. P.), Utilization of Stripped Autumn Plants as Green Manure, 364
- Deiopetia pulchella* caught near Southampton, the rare crimson speckled, 160
- Delauney (M.), the Acceleration of Mortality in France, 168
- Delboeuf (Prof.), Power of Somnambulist of judging Time, 363
- Demontzey (P.), the Lava of July 12, 1892, St. Gervais Catastrophe, 387
- Denay (Dr.), the Oviparity of the large Victorian Peripatus, 239
- Denning (W. F.), Comet II. 1892 (Denning, March 18), 65, 541, 551; the Perseids, 371; Discovery of a Fifth Satellite to Jupiter, 492; the Red Spot on Jupiter, 391; Comets of Brorsen (1846 VII.) and Brooks (1892 "d"), 514
- Density of Nitrogen, Lord Rayleigh, F.R.S., 512
- Denza (Prof.), Photographs of the Lyra Ring Nebula, 41
- Depth of Water in a River, an Acoustic Method whereby the, may be measured at a Distance, Fred. J. Smith, 246
- Deslandres (M.), New Results as to Hydrogen, obtained by Spectroscopic Study of the Sun, 340; Hydrogen Spectrum in the Solar Atmosphere, 401
- Despeignes (M.), Earthworms and Tuberculosis, 263
- Dessior (Dr.), the Sense of Temperature, 340
- Determination of the Constant of Aberration, Prof. G. C. Comstock, 41
- Deutsche Seewarte Meteorological Observations at Distant Stations, 255
- Devaux (H.), Ants and Saccharine, 573
- Diabetes, Pancreatic, Lancereux and Thiroloix, 412
- Diamonds, Hardness of, not Perceptibly reduced by Cutting and Polishing, W. A. Rogers, 257
- Dickson (H. V.), Physical Condition of the Waters of the English Channel, 384
- Dictionary (Watts') of Chemistry, Forster Morley and M. M. Pattison Muir, Sir H. E. Roscoe, F.R.S., 242
- Dielectric of Condensers, on the, W. H. Preece, F.R.S., 385
- Diet, a Farinaceous, the Effect on Animals of, Prof. Voit, 618
- Dietetic Value of Bread, John Goodfellow, 54
- Dioptric Lens, Notes on the Progress of the, as used in Light-house Illumination, Chas. A. Stevenson, 431, 514
- Disinfection, Contributions to the Study of, Prof. J. Maschek, Mrs. Percy Frankland, 613
- Disks on Axis Rotating at High Speeds, Prof. Neesen's Researches on Notion of Loose, 168
- Dispersion in Double Refraction due to Electric Stress, Dr. John Kerr on, 385
- Distant (W. L.), Protective Resemblance, 254; the White Rhinoceros, 29; are the Solpugidae Poisonous? 247
- Distribution of Energy, Maxwell's Law of, Rev. H. W. Watson, F.R.S., and S. H. Burbury, F.R.S., 100
- Dixon (A. E.), Chemistry of Compounds of Thiourea and Thiocarbamides with Aldehyde-ammonia, 23; Action of Bromine on Allylthiocarbimide, 190
- Dixon (Edward T.), the Grammar of Science, 269; the Limits of Animal Intelligence, 392
- Dixon (H. H.), Mode of Walking of the Arthropoda, 167
- Dobbie (J. J.), Corydaline, ii., 190
- Doberck (Mis.), Appointed Assistant Meteorologist at Hong Kong, 108
- Dockyard, Portsmouth, Shipbuilding in, W. H. White, F.R.S., 337; Lifting and Hauling Appliances in, J. T. Corner, 338
- Dogs, Tuberculous Vaccination of, Héricourt and Richet, 168
- Dohrn's (the late Dr. C. A.), Entomological Collections, 616
- Donaldson (Dr.), Investigation of Laura Bridgman's Brain, 364
- Dönnenberg (E. G.), the Dra Dwarfs, 616
- Double Star Measures, S. W. Burnham, 496
- Double Star Observations, Prof. Asaph Hall, 524
- Douglas (Prof. R. K.), the Social and Religious Ideas of the Chinese, as Illustrated in the Ideographic Characters of the Language, 23
- Douliot (Henri), Death of, 548
- Dove (H. S.), Aurora Australis, 368
- Drygalski (Dr. von), German Scientific Expedition to West Greenland under, 38
- Dublin Royal Society, 167
- Dublin, University of; Tercentenary Celebration, 203
- Dugong, Australian, on the Skeleton and Teeth of the, Prof. G. B. Howes and J. Harri-on, 406
- Dulcitol Group, Prof. Emil Fischer on the Constitution of the, 16
- Dulier (Col. E.), Smoke Prevention, 431
- Dundee Antarctic Whaling Expedition, Sailing of the, 477
- Duner (Prof.), Light Variations of γ -Cygni, 87, 134
- Dunn (Matthias), Pilchards and Blue Sharks, 368
- Dunstan (W. R.), the Existence of two Acetaldoximes, 94, 312; Action of Paraffin Nitrites on Muscular Tissue, 339
- Duparc (Prof.) Theory of Cause of St. Gervais Disaster, 299
- Duquesnay (M.), Résistance des Matériaux, 221
- Dust Storm at Sea, Prof. John Milne, F.R.S., 128
- Dwarfs, the Dra, E. G. Dönnenberg, 616
- Dwelshauvers-Dery (V.) Etude expérimentale calorimétrique de la Machine à Vapeur, 221
- Dybowski (M.), Return of, 301
- Dyeing, Silk, Printing, and Finishing, Geo. H. Hurst, 75
- Dyer (Col. H. S.), the Production of Fine Iron in the Basic Furnace, 114
- Dymond (T. S.), the Existence of Two Acetaldoximes, 94, 312
- Dynamics: Dynamics of Rotation: an Elementary Introduction to Rigid Dynamics, A. M. Worthington, 4; Spinning Tops, John Perry, 4; Maxwell's Law of Distribution of Energy, Rev. H. W. Watson, F.R.S., and S. H. Burbury, F.R.S., 100; the Elementary Part of a Treatise on the Dynamics of a System of Rigid Bodies, E. J. Routh, F.R.S., Prof. A. G. Greenhill, F.R.S., 145; Key to J. B. Lock's Elementary Dynamics, G. H. Lock, 173; Weight, Prof. A. G. Greenhill, F.R.S., 247; Key to Elementary Dynamics, S. L. Loney, 268; Dynamo-Electric Machinery, Prof. A. Gray, F.R.S., 296; on Graphic Solutions of Dynamical Problems, Lord Kelvin, F.R.S., 385; Reduction of Every Problem of Two Freedoms in Conservative Dynamics to the Drawing of Geodetic Lines on a Surface of Given Scientific Curvature, 386; Direct Determination of the Gravitational Constant by means of a Tuning-fork: a Lecture Experiment, A. M. Worthington, 490; Determination of G by means of a Tuning-fork, A. M. Worthington, 561; Modern Dynamical Methods, A. B. Basset, 516; to Draw a Mercator Chart on One Sheet Representing the whole of any Complexly Continuous Closed Surface, Lord Kelvin, F.R.S., 541
- Dyson (F. W.), the Potential of an Anchor-ring, 92
- Ear, on a Use of the External, Prof. A. Crum Brown, F.R.S., 404
- Earth, the Motion of the Ether near the, Dr. Oliver J. Lodge, F.R.S., 497
- Earth Current Storms in 1892, W. H. Preece, F.R.S., 385
- Earth-Fractures and Mars "Canals," Prof. G. A. Lebour, 611
- Earth's Crust, on the Causes of the Deformation of the, Prof. E. Reyer, 224; T. Mellard Reade, 315
- Earth's Physical History, the Microscope's Contributions to the, Prof. T. G. Bonney, F.R.S., 180
- Earthquakes: the Great Earthquake in Japan, 1891, 34; Earthquake in West Cornwall, 61; at Madras, 109; in Italy, 132; in Guadalajara, 209; the Recent Earthquakes, Chas. Davison, 401; an Earthquake Investigation Committee, D. Kikuchi, 418; Earthquake at Huelva, 548; Earthquakes in Roumania and Servia, 594; the New Zealand System of Earthquake Observation, G. Hogben, 594
- Earthworms, New British, Rev. Hilderic Friend, 621
- Earthworms and Tuberculosis, Lortet and Despeignes, 263

- Easter Island, William J. Thomson, 258
 Easter Island Inscriptions, Alleged Decipherments of the, Dr. A. Carroll, 494
 Eastman (J. R.), Some Problems in the Old Astronomy, 424
 Easton (G. W.), *Aurora Australis*, 368
 Echinochrome, a Respiratory Pigment, A. B. Griffiths, 508
 Echinoderm Fauna of Kingston Harbour, Jamaica, G. W. Field, 40
 Eclipses, Lunar, May 11, 1892, 64, 372
 Eclipse, the Total Solar, April 15-16, 1893, 201; John King and William Martin, 561
 Economics of Industry, Elements of, Prof. Alfred Marshall, 27
 Edgar (E.): a Portable Instrument for Measuring Magnetic Fields, 93; Experiments on Magnetized Watches, 93
 Edinburgh: Edinburgh Royal Society, 143, 262; Edinburgh Meeting of the British Association, 316; F. Grant Ogilvie, 270; Electrical Lighting of Edinburgh, Prof. Geo. Forbes, 429; Edinburgh Summer Meeting, Vacation Courses, 449
 Eddins (Rev. Dr.), Persian Ideas in China, 522
 Education: Sex in Education, Sir James Crichton-Browne, 13; the University Extension Movement in the United States, 15; the Edinburgh Summer Meeting, Vacation Courses, 449; the Townshend Scholarships, 449; Anthropology as a Branch of University Education, Dr. D. G. Brinton, 39; the National Home Reading Society, 84; the Association for Promoting a Teaching University for London, 253; Agricultural Education at the University College, North Wales, Bangor, 474; Technical Education: Sydney Technological Museum taken over by Department of Public Instruction, 85; the Nebraska Sugar-School, 210; the Proposed Laboratory for Electrical Engineering at University College, 227; further Gift by Drapers' Company towards Nottingham University College Technical Schools, 276; City and Guilds of London Institute Woodwork Examination, 300; the Westminster Technical Institute, 449
 Eeden (Dr. F. van), Hypnotic Cases at Amsterdam, 363
 Egg-boiling Machine, New, M. Mesdran, 39
 Egypt: Egyptian Agriculture, Prof. Robert Wallace, 15; the Tell el Amarna Tablets in the British Museum, 49; the Origin of the Ancient Egyptians, Prof. G. Nicolucci, 162; Ancient Skeletons from Medum, Dr. Garson, 433; on some Facial Characters of the Ancient Egyptians, Prof. A. Macalister, 433
 Eiassi Lake, Discovery by Dr. O. Baumann of a new African Lake, 280
 Eiffel Tower, Experiments on Falling Bodies and Air-Resistance at the, L. Cailliet and E. Colardeau, 262
 Elder, Protection against Rain in the, Alfred W. Bennett, 201
 Electricity: A Mnemonic Table for changing from Electro static to Practical and C.G.S. Electromagnetic Units, W. Gleed, 23; Prof. J. J. Thomson's New Edition of Clerk Maxwell's Treatise on Electricity and Magnetism, 38; an Elementary Text-book of Magnetism and Electricity, R. Wallace Stewart, 441; Elements of Magnetism and Electricity, John Angell, 610; Magic Lantern illuminated by Arc Light at the Crystal Palace, 39; Vacuum Tubes without Electrodes, Dr. Bottomley, 44; Electric Sparks in and to Water, Prof. Oliver Lodge, 44; Electric Retina, Prof. Oliver Lodge, 44; Experiments of Electric Currents of High Potential and Extreme Frequency à la Tesla, W. Crookes, 44; New Electrical Method of Determining very High Temperatures, Prof. H. Le Chatelier, 45; Electric Tram Chronograph, Rev. F. J. Smith, 45; on the Laws of Electrolysis, A. Chassy, 47; the Art of Internal Illumination of Buildings by, W. H. Preece, F.R.S., 62; the Crocker-Wheeler Motor for Gatling Gun, W. B. L. Hamilton, 62; Mr. George Forbes and the Cataract Construction Company for Transmission of Electrical Power from Niagara Falls to Buffalo, 84; Transformers, 90; a New Ballistic Galvanometer, F. H. Nalder, 93; a Portable Instrument for Measuring Magnetic Fields, Edgar and Stansfeld, 93; Experiments on Magnetized Watches, Edgar and Stansfeld, 93; Institution of Electrical Engineers: the Salomons Scholarship, 131; the Proposed Electrical Engineering Laboratory at University College, 227; Electrical Engineering as a Profession, and How to Enter it, A. D. Southam, 608; Difficulty of Obtaining Iron adapted for Electrical Purposes in United States, W. S. Key, 133; the Pressure at which Electrical Strength of Gas is a Minimum, Prof. J. J. Thomson, 143; Propagation of Electrical Oscillation, H. Poincaré, 144; Absolute Electrometer for Lecture Purposes, Prof. F. Braun, 150; a New Electrolytic Galvanometer, J. Joly, 167; a New Determination of Ratio ν between Electro-magnetic and Electrostatic C.G.S. Units, H. Abraham, 168; Burning Nitrogen, W. Crookes, F.R.S., 185; the Oxidation of Nitrogen by Means of Electric Sparks, Dr. V. Lepel, 210; Current Curves, Major R. L. Hipplesley, 187; Electrodynamics as Affected by the Nature of the Mechanical Stresses in Excited Dielectrics, the Theory of, J. Larmor, 189; Improved Form of Electrodynamometer for Measurement of Telephonic Currents, P. J. Kipp and Sons, 399; the Co-existence of Dielectric Power and Electrolytic Conductivity, E. Bouty, 192; the National Electrical Exhibition at the Crystal Palace, 176; the Coronoidal Discharges, M. I. Pupin, 211; a New Form of Air Leyden, Lord Kelvin, P.R.S., 212; Some Points Connected with Electromotive Force of Secondary Batteries, Dr. Gladstone and W. Herbert, 214; Workshop, Ballistic, and other Shielded Galvanometers, Prof. W. E. Ayrton, F.R.S., and T. Mather, 214; a Guide to Electric Lighting, S. R. Bottone, 221; Electric Light Cables, 290; Electrical Lighting of Edinburgh, Prof. Geo. Forbes, 429; Influence of Electric Light upon Tree-Structure, Gaston Bonnier, 532; Lepidoptera and the Electric Light, D. S. Stewart, 550; Effect of Electric Light on Herbaceous Plants, Gaston Bonnier, 580; the Electric Current, Edward Hamilton, 223; the Future of Electricity, Prof. E. J. Houston, 229; the Rationalization of the Dimensional Formulæ of Electrical Quantities, W. Williams, 237; Breath Figures, W. B. Croft, Rev. F. J. Smith, and Prof. S. P. Thompson, 236; Measurement of Internal Resistance of Cells, E. Wythe Smith, 237; Electro-Therapeutics, Physiological Effects of Alternating Currents with Sinusoidal Variations, A. d'Arsonval, 240; Execution by Electricity in New York State, Dr. C. F. Macdonald, 256; the Herring Fishery and the Electric Telegraph, 278; Distribution de l'Electricité, R. V. Picon, 291; the Position of 4 π Electromagnetic Units, Prof. Oliver J. Lodge, F.R.S., 292; Oliver Heaviside, F.R.S., 292; Dynamo-Electric Machinery, Prof. A. Gray, F.R.S., 296; Method of Increasing Range of the Capillary Electrometer, John Whitmore, 311; the Measurement of the Dielectric Constant, A. Perot, 312; the British Association on Electrical Standards, Prof. Oliver J. Lodge, F.R.S., 334; Electricity in Navy, H. E. Deadman, 337; Mr. Compton, 338; Velocity of Propagation of Electromagnetic Undulations in Insulating Media, R. Blond, 340; Report on the Discharge of Electricity from Points, 383; Report on Electrical Standards, 383; Wire Standards of Electric Resistance, Dr. Lindeck, 383; on Primary and Secondary Cells in which the Electrolyte is a Gas, Prof. Schuster, 384; Experiments on the Electric Resistance of Metallic Powders, Dr. Dawson Turner, 384; on Dispersion in Double Refraction due to Electric Stress, Dr. John Kerr, 385; a Property of Lamellar Bimetallic Conductors submitted to Electromagnetic Induction, Ch. Reigier and G. Parrot, 387; Prof. Crum Brown on Electrolytic Synthesis, 401; on the Origin of the Electric Nerves in the *Torpedo*, *Gymnotus*, *Mormyrus*, and *Malapterurus*, Prof. G. Fritsch, 404; the World's Congress of 1893, Prof. Elisha Gray, 450; Electric Locomotives, Alex. Siemens, 429; New Design of Electric Locomotive, E. H. Woods, 430; Prof. Elihu Thomson's Prize for the Development of Theoretical Knowledge of Electricity, 451; Magnetic Disturbances caused by Electric Railways, Prof. F. P. Whitman, 455; Electro-Metallurgy, J. Wilson Swan, 478; Electricity of Waterfalls, Ph. Lenard, 484; a Phosphoroscope with Spark Illumination, Ph. Lenard, 484; a New Form of Induction Apparatus, J. Morin, 484; a Pocket-book of Electrical Rules and Tables, John Munro and Andrew Jamieson, 486; Generalization of "Mercator's" Projection performed by aid of Electrical Instruments, Lord Kelvin, P.R.S., 490; Thermal Variation of Electrical Resistance of Mercury, C. E. Guillaume, 508; Electrical Heating for Conservatories, M. Olivet, 522; the Liverpool Overhead Railway, J. H. Greathead, 526; Production of Hertz Oscillator Spark in Liquid Dielectric instead of Air, Sarasin and De la Rive, 532; Luminous Fountain built by M. G. Trouvé for Mme. Patti at Craig-y-Nos, 549; the Individual Properties of Metals in Absorbing the Energy of Electric Waves, V. Bjerknes, 573; Method of Exhibiting Hertzian Oscillations to a large Audience, L. Zehnder, 573; Phenomena exhibited at Nega-

- tive Poles of Vacuum Tubes, Prof. E. Goldstein, 594; Lenard's Phosphoroscope for Use with the Electric Spark, 618; the Age-coating in Incandescent Lamps, E. L. Nichols, 627
- Element, the New, Masrium, A. E. Tutton, 79
- Elements, the Line Spectra of the, Prof. C. Runge, 100, 200, 247; Dr. G. Johnstone Stoney, F.R.S., 29, 126, 222, 268
- Elkin (Dr.), Yale College Observatory Report, 280
- Ellis (William), Magnetic Variations, 67; Mean Daily Temperatures at Greenwich on Average of Fifty Years (1841-1890), 191
- Elwes (H. J.), Supplementary Appendix to Travels amongst the Great Andes of the Equator, Edward Whymper, 147
- Embleton (Dr.), John Hancock, 255
- Embryogeny of Gnetum, Herr Karsten, 260
- Emin Pasha's Return Expedition to the Equatorial Lakes, Dr. Stuhlmann, 110
- Emin Pasha's Expedition, Additional Particulars of, Dr. Stuhlmann, 302
- Encyclopædia, Chambers's, 221
- Encyclopédie Scientifique des Aide-Memoire, 221
- Energy, Maxwell's Law of Distribution of, Rev. H. W. Watson, F.R.S., and S. H. Burbury, F.R.S., 100
- Engano, Dr. Modigliani's Recent Explorations in Central Sumatra and, Prof. Henry H. Giglioli, 565
- England, Note on the Occurrence of a Freshwater Nemertine in, W. Blaxland Benham, 611
- English Channel, Physical Condition of the Waters of the, H. V. Dickson, 384
- Enock (F.), the Mustard Beetle, 238
- Engineering: Recent Developments of Engineering, W. Cawthorne Unwin, F.R.S., 355; Launch of the Cunard s.s. *Campania*, 472; Death of Dr. Jas. Thomson, F.R.S., 38; Institution of Civil Engineers, 131; Institution of Electrical Engineers, the Salomons Scholarship, 131; the Proposed Electrical Engineering Laboratory at University College, 227; Electrical Engineering as a Profession and How to Enter It, A. D. Southam, 608; Institute of Marine Engineers, Lord Kelvin's Inaugural Address, 132; Ordinary General Meeting of Institution of Mechanical Engineers, 41; Inaugural Address of President, Dr. W. Anderson, F.R.S., 42; Report of Marine Engine Trials Research Committee of Institution of Mechanical Engineers, 43; Institution of Mechanical Engineers, 276, 593; Institution of Mechanical Engineers, Summer Meeting, 298, 337; on Shipbuilding in Portsmouth Dockyard, W. H. White, F.R.S., 337; Electricity in Navy, H. E. Deadman, 337; Mr. Crompton, 338; Lifting and Hauling Appliances in Portsmouth Dockyard, J. T. Corner, 338; Federated Institution of Mining Engineers, 131
- Entomology: Ants in Ceylon, W. F. Liesching, 15; Entomological Society, 24, 70, 166, 603; Protective Resemblance, Rev. Canon Fowler, W. L. Distant, 24; Insects taken by Philadelphia Academy of Natural Sciences Expedition to Greenland in 1891, 40; Annual Exhibition of South London Entomological and Natural History Society, 46; Experiments on Effect of Temperature on Pupæ of certain Species in Causing Variation, F. Merrifield, 46; Locusts in India, 86; *Peripatus* from St. Vincent, R. J. Pocock, 100; Appearance of the Diamond-back Moth in Yorkshire and Northumberland, 108; Mr. Arthur Nash's Sale, High Prices fetched by Specimens of Extinct British Lepidoptera, 109; Effect of the Weather (during April 1892) upon Insect Life in Dorsetshire, C. W. Dale, 109; the Process of Oviposition as observed in Cattle Tick, R. T. Lewis, 165; Mode of Walking of the Arthropoda, H. H. Dixon, 167; Carnivorous Caterpillars, R. McLachlan, F.R.S., 151; Are the Solpugidæ Poisonous? Henry Bernard, 223; W. L. Distant, 247; *A. Colias edusa* Butterfly in London, H. Rowland-Brown, 228; the Mustard Beetle, 238; Fossil of Nova Scotia, Sir J. W. Dawson, F.R.S., 236; the Tertiary Rhynchophora of North America, S. H. Scudder, 256; Locusts in America, C. V. Riley, 256; Directions for Collecting and Preserving Insects, C. V. Riley, 416; Abundance of Moth (*Deiopeia pulchella*) in Malta, A. C. Gatto, 474; a Sydney Bird-catching Spider, Mr. Rainbow, 474; Sugar-Cane Borers in the West Indies, 531; Sketches of British Insects, Rev. W. Houghton, 540; a Text-book of Agricultural Entomology, Eleanor A. Ormerod, 561; Ants and Saccharine, H. Devaux, 573; the Alleged "Aggressive Mimicry" of the *Volucella*, William Bateson, 585; Habits of Parasol Ants, J. E. Tanner, 595; Some Victorian Lepidoptera, Ernest Anderson, 595; a Wave of Wasp Life, G. W. Peckham, 611; the Late Dr. C. A. Dohrn's Collections, 616
- Eocene, Palæonticists in the American Lower, Henry F. Osborn, 30
- Epidemics, a History of, in Great Britain, from A.D. 664 to the Extinction of Plague, Dr. Charles Creighton, 148
- Epidemics, Plagues, and Fevers: their Causes and Prevention, Hon. Rollo Russell, 413
- Epilepsy, Physiology of, M. Brown-Séquard, 507
- Epochs, Prehistoric, Edmond Bordage, 418
- Equations, an Elementary Course in Theory of, C. H. Chapman, 199
- Errera (Prof. L.), on the Cause of Physiological Action at a Distance, 555
- Eruption of Etna, 254, 276, 299, 331, 361, 371, 398; the Recent, 450, 460; Gaetano Platania, 542
- Eruption at Sangir, the, 287; George Ormsby, 457
- Eruption of Vulcano (August 3, 1888, to March 22, 1890), G. W. Butler, 117
- Eskimo, the Ulu or Woman's Knife of the, O. T. Mason, 550
- Espin (T. E.), a New Variable, 17; Nova Aurigæ, 476
- Essays and Criticisms, Dr. St. George Mivart, 265
- Essex Field Club, the, 132
- Ether, Motion of the, near the Earth, Dr. Oliver J. Lodge, F.R.S., 497
- Ether and Matter, Historical Summary of our Knowledge of the Connection between, Prof. O. J. Lodge, F.R.S., 164
- Etheridge (R., jun.), a Peculiar Form of Womerah, 86; Remarkable Specimen of Belonostomus from Queensland, 256
- Ethiopians, the God of the, W. Hammond Tooke, 78
- Ethnography: an Ethnographical Survey of the United Kingdom, 615
- Ethnology: Ethnology of Egypt, Prof. Nicolucci on the Origin of the Ancient Egyptians, 162; Non-Chinese Dialects of Hainan, Mr. Parker, 179; an Ethnological Enquiry into the Basis of our Musical System, Dr. Wallaschek, 238; Omalius d'Halloys the Author of the Theory of the European Origin of the Aryan Race, Dr. Brinton, 278; the Ainos of Japan, R. Hitchcock, 421; Summer Ceremonials at Tusayan Pueblos, F. W. Fewkes, 421; the Value of Art in Ethnology Prof. A. C. Haddon, 432; a Maid of Wolpai, Dr. Shufeldt, 451; Evolution of House Building among the Navajo Indians, Dr. Shufeldt, 451; Ethnology at the Chicago Exhibition, the Native American Section, Prof. F. W. Putnam, 454; Founding of a Robinson Commemorative Association for Study of Hausa Language and People, 572; Ancient Chinese Coins Discovered in an Alaskan Grave, Lieut. Dix Bolles, 574
- Etienne's (Dr.) Meteorological Observations at Banana, Africa, 255
- Etna (Mt.), Eruption of, 254, 276, 299, 331, 361, 371, 398; Fresh Eruption of, 450; the Present Eruption of, M. Wallerant, 460; Gaetano Platania, 542
- Euclid, an Obvious Demonstration of the 47th Proposition of, A. J. Bickerton, 315
- Europe, the Glacial Succession in, Prof. James Geikie, 143
- Europe, Time Standards of, Dr. Hugh Robert Mill, 174
- Europe, Statistics of the Vineyards of, 450
- Ewart (Prof. J. C.), on the Cranial Ganglia, 405; Sea Fisheries, 405
- Ewing (Prof. J. A., F.R.S.), a Magnetic Curve Tracer, 385; Magnetic Induction, 552
- Execution by Electricity in New York State, Dr. C. F. MacDonald, 256
- Exhibition at the Crystal Palace, the National Electrical, 176
- Exhibition, Chicago, Mining at the, 178; Solid Gold Brick Exhibit at, 256
- Exhibition, the Columbus; Juan de la Cosa's, the First Chart of America, 453
- Expedition, the Relief of the Peary Greenland, 476; Sailing of the Dundee Antarctic Whaling Expedition, 477
- Expression, Facial, Relations of the Motor Muscles of the Eyes to, Dr. G. T. Stevens, 86
- Eyes, Relations to Facial Expression of the Motor Muscles of the, Dr. G. T. Stevens, 86
- Fabre (Charles), *Traité Encyclopédique de Photographie*, 464
- Facial Characters of the Ancient Egyptians, on Some, Prof. A. Macalister, 433
- Famintzin (A.), a New Bacterium, *Nevskia ramosa*, 68
- Farmer (J. B.), the Embryology of *Angiopteris evecta*, 92

- Farmyard Manure, C. M. Aikman, 100
Fauna of British India, including Ceylon and Burma, W. T. Blanford, F.R.S., 5
Faye (M.), Means of Producing Rain Artificially, ; Another Blow to the Ascent Theory of Cyclones, 144
Federated Institution of Mining Engineers, 131
Fényi (J.), a Remarkable Prominence, 334
Ferguson (J.), Coffee, Cacao and Rubber Cultivation in Ceylon, 300
Feron (Mr.), Annual Loss to U.S. Forestry Bureau through Thieves and Fire, 454
Ferran (J.), New Chemical Function of Comma Bacillus of Asiatic Cholera, 436
Ferrero (General), Scientific Measuring Instruments, 388
Ferrini (Rinaldo), "Recenti Progressi nelle Applicazioni dell' Elettricità, 296
Fessenden (C. E.), Elements of Physic, 245
Fever, Bilious, of Hot Countries, Bacterian Origin of, Domingos Freire, 460
Fevers, Epidemics, Plagues and, Hon. Rollo Russell, 413
Fewkes (J. S.), Summer Ceremonials at the Tusayan Pueblos, 421
Field (E. W.), the Echinoderm Fauna of Kingston Harbour, Jamaica, 40; the Problem of Marine Biology, 623
Fig, Fertilization of the, and Capricification, C. V. Riley
Films, Specific Conductivity of Thin, Profs. Reinold and Rücker, 384
Finnish Expedition to the Kola Peninsula, 178
Fiorelli (Signor Guiseppe), Proposed Testimonial to, on his Retirement, 176
Fire, Great, at St. John's, the Cause of, the 295
Fire Extinction on Board Ship, H. C. Carver, 432
Fire-making, the Methods of, Walter Hough, 474
Fischer (Prof. Emil), on the Constitution of the Dulcitol Group, 16
Fish: United States, Pacific Coast Fisheries, 63; the North Sea Fisheries, E. W. L. Holt's Investigations, 158; Scientific Investigation of the Scottish Fishery Board, 395; on the Destruction of Immature Fish, E. W. L. Holt, 404; the Food of Fishes, Dr. W. Ramsay Smith, 405; the Herring Fishery and the Electric Telegraph, 278; Pearl Fishery of the Gulf of California, C. H. Townsend, 333; a Sketch of the Scotch Fisheries chiefly in their Scientific Aspects during the Past Decade 1882-92, Prof. McIntosh, F.R.S., 404; Prof. Ewart on our Sea Fisheries, 404; Damage by Naphtha to Volga Fisheries, 421
Fisher (Prof. Emil), Glycol Aldehyde, 596
Fisher (Osmond), the Hypothesis of a Liquid Condition of the Earth's Interior, considered in connection with Darwin's Theory of the Genesis of the Moon, 166
Fitzgerald (Prof.), the Discussion on a National Physical Laboratory, 383; an Estimate of the Rate of Propagation of Magnetization in Iron, 385
Fitzgerald (R. D.), Death of, 572
Flame, Experiments on, Prof. Smithells, 402
Flames, on the Luminosity of Hydrocarbon, Prof. Lewes, 401
Flammarion (M. Camille), Atmospheric Depressions and their Analogy with the Movements of Sun-spots, 280; Measures of the Diameter of Mars, 460
Flechia (Prof. Giovanni), Death of, 254
Flegel's (Herr K.), Archæological Discoveries in Kalymnos, 521
Fletcher (L., F.R.S.), the Optical Indicatrix and the Transmission of Light in Crystals, 581; Geikielite and Baddeleyite, two new Mineral Species, 620
Fleurent (E.), Action of Potassium Cyanide on Ammoniacal Copper Chloride, 71
Flints, Pre-Palæolithic, J. Montgomerie Bell, 432
Flora and Fauna of Bromley, J. French, 316
Florida, South, the West Indian Fauna in, T. D. A. Cockerell, 458
Floyer (E. A.), the Geology of the Northern Etbai or Eastern Desert of Egypt, 70
Fluorine contained in Fossil Woods, T. L. Phipson, 580
Flying-Machine Work, L. Hargrave, 556
Foerster (W.), Luminous Night Clouds, 575; Invitation to Observe the Luminous Night Clouds, 589
Fog, London, Damage to Plants from, Prof. F. W. Oliver, 185
Fog Signalling, Petroleum Engines for, Dr. A. Stevenson, 430
Fog, Reflection on Valley, J. Edmund Clark, 514
Fonvielle (W. de), the Discovery of Line of no Declination, 532
Forbes (George) and the Cataracts Construction Company for the Transmission of Electrical Power from Niagara Falls, 84; a Planet beyond Neptune, 179; Electrical Lighting of Edinburgh, 429; Disposal of Town Refuse, 429
Forbes (Henry O.): Aphanapteryx and other Remains in the Chatham Islands, 252; Sub-fossil Bones of Extinct Birds of New Zealand and the Chatham Islands, 404; Discovery of the Bones of a Flightless Bird in the Chatham Islands, 408; on the Contemporaneity of the Maori and the Moa, 433
Forcrand (M. de), Thermal Value of Replacement of Hydrogen in Phenolic Hydroxyl, 48; Sodium Trimethylcarbinol, 71
Forel (Prof.): Theory of Cause of St. Gervais Disaster, 299; Table showing Behaviour of Small Lake at Great St. Bernard with regard to Cold, 371; the Periodic variations of Alpine Glaciers, 386
Forest, Submerged, 128
Forest Map of North Germany during Middle Ages, Dr. E. H. L. Krause, 620
Forestry in United States; the Annual Loss to Government through Thieves and Fire, M. Fernow, 454
Formosa, Southern, Remarkable Accounts of Interior of, D. J. Macgowan, 228
Formosa, Effects of Rainfall in, John Thomson, 406
Foster (Prof. T.), Action of Heat on Tuberculous Matter, 263; Development of Bacteria in a Temperature of Melting Ice, 264
Fossil Botany, a New Genus of Permian-Carboniferous Stems *G. retinodendron*, Rigolloti, B. Renault, 412
Fossil Entomology of Nova Scotia, Sir J. W. Dawson, F.R.S., 236
Fossil Remains, Discovery of Australian-like Mammals in South America, R. Lydekker, 11
Fossils, Triassic, Brachiopoden der Alpinen Trias, A. Bittner, F. A. Bather, 25
Fossils, Vertebrate, Prof. Marsh's, 595
Fossils, Vertebrate, the Washington Collection of, R. Lydekker, 295
Fossil Wood containing Fluorine, T. L. Phipson, 580
Fowl Enteritis, the Etiology and Pathology of Grouse Disease, Dr. E. Klein, F.R.S., 289
Fowler (A.), the Lightning Spectrum, 268
Fowler (Rev. Canon), Protective Resemblance, 24
Foxes in Australia, the Spread of, 15
Frampton (Cyril), Origin of Idea that Snakes Sting, 418
France: Botanical Society of France, 107; the Acceleration of Mortality in France, M. Delauney, 168; Geography in France, 258; the Subterranean Geography of, E. A. Martel, 258; the Industrial Preparation of Carbonic Acid in France, 399
Frank (Dr. A. B.), Lehrbuch der Botanik nach dem gegenwärtigen Stand der Wissenschaft, 610
Frankland (Prof. Percy F., F.R.S.), Micro-organisms in their Relation to Chemical Change, 135; the Nitric Organisms, 200; Fermentation of Arabinose by *Bacillus ethacetius*, 311
Frankland (Mrs. Percy), Bacteriologisches Practicum zur Einführung in die practischwichtigen bacteriologischen Untersuchungsmethoden für Aerzte, Apotheker, Studierende, Dr. W. Migula, 198; Contributions to the Study of Disinfection, Prof. J. Maschek, 613
Freeman (the late Prof.), and his Services to Geography, 135
Freeman (Rev. A.), Saturn's Rings, 150; Nova Aurigæ, 453
Freire (Domingos), Bacterian Origin of Bilious Fever of Hot Countries, 460
French (J.), Flora and Fauna of Bromley, 316
Freshwater Nemertine in England, Note on the Occurrence of a, W. Blaxland Benham, 611
Fresnel's Theory of Double Refraction, L. Fletcher, 581
Friend (Rev. Hilderic), New British Earthworms, 621
Fritsch (Prof. G.), on the Origin of the Electric Nerves in the *Torpedo*, *Gymnotus*, *Mormyrus*, and *Malapterurus*, 404
Frog Heart Apparatus, Williams's, Prof. R. Kobert, 177
Fromm's (Lieut.) Explorations in Southern German East Africa, 525
Frost (E. B.), Thermal Absorption in the Solar Atmosphere, 400, 455
Fruit Culture in Australia, 494
Fuegian Languages, Dr. Brinton, 278
Fuels and their Use, Dr. J. Emerson Reynolds, F.R.S.,

- Fullerton (Capt. J. D.), Modern Aërial Navigation, 63
 Functional Hermaphrodite Ascidian, a, Prof. W. A. Herdman, F.R.S., 561
 Fungicide, Copper Sulphate Spray as, 422
 Fur-bearing Animals in Nature and Commerce, Henry Poland, 605
- Gage (Simson Henry), the Microscope and Histology for the use of Laboratory Students in the Anatomical Department of the Cornell University, W. H. Dallinger, 440
 Gage (Prof. Simon Henry), the Comparative Physiology of Respiration, 598
 Galileo, Proposed Festival at Padua in honour of, 572
 Gall (John) and David Robertson, Popular Readings in Science, 291
 Gallwey (Capt.), Canoe Canal traced through Benin-Lagos Deltaic Swamps, 65
 Galopin (Paul), Variations in Temperature of Water suddenly compressed to 500 atmospheres between 0° and 10°, 240
 Galt (A.), Experiments with a Ruhmkorff Coil, 384
 Galvanometer, a New Electrolytic, J. Joly, 167
 Galvanometers, Workshop Ballistic and other Shielded, Ayrton and Mather, 214
 Garden Design and Architects' Gardens, W. Robinson, 585
 Gardner (Prof. R. L.), the Speech of Monkeys, 451
 Garman (S.), Fishes of Families Cyclopteridae, Liparopsidae, and Liparididae, 422
 Garner (R. L.), the Speech of Monkeys, C. Ll. Morgan, 509
 Garrison (F. L.), the Development of American Armour-plate, 86
 Garson (Dr.), Ancient Skeletons from Medum, Egypt, 433
 Garstang (Walter), appointed to Naturalists' Post on Staff of Marine Biological Association at Plymouth, 83; the Development of the Stigmata in Ascidians, 93
 Gas Compression and Temperature, a Question in Physics, Prof. H. A. Hazen, 55
 Gas, Pressure at which Electric Strength of, is a Minimum, Prof. J. J. Thomson, 143
 Gas Pressures, Scale for Measurement of, Orme Masson, 294
 Gas Engines in United States, 595
 Gases, on a Proposition in the Kinetic Theory of, Rev. H. W. Watson, F.R.S., 29
 Gases, Waterston's Theory of, 30
 Gatto (A. C.), Abundance of Moth (*Deiopeia pulchella*), in Malta, 474
 Gatty (C. H.), Endowment of Laboratory at St. Andrews by, 369
 Gaudry (Albert), the Pythonomorphs of France, 387
 Gaultier's (M. J.), System of Photographic Surveying, 525
 Gautier (A.), Residual Life, 71
 Gautier and Landi (MM.), the Products of the Residual Life of the Tissues, 167
 Gautier (H.), Determination of Density of Gases, 288
 Geelmuyden (H.), Aurora, 55
 Geikie (Sir Archibald, LL.D., For. Sec. R.S.), Inaugural Address at the Edinburgh Meeting of the British Association, 317
 Geikie (Prof. James, F.R.S.), the Glacial Succession in Europe, 143; Opening Address in Section E of the British Association, 348
 Geikielite and Baddeleyite, two new Mineral Species, L. Fletcher, F.R.S., 620
 Genoa, the Coming International Botanical Congress at, 208
 Genoa Botanical Institute, Presentation by Mr. Thomas Hanbury of the late Prof. Willkomm's Collection of Vascular Plants to, 254
 Genoa, Opening of Hanbury Botanical Institute at, 448
 General Circulation of the Atmosphere, J. Carrick Moore, F.R.S., 7
 Geodesy: Geodetic Survey of South Africa, 362; Prof. R. S. Woodward's Iced-Bar Base Apparatus, 455; a Standard Yard and Metre on Polished Steel, Prof. W. A. Rogers, 455; M. J. Gaultier's System of Photographic Surveying, 525; Application of Conventional System of Rectangular Co-ordinates to Triangulation of Coasts of Corsica, M. Hatt, 556; Progress of Indian Surveys during last Field Season, 576
 Geography: Military Geography, Col. J. F. Maurice on, 14; Henry Brugsch Pasha on Lake Mæris, 15; German Scientific Expedition to West Greenland under Dr. von Drykalski, 38; Imèrina, the Central Province of Madagascar, Rev. James Sibree, 47; Geographical Notes, 65, 135, 162, 230, 258, 280, 301, 453, 476, 525, 552, 576, 598, 620; the Neglect of Scientific Geography in England, Louis Lóczy, 65; the Mississippi River Commission Report on the Levees, 65; Canoe Canal traced by Capt. Gallwey through Benin and Lagos Deltaic Swamps, 65; Mr. G. T. Carter's Journey into the Interior of Lagos, 65; the Former Connection of Southern Continents, J. Mellard Reade, 77; Prof. J. P. O'Reilly, 101; Anniversary Meeting of the Royal Geographical Society, President's Address, 87; the Royal Geographical Society's Soirée, 180; Women to be admitted Fellows of the Royal Geographical Society, 258; Berlin Geographical Society, 369; Projected Publication by Berlin Geographical Society of Atlas of Unpublished Early Maps as Memento of Columbus Celebration, 424; Elementary Geography of the British Colonies, Geo. M. Dawson, F.R.S., and Alexander Sutherland, 100; Emin Pasha's Return Expedition to the Equatorial Lakes, Dr. Stuhlmann, 110; Additional Particulars of Emin Pasha's Expedition, Dr. Stuhlmann, 302; Sir William Macgregor's Explorations in New Guinea, 110; Lieut. Mizon's Explorations in Africa; Two Pillars Erected by Diogo Cão, the first Portuguese Explorer, on West Coast of Africa, brought back to Lisbon, 111; the Pygmies of Africa, Dr. H. Schlichter, 135; the Ordnance Maps of Great Britain, 135; the late Prof. Freeman and his Services to Geography, 135; Señor Julio Popper's Expedition to Argentine Tierra del Fuego, 135; Mrs. Isabella Bishop's Journey to Little Tibet, 135, 406; Dr. W. L. Abbot on the Climate of Kilima-Njaro, 160; Report on the New Road across the Andes, 162; a New Russian Expedition to Tibet to be Led by M. Potanin, 162; the Gold Medal Presentations of the Paris Société de Géographie, 162; the Hypothesis of a Liquid Condition of the Earth's Interior Considered in Connection with Darwin's Theory of the Genesis of the Moon, Osmond Fisher, 166; the Marshall Islands, 180; Mr. Schwatka's Yukon Expedition, 180; Return of Prince Henry of Orleans from the Upper Mekong, 180; Death and Obituary Notice of Capt. W. G. Stairs, 180; Death of Joseph Martin, 211; Crossing of the Kalahari Desert, 211; Completion of Aden Survey, 212; Russian Geological, &c., Expedition to East Siberia, 212; Formation of a New Islet in the Caspian, 212; Mr. Conway's Mountaineering Expedition to the Himalayas, 212, 370, 525; Remarkable Accounts of Interior of Southern Formosa, D. J. Macgowan, 228; Charles Alluard's Researches in the Island of Mahé (Seychelles), 230; Collapse and Abandonment of the Proposed Antarctic Expedition, 230; Discovery of America to be Celebrated in Hamburg, October 11-12, 230; Manchester Geographical Society, 230; a Synoptical Geography of the World, 246; Geography in France, 258; the Piratical Tugere Tribe of New Guinea, 258; the Subterranean Geography of France, E. A. Martel, 258; the Uganda Question, 280; Projected Antarctic Whaling Cruise from Dundee, 280; Dr. O. Baumann's Survey of Road to Victoria Nyanza, Discovery of a New Great Lake (Lake Eiasi), 280; New Zealand Alpine Club Journal, 280; Return of M. Dybowski, 301; the Royal Belgian Society of Geography and Local (Belgian) Geography, 301; Scottish Geographical Magazine, 302; M. Dauvergne's Pamir Journey, Geographical Results of, 302; Death of Dr. Theodor Menke, 302; Opening Address by Prof. James Geikie, F.R.S., in Section E. of the British Association, 348; the Geographical Development of Coast Lines, Prof. James Geikie, F.R.S., 348; International Geographical Congress (1895), 361; the First Ascent of Oraefa Jökull, F. W. W. Howell, 406; Place Names, Dr. J. Burgess, 406; Effects of Rainfall in Formosa, John Thomson, 406; the North Atlantic, Prince of Monaco, 406; Detailed Oceanography and Meteorology, J. Y. Buchanan, 407; the Desert of Atacama, Mrs. Lilly Grove, 407; Photography and Surveying, Colonel Tanner, 407; Determination of Longitude by Photography, Dr. H. Schlichter, 407; African Travels, 407; Account of the Industrial Resources of Nyasaland, John Buchanan, 407; Prof. Penck's Proposed New Map of the Globe, 407; Recent Travels, Walker Harris, 408; H. O. Forbes's Visit to the Chatham Islands, 408; Sub-section on Chemical Oceanography, J. Y. Buchanan, 408; Prof. Pettersson on the Hydrography of the Kattegat and Baltic, 408; Results of the Recent Russian Investigations on the Black Sea, Dr. Andrusoff, 408; Reported Death of M. Hodister, 424; Model

- of Ocean Currents at Chicago Exhibition, 451; Montenegro, Dr. Hassert, 453; the Mombasa-Victoria-Nyanza Survey, 453; Railways in Tropical Africa and Native Passengers, 453; Prof. Pouchet's Visit to Jan Mayen and Spitzbergen, 453; Lieutenant Ryder's East Greenland Expedition, 453; the First (Juan de la Cosa's) Chart of America, 453; The Labrador Coast: a Journal of Two Summer Cruises in that Region, Dr. A. S. Packard, 462; the Relief of the Peary Expedition, 476; Sailing of the Dundee Antarctic Whaling Expedition, 477; Completion of the Jaffa-Jerusalem Railway, 477; the Gilbert Islands brought under British Protection, 477; White and Hoffman's Journey in Sikkim, 477; Discovery by Th. Thoroddsen of Unknown Lake in Iceland, 477; Mount Milanji in Nyassaland, Alexander Whyte, 482; Korea and the Koreans, 522; the Discovery of Line of no Declination, 532; Change in Samoan Calendar, 552; Return of Capt. Lugard, 552; Dr. Modigliani's Recent Explorations in Central Sumatra and Engano, Prof. Henry H. Giglioli, 565; the Melanesian Submarine Plateau, an Alleged Submerged Continent, C. Hedley, 574; Reported Death of Prof. Cherski, 576; Progress of Indian Surveys during last Field Season, 576; Longmans' School Geography for North America, Geo. G. Chisholm and C. H. Leete, 585; Measurement of Mount Orizaba by J. T. Scovell, 598; Change in Small Lakes near Mansfield, North Germany, through Brine-pumping from Salt Mines, 598; Death of Dr. Karl Spruner von Merz, 598; Camels in German South-west Africa, 598; Lieut. Fromm's Explorations in Southern German East Africa, 525; Physical Conditions of the Weissensee, Carinthia, Dr. K. Grissinger, 525; Coast Line of United States, 525; M. J. Gaultier's System of Photographic Surveying, 525; Mr. Joseph Thomson's Journey to the Lake Bangweola Region, 620; Dr. E. H. L. Krause's Forest Map of North Germany during the Middle Ages, 620; Geographical Society—See Royal
- Geology: the Division According to Terrestrial Latitudes and Longitudes of the Geological Groups on the Earth, A. de Tillo, 24; Brachiopoden der Alpenen Trias, A. Bittner, F. A. Bather, 25; the Geology of Barbadoes, J. B. Harrison and A. J. Jukes Browne, 59; Influence of Swamp Waters in Formation of Phosphate Nodules of South Carolina, Dr. C. L. Reece, 67; Geological Society, 70, 95, 165, 190, 238; the Common Processes of Mineralization of Fossil Remains, illustrated by Fossil Nautilus and Starfish, Prof. W. C. Williamson, F.R.S., 70; the Geology of the Northern Etbai or Eastern Desert of Egypt, E. A. Floyer, 70; the So-called Gneiss of Carboniferous Age at Guttannen, Prof. T. G. Bonney, F.R.S., 95; the Lithophyses in Obsidian of Rocche Rosse, Lipari, Cole and Butler, 95; L'Annuaire Géologique Universel, 109; Geology of the Bas Boulonnais, E. Rigaux, 109; the Glacial Succession in Europe, Prof. James Geikie, 143; Tertiary Microzoic Formations of Trinidad, by R. J. L. Guppy, 190; Geology of the Nile Valley, E. A. Johnson Pasha and H. D. Richmond, 190; Russian Geological Expedition to East Siberia, 212; on the Causes of the Deformation of the Earth's Crust, Prof. E. Reyer, 224; J. Mellard Reade, 315; the Saurischia of Europe and Africa, Prof. H. G. Seeley, F.R.S., 238; the Speeton Clays and their Equivalents, Prof. A. Pavloff and G. W. Lamplugh, 257; Geology of Easter Island, 258; Post-Laramie Deposits of Colorado, Whitman Cross, 311; Origin of Terraces in Glaciated Regions, R. S. Tarr, 311; Cambrian Rocks of Virginia, &c., C. D. Walcott, 311; Fossils in Archæan Rocks of Central Piedmont, Virginia, N. H. Darton, 311; Inaugural Address by Sir Archibald Geikie, LL.D., For. Sec. R.S. at the Edinburgh Meeting of the British Association, 317; Opening Address by Prof. C. Lapworth, F.R.S., in Section C of the British Association, 372; Messrs. Peach and Horne on the Radiolarian Chert of Arenig Age, 428; Palæozoic Rocks, Prof. Sollas and Prof. Bonney, 428; Glacial Papers, Dr. Crosskey, Mr. Lomas, Mr. Bell, Messrs. Peach and Horne, 428; Palæontological Papers, E. J. Newton, M. Laurie, 428; Petrological Papers, Mr. Ussher, Mr. Goodchild, Mr. Harker, Mr. Teall, Mr. Somervail, 428; Landslips in the South Tyrol, Miss Ogilvie, 428; the Pliocene Mollusca of New Zealand, Prof. F. W. Hutton, 474; International Geological and other Records, H. J. Johnston-Lavis, 441; the Passage of Granite Rock into Fertile Soil, Alexander Johnstone, 517; Earth Fractures and Mars "Canals," Prof. G. A. Lebour, 611; Miocene Formations of Western Algeria, Jules Welsch, 628
- Geometrical Deductions, James Blaikie, W. Thomson, 291
- Geometry: to Draw a Mercator Chart on one Sheet representing the whole of any complexly continuous closed Surface, Lord Kelvin, P.R.S., 541
- German Anthropological Congress, 420
- German Scientific Expedition to West Greenland under Dr. von Drygalski, 38
- Germany: on Anomalies of Temperature in, Observations based on Synoptic Weather Chart, Dr. Schwalbe, 120
- Germany: Exhibition at Nürnberg by the German Mathematical Association, 204
- Germany, North, during Middle Ages, Forest Map of, Dr. E. H. L. Krause, 620
- Gibbs (J. Willard), Thermodynamische Studien, 245
- Giglioli (Prof. Henry H.), Dr. Modigliani's Recent Explorations in Central Sumatra and Engano, 565
- Gignac, Remarkable Jade Head found at, M. de Lapouge, 421
- Gilbert (Prof. G. K.), the Origin of Coon Butte, Arizona, 454
- Gilbert (Dr.), Allotments and Small Holdings, 602
- Gilbert Islands brought under British Protection, 477
- Gill (Dr.), Comparison Stars of the Planet Victoria, 423
- Gillespie (Dr. Lockhart), on Proteid-hydrochlorides, 403
- Gilson (Prof. G.), on the Affinity of Nuclein for Iron and other Substances, 405
- Giltay (Dr. E.), the Use of the Camera Lucida in Drawing Bacteria, 69
- Giordano (Dr. Felice), Death of, 331
- Glacial Papers, Dr. Crosskey, 428; Mr. Bell, 428
- Glacial Succession in Europe, the, Prof. James Geikie, 143
- Glaciers: Glacier Slip Disaster at St. Gervais les Bains, 254; Theories of the Cause of, Profs. Duparc and Forel, 299; the Lava of July 12, 1892 (St. Gervais Catastrophe), P. Dementzey, 387; Causes of St. Gervais Catastrophe, 420; Alpine Glaciers, the Present Extension of, the Glacier des Boissons, 370; the Periodic Variations of Alpine Glaciers, F. A. Forel, 386; Crater-like Depressions in Glaciers, R. von Lendenfeld, 466
- Gladstone (Dr.): Some Points connected with Electromotive Force of Secondary Batteries, 214; Molecular Refraction and Dispersion of Metallic Carbonyls and of Indium, Gallium and Sulphur, 402
- Glasgow, Marine Machinery at, 430
- Glass Mirrors, Silvering, Mr. Common, 597
- Glassford (W. A.), Progress of Meteorology in United States, 483
- Glazebrook (R. T., F.R.S.), the Discussion on a National Physical Laboratory, 383
- Gleed (W.), a Mnemonic Table for Changing from Electrostatic to Practical and C.G.S. Electro-magnetic Units, 23
- Glendinning (T. A.), Note on Diastatic Action, 142
- Globe, Prof. Penck's Proposed New Map of the, 407
- Gnetum, Embryogeny of, Herr Karsten, 260
- God of the Ethiopians, the, W. Hammond Tooke, 78
- Godwin-Austen (H. H.), the Mustakh Exploration, 464
- Goebel (Prof.), on the Simplest Form of Moss, 554
- Gold Brick Exhibit, Solid, at Chicago Exhibition, 256
- Goldstein (Prof. E.), Phenomena Exhibited at Negative Poles of Vacuum Tubes, 594
- Gomphostemma, the Genus, D. Prain, 122
- Gooch (F. A.), Certain Points in Inter-action of Potassium Permanganate and Sulphuric Acid, 627
- Goodchild (Mr.), Petrological Papers, 428
- Goodfellow (John), the Dietetic Value of Bread, 54
- Gooseberries, Rats and, by G. Reade, 550
- Gorilla, the Brain of the, Dr. H. G. Chapman, 229
- Gothard (Herr E. von), the Spectrum of Nova Aurigæ, 620
- Göttingen Royal Scientific Society, 580
- Göttingen Royal Society of Sciences, 72
- Gouilly (Al.), Air Comprimé ou Rarefié, 221
- Grabham (M.), Peripatus Re-discovered in Jamaica, 514
- Graff (Dr. Ludwig von), Bibliothek des Professors des Zoologie und Vergl. Anatomie, 54
- Grammar of Science, the, 221; Karl Pearson, 97, 199, 247; Edward T. Dixon, 269; Dr. St. George Mivart, F.R.S., 269
- Granite Rock, the Passage of, into Fertile Soil, Alexander Johnstone, 517

- Grantham (R. F.), on the Absorption and Filtration of Sewage, 429
- Graphic Solutions of Dynamical Problems, Lord Kelvin, F.R.S., 385
- Grasses, C. H. Johns, 487
- Gravitative Constant, Direct Determination of the, by Means of a Tuning-fork: a Lecture Experiment, A. M. Worthington, 490
- Gray (Prof. A., F.R.S.), Dynamo-Electric Machinery, 296
- Gray (Prof. Elisha), The World's Congress of 1893, 450
- Gray (J.), a Contribution to the Theory of the Perfect Influence Machines, 384
- Gray (Thomas), the Measurement of the Magnetic Properties of Iron, 163
- Great Britain, the Ordnance Maps of, 135
- Great Britain, a History of Epidemics in, from A.D. 664 to the Extinction of Plague, Dr. C. Creighton, 148
- Great Sangir, the Volcanic Eruption at, 299, 332
- Greathead (J. H.), the Liverpool Overhead Railway, 526
- Greely (General A. W.), Diurnal Fluctuations of Atmospheric Pressure in United States, 177
- Greenhill (Prof. A. G., F.R.S.), the Elementary Part of a Treatise on the Dynamics of Rigid Bodies, E. J. Routh, F.R.S.; a Treatise on Analytical Statics, E. J. Routh, F.R.S., 145; an Introduction to the Study of the Elements of the Differential and Integral Calculus, Axel Harnack, G. L. Cathcart, 218; Weight, 247
- Greenland in 1891, Insects taken by Philadelphia Academy of Natural Sciences Expedition to, 40
- Greenland, West, German Scientific Expedition to, under Dr. von Drygalski, 38
- Greenland Expedition, the Relief of the Peary, 476
- Greenwich Observatory, Annual Visitation of the, 156
- Grenada, the Orchids of, Mr. R. V. Sherring's Collection, 300
- Griffiths (Dr. A. B., F.R.S.), Physiology of the Invertebrata, 414; Ptomaine obtained from Cultivation of *Micrococcus tetragenus*, 508; Echinochrome, a Respiratory Pigment, 508; a Respiratory Globuline in Blood of Chitons, 580
- Griffiths (Riseley), the Gigantic Land Tortoises of Aldabra Islands, Seychelles, 398
- Grissinger (Dr. Karl), Physical Conditions of the Weissensee in Carinthia, 525
- Grotto at Taverny, Discovery of Remarkable, 449
- Grouse Disease and Fowl Enteritis, the Etiology and Pathology of, Dr. E. Klein, F.R.S., 289
- Grubb (Sir Howard, F.R.S.) New Chronograph for Cape Town Observatory, 167
- Grubor (Prof.), the Association of Colour with Sound, 363
- Guadalajara, Earthquake in, 209
- Gubbins (Mr.), Progress and Imported Industries in Japan, 177
- Guesenz (M.), Cyanide of Arsenic, 109
- Guiana, British, North-western District of, Everard im Thurn, 234
- Guillaume (C. E.), Thermal Variation of Electrical Resistance of Mercury, 508
- Guns: Calculation of Trajectories of Elongated Projectiles, Rev. F. Bashforth, 366
- Guppy (R. J. L.), Tertiary Microzoic Formations of Trinidad, 190
- Haddon (Prof. A. C.), the Value of Art in Ethnology, 432
- Hainan, the Non-Chinese Dialects of, Mr. Parker, 179
- Hairlessness of Terminal Phalanges in Primates, Dr. Geo. J. Romanes, F.R.S., 247
- Hale (Prof. G. E.): Researches on the Solar Atmosphere, 192; Photographs of Solar Phenomena, 452; Mounting of Objectives, 452; Solar Photography, 455
- Hale (Horatio), the True Basis of Anthropology, 206
- Hall (Prof. Asaph), Double Star Observations, 524
- Hall (Maxwell), Tropical Cyclones, 393
- Hall (T. S.), Musical Sands, 279
- Hallopeau (L. A.), Quantitative Determination of Peptone, 436
- Halo, a Solar, J. Edmund Clark, 222
- Hamilton (Edward), the Electric Current, 223
- Hamilton (W. B. L.), the Crocker-Wheeler Electric Motor for Gatling Gun, 62
- Hanbury Botanical Institute at Genoa, Opening of, 448
- Hancock (John), Dr. Embleton, 255
- Hargrave (L.), Flying-Machine Work, 556
- Harker (Dr. J. A.): on a Delicate Calorimeter, 385; the Reaction of Hydrogen with Mixtures of Hydrogen and Chlorine, 402
- Harker (Mr.), Petrological Papers, 428
- Harnack (Axel): an Introduction to the Study of the Elements of the Differential and Integral Calculus, G. L. Cathcart, Prof. A. G. Greenhill, F.R.S., 218
- Harries (Henry), Aurora Borealis, 391
- Harris (Walker), Recent Travels, 408
- Harrison (J.), on the Skeleton and Teeth of the Australian Dugong, 406
- Harrison (J. B.), and A. J. Jukes Browne, the Geology of Barbadoes, 59
- Harrison (W. J.), Proposed National Photographic Record and Survey, 209
- Hart (F. H.), Rainfall at Trinidad for thirty years ending 1891, 420
- Hartog (P. J.), on a Delicate Calorimeter, 385
- Harting (J. E.), Vermin of the Farm, 262
- Harvard Observatory; Appeal for Donations for Construction of Great Refracting Telescope, E. C. Pickering, 548
- Hassert (Dr.), Montenegro, 453
- Hatch (Dr. Frederick H.), Mineralogy, 149
- Hatt (M.), Application of Conventional System of Rectangular Co-ordinates to Triangulation of Coasts of Corsica, 556
- Hausa Language and People, Founding of a Robinson Commemorative Association for Study of, 572
- Haviland (G. D.), a Sparrow's Antipathy to Purple, 394
- Hawkins (E. M.), New Method of determining number of NH_2 Groups in certain Organic Bases, 311
- Hay (O. P.), a Curious Habit of Horned Toads, 596
- Hazen (Prof. H. A.), a Question in Physics, 55
- Heart Studied by Chronophotography, the Movements of the, M. Marey, 604
- Heat: Radiation of Atmospheric Air, C. C. Hutchings, 67; Atmospheric Radiation of Heat, Prof. Cleveland Abbe, 67
- Heat, a Redetermination of the Mechanical Equivalent of, C. Miclescu, 618
- Heat and Light, Lessons in, D. E. Jones, 610
- Heat and Sun, Caloric Distribution of, at Surface of Northern and Southern Hemispheres of Earth, Le G. de Tromelin, 508
- Heath (Grace), a New Course of Chemical Instruction, 540
- Heavens, Photographic Map of the, 274
- Heaviside (Oliver, F.R.S.), the Position of 4π Electromagnetic Units, 292
- Hedgehog, on the Hibernating Gland of the, Dr. E. W. Carlier, 403
- Hedgehog, Skin of the, Dr. Carlier, 405
- Hedges (Killingworth), Anti-Friction Material for Bearings used without Lubrication, 430
- Hedley (C.), the Melanesian Submarine Plateau, an Alleged Submerged Continent, 574
- Hellyer (S. Stevens), Principles and Practice of Plumbing, 584
- Helmholtz (Prof. von), the Discussion on a National Physical Laboratory, 383
- Hemp Fibre (*Sansevieria ehrenbergii*), a New, 277
- Hemsley (W. Botting, F.R.S.), Annals of the Royal Botanic Gardens, Calcutta, 122
- Henry (Chas.), New Method of Preparation and Photometry of Phosphorescent Sulphide of Zinc, 604
- Herdman (Prof. W. A., F.R.S.), Innervation of Cerata of some Nudibranchiata, 339; on the Geographical Distribution of Ascidians, 405; on the Presence of Atrial Tentacles in various Genera of Tunicata, with a Suggestion as to their Function, 405; Rules of Nomenclature, 417; a Functional Hermaphrodite Ascidian, 561
- Heredity, Essays on, Dr. A. Weismann, 558
- Heredity, the Transmission of Acquired Character through, Prof. C. V. Riley, 504
- Heri court (M.), Tuberculous Vaccination of Dogs, 168
- Hermann (E.), German Coast-Storms of 1878-87, 450
- Hermaphrodite Ascidian, a Functional, Prof. W. A. Herdman, F.R.S., 561
- Hero-Worshippers, a New Sect of, 459
- Herring Fishery and the Electric Telegraph, the, 278
- Hewitt (George H.), a So-called Thunderbolt, 513
- Hibbert (W.), Some Points connected with Electromotive Force of Secondary Batteries, 214
- Hibernating Gland of the Hedgehog, Dr. E. W. Carlier, 403

- Hick (J.), "Calamostachys Binneyana Schimp," 555
Hicks (Dr. Henry, F.R.S.), the Discovery of Mammoth, &c.,
Remains in Endsleigh-street, 166
Hilgard (Prof. E. W.), Relation of Soil to Climate, 521
Hill (Dr. Alex.), the Hippocampus, 189
Hill (Prof. R. T.), Volcanic Craters of United States, 456
Himmel und Erde, 371, 598
Himalayas, Mr. Conway's Mountaineering Expedition to the,
212, 525
Hindu-Kush, Mr. Conway's Explorations in the, 370
Hippisley (Major R. L.), Current Curves, 187
Hippocampus, the, Dr. Alex. Hill, 189
Histology : the Microscope and Histology for the Use of Labo-
ratory Students in the Anatomical Department of the Cornell
University, Simson Henry Gage, W. A. Dallinger, 440
Hitchock (Romy), the Ainos of Japan, 421; Arrow Poisons
used by the Ainos of Japan, 475
Hoffman (Mr.), Journey in Sikkim, 477
Hodges (J. A.) the Process of Photograph-Enlarging, 209
Hodgkins (Mr. Thomas), Gift to Royal Institution for Pro-
motion of Scientific Research by, 572
Hodister (M.), Reported Death of, 424
Hoernle (Dr.), Discovery of an Ancient Sanscrit Birch-bark
Manuscript, by Lieut. Bower, 370
Hofmann (Prof. A. W.), Death and Obituary Notice of, 37
Hofmann (Prof. von), Proposed Chemical Institute in Memory
of, 449
Hogben (G.), the New Zealand System of Observing Earth-
quake Phenomena, 594
Holborn (L.), Measurement of High Temperatures, 602
Holden (Prof.), Lunar Photography, 257
Holetschek (Dr. J.), Nova Aurigæ, 576
Holt's (E. W. L.), North Sea Investigations, 158; on the
Destruction of Immature Fish, 404
Hong Kong Meteorological Observatory; Report of Director,
361
Hooker (S. C.), Lapachic Acid and its Derivatives, 190
Hopkins Seaside Laboratory, the, 493
Hopkins (F. G.), Estimation of Uric Acid in Urine, 236
Hore (Edward Coode), Tanganyika : Eleven Years in Cen-
tral Africa, 6
Horsley (Victor, F.R.S.), The Structure and Functions of the
Brain and Spinal Cord, 606
Horticulture : Contributions to Horticultural Literature, William
Paul, Dr. Maxwell T. Masters, F.R.S., 582
Hoskyns-Abraham (J. L.), Atomic Weight of Boron, 23
Hough (Walter), the Methods of Firemaking, 474
Houghton (Rev. W.), Sketches of British Insects, 540
Hours of the Day, Numbering the, T. W. Backhouse, 392
Houston (Prof. E. J.), the Future of Electricity, 229
Howell (F. W. W.), the First Ascent of Oræfa Jökull, 406
Howes (A. G.), Pearl-shell Diving at Tahiti, 301
Howes (Prof. G. B.), on the Skeleton and Teeth of the
Australian Dugong, 406
Howrah, Persons Bitten by Jackals in, 210
Huelva, Earthquake at, 548
Hughes (Dr. A. W.), the Rotatory Movements of the Human
Vertebral Column, 262
Hugnet (M.), Waste of Nitrogen from Excessive Fatigue, 364
Hulke (J. W., F.R.S.), the Shoulder Girdle in Ichthyosauria
and Sauropterygia, 93
Hull (Edward, F.R.S.), Volcanoes : Past and Present, 220
Human Body, the Temperature of the, L. Cumming, 541; G.
N. Stewart, 588; Dr. W. Hale White, 588
Human Mind, the : a Text-book of Psychology, James
Sully, 1
Human Osteometry, Sir William Turner, 433
Humming Birds, Ridgway on the, R. W. Shufeldt, 465
Humphrey (Prof. J. E.) Fungous Diseases and their Remedies,
574
Hunt (E.), Colour Vision, 485
Hurricane (April 29, 1892) in Mauritius, Terrible, 84, 108;
Dr. C. Meldrum, P.R.S., 128
Hurst (Geo. H.), Silk Dyeing, Printing, and Finishing, 75
Hutchins (C. C.) Radiation of Atmospheric Air, 67
Hutton (Prof. F. W.), the Pliocene Mollusca of New Zealand,
474
Hutton's Theory of the Earth, its Features and Results, 317
Huxley (Rt. Hon. T. H., F.R.S.), the Privy Councillorship
Conferred on, 397; Science and the State, 416
Hydraulics : a Tide-motor, F. Purdon and H. E. Walters, 429
Hydrocarbon Flames, Luminosity of, Prof. Lewes, 401
Hydrogen : the Cause of the Absence from the Earth's Atmo-
sphere of Hydrogen, Dr. G. J. Stoney, F.R.S., 71; new
Results as to Hydrogen obtained by Spectroscopic Study of
Sun, M. Deslandres, 340; Hydrogen Spectrum in the Solar
Atmosphere, M. Deslandres, 401; the Reaction of Hydrogen,
with Mixtures of Hydrogen and Chlorine, Dr. J. A. Harker,
402; on the Relative Densities of Hydrogen and Oxygen,
Lord Rayleigh, Sec.R.S., 101
Hydrography of the Kattegat and Baltic, Prof. Pettersson, 408
Hydrography; the Marine Survey of India, Dr. A. Alcock,
549
Hydrostatics : Elementary Hydrostatics, W. H. Besant, F.R.S.,
172
Hygiene : the Ventilation of Public Buildings, Dr. Hunter
Stewart, 143; the Contamination of the Street Surface of
Large Cities, with special reference to Naples, Dr. L. Man-
fredi, 163; a Treatise on Hygiene and Public Health, T.
Stevenson, 609
Hypnotism, &c. : Hypnotic cases at Amsterdam, Dr. F. van
Eeden, 363; Hysterical Amaurosis, Prof. Bernheim, Dr.
Berillon, 363; Hypnotism in Yorkshire Medical Practice,
Dr. Bramwell, 363; Power of Somnambulist of Judging
Time, Prof. Delbœuf, 363; Hallucination by Crystal Vision,
F. W. H. Myers, Prof. P. Janet, 363; Report of Census of
Hallucinations, Prof. Sidgwick, 363; Hypnotism in Educa-
tion, Dr. Berillon, 364; Experiments in Thought-transfer-
ence, Mr. H. Sidgwick, 364
Hypnotism and its Antecedents, Dr. Joseph Jastrow, 454
Ice in the South Atlantic, Robert H. Scott, F.R.S., 173; Capt.
Edgar H. Andrew, 173
Ice, Specific Gravity and Fusion of, J. von Zakrzewski, 602
Icebergs in the Atlantic, 160
Iceland : Discovery of Unknown Lake by Th. Thoroddsen, 477
Ichthyology : the Ceratodus, Prof. Baldwin Spencer, 161; a
Trip to Queensland in Search of Ceratodus, Prof. W. Baldwin
Spencer, 305; Remarkable Specimen of Belonostomus from
Queensland, R. Etheridge, jun., 256; Fine Specimen of Saw
Fish, New South Wales, Mr. Pedley, 257; Large Shark
(Couch's Ponbeagle) caught at Mervagisey, M. Dunn, 257;
Cyclopteridæ, Liparopsidæ and Liparididæ, S. Garman, 422;
Cancer in Fish, Prof. Scott, 573
Idea that Snakes Sting, Origin of, Cyril Frampton, 418
Identification, Anthropometric, Dr. Manouvrier, 432
Im Thurn (Everard), North-Western District of British Guiana,
234
Imèrina, the Central Province of Madagascar, Rev. James
Sibree, 47
Immunity of the African Negro from Yellow Fever, Dr. C.
Creighton, 200, 222
Imperial Institute, the, 173
Imperial Institute at St. Petersburg, Armand Ruffer, 520
Impure Water in Bread, 514
Inaudi, the Calculator, MM. Charcot and Darboux, 167
Indexing of Zoological Literature, a Suggestion for the, T. D.
A. Cockerell, 442
India : the Fauna of British India, including Ceylon and Burma,
W. T. Blandford, F.R.S., 5; Proposed Systematic Enquiry
into Snake-poison, 14; Locusts in India, 86; Indian Botany,
W. Botting Hemsley, F.R.S., 122; Discovery of Buddhist
Antiquities at Bhatuprolu, 178; Whirlwinds in the South
Indian Ocean, Robert H. Scott, 294; White and Hoffman's
Journey in Sikkim, 477; the Marine Survey of India, Dr. A.
Alcock, 549; Indian Surveys during last Field Season, Pro-
gress of, 576
Indian, West, Fauna in South Florida, T. D. A. Cockerell,
458
Induction and Deduction, E. E. Constance Jones, 293, 586;
Francis C. Russell, 586
Induction, Magnetic, Prof. J. A. Ewing, F.R.S., 552
Industrial Progress in Japan, M. Gubbins, 177
Industry, Elements of Economics of, Prof. Alfred Marshall, 27
Infants, Prehensile Power of, Dr. Louis Robinson, 433
Influence Machines, a Contribution to the Theory of the Perfect,
J. Gray, 384
Inorganic Synthesis of Azoidide N₃H, A. E. Tutton, 286
Insectivore (*Tupaia javanensis*), the Javanese, 60

- Insects, Directions for Collecting and Preserving, C. V. Riley, 416
 Insects, Sketches of British, Rev. W. Houghton, 540
 Institute, the Imperial, 173
 Institution of Civil Engineers, 131
 Institution of Electrical Engineers, the Salomons Scholarship, 131
 Institute of Marine Engineers, Lord Kelvin's Inaugural Address, 132
 Institution of Mechanical Engineers, 298, 337, 593
 Intelligence, the Limits of Animal, Edward T. Dixon, 392; C. Lloyd Morgan, 417; Dr. St. George Mivart, F.R.S., 466
 Interference Methods, the application of, to Spectroscopic Measurement, Prof. Michelson, 385
 International Conference on Chemical Nomenclature, Prof. H. E. Armstrong, F.R.S., 56
 International Congress of Experimental Psychology, 362; F. W. H. Myers and James Sully, 261
 International Congress of Orientalists, Ninth, 107, 456, 472
 International Congress of Prehistoric Archaeology and Zoology, the Coming Moscow, 108
 International Geological and other Records, H. J. Johnston-Lavis, 441
 International Time, Major the Hon. E. Noel, 423
 International Zoological Record, an, F. A. Bather, 417
 Invertebrata, the Physiology of the, Dr. A. B. Griffiths, F.R.S., 414
 Inwards (R.), an Instrument for Drawing Parabolas, 93
 Ireland, Dr. A. A. Rambaut, the new Astronomer-Royal for, 615
 Iron: Iron and Steel Institute, 111, 471, 525; the Production of Pure Iron in the Basic Furnace, Colonel H. S. Dyer, 114; the Elimination of Sulphur from Iron, Ball and Wingham, 115, E. Saniter and J. A. Stead, 527; the Measurement of the Magnetic Properties of Iron, Thomas Gray, 163; on the Carburation of Iron, John Parry, 283; an Estimate of the Rate of Propagation of Magnetization in Iron, Prof. Fitzgerald, 385; Propagation of Magnetic Impulses along a Bar of Iron, V. A. Julius, 392; Iron in its Relation to Plant Life, Dr. Hans Molisch, 512; the Manufacture of Iron in its Relations with Agriculture, Sir Lowthian Bell, 525; the Alloys of Iron and Chromium, R. A. Hadfield, 526; Failures in Necks of Chilled Rolls, C. A. Winder, 527
 "Island Life," Correction in, Dr. Alfred R. Wallace, 56
 Isopods, the Early Development of the, Prof. J. Playfair McMurrich, 406
 Italy, Earthquake in, 132
 Ives (F. C.), in Colour Photography, Mr. John Carbutt on results achieved by, 13

 Jackals, Hyde Clarke, 247
 Jackals, Persons bitten by, 210
 Jackson (Dr. Sheldon), Acclimatization of Reindeer in Alaska, 109
 Jacoby (Harold), Rutherford Measures of Stars about β Cygni, 619
 Jade Head found at Gignac, M. de Lapouge, 421
 Jade Mines of Upper Burma, Dr. Noetling, 550
 Jaffa-Jerusalem Railway, Completion of, 477
 Jahrbuch der Chemie, 133
 Jamaica, the Echinoderm Fauna of Kingston Harbour, G. W. Field, 40
 Jamaica, Projected Laboratory of Marine Biology in, 176
 Jamaica, Peripatus Re-discovered in, M. Grabham and T. D. A. Cockerell, 514
 James (William), Text-book of Psychology, 1
 Jamieson (Andrew), a 'Pocket-book of Electrical Rules and Tables, 486
 Janet (Prof. P.), Curious Case of Sudden Loss of Memory, &c., (L'Aboulie), 363; Hallucination by Crystal Vision, 363
 Japan: the Great Earthquake in Japan, 1891, 34; the Ainos of Japan, Isabella Bishop, 119, R. Hitchcock, 421; Arrow Poisons used by the Ainos of Japan, Romyne Hitchcock, 475; Progress of Imported Industries in Japan, Mr. Gubbins, 177; a New Sect of Hero-Worshippers, 459; Importance attached to Albino and other White Animals in Japan, Herr J. L. Janson, 493; Imperial University of Japan, 551
 Jastrow (Dr. Joseph), Hypnotism and its Antecedents, 454; some Optical Illusions, 590

 Jerningham (M.), the Recent Hurricane in Mauritius, 277
 Jerusalem Jaffa Railway, Completion of, 477
 Jesse (O.), Luminous Night Clouds, 575; Invitation to Observe the Luminous Night Clouds, 589
 Johns (C. H.), Grasses, 487
 Johnson (Amy), Sunshine, 537
 Johnson (Prof. W. W.), Some Theorems relating to Groups of Circles and Spheres, 68
 Johnson Pasha (E. A.), Geology of the Nile Valley, 190
 Johnston-Lavis (H. J.), International Geological and other Records, 441
 Johnstone (Alexander), the Passage of Granite Rock into Fertile Soil, 517
 Joly (Dr. J.), a New Mercury-Glycerine Barometer, 71; a New Electrolytic Galvanometer, 167
 Jones (D. E.), Lessons in Heat and Light, 610
 Jones (E. E. Constance), Induction and Deduction, 293, 586
 Journal of Botany, 436
 Journal of Royal Agricultural Society of England, 598
 Julius (Paul) und Gustav Schultz, Tabellarische Uebersicht der künstlichen organischen Farbstoffe, R. Meldola, 313
 Julius (V. A.), Propagation of Magnetic Impulses along a Bar of Iron, 392
 Jupiter: the Red Spot on Jupiter, J. J. Landerer, 229; W. F. Denning, 391; Position of Jupiter, 453; Discovery of a Fifth Satellite to, 476, 592; W. F. Denning, 492; Prof. Barnard, 620; Jupiter and his System, Miss E. M. Clerke, 620

 Kahle (Dr.), on the Clark Cell, 383
 Kalahari Desert, South Africa, Crossing of the, 211
 Kalmnos, Herr K. Flegel's Archaeological Discoveries in, 521
 Kanaka Labourer, Coiffure of a, Sir William Turner, 433
 Kansas, Destructive Cyclone in, 108
 Kapp (Gisbert), Power Transition by Alternating Current, 430
 Kapteyn (Prof. J. C.), Photographic and Visual Magnitudes of Stars, 41; Distribution of Stars in Space, 72
 Karsten (Herr), Embryogeny of Gnetum, 260
 Kattegat and Baltic, Hydrography of the, Prof. Pettersson, 408
 Kekulé Festival at Bonn, J. E. Marsh, 205
 Kelvin (Lord, P.R.S.), On a Decisive Test Case disproving the Maxwell-Boltzmann Doctrine regarding distribution of Kinetic Energy, 21; Lord Kelvin's Test Case on the Maxwell-Boltzmann Law, Edw. B. Culverwell, 76; Inaugural Address to the Institute of Marine Engineers, 132; a New Form of Air Leyden, 212; the Discussion on a National Physical Laboratory, 383; on the Stability of Periodic Motions, 384; on Graphic Solutions of Dynamical Problems, 385; Reduction of Every Problem of Two Freedoms in Conservative Dynamics to the Drawing of Geodetic Lines on a Surface of given Specific Curvature, 386; Generalization of "Mercator's" Projection performed by aid of Electrical Instruments, 490; to Draw a Mercator Chart on One Sheet Representing the whole of any Complexly Continuous Closed Surface, 541; our Sun's History, 597
 Kent (W.), the American Association of Science in the United States, 494
 Kerr (Dr. John), on Dispersion in Double Refraction due to Electric Stress, 385
 Kerr (J. Graham), Weapons and Articles of Clothing used by the Toba Indians of the Gran Chaco, 432
 Kew, new Bamboo Garden at, 278
 Kew Bulletin, 473, 593
 Kew Observatory, Method of Examination of Photographic Objectives at, Major L. Darwin, 188
 Key (W. S.), Difficulty of obtaining Iron adapted for Electrical Purposes in United States, 133
 Kikuchi (D.), an Earthquake Investigation Committee, 418
 Kilima-Njaro, the Climate of, Dr. W. L. Abbot, 160
 Kinetic Theory of Gases, on a Proposition in the, Rev. H. W. Watson, F.R.S., 29
 King (G., F.R.S.), the Species of Myristica of British India, 123
 King (John), Total Eclipse of the Sun, 1893, 561
 Kipp and Sons (P. G.), Improved Form of Electro-dynamometer for Measurement of Telephonic Currents, 399
 Kipping (F. S.), Formation of a Hydrocarbon ($C_{18}H_{12}$) from Phenylpropionic Acid, 142
 Kirby (W. F.), a Synonymic Catalogue of Lepidoptera Heterocera (Moths), 487

- Klein (Dr. E., F.R.S.), the Etiology and Pathology of Grouse Disease and Fowl Enteritis, 289
 Klengel (M.), Seven Years' Meteorological Observations on Pic du Midi, 548
 Klingemann (F.), Products of Dry Distillation of Bran with Lime, 312
 Klinkerfues, the Observations of, Reduced, Prof. Wilhelm Schur, 452
 Klossovsky (Prof.), Timchenko's Anemometer, 595
 Knight (J.), Development of Rai-in Industry in Victoria, 256
 Knott (Dr. C. G.), the Volume-Effects of Magnetization, 143, 262; the Volume-Effects of Magnetism, 385
 Knubble (E. P.), the Question of Legislative Protection for Wild Birds' Eggs, 595
 Kobert (Prof. R.), Williams's Frog Heart Apparatus, 177
 Koenig's (Prof.), New Spectrophotometer, 263
 Köhler (Dr. Reinhold), Death of, 520
 Kola Peninsula, the Finnish Expedition to the, 178
 Konkoly (Prof.), Spectrum of Swift's Comet, 17; Nova Aurigæ, 17
 Korea and the Koreans, 522
 Kostinsky (S.), Variation of Latitude at Pulkova, 524
 Krause's (Dr. E. H. L.) Forest Map of North Germany during Middle Ages, 620
 Kroeger (Herr Cand. F.), Nova Aurigæ, 496
 Krone (H.), Photography of Spectra in Natural Colours, 449
 Küstner (Prof.), Nova Aurigæ, 476
- La Bere (K. B. Baghot de), Country Thoughts for Town Readers, 246
 Laboratory to be established in Calcutta Zoological Gardens, New Biological, 493; the Wood Hole Marine Biological Laboratory, 493; the Hopkins Seaside Laboratory, 493
 Laboratory, Chemical, of St. Petersburg University, laying Foundation-stone of New, 572
 Laboratory, Discussion on a National Physical, Prof. Oliver J. Lodge, F.R.S., 382; Mr. Glazebrook, 383; Prof. Von Helmholtz, 383; Lord Kelvin, F.R.S., 383; Prof. Rücker, 383; Prof. Fitzgerald, 383
 Laboratory Practice: a Series of Experiments on the Fundamental Principles of Chemistry, Josiah Parsons Cooke, 99
 Labrador, Geography of, Dr. A. S. Packard, 462
 Ladeking (C.), Synthesis of Crocoite and Phœnicochroite, 311
 Ladies' Conversazione of the Royal Society, 184
 Lagos, Canoe Canal traced by Capt. Gallwey through Benin-Lagos Deltaic Swamps, 65; Mr. G. T. Carter's Journey into interior of Lagos, 65
 Lake-Village in Somersetshire, the Recent Discovery of an Ancient, Dr. R. Munro, 617
 Lamarlière (L. G. de), Comparative Assimilation of Plants developed in Sun and in Shade, 460
 Lamp, Investigations of a Proposed Safety, Prof. Clowes, 402
 Lamplugh (G. W.), the Speeton Clays and their Lincolnshire Equivalents, 257
 Lancashire, the Birds of, F. S. Mitchell, 540
 Lancereaux (M.), Pancreatic Diabetes, 412
 Land and Freshwater Shells peculiar to the British Isles, R. F. Scharff, 173
 Land Animals, the Origin of; a Biological Research, W. J. Sollas, 271
 Landrer (J. J.), the Red Spot on Jupiter, 229; Determination of Angle of Polarization of Venus, 240
 Landlips in the South Tyrol, Miss Ogilvie, 428
 Landi (L.), Residual Life, 71
 Landi and Gautier (MM.), the Products of the Residual Life of the Tissues, 167
 Landsteiner (Dr.), Glycol Aldehyde, 596
 Lane Fox Mercurial Pump, Bumping in the, 394
 Lange (Victor von), Einleitung in die Theoretische Physik, 73
 Language as a test of Mental Capacity, Horatio Hale, 206
 Lankester (Prof. E. Ray, F.R.S.), the Apodidæ, a Morphological Study, H. M. Bernard, 267
 Lantern, Magic, at Crystal Palace illuminated by Arc Light, 39
 Lao Tea, 593
 Lapouge (M. de), Remarkable Jade Head found at Gignac, 421
 Lapworth (Prof. C., F.R.S.), Opening Address in Section C of the British Association, 372
- Larmor (J.), Application of the Spherometer to Surfaces not Spherical, 143; the Theory of Electrodynamics as affected by the Nature of the Mechanical Stresses in Excited Dielectrics, 189
 Larvæ and their Relations to Adult Forms, Dr. J. Beard, 404
 Latitude, Declinations of Stars for Reduction of Variations in, 65
 Latitude Observations at Waikiki, Mr. Preston, 64
 Latitude, Variation of, Dr. Chandler, 211, 476
 Latitude, Variation of, at Pulkova, B. Wanach, 524; S. Kostinsky, 524
 Latitudes, the Variation of Terrestrial, M. Antoine d'Abbadie, 65
 Lauder (A.), Corydaline, ii., 190
 Laurie (M.), Palæontological Papers, 428
 Laurie (Surgeon-Major), Fall of Blood-pressure under Chloroform owing to its action on Brain, not Heart, 572
 Lava in the Bournemouth Drift, Musical Sand, Cecil Carus-Wilson, 316
 Lawes (Sir J. B.), Allotments and Small Holdings, 602
 Layard (Miss Nina F.), on the Arrangement of Buds in Lemna Minor, 555
 Laycock (W. F.), Products of Dry Distillation of Bran with Lime, 312
 Leaky Magnetic Circuits, Dr. du Bois on, 384
 Learning and Research, Prof. Virchow, 593
 Leather's (Dr. J. W.) Method of Detecting and Exterminating Castor-oil Seeds in Cattle Foods, 602
 Lebour (Prof. G. A.), Earth-Fractures and Mars Canals, 611
 Le Chatelier (Prof. H.), New Electrical Method for Determining very High Temperatures, 45
 Le Chatelier Pyrometer, a Modification of the, Prof. W. C. Roberts-Austen, 526
 Leduc (A.), the Composition of Water and Gay-Lussac's Law of Volumes, 263; Application of Measurement of Density to Determination of Atomic Weight of Oxygen, 387
 Leeds, Yorkshire College: the County (Agricultural) Lectures to Farmers, 300
 Lees (C. H.), on a Method of Determining Thermal Conductivities, 385
 Leete (C. H.), Longmans' School Geography for North America, 585
 Lehfeldt (Robt.), the Atomic Weight of Oxygen, 151
 Lemna Minor, on the Arrangement of Buds in, Miss Nina F. Layard, 555
 Lenard (Ph.), Electricity of Waterfalls, 484; a Phosphoroscope with Spark Illumination, 484, 618
 Lendenfeld (R. von), Crater-like Depressions in Glaciers, 466
 Lens, a new Giant Lighthouse, J. R. Wigham, 71
 Lepel (Dr. V.), the Oxidation of Nitrogen by means of Electric Sparks, 210
 Lepidoptera and the Electric Light, D. S. Stewart, 550
 Lepidoptera, some Victorian, Ernest Anderson, 595
 Lepidoptera Heterocera, a Synonymic Catalogue of, W. F. Kirby, 487
 Lepinay (J. M. de), Experimental Illustration of Mirage, 617
 Lewes (Prof.), on the Luminosity of Hydrocarbon Flames, 401
 Lewis (A. L.), Stone Circles, the Sun and the Stars, 127
 Lewis (R. T.), the Process of Oviposition as observed in Cattle Tick, 165
 Ley (W. Clement), Luminous Clouds, 294
 Leyden, a New Form of Air, Lord Kelvin, P.R.S., 212
 Libraries, the Paris Free, Alderman W. H. Bailey, 617
 Lick Observatory, the Staff at the, 452; Day-time Seeing at the, Henry Crew, 465
 Liesching (W. F.), Ants in Ceylon, 15
 Life and Death, Prof. Armand Sabatier, 560
 Life in Motion, or Muscle and Nerve, John Gray McKendrick, F.R.S., 583
 Life of Plants and Animals, the Surface-film of Water and its Relation to the, Prof. L. C. Miall, 7
 Light and Colour, an Unit of Measurement of, J. W. Lovibond, 93
 Light, Absence of, Effects upon Animal Life, 421
 Light in Crystals, the Optical Indicatrix and the Transmission of, L. Fletcher, 581
 Light, Lessons in Heat and, D. E. Jones, 610
 Light of Various Colours, on the Polarization of, by the Atmosphere, N. Piltchikoff, 627

- Light, the Reflection of, by Moving Bodies, H. A. Lovenby, 628
- Light, Electric, Effect on Herbaceous Plants on, Gaston Bonnier, 580
- Light Variations of γ Cygni, Prof. Dunér, 87, 134; Mr. Yendell, 134
- Lighthouse Illumination, on the Progress of the Dioptric Lens as used in, C. A. Stevenson, 431; Chas. A. Stevenson, 514
- Lighthouse Lens, a New Giant, J. R. Wigham, 71
- Lightning Spectrum, A. Fowler, 268
- Lightning, Treatment of Persons Struck by, Dr. R. Assmann, 521
- Lightning, Globular, Curious Instance of, 548
- Lilienfeld's (Dr.) Investigations on Distribution of Phosphorus in Various Tissues, 263
- Lilley (H. T.), a Lecture Course of Elementary Chemistry, 585
- Limits of Animal Intelligence, the, Edward T. Dixon, 392; C. Lloyd Morgan, 417; Dr. St. George Mivart, F.R.S., 466
- Lindeck (Dr.), Wire Standards of Electric Resistance, 383
- Linebarger (C. E.), Molecular Masses of Dextrine and Gum Arabic, as Determined by their Osmotic Pressures, 67
- Line of Sight, Motion in the, W. W. Campbell, 64
- Line Spectra of the Elements, Dr. G. Johnstone Stoney, F.R.S., 29, 126, 222, 268; Prot. C. Runge, 100, 200, 247
- Ling (A. R.), Studies on Isomeric Change, iv.; Halogen Derivatives of Quinine, 142
- Linnean Society, 143, 190, 238
- Linnean Society of New South Wales, 572; Proposed Publication in Memory of Sir William Macleay, 227
- Lippmann (G.), the Photography of Colours, 24
- Litten (Prof.), a Phenomenon of Human Respiration, 263
- Live Stock, Prof. Wrightson, 76
- Liverpool Marine Biological Station at Port Erin, Opening of the, 155
- Liverpool Observatory, Mr. W. E. A. Plummer appointed Director of, 276
- Liverpool Overhead Railway, the, J. H. Greathead, 526
- Lizards (popularly called Horned Toads), a Curious Habit of, O. P. Hay, 596
- Lock (G. H.), Key to J. B. Lock's Elementary Dynamics, 173
- Lockyer (J. Norman, F.R.S.), Origin of the Year, 104; the Opposition of Mars, 443
- Lockyer (N. J.), the Locomotive Engine and its Development, Clement E. Stretton, 538
- Locomotive Engine and its Development, the, Clement E. Stretton and N. J. Lockyer, 538
- Locomotive, New Design of Electric, E. H. Woods, 430
- Locomotives, Two Electric, Alex. Siemens, 429
- Locusts in India, 86
- Locusts in America, C. V. Riley, 256
- Löczy (Louis), the Neglect of Scientific Geography in England, 65
- Lodge (Prof. Oliver J., F.R.S.), Electric Sparks in and to Water, 44; Electric Retina, 44; Historical Summary of our Knowledge of the Connection between Ether and Matter, 164; the Motion of the Ether near the Earth, 497; the Position of 4 π Electromagnetic Units, 292; the British Association Committee on Electrical Standards, 334; Units Discussion at the British Association, 368; the Discussion on the Nomenclature of Units, 383; Discussion on a National Physical Laboratory, 382; a so-called Thunderbolt, 513
- Loew (O.), the Active Albumen in Plants, 491
- Loewy (Prof.), Experiments on Respiration under reduced atmospheric pressure, 168
- Logic, the Student's Manual of Deductive, Theory and Practice, K. R. Bose, 561
- Logic: Induction and Deduction, Francis C. Russell, 586; E. E. Constance Jones, 293, 586
- Lohse (Dr.), Photographs of Sun-spots, 258
- London Institute, City and Guilds of, Woodwork Examination, 300
- London, a Professorial University of, 121
- London University, the New, 151, 169
- London University of the Future, the, 193
- London Water Supply for September, 1892, Profs. W. Crookes and W. Odling, 617
- Loney (S. L.), Key to Elementary Dynamics, 268
- Longitude, Determination of, by Photography, Dr. H. Schlichter, 407
- Longmans' School Geography for North America, Geo. G. Chisholm and C. H. Leete, 585
- Longstaff (Dr. G. D.), Death of, 520
- Lorentz (H. A.), the Reflection of Light by Moving Bodies, 628
- Lortet (M.), Earthworms and Tuberculosis, 263
- Lovering (Prof. Joseph), Memorial of, 521
- Lovibond (J. W.), an Unit of Measurement of Light and Colour, 93
- Lowe (E. J., F.R.S.), Raindrops, 95
- Lowne (B. Thompson), Anatomy, Physiology, Morphology, and Development of the Blow-fly (*Calliphora erythrocephala*), 267
- Lugard (Capt.), Return of, 552
- Luminosity of Hydrocarbon Flames, Prof. Lewes on the, 401
- Luminous Clouds, W. Clement Ley, 294
- Luminous Night Clouds, W. Foerster and Prof. O. Jesse, 575, 589
- Lunar Eclipse, May 11, 1892, 372
- Lunar Photography, Dr. L. Weinek, Prof. Holden, 257
- Lunar Volcanoes, Active, Prof. Pickering, 134
- Lydekker (R.), the Discovery of Australian-like Mammals in South America, 11; Phases of Animal Life, Past and Present, 74; the Washington Collection of Fossil Vertebrates, 295
- Lyra Ring Nebula, Photographs of the, Prof. Denza, 41
- Mabery (Prof. C. F.) Sal-Soda Manufacture in the United States, 332
- Macalister (Andrew, F.R.S.) Opening Address in Section H of the British Association, 378; on Some Facial Characters of the Ancient Egyptians, 433
- McClure (Rev. Edmund), Aurora Borealis, 368
- McCook (Dr. Henry C.), on the Social Habits of Spiders, 403; Can Spiders Prognosticate Weather Changes? 406
- Macdonald (A. C.), the Extinction of the Antbear in Cape Colony, 522
- Macdonald (Dr. C. F.), on the Success of Execution by Electricity in New York State, 256
- Magowan (D. J.), Remarkable Accounts of Interior of Southern Formosa, 228
- Macgregor's (Sir Wm.) Explorations in New Guinea, 110
- Macgregor (J.), Fermentation of Arabinose by *Bacillus ethacet-icus*, 311
- Machinery, Dynamo-Electric, Prof. A. Gray, F.R.S., 296
- McIntosh (Prof., F.R.S.), a Sketch of the Scotch Fisheries, chiefly in their Scientific Aspects, during the past Decade 1882-92, 404
- McKendrick (John Gray, F.R.S.), Life in Motion, or Muscle and Nerve, 583; Method of Recording Curves of Muscular Contraction, 404
- MacLachlan (R., F.R.S.), Carnivorous Caterpillars, 151
- Maclean (Magnus), Experiments with a Ruhmkorff Coil, 384
- Macleay (Sir Wm.), Proposed Memorial Publication of Linnean Society of New South Wales, 227; Memorial Volume, the Proposed, 572
- McLeod (Prof. Herbert, F.R.S.), Opening Address in Section B of the British Association, 327
- McMurrich (Prof. J. Playfair), the Early Development of the Isopods, 406
- Madagascar, Imérina, the Central Province of, Rev. James Sibree, 47
- Madras, Earthquake, 109
- Madras Observatory, 301
- Magnetism: Magnetic Storm of February in Mauritius, 20; Prof. J. J. Thomson's new Edition of Clerk Maxwell's Treatise on Magnetism and Electricity, 38; Wave-Propagation of Magnetism, Fred T. Tronton, 56; Magnetic Variations, William Ellis, 67; on the Changes Produced in the Length of Wires Carrying Currents by Magnetization, Shelford Bidwell, F.R.S., 140; a Compound Magnetometer for Testing Magnetic Properties of Iron and Steel, G. F. C. Searle, 143; the Volume-Effects of Magnetization, Dr. C. G. Knott and A. Shand, 143, 262; the Measurement of the Magnetic Properties of Iron, Thomas Gray, 163; the Volume-Effects of Magnetism, Dr. C. G. Knott, 385; Leaky Magnetic Circuits, Dr. du Bois, 384; on a Magnetic Balance and its Practical Use, Prof. du Bois, 385; Magnetic Curve Tracer, Prof. Ewing, 385; an Estimate of the Rate of Propagation of Magnetization in Iron, Prof. Fitzgerald, 385; Propagation of Magnetic Impulses along a Bar of Iron, V. A. Julius, 392;

- an Elementary Text-book of Magnetism and Electricity, R. Wallace Stewart, 441; Magnetic Disturbances Caused by Electric Railways, Prof. F. P. Whitman, 455; Magnetic Induction, Prof. J. A. Ewing, F.R.S., 552; Elements of Magnetism and Electricity, John Angell, 610
- Magnier de la Source (Dr.), Analyse des Vins, 170
- Magnoliaceae of British India, G. King, F.R.S., 122
- Mahé (Seychelles), Charles Alluaud's Researches in the Island of, 230
- Malta: Malta's Spring Visitors, Birds, 210; Byssus Silk Industry at, late Rev. H. Seddall, 229; Remarkable Rainfall in, 473; Abundance of Moth (*Deiopeia pulchella*) in, A. C. Gatto, 474; Birds versus Insects in, 618
- Mammalia of British India, W. T. Blanford, F.R.S., 5
- Mammals, Australian-like, Discovery of, in South America, R. Lydekker, 111
- Mammals, Observations on the Development of the Posterior Cranial and Anterior Spinal Nerves in, Dr. Arthur Robinson, 405
- Manche Arctic Expedition, the, 397
- Manchester Geographical Society, 230
- Manchester, Address to the Museums Association, Prof. Boyd Dawkins, F.R.S., 280
- Manchester Field Naturalists and Archaeologists' Society; Visit to Buxton, 541
- Manfredi (Dr. L.), the Contamination of the Street Surface of Large Cities, with Special Reference to Naples, 163
- Mann (Dr. G.), on the Functions, Staining Reactions, and Structures of Nuclei, 403; on the Origin of Sex, 404
- Manouvrier (Dr.), Anthropometric Identification, 432
- Mansfeld, North Germany, change through Brine-pumping from Salt Mines, in Small Lakes near, 598
- Manual Instruction; Woodwork, the English Slöyd, S. Barter, 244
- Manure, Farmyard, C. M. Aikman, 100
- Maori and the Moa, on the Contemporaneity of the, H. O. Forbes, 433
- Map of the Globe, Prof. Penck's proposed New, 407
- Map of the Heavens, Photographic, 274
- Maps of Great Britain, the Ordnance, 135
- Maquenne (Mr.), a New Method of Preparing Acetylene Gas, 619
- Marchand (E.), Sun-spot Observations at Lyons Observatory, 340
- Marey (M.), Movements of Minute Organisms Analysed by Chronophotography, 47; the Movements of the Heart studied by Chronophotography, 604
- Marine Biology: Endowment by Mr. C. H. Gatty of Laboratory at St. Andrews, 369; the *Albatross* Voyage; Remarkable Stalked Crinoid, 421; the Wood-Hole Marine Biological Laboratory, 493; the Hopkins Seaside Laboratory, 493; the Problem of Marine Biology, George W. Field, 623
- Marine Engineers, Institute of; Lord Kelvin's Inaugural Address 132
- Marine Floras of the Warm Atlantic and Indian Ocean, G. Murray, 405
- Marine Machinery at Glasgow, 430
- Marix (Paul), a Means of Bringing Two Non-miscible Liquids into Intimate Contact in Definite Proportions, 144
- Markovnikoff (W.), Action of Bromine in Presence of Aluminium Bromide on Cyclic Chain Carbon Compounds, 532
- Mars, the Planet, 162; Colours on the Surface of Mars, Prof. Pickering, 179; the Opposition of, 258, 400; J. Norman Lockyer, F.R.S., 443; Measures of the Diameter of, Camille Flammarion, 460; Observations of the Planet Mars, M. Perrotin, 482; Earth Fractures and Mars "Canals," Prof. G. A. Lebour, 611
- Marsh (J. E.), Kekulé Festival at Bonn, 205
- Marsh's (Prof.) Vertebrate Fossils, 595
- Marshall (Prof. Alfred), Elements of Economics of Industry, 27
- Marshall Islands, the, 180
- Martel (E. A.), the Subterranean Geography of France, 258
- Martel (M.), Curious Basalt Cavern at Mont Dore, 400
- Martin (Joseph), Death of, 211
- Martin (William M.), Total Eclipse of the Sun 1893, 561
- Mascart (M.), the White Rainbow, 532, 555
- Maschek (Prof. J.), Beiträge zur Theorie und Praxis der Desinfection, Mrs. Percy Frankland, 613
- Mashonaland, on the Present Inhabitants of, and their Origin, J. Theodore Bent, 432
- Mason (O. T.), the Ulu or Woman's Knife of the Eskimo, 550; Women and Musical Instruments, 561
- Masonry Dams, a Text-Book on Retaining Walls and, Prof. Mansfield Merriman, 415
- Masrium, the New Element, A. E. Tutton, 79
- Massee (George), A Monograph of the Myxogastres, 365
- Massol (G.), Dibromomalonic Acid, G. Massol, 119
- Masson (Orme), Scale for Measurement of Gas Pressures, 294
- Masters (Dr. Maxwell T., F.R.S.), Contributions to Horticultural Literature, William Paul, 582
- Materia Medica and Therapeutics, Elements of, C. A. Armand Simple, 28
- Mathematics: Graduated Mathematical Exercises, A. T. Richardson, 54; Some Theorems relating to Groups of Circles and Spheres, Prof. W. W. Johnson, 68; a Newtonian Fragment on Centripetal Forces, W. W. Rouse Ball, 71; Einleitung in die Theoretische Physik, Victor von Lange, 73; the Potential of an Anchor Ring, F. W. Dyson, 92; Mathematical Recreations and Problems of Past and Present Times, W. W. Rouse Ball, 123; Application of the Spherometer to Surfaces not Spherical, J. Larmor, 143; the Calculator Inaudi, MM. Charcot and Darboux, 167; Mathematical Society, 71, 191; Bulletin of New York Mathematical Society, 236, 435; Moveable Hyperboloid of One Sheet, Prof. Henrici, 191; the Second Discriminant of the Ternary Quantic $x^2u + y^2u + z^2u$, J. E. Campbell, 191; Neue Rechnungsmethoden der Höheren Mathematik, Dr. Julius Berghörm, 199; Neue Integrationsmethoden auf Grund der Potenzial-Logarithmal- und Numeralrechnung, Dr. Julius Berghörm, 199; Exhibition at Nürnberg by the German Mathematical Association, 204; an Introduction to the Study of the Elements of the Differential and Integral Calculus, Axel Harnack, G. L. Cathcart, Prof. A. G. Greenhill, F.R.S., 218; Memoirs of the Mathematical Section of Odessa University, 236; on the Stability of Periodic Motions, Lord Kelvin, F.R.S., 384; Opening Address in Section A of the British Association by Prof. Arthur Schuster, 323; Generalization of "Mercator's" Projection performed by Aid of Electrical Instruments, Lord Kelvin, F.R.S., 490; Printing Mathematical Symbols, Prof. Silvanus P. Thompson, F.R.S., 513
- Mather (T.), Workshop Ballistic and other Shielded Galvanometers, 214
- Mathias (E.), the Precise Determination of the Critical Density, 263
- Matignon (M.), Heat of Production of some Chlorine Compounds, 436
- Maurice (Col. J. F.), on Military Geography, 14
- Mauritius, Magnetic Storm of February in the, 20
- Mauritius Hurricane (April 29, 1892), the, 84, 108; Dr. C. Meldrum, F.R.S., 128; Mr. Jerningham, 277
- Maxwell's (Clerk) Treatise on Electricity and Magnetism, Prof. J. J. Thomson's New Edition of, 38
- Maxwell's Law of Distribution of Energy, Rev. H. W. Watson, F.R.S., and S. H. Burbury, F.R.S., 100
- Maxwell-Boltzmann Law, Lord Kelvin's Test-case on the, Edward B. Culverwell, 76
- Mazzarelli (G. F.), Physiology of the Glands of Bohadsch in the Aplysiidae, 163
- Mean Time Sun-Dial, Major-General Oliver, 230
- Meares (C.), Cheetah Killed by Wild Boar, 178
- Measurement of Gas Pressures, Scale for, Orme Masson, 294
- Measuring Instruments, Scientific, General Ferrero, 388
- Mechanics: the Potential of an Anchor Ring, F. W. Dyson, 92; an Instrument for Drawing Parabolas, R. Inwards, 93; a Treatise on Analytical Statics, Edward John Routh, F.R.S., 145; the Elementary Part of a Treatise on the Dynamics of a System of Rigid Bodies, Edward John Routh, F.R.S., Prof. A. G. Greenhill, F.R.S., 145; Institution of Mechanical Engineers, 337; Opening Address by W. Cawthorne Unwin, F.R.S., in Section G of the British Association, 355; Electrical Lighting of Edinburgh, Prof. Geo. Forbes, 429; Disposal of Town Refuse, Prof. Geo. Forbes, 429; the Refuse-Destructor Question, G. Watson, 429; Absorption and Filtration of Sewage, R. F. Grantham, 429; Shield Tunneling in Loose Ground, G. F. Deacon, 429; Proposed Ship Canal between the Forth and the Clyde, D. A. Steven-

- son, 429; Mechanical System for the Distribution of Parcels, D. Cunningham, 429; Electric Locomotives, Alex. Siemens, 429; a Tide-Motor, F. Purdon and H. E. Walters, 429; Marine Machinery at Glasgow, 430; Necessity for Connection between Stack Pipes and Earth, W. H. Preece, F.R.S., 430; Power Transmission by Alternating Current, Gisbert Kapp, 430; New Design of Electric Locomotive, E. H. Woods, 430; Ingenious Coin-Counting Machine in the Royal Mint, Lieut. W. B. Basset, 430; Anti-Friction Material for Bearings used without Lubrication, Killingworth Hedges, 430; Petroleum Engines for Fog Signalling, D. A. Stevenson, 430; Influence of Acoustic Clouds, David Cunningham, 430; Sound-Carrying Power of Water, A. R. Sennett, 430; on the Progress of the Dioptric Lens as used in Lighthouse Illumination, C. A. Stevenson, 431, 514; Smoke Prevention, A. R. Sennett, 431; Col. E. Dulier, 431; Investigation of the Phenomena which Accompany the Burning of Carbon and Phosphorus in Oxygen, H. Brereton Baker, 431; Fire Extinction on Board Ship, H. C. Carver, 432; Magnetic Induction, Prof. J. A. Ewing, F.R.S., 552
- Medical Association, British, Sixteenth Annual Meeting, 298
- Medicine, Atlas of Clinical, Byrom Bramwell, 389
- Mediterranean, Varying Colours of the Waters of the, 84
- Melander (G.), Expansion of Gases at Low Pressures, 602
- Melanesian Submarine Plateau, the, an Alleged Submerged Continent, C. Hedley, 574
- Melbourne, Royal Society of, Victoria, 239
- Meldola (Prof. R., F.R.S.), Ethylene Derivatives of Diazo-amido Compounds, 189; New Method of Determining Number of NH_2 Groups in certain Organic Bases, 311; Coal Tar Colouring Matter, Gustav Schultz and Paul Julius, 313; a Modern Revival of Prout's Hypothesis, Henry Wilde, F.R.S., 568
- Meldrum (Dr. C., F.R.S.), the Hurricane in Mauritius, 128
- Mendip Valley, a, its Inhabitants and Surroundings, Theodore Compton, 268
- Menke (Dr. Theodor), Death of, 302
- Mental Arithmetic, G. Daehne, 247
- Mercator Chart, to Draw a, on One Sheet Representing the Whole of any Complexly Continuous Closed Surface, Lord Kelvin, P.R.S., 541
- Mercator's Projection, Generalization of, Performed by Aid of Electrical Instruments, Lord Kelvin, P.R.S., 490
- Mercurial Pump, Bumping in the Lane Fox, 394
- Mercury Mining in Russia, 86
- Mercury, Thermal Variation of Electrical Resistance of, C. E. Guillaume, 508
- Merriman (Prof. Mansfield), a Text-book on Retaining Walls and Masonry Dams, 415
- Meslans (M. Maurice), Acetyl Fluoride prepared by, 40; the Nature and Chemical Behaviour of Acetyl Fluoride, 63
- Metallurgy; the Development of American Armour-plate, F. L. Garrison, 86; Sir F. Abel's Presidential Address to the Iron and Steel Institute, 111; Experiments with Basic Steel, W. H. White, F.R.S., 114; the Production of Pure Iron in the Basic Furnace, Colonel H. S. Dyer, 114; the Elimination of Sulphur from Iron, Ball and Wingham, 115, E. Saniter, J. A. Stead, 527; Platinum Pyrometers, H. L. Callendar, 115; Prof. W. Spring's Brass made by Compression, Mr. Behrens, 216; Metallic Carbonyls, Ludwig Mond, F.R.S., 230; on the Carburization of Iron, John Parry, 283; Experiments on the Electric Resistance of Metallic Powders, Dr. Dawson Turner, 384; Effect of Small Quantities of Foreign Matter on the Properties of Metals, Prof. Roberts Austen, 402; the Manufacture of Iron in its Relations with Agriculture, Sir Lowthian Bell, 525; an Apparatus for Autographically Recording the Temperature of Furnaces, Prof. W. C. Roberts-Austen, 526; the Alloys of Iron and Chromium, R. A. Hadfield, 526; Failures in the Necks of Chilled Rolls, C. A. Winder, 527; a New Chain-making (the "Triumph") Machine, 527
- Meteorology; the General Circulation of the Atmosphere, J. Carrick Moore, F.R.S., 7; the Week's Weather, 13, 38, 61, 85, 108, 132, 159, 177, 209, 227, 254, 277, 299, 332, 361, 369, 399, 420, 449, 473, 493, 521, 548, 573, 594, 616; a New England Weather Service, 14; New Meteorological Observatories at Chaman and Murree (India), 14; Magnetic Storm of February in the Mauritius, 20; Terrible Hurricane (April 29, 1892), in Mauritius, 84, 108; Dr. C. Meldrum, F.R.S., Mr. Jerningham, 277; Means of Producing Rain Artificially, M. Faye, 24; Anticyclone over British Islands and Atlantic, 38; Pilot Chart of North Atlantic for April, 38, 493; Two New Russian Monthly Meteorological Bulletins, 38; Remarkable Auroræ Boreales over Moscow, 39; Auroræ Borealis, Warrington Stock, 79; Henry Harries, 391; Aurora, James Porter, 151; a Fireball, C. C. Bayley, 62; Meteorological Society's Hints to Meteorological Observers, 62; Meteorological Service of Canada, Report from Oct. 1, 1890, to Oct. 31, 1891, 62; Tidal Phenomenon at Kiungchow, Hainan, China, E. H. Parker, 63; Magnetic Variations, William Ellis, 67; Transmission of Sunlight through Earth's Atmosphere, ii; Scattering at Different Altitudes, 69; a New Mercury-Glycerine Barometer, Dr. J. Joly, 71; Meteorological Work for Agricultural Institutions, Pamphlet issued by Washington (U.S.) Weather Bureau, 85; Rainfall Observations (1890) in East Indian Archipelago, 85; Observations (1890) at Batavia Observatory, 85; on some Phenomena Connected with Cloudy Condensation, John Aitken, F.R.S., 90; Raindrops, E. J. Lowe, F.R.S., 95; Comparison of Richard's Anémocinémographe with Standard Beckley Anemograph at Kew Observatory, G. M. Whipple, 95; Levels of River Vaal at Kimberley, South Africa, compared with Rainfall of Watershed, W. B. Tripp, 95; Miss Döberck appointed Assistant Meteorologist at Hong Kong, 108; Destructive Cyclone in Kansas, 108; Fall of Hail and Dust in Sweden and Norway, 108; Brilliant Meteor over Tiflis, 108; Observations on Anomalies of Temperature in Germany, based on Synoptic Weather-Charts, Dr. Schwalbe, 120; the Height of the Nacreous Cloud of January 30, J. Edmund Clark, 127; Notes on the Climate of the British Isles, R. H. Scott, 132; Devastation by Storm of the Petroleum District, Pennsylvania, 133; Contributions to Knowledge of Saharian Climate, G. Rolland, 144; another Blow to the Ascent Theory of Cyclones, M. Faye, 144; the Meteorological Council Tables of Improved Means of Temperature, Rainfall, and Sunshine, 159; Dr. J. Hann's Further Researches into the Daily Oscillations of the Barometer, 159; a Second Attempt to Build an Observatory on Mount Blanc, 159; Icebergs in the Atlantic, 160; Ice in the South Atlantic, Robert H. Scott, F.R.S., 173; Capt. Edgar H. Andrew, 173; Solar Observations during First Quarter of 1892, M. Tacchini, 167; Diurnal Fluctuations of Atmospheric Pressure in United States, General A. W. Greely, 177; Royal Meteorological Society, 191; English Climatology, 1881-90, F. C. Bayard, 191; Mean Daily Temperature at Greenwich on Average of Fifty Years, 1841-1890, W. Ellis, 191; L'Atmosphère, a new Meteorological Journal, 209; a Solar Halo, J. Edmund Clark, 222; Washington Weather Bureau Report for last Six Months of 1891, 228; Stags Smothered by Snow in Scotland last Winter, 228; American Meteorological Journal, 235, 435, 483; Meteorology in the Schools, Prof. W. M. Davis, 235; Thunderstorms in New England during 1886, R. de C. Ward, 235; Storm of March 1-4, 1892, J. W. Smith, 235; Flood-stage River Predictions, Prof. T. Russell, 235; Snowstorms at Chicago, A. B. Crane, 235; Climate and Meteorology of Death Valley, California, 255; Deutsche Seewarte Meteorological Observations at Distant Stations, iv., 255; Dr. Etienne's Meteorological Observations at Banana, Africa, 255; Diurnal Variations of Summer Barometric Readings in Polar Regions, Dr. Buchan, 262; Luminous Clouds, W. Clement Ley, 294; Invitation to Observe the Luminous Night Clouds, W. Foerster and Prof. O. Jesse, 575, 589; Pubblicazioni of the Vatican Observatory, vol. ii., 299; Variations of Temperature and Rainfall at Different Heights, Prof. J. Bute, 299; Project of Atlantic Ocean Observatories, Prince of Monaco, 312; the Sonnblick Observatory, 332; Aurora in Canada, 361; Dr. R. Assmann's Aspiration Apparatus, 361; Report of Director of Hong Kong Observatory, 361; British Rainfall for 1891, 399; the Devonshire Blizzard of 1891, 399; Summary of Climate of British Empire for 1891, 399; Detailed Oceanography and Meteorology, 407; Advantages to Meteorology and Navigation of daily telegraphing Atmospheric Conditions of the North Atlantic to Europe, Prince of Monaco, 407; Investigations of New England Meteorological Society, 420; Tornado of July 26, 1890, at St. Lawrence (Mass.), Helen Clayton, 420; Rainfall at Trinidad for Thirty Years ending 1891, F. H. Hart, 420; Appearance and Progressive Motion of Cyclones in Indian Region, W. L. Dallas, 435; the Eye of the Storm,

- S. M. Ballou, 435; Recent Efforts towards Improvement of Daily Weather Forecasts, H. H. Clayton, 435; Rain with a High Barometer, Robt. M. W. Swan, 442; Destructive Wind-rush in Slavonia, Prof. Mohorovićić, 450; German Coast-storms of 1878-87, E. Herrmann, 450; Thermodynamics of the Atmosphere, Prof. von Bezold, 450; New South Wales Rainfall during 1890, Mr. Russell, 473; Meteorology of Perak for 1891, 473; Remarkable Rainfall in Malta, 473; Progress of Meteorology in United States, W. A. Glassford, 483; Winter Thunderstorms, Prof. W. M. Davis, 483; Atmospheric Depressions and their Analogy with the Movements of Sunspots, F. Howard Collins, 489; Report of Cape Colony Meteorological Commission for 1891, 493; Tract of Drift of two Halves of Derelict Ship, Fred. B. Taylor, 493; Annual Convention of American Association of State Weather Services, 493; the Storms of the Baltic, B. von Nasackin, 521; the Treatment of Persons Struck by Lightning, Dr. R. Assmann, 521; Relation of Soil to Climate, Prof. E. W. Hilgard, 521; the White Rain-bow, M. Mascart, 532, 555; Cirro-Stratus, J. Porter, 541; Seven Years' Meteorological Observations on Pic du Midi, M. Klengel, 548; Curious Instance of Global Lightning, 548; Thunderstorms in New England during 1887, R. de C. Ward, 555; Effect of Topography on Thunderstorms, R. S. Tarr, 555; Timchenko's Anemometer, Prof. Klossovsky, 594; Annuaire of Montsouris Observatory, 1892-93, 594; a new Spanish Meteorological Journal, 616; Experimental Illustration of Mirage, J. M. de Lépinay and A. Perot, 617
- Meteor, Observation of, A. L. Simon, 48
- Meteor, a, Grace E. Chisholm, 490
- Meteorite, a, H. L. Preston, 452
- Meteorite from Central Pennsylvania, Chemical Analysis of, Prof. W. G. Owens, 67
- Mexico, the Culture of Sisal Grass in, 63
- Mexico, Discovery of Onyx Deposits in, 495
- Miall (Prof. L. C.), the Surface-film of Water and its Relation to the Life of Plants and Animals, 7
- Michelson (Prof. A.), the Application of Interference Methods to Spectroscopic Measurement, 385
- Michigan, Acorn-eating Birds of, Dr. Morris Gibbs, 495
- Micrometric and Photographic Measures, Refraction in, Dr. S. C. Chandler, 401
- Micro-organisms in their Relation to Chemical Change, Prof. Percy F. Frankland, F.R.S., 135
- Micro-organisms of the Soil, Prof. Alfred Springer, 576
- Microscopy: Prof. Penhallow's Improved Method of Labelling Slides, 69; the Deep-Sea Deposits of the Eastern Archipelago, P. W. Bassett-Smith, 69; the Use of the Camera Lucida in Drawing Bacteria, Dr. E. Giltay, 69; the Microscopic Structure of Alloys, Behrens, 72; the Process of Oviposition as observed in Cattle Tick, R. T. Lewis, 165; Penetration in the Microscope, E. M. Nelson, 165; the Observation of Rings and Brushes of Crystals, E. M. Nelson, 165; the Microscope's Contributions to the Earth's Physical History, Prof. T. G. Bonney, F.R.S., 180; Quarterly Journal of Microscopical Sciences, 338; a new Branchiate Oligochaete (*Branchiura sowerbyi*), F. E. Beddard, 338; Pigment-cells of the Retina, I. S. Boden and F. C. Spranson, 339; Primitive Segmentation of Vertebrate Brain, B. H. Waters, 339; Oscula and Anatomy of *Leucosolenia clathrus*, E. A. Minchin, 339; Innervation of Cerata of some Nudi-branchiata, Dr. W. A. Herdman and J. A. Clutt, 339; the Microscope and Histology for the Use of Laboratory Students in the Anatomical Department of the Cornell University, Simson Henry Gage, W. H. Dallinger, 440
- Micule cu (C.), a Re-determination of the Mechanical Equivalent of Heat, 618
- Migula (Dr. W.), Bacteriologisches Practicum zur Einführung in die practisch-wichtigen bacteriologischen untersuchungsmethoden für Aerzte, Apotheker, Studierende, Mrs. Grace C. Frankland, 198
- Milanji, Mount, in Nyassaland, Alexander Whyte, 482
- Military Geography, Colonel J. F. Maurice on, 14
- Milk, the Antiseptic Properties of, Herr Winternitz, 550
- Mill (Dr. Hugh Robt.), Time Standards of Europe, 174
- Milne (Prof. John, F.R.S.), the Great Earthquake in Japan, 1891, 34; Dust Storm at Sea, 128
- Mimicry, the Alleged Aggressive, of *Volucella*, William Bateson, 585
- Mimicry, Protective, Rose Haig Thomas, 612
- Minchin (E. A.), Oscula and Anatomy of *Leucosolenia clathrus*, 339; a Plea for an International Zoological Record, 367
- Mineralogy: Mineralogy, Dr. F. H. Hatch, 149; the System of Mineralogy of James Dwight Dana, 1837-68, Descriptive Mineralogy, Edward Salisbury Dana, 217; Polybasite and Tennantite from Colorado, S. L. Penfield and S. H. Pearce, 310; Synthesis of Crocoite and Phenicochroite, C. Ludeking, 311; Specific Heat and Latent Heat of Fusion of Aluminium, J. Pionchon, 312; Diamond Robbery from South African Museum, 332; Discovery of Onyx Deposit in Mexico, 495; the Tin District in Burma, H. Warth, 522; the Amber and Jade Mines of Upper Burma, Dr. Noetling, 549, 550; Geikielite and Baddeleyite, two new Mineral Species, L. Fletcher, F.R.S., 620
- Mines and Mining at the Chicago Exhibition, 178, 601
- Mining, Coal: Model illustrating Phenomena of Explosions through Dust Particles, in explanation of Colliery Explosions, Prof. T. E. Thorpe, 44; Miner's Safety Lamp converted into In-strument for detecting Coal-damp, Prof. Clowes, 44
- Mining Engineers, Federated Institution of, 131
- Mining, Mercury, in Russia, 86
- Minor Planets, Photography and, 576
- Mirage, Experimental Illustration of, J. M. de Lépinay and A. Perot, 617
- Mississippi River, Commissioners Report on the, Levees, 65
- Mitchell (F. S.), the Birds of Lancashire, 540
- Mivart (Dr. St. George, F.R.S.), Essays and Criticisms, 265; the Grammar of Science, 269; the Limits of Animal Intelligence, 466
- Mizon (Lieut.), Explorations in Africa, 110
- Mockler-Ferryman (Captain A. F.), Up the Niger, 512
- Modigliani's (Dr. Elio) Recent Explorations in Central Sumatra and Engano, Prof. Henry H. Giglioli, 565
- Moeris, Lake, Henry Brugsch Pasha, 15
- Moissan (H.), Determination of Density of Gases, 288; Boron Trisulphide, 340; Boron Pentasulphide, 364; Proto-iodide of Carbon, 312
- Molisch (Dr. H.), Iron in Plants, 255; Die Pflanze in ihren Beziehungen zum Eisen, 512
- Mombello (Prof. di), Trattato di Fisico-Chimica secondo la Teoria Dinamica, 439
- Monaco (Prince of), Project of Atlantic Ocean Observatories, 312; Oceanography, 406; North Atlantic, 406; Advantages to Meteorology and Navigation of daily telegraphing Atmospheric Conditions of the North Atlantic to Europe, 407
- Mond (Ludwig, F.R.S.), Metallic Carbonyls, 230
- Mondesir (P. de), Existence in Earth of an Acid Mineral Substance as yet Undetermined, 387
- Mongoose, Official Denial of Reported intention of U.S. Government to Introduce, to Exterminate Troublesome Rodents in West, 39
- Monkeys, the Speech of, Prof. R. L. Gardner, 451; R. L. Garner, C. Ll. Morgan, 509
- Monocotyledons, Observations on Secondary Tissues in, Dr. Scott and Mr. Brebner, 554
- Mont Dore, Curious Basalt Cavern at, M. Martel, 400
- Montenegro, Dr. Hassert, 453
- Monti's (Dr.) Experiments on Absorption of Oxygen by Tissues after Death, 263
- Montsouris Observatory, Annuaire of, 594
- Moody (G. T.), Sulphonic Acids derived from Anisoils (i.), 94
- Moou, the Late Partial Eclipse of, the, 64
- Moon, the Cause of the Absence of Water and Air from the, Dr. G. J. Stoney, F.R.S., 71
- Moon, Observations of the, Mr. Stone, 179
- Moon, Bright Streaks on the Full, Prof. Pickering, 476
- Moore (J. Carrick, F.R.S.), the General Circulation of the Atmosphere, 7
- Moore (J. E. S.), on the Relationships and Rôle of the Archoplasmic Body during Mitosis in the Larval Salamander, 404
- Morbology; Pancreatic Diabetes, Lancereaux and Thiroloix, 412; the Life of Cholera-Germs, Dr. Doremberg, 436; a New Chemical Function of the Comma Bacillus of Asiatic Cholera, J. Ferran, 436; Treatment of Cancer and Cholera by Testicular Liquid, M. Brown-Séquard, 484; Places of Origin of Cholera Epidemics, J. D. Tholozan, 555; Carceag, an Enzootic Disease of Sheep in Rumania, V. Babes, 436; Bacterian Origin of Bilious Fever of Hot Countries, Domin-

- gos Freire, 460; Physiology of Epilepsy, M. Brown-Séquard, 507
- Morgan (Prof. Lloyd), the Method of Comparative Psychology, 404; the Limits of Animal Intelligence, 417; the Speech of Monkeys, R. L. Garner, 509
- Morin (J.), a New Form of Induction Apparatus, 484
- Moritz (E. R.), Note on Diastatic Action, 142
- Morley (Forster), and M. M. Pattison Muir, Watts' Dictionary of Chemistry, Sir H. E. Roscoe, F.R.S., 242
- Morphology: Anatomy, Physiology, Morphology, and Development of the Blow-fly (*Calliphora erythrocephala*), B. Thompson Lowne, 267; the Apodidæ, Prof. E. Ray Lankester, F.R.S., 267; Henry M. Bernard, 267, 366; Notes on the Morphology of the Spore-bearing Members in the Vascular Cryptogams, Prof. F. O. Bower, 555
- Morse (E. S.), the Older Forms of Terra-Cotta Roofing Tiles, 474
- Moscow, Remarkable Aurora Boreales over, 39
- Moscow International Congresses of Prehistoric Archaeology and Zoology, the Coming, 108
- Moscou, Bulletin de la Société des Naturalistes de, 236
- Moss, on the Simplest Form of, Prof. Goebel, 554
- Mosso (Prof. Angelo), the Temperature of the Brain, 17
- Moth (*Diopieia pulchella*) in Malta, abundance of, A. C. Gatto, 474
- Moth, Diamond-back, appearance in Yorkshire and Northumberland of, 108
- Moths of the World, W. F. Kirby, 487
- Motion in the Line of Sight, W. W. Campbell, 64
- Motion, the Laws of, Part II., Prof. Tait, 262
- Motion, Life in, or Muscle and Nerve, John Gray McKendrick, F.R.S., 583
- Mott (Albert C.), the Lesser Spotted Woodpecker, 77
- Mountaineering Party in the Himalayas, Mr. Conway's, 525
- Mountains; Measurement of Mount Orizaba, by J. T. Scovell, 598
- Mouchez (Admiral), Paris Observatory Report, 86; Death of, 208; Obituary Notice of, 253
- Mud Springs, Australian, Prof. Edgeworth David, 256
- Muggenburg (Dr. S. S. von), Death of, 14
- Muir (M. M. Pattison) and Forster Morley, Watts' Dictionary of Chemistry, Sir H. E. Roscoe, F.R.S., 242
- Munro (John), a Pocket-book of Electrical Rules and Tables, 486
- Munro (John M. H.), Soils and Manures, 125
- Munro (Dr. R.), the Recent Discovery of an Ancient Lake-Village in Somersetshire, 617
- Murray (G.), Marine Floras of the Warm Atlantic and Indian Ocean, 405
- Muscles, Experiments to Determine Cause of Difference in Latent Period in Direct and Indirect Stimulation of, Dr. Boruttau, 96
- Muscular Contraction, Method of Recording Curves of, Prof. McKendrick, F.R.S., 404
- Museum of Anatomy at Pennsylvania University, Endowment by General Wister of, 38
- Museum of Perthshire Society of Natural Science, 472
- Museum Question, the, Prof. Boyd Dawkins, F.R.S., 280
- Museum, South African, Diamond Robbery from, 332
- Museums Association, Annual Meeting of, 276
- Musgrove (Dr. J.), the Blood-vessels and Lymphatics of the Retina, 404
- Music: an Ethnological Enquiry into the Basis of our Musical System, Dr. Wallaschek, 238
- Musical Instruments, Women and, Otis T. Mason, 561
- Musical Sands, T. S. Hall, 279
- Musical Sand and Lava in the Bournemouth Drift, Cecil Carus-Wilson, 316
- Mustakh Exploration, the, H. H. Godwin Austen, 464
- Myeloxylon from the Millstone Grit and Coal-Measures, A. C. Seward, 555
- Myers (F. W. H.), International Congress of Experimental Psychology, 261; Hallucination by Crystal Vision, 363
- Myers (W. S.), Production of Pyridine Derivatives from Lactone of Triacetic Acid, 311
- Myristica of British India, the Species of, G. King, F.R.S., 122
- Myxogastres, a Monograph of the, George Massee, 365
- Nacreous Cloud of January 30, the Height of the, J. Edmund Clark, 127
- Nadaillay (Marquis de), the Baoussé Roussé Caves, 574
- Nalder (F. H.), a New Ballistic Galvanometer, 93
- Naphtha, Damage to Volga Fisheries by, 421
- Naples Academy of Sciences, 162
- Naples, the Contamination of the Street Surface of large Cities, with special reference to, Dr. L. Manfredi, 163
- Nasackin (B. von), the Storms of the Baltic, 521
- Natal Observatory, 362
- National Home Reading Society, the, 84
- National Physical Laboratory, Discussion on a, Prof. Oliver J. Lodge, F.R.S., 382; Mr. Glazebrook, 383; Prof. von Helmholtz, 383; Lord Kelvin, F.R.S., 383; Prof. Rücker, 383; Prof. Fitzgerald, 383
- Natural History: John Hancock, Dr. Embleton, 255; South London Entomological Natural History Society, 46; Excursion of Victoria Field Naturalists' Club to the Grampians (Australia), 63; the Essex Field Club, 132; Bulletin de la Société des Naturalistes de Moscou, 236; Norfolk and Norwich Naturalists' Society, 450; Improvement in British Museum Natural History Collection, 473; Trinidad Field Naturalists' Club, 522; Manchester Field Naturalists' and Archaeologists' Society's Visit to Buxton, 549; the Alleged "Aggressive Mimicry" of *Volucella*, William Bateson, 585
- Natural Selection and Alternative Hypothesis, F. E. Beddard, F.R.S., Edward B. Poulton, F.R.S., 533
- Navajo Indians, Evolution of House-building among the, Dr. Shufeldt, 451
- Navy, Electricity in, H. E. Deadman, 337
- Nebraska Sugar-Schools, the, 210
- Nebula, Photographs of the Lyra Ring, Prof. Denza, 41
- Nebula, the Trapezium in the Orion, Dr. L. Ambronn, 334
- Nebule, Mr. Burnham, 87
- Nebulæ, Catalogue of, 135
- Nebulæ, Variable, E. E. Barnard, 211
- Nebular Spectrum of Nova Aurigæ, Ralph Copeland, 464
- Nebulous Star, a New, E. E. Barnard, 279
- Necropoleis in the Pyrenees and in North Britain, on the Similarity of Certain Ancient, Dr. J. S. Phené, 432
- Neesen's (Prof.) Researches on Motion of Loose Disks on Axis Rotating at High Speeds, 168
- Nelson (E. M.), Penetration in the Microscope, 164; the Observation of Rings and Brushes of Crystals, 165
- Nemertine, Freshwater, Note on the Occurrence of a, in England, W. Blaxland Benham, 611
- Neptune, a Planet beyond, Prof. Forbes, 179; Mr. Roberts, 179
- Neritidæ, Growth and Structure of Shell in, B. B. Woodward, 215
- Nervous Complaints, a Shaking Cure for, Dr. Charcot, 451
- Neutral Point in the Pendulum, Wm. Flinders Petrie, 293
- New England during 1887, Thunderstorms in, R. de C. Ward, 1887, 555
- New Guinea, Sir Wm. Macgregor's Explorations in, 110; the Piratical Tugere Tribe in, 258
- New South Wales: a New Method of Rabbit-Destruction in, 161; Perfume-Flower-Farming in, 161; Royal Society of New South Wales, 191; the Carob-bean Tree in, F. Turner, 210; Fine Specimen of Saw Fish, Mr. Pedley, 257; New South Wales Rainfall during 1890, Mr. Russell, 473
- New York Mathematical Society's Bulletin, 68, 236, 435
- New York State, Execution by Electricity in, Dr. C. F. MacDonald, 256
- New Zealand: Miss C. F. Gordon-Cumming's Paintings of Volcanic District in, 254; Sub-fossil Bones of Extinct Birds of New Zealand and the Chatham Islands, H. O. Forbes, 404; the Pliocene Mollusca of, Prof. F. W. Hutton, 474; Native New Zealand Birds, Earl of Onslow, 502; New Zealand System of Observing Earthquake Phenomena, G. Hogenben, 594
- Newall (H. F.), Nova Aurigæ, 489
- Newton (Prof. Alfred, F.R.S.), Range of the Sanderling in Winter, 177, 222
- Newton (E. T.), Palæontological Papers, 428
- Newton's Rings, on a New Method of Viewing, T. C. Porter, 80
- Niagara Falls to Buffalo, Mr. George Forbes, and the Cataract

- Construction Company for the Transmission of Electrical Power from, 84
- Nichols (E. L.), the Age-coating in Incandescent Lamps, 627
- Nicolucci (Prof. G.), the Origin of the Ancient Egyptians, 162
- Niger, Up the, Capt. A. F. Mockler-Ferryman, 512
- Nitric Organisms, R. Warington, F.R.S., 151; Prof. Percy F. Frankland, F.R.S., 200
- Nitrogen, Burning, W. Crookes, F.R.S., 185; Density of, Lord Rayleigh, F.R.S., 512
- Nixon (R. C. J.), Elementary Plane Trigonometry, 488
- Noble (Major-General), Death of, 84
- Nock (Mr.), Wild Strawberries in Ceylon, 494
- Noel (Major the Hon. E.), International Time, 423
- Noetling (Dr.), the Amber and Jade Mines of Upper Burma, 549, 550
- Nomenclature, the International Conference on Chemical, Prof. H. E. Armstrong, F.R.S., 56
- Nomenclature of Units, Discussion on the, Prof. Oliver J. Lodge, F.R.S., 383
- Nomenclature, Rules of, W. A. Herdman, 417
- Norfolk and Norwich Naturalists' Society, 450
- North America, Longmans' School Geography for, Geo. Chisholm and C. H. Leete, 585
- North Atlantic, Prince of Monaco, 406
- North Sea Fisheries, the; Mr. E. W. L. Holt's Investigations, 158
- Norway, Handbook for Travellers in, 390
- Norway and Sweden, Fall of Hail and Dust in, 108
- Nova Aurigæ, 400; Prof. Konkoly, 17; Rev. A. Freeman, 453; Rev. T. E. Espin, 476; Prof. Küstner, 476; H. F. Newall, 489; Dr. F. Ristenpart, 496; Herr Cand. F. Kroeger, 496; Prof. E. E. Barnard, 496; H. Seelinger, 552; A. Belopolsky, 552, 576; Dr. J. Holetschek, 576; Photographic Magnitudes of, J. M. Schaeberle, 423; Nebular Spectrum of, Ralph Copeland, 464; the Spectrum of, Herr E. von Gothard, 620
- Nova Scotia, Fossil Entomology of, Sir J. W. Dawson, F.R.S., 236
- Nova Scotian Institute of Sciences, 550
- Nuclei, on the Functions, Staining Reactions and Structures of, Dr. G. Mann, 403
- Nuclein, on the Affinity of, for Iron and other Substances, Prof. G. Gilson, 405
- Nucleus in the Vegetable Cell, Experimental Observations on the Functions of the, Dr. J. Clark, 404
- Numbering the Hours of the Day, T. W. Backhouse, 392
- Numeration of Asteroids, 372
- Nuovo Giornale Botanico Italiano, 90, 436
- Nürnberg, Exhibition at, by the German Mathematical Association, 204
- Nyasaland, Industrial Resources of, John Buchanan, 407
- Nyassaland, Mount Milanji in, Alexander Whyte, 482
- Objectives, Mounting of, Prof. G. E. Hale, 452
- Observations of Klinkerfues Reduced, the, Prof. Wilhelm Schur, 452
- Observatories: Paris Observatory Report, Admiral Mouchez, 86; Annual Visitation of the Greenwich Observatory, 156; Mr. W. E. Plummer appointed Director of Liverpool Observatory, 276; Yale College Observatory Report, Mr. Brown, Dr. Elkin, 280; Vatican Pubblicazioni, vol. ii., 299; Madras Observatory, 301; Oxford University Observatory, 301; Solar Observations at the R. Osservatorio del Collegio Romano, Prof. Tacchini, 334; Natal Observatory, 362; the Staff at the Lick Observatory, 452; Daytime Seeing at the Lick Observatory, Henry Crew, 465; New Observatories, 476; Harvard Observatory, Appeal for Donations to Construct Great Refracting Telescope, E. C. Pickering, 548; Report of Mr. Tebbutt's Observatory, 576; Meteorological Observatories: the Sonnblick, 332; Hong Kong Observatory, Report of Director, 361
- Ocean Currents at Chicago Exhibition, Model of, 451
- Oceanic Circulation, Preliminary Account of, based on the *Challenger* Observations, Dr. A. Buchan, 383
- Oceanography, Prince of Monaco, 406
- Oceanography, Chemical, 408
- Oceanography, Detailed, and Meteorology, 407
- Odessa University, Memoirs of Mathematical Section of, 236
- Odling (W.), London Water Supply for September, 1892, 617
- Off (Hussein), Masrite and Masrium, 94
- Ogilvie (F. Grant), the Edinburgh Meeting of the British Association, 270
- Ogilvie (Miss), Landslips in the South Tyrol, 428
- Oil as a Wave-Calmer, 228
- Oleomargarin, Prof. G. C. Caldwell, 522
- Oliver (Prof. F. W.), Damage to Plants from London Fog, 185
- Oliver (Major-General), a Mean Time Sun-dial, 230
- Olivier (M. Louis), La Canalisation des Cellules et la Continuité de la Matière vivante chez les Végétaux et les Animaux, 404
- Olivet (M.), Electric Heating for Conservatories, 522
- Omori (F.), Comparison of Earthquake Measurements in a Pit and on the Surface, 85
- Onslow (Earl of), Native New Zealand Birds, 502
- Onyx, Deposits in Mexico, Discovery of, 495
- Ophidia, Alimentation in, Léon Vaillant, 364
- Opposition of Mars, 258, 400; J. Norman Lockyer, F.R.S., 443
- Optics: Apparatus for Measuring Colour-Blindness, Brudenell Carter, 44; on a New Method of Viewing Newton's Rings, T. C. Porter, 80; an Unit of Measurement of Light and Colour, T. W. Lovibond, 93; Reflection and Refraction of Light from a Magnetized Transparent Medium, A. B. Basset, F.R.S., 191; a Treatise on Physical Optics, A. B. Basset, F.R.S.; Arthur Schuster, 267; Basset's Physical Optics, A. B. Basset, 315; Refraction of Rays of Great Wave-length in Rocksalt, Sylvine and Fluorspar, Rubens and Snow, 483; Reflection and Transmission of Light in Certain Æolotropic Structures, H. E. J. G. du Bois, 483; the Optical Indicatrix and the Transmission of Light in Crystals, L. Fletcher, 581; Some Optical Illusions, Dr. Joseph Jastrow, 590; Optical Projection, Sir David Salomon, 625; the Polarization of Light of Various Colours by Atmosphere, N. Piltschikoff, 627; the Reflection of Light by Moving Bodies, H. A. Lorentz, 628
- Oraefa Jökuehl, the First Ascent of, F. W. W. Howell, 406
- Orchids of Grenada, the, Mr. R. V. Sherring's Collections, 300
- Ordnance Maps of Great Britain, the, 135
- O'Reilly (Prof. J. P.), the Former Connection of Southern Continents, 101
- Organisms, the Nitric, Prof. Percy F. Frankland, F.R.S., 200
- Orientalists, the International Congress of, 107, 456, 472
- Orientation; Stone Circles, the Sun, and the Stars, A. L. Lewis, 127
- Origin of Land Animals, W. J. Sollas, 271
- Origin of the Year, J. Norman Lockyer, F.R.S., 104
- Orion Nebula, the Trapezium in the, Dr. L. Ambronn, 334
- Orizaba (Mount), Measurement by J. T. Scovell of, 598
- Orleans (Prince Henry of), Return of, 180
- Ormerod (Eleanor A.), a Text-Book of Agricultural Entomology, 561
- Ormsby (George), the Eruption at Sangir, 457
- Ornithology: Imitation Habits of Starling, 15; the Lesser Spotted Woodpecker, Albert C. Mott, 77; the Range of the Sanderling in Winter, Prof. Alfred Newton, F.R.S., 177, 222; Curious Case of Malformation in Beak of Indian Parrakeet, Captain D. Phillott, 190; Malta's Spring Visitors, 210; Aphanapteryx and other Remains in the Chatham Islands, Henry O. Forbes, 252; the Birds of Sutherland and Caithness, T. E. Buckley, 279; Ridgway on the Hummingbirds, R. W. Shufeldt, 465; Acorn-eating Birds of Michigan, Dr. Morris Gibbs, 495; Native New Zealand Birds, Earl of Onslow, 502; the Question of Legislative Protection for Wild Birds' Eggs, E. P. Knubley, 595; the Birds of Lancashire, F. S. Mitchell, 540; a Siberian Pectoral Sandpiper Killed at Yarmouth, 549; the British Ornithologists' Union, 572; the Madagascar Pratincole at the Zoological Gardens, 616
- Osborne (Henry F.), Palæontic in the American Lower Eocene, 30
- Osteology of Vertebrate Animals, Catalogue of the Specimens Illustrating the, Recent and Extinct, contained in the Museum of the Royal College of Surgeons of England, R. Bowdler Sharpe, 125
- Osteometry, Human, Sir William Turner, 433
- Ostwald's Klassiker der Exakten Wissenschaften, 391
- O'Sullivan (J.), Hydrolytic Functions of Yeast, 190
- Owens (Prof. W. G.), Chemical Analysis of Meteorite from South Pennsylvania, 67

- Oxford, Dr. J. S. B. Sanderson appointed Waynflete Professor of Physiology at, 37
 Oxford University Junior Scientific Club, 71, 95, 262
 Oxford University Observatory, 301
 Oxygen, the Atomic Weight of, Robert Leffeldt, 151
 Oxygen, Investigation of the Phenomena which accompany the Burning of Carbon and Phosphorus in, H. Brereton Baker, 431
 Oxygen and Hydrogen, on the Relative Densities of, Lord Rayleigh, Sec. R.S., 101
- Pacific, Further Notes on a Recent Volcanic Island in the, Captain W. J. L. Wharton, F.R.S., 611
 Pacific, Central, Gilbert Islands brought under British Protection 477
 Pacific Coast Fisheries, United States, 63
 Packard (Dr. Adolphus S.), the Labrador Coast, 462
 Padua, Proposed Festival in Honour of Galileo at, 572
 Palaeography, Alleged Discovery by Cyrus Thomas of the Key to the Central American Inscriptions, 160; Discovery of an Ancient Sanscrit Birch Bark Manuscript by Lieutenant Power, Dr. Hoernle, 370; Alleged Decipherment of the Easter Island Inscriptions, Dr. A. Carroll, 494
 Palaeolithic Man discovered in Hermann's Cave (Harz), Interesting Trace of, 39
 Palaeolithic Weapons in Scotland, on the Discovery of the Common Occurrence of, Rev. Frederick Smith, 432
 Palaeontic in the American Lower Eocene, Henry F. Osborn, 30
 Palaeontology: the Baoussé Roussé Caves, Marquis de Nadaillay, 574; Discovery of Australian-like Mammals in South America, R. Lydekker, 11; Palaeontic in the American Lower Eocene, Henry F. Osborn, 30; *Delphinognathus conocephalus*, Prof. H. G. Seeley, F.R.S., 166; Further Evidence of *Endothiodon bathystoma*, Prof. H. G. Seeley, F.R.S., 166; the Discovery of Mammoth Remains in Endsleigh Street, Dr. Henry Hicks, F.R.S., 166; Aphanapteryx and other Remains in the Chatham Islands, Henry O. Forbes, 252; Analysis of Fossil Bones from the Natchez Bluff, Mississippi, Dr. Thomas Wilson, 255; Remarkable Specimen of *Belonostomus* from Queensland, R. Etheridge, jun., 256; the Tertiary Rhynchophora of North America, S. H. Scudder, 256; the Washington Collection of Fossil Vertebrates, R. Lydekker, 295; the Pythonomorphs of France, Albert Gaudry, 387; Application of Chemical Analysis for Fixing Age of Prehistoric Human Remains, Adolph Carnot, 412; Palaeontological Papers, E. T. Newton, M. Laurie, 428; the Deep Dale Bone Cave near Buxton, J. J. Fitzpatrick, 521
 Palaeozoic Rocks, Prof. Sollas, Prof. Bonney, 428
 Pantelleria, Sponge Deposits discovered near, 474
 Paoletti (G.), Movements of Leaves of *Portiera hygrometrica*, 90
 Palestine, Progress of the Akka-Damascus Railway, 279
 Parabolas, an Instrument for Drawing, R. Inwards, 93
 Paraffin, Death from, and Members of Parliament, 223
 Paraguay, the Land and the People, Natural Wealth and Commercial Capabilities, Dr. E. de Bourgade La Dardye, 488
 Paris Academy of Sciences, 24, 47, 71, 96, 119, 144, 167, 192, 215, 240, 262, 288, 312, 339, 364, 387, 412, 436, 460, 484, 507, 532, 555, 580, 603, 627
 Paris Free Libraries, the, Alderman W. H. Bailey, 617
 Paris Observatory Report, Admiral Mouchez, 86
 Parker (E. H.), Tidal Phenomenon at Kiungchow, Hainan, China, 63; the Non-Chinese Dialects of Hainan, 179
 Parmentier (F.), a New Case of Abnormal Solution; Decrease of Solubility of Ethyl Bromide in Ether, with Increase of Temperature, 48
 Parrot (G.), a Property of Lamellar Bimetallic Conductors submitted to Electromagnetic Induction, 387
 Parry (John), on the Carburization of Iron, 283
 Passy (Jacques), Odoriferous Properties of Fatty Alcohols, 96
 Pathology: the Bearing of Pathology upon the Doctrine of the Transmission of Acquired Characters, Henry J. Tylden, 302
 Paul (William), Contributions to Horticultural Literature, Dr. Maxwell T. Masters, F.R.S., 582
 Pavloff (Prof. A.), the Cephalopods found in the Speeton Clays, 257
 Peabody Institute of Baltimore, Report of, 398
 Peach and Horne (Messrs.), on the Radiolarian Chert of Arenig Age, 428; Glacial Papers, 428
 Pearce (S. H.), Polybasite and Tennantite from Colorado, 310
 Pearl Fishery of Gulf of California, C. H. Townsend, 333
 Pearl-shell Diving at Tahiti, A. G. Howes, 301
 Pearson (Prof. Karl), the Grammar of Science, 97, 199, 247
 Peary Expedition, the Relief of the, 476
 Peckham (G. W.), a Wave of Wasp-life, 611
 Peddie (Dr. William), a Manual of Physics, 52; Experimental Proof that the Coefficient of Absorption is not affected by Density of Illumination, 385
 Pedicularis of the Indian Empire, the Species of, D. Prain, 122
 Pedley (Mr.), Fine Specimen of Saw Fish, New South Wales, 257
 Peek (Cuthbert E.), Variable Star T Cassiopeiae, 443
 Penck's (Prof.) Proposed New Map of the Globe, 407
 Pendulum on its Plane of Suspension, Nature of Rotation of Knife-edge of, G. Defforges, 263
 Pendulum, Neutral Point in the, Wm. Flinders Petrie, 293
 Penfield (S. L.), Polybasite and Tennantite from Colorado, 310
 Penhallow (Prof.), an Improved Method of Labelling Slides, 69
 Pennsylvania University, Endowment by General Wister of Museum of Anatomy at, 38
 Pennsylvania, Devastation by Storm of Petroleum District, 133
 Pensions, Civil List, for year ending June 20, 1892, 254
 Peptone, Quantitative Determination of, L. A. Hallopteau, 436
 Perak during 1891, Meteorology of, 473
 Perigaud (M.), Influence of Place of External Thermometer in Observations of Zenith Distances, 263
 Periodic Effect which the Size of the Bubbles has on their Speed of Ascent in Vertical Tubes containing Liquid, A. Dr. F. T. Trouton, 385
 Periodic Variations of Alpine Glaciers, F. A. Forel, 386
 Peripatus from St. Vincent, R. I. Pocock, 100
 Peripatus, the Oviparity of the Larger Victorian, Dr. Dendy, 239
 Peripatus Re-discovered in Jamaica, M. Grabham and T. D. A. Cockerell, 514
 Perkin (W. H.), the Magnetic Rotation of Compounds supposed to contain Acetyl or of Ketonic Origin, 141
 Perot (A.), the Measurement of the Dielectric Constant, 312; Experimental Illustration of Mirage, 617
 Perrotin (M.), Observations of the Planet Mars, 482
 Perry (John), Spinning Tops, 4
 Perseids, the, W. F. Denning, 371
 Perseids, the, J. Edmund Clark, 442
 Persia, M. J. Bornmüller's Botanical Exploring Expedition in, 523
 Persian Ideas in China, Rev. Dr. Edkins, 522
 Personality, Alterations of, Alfred Binet, 219
 Perthshire Society of Natural Science, Museum of, 472
 Pests, Insect; Appearance of the Diamond-back Moth in Yorkshire and Northumberland, 108
 Petrie (Wm. Flinders), Neutral Point in the Pendulum, 293
 Petroleum District, Pennsylvania, Devastation by Storms of, 133
 Petroleum Engines for Fog Signalling, D. A. Stevenson, 430
 Petroleum Trade, the Caucasus, 333
 Petrological Papers, Messrs. Ussher, Goodchild, Harker, Teall and Somerville, 428
 Petterson (Prof.), on the Hydrography of the Kattegat and Baltic, 408
 Pflanze in ihren Beziehungen zum Eisen, die, Dr. Hans Molisch, 512
 Pharyngeal Teeth in the Labridae, Development of the, Prof. E. E. Prince, 405
 Phené (Dr. J. S.), on the Similarity of Certain Ancient Necropoleis in the Pyrenees and in North Britain, 432
 Philadelphia Academy of Natural Sciences Expedition to Greenland in 1891, Insects taken by, 40
 Philadelphia Loan Collection of Objects used in Worship, 84
 Philadelphia, Zoological Society of, 133
 Philippine Islands, Geographical Distribution of the Land-Mollusca of the, Rev. A. H. Cooke, 142
 Philippine Islands: Volcanic Eruption at Great Sangir, 287, 299, 332
 Philippon (G.), Effect of Sudden Release on Animals placed in Compressed Air, 312

Phillott (Captain D.), Curious Case of Malformation in Beak of Indian Parrakeet, 190
 Philology: Alleged Discovery by Mr. Cyrus Thomas of the Key to the Central American Inscriptions, 160; Fugan Languages, Dr. Brinton, 278
 Philosophische Studien, Wundt's, 133
 Pipson (T. L.), Fossil Wood containing Fluoride, 580
 Phosphoroscope for use with the Electric Spark, Lenard's, 484, 618
 Photography: Beginner's Guide to Photography, 6; Photography in Colours, 12; Mr. John Carbutt on Results achieved by Mr. F. E. Ives in Colour Photography, 13; the Photography of Colours, G. Lippmann, 24; Colour Photography, Prof. Vogel's Method, 263; Photographic and Visual Magnitudes of Stars, Prof. J. C. Kapteyn, 41; Photographs of the Lyra Ring Nebula, Prof. Denza, 41; Photographs of Flying Bullets, Mr. Boys, 45; Photographs of Coral Reefs and Marine Fauna of Great Barrier District of Australia, W. Saville-Kent, 45; Photographic Measures of the Pleiades, 161; Method of Examination of Photographic Objects at Kew Observatory, Major L. Darwin, 188; the Process of Enlarging, J. A. Hodges, 210; Proposed National Photographic Record Survey, W. J. Harrison, 209; Lunar Photography, Dr. L. Weinek, Prof. Holden, 257; Dr. Lohse's Photographs of Sun-Spots, 258; Photographic Map of the Heavens, 274; Photographic Chart of the Heavens, H. C. Russell, 576; Refraction in Micrometric and Photographic Measures, Dr. S. C. Chandler, 401; Photography and Surveying, Colonel Tanner, 407; Determination of Longitude by Photography, Dr. H. Schlichter, 407; Photographic Magnitudes of Nova Aurigæ, J. M. Schaeberle, 423; Photography of Spectra in Natural Colours, H. Krone, 449; Photographs of Solar Phenomena, Prof. G. E. Hale, 452; Solar Photography, Prof. G. E. Hale, 455; *Traité Encyclopédique de Photographie*, Charles Fabre, 464; Minor Planets Discovered by Photography, 576; Discovery of Three New Planets by Photography, 619; Mr. J. Gaultier's System of Photographic Surveying, 525; Photographic Dry Plates, 588; Researches in Stellar Parallax by the Aid of Photography, Prof. Charles Pritchard, F.R.S., 612
 Photometric Observations of the Sun and Sky, William Branden, 284
 Phycological Memoirs, 75
 Physics: On a decisive Test-Case disproving the Maxwell-Boltzmann Doctrine respecting distribution of Kinetic Energy, 21; Physical Society, 23, 93, 164, 214, 236, 263; on a Proposition in the Kinetic Theory of Gases, Rev. H. W. Watson, F.R.S., 29; Waterston's Theory of Gases, 30; a Manual of Physics, William Peddie, 52; a Question in Physics, Prof. H. A. Hazen, 55; Radiation of Atmospheric Air, C. C. Hutchins, 67; Atmospheric Radiation of Heat and its Importance in Meteorology, Prof. Cleveland Abbe, 67; the Cause of the Absence of Hydrogen from the Earth's Atmosphere and of Water and Air from the Moon, Dr. G. J. Stoney, F.R.S., 71; Mathematics used in Physics, Victor Von Lange, 73; Lord Kelvin's Test-Case on the Maxwell-Boltzmann Law, Edw. B. Culverwell, 76; on some Phenomena connected with Cloudy Condensation, John Aitken, F.R.S., 90; the Potential of an Anchor Ring, F. W. Lyson, 92; Study of Physical and Chemical Phenomena under Influence of very Low Temperatures, Raoul Pictet, 144; a means of bringing Two Non-miscible Liquids into Intimate Contact in definite proportions, Paul Marix, 144; Historical Summary of our Knowledge of the Connection between Ether and Matter, Prof. O. J. Lodge, F.R.S., 164; the Hypothesis of a Liquid Condition of the Earth's Interior considered in connection with Darwin's theory of the Genesis of the Moon, Osmond Fisher, 166; Prof. Neesen's Researches on motion of Loose Disks on Axis Rotating at High Speeds, 168; Relation of Dimensions of Physical Quantities to Directions in Space, W. Williams, 237; Variations in Temperatures of Water suddenly compressed to 500 atmospheres between 0° and 10°, Paul Galopin, 240; Elements of Physics, C. E. Fessenden, 245; Experiments at the Eiffel Tower on Falling Bodies and Air-Resistance, L. Cailliet and E. Colartreau, 262; the Laws of Motion, part ii., Prof. Tait, 262; Nature of Rotation of Knife-Edge of Pendulum on its plane of suspension, G. Defforges, 263; Experiments on the Measurement of High Temperatures, Dr. Wien, 263; a Treatise on Physical Optics, A. B. Basset, F.R.S., Arthur Schuster,

267; Basset's Physical Optics, A. B. Basset, 315; Determination of Density of Gases, H. Moissan and H. Gautier, 288; Measurement of Absolute Intensity of Gravity at Breteuil, G. Defforges, 288; Change of Heat Conductivity on passing isothermally from Solid to Liquid, C. Barus, 310; Opening Address in Section A of the British Association by Prof. Arthur Schuster, F.R.S., 323; Employment of Calorimetric Shell, M. Berthelot, 339; Velocity of propagation of Electromagnetic Undulations in Insulating Media, R. Blondlot, 340; Physics at the British Association, 382; Opening Address in Section A, by Prof. Arthur Schuster, F.R.S., at the British Association, 323; Discussion on a National Physical Laboratory, Prof. Oliver J. Lodge, F.R.S., 382; R. T. Glazebrook, F.R.S., Prof. Fitzgerald, F.R.S., 383; Discussion on Nomenclature of Units, 383; Report on Underground Temperature, 383; Report on the Discharge of Electricity from Points, 383; Report on Electrical Standards, 383; Wire Standards of Electric Resistance, Dr. Lindeck, 383; Dr. Kahle on the Clark Cell, 383; Preliminary Account of Oceanic Circulation based on the *Challenger* Observations by Dr. A. Buchan, 383; Physical Condition of the Waters of the English Channel, H. V. Dickson, 384; on Primary and Secondary Cells in which the Electrolyte is a Gas, Prof. Schuster, F.R.S., 384; on Leaky Magnetic Circuits, Dr. du Bois, 384; Experiments on the Electric Resistance of Metallic Powders, Dr. Dawson Turner, 384; on the Stability of Periodic Motions, Lord Kelvin, F.R.S., 384; on the Specific Conductivity of Thin Films, Profs. Reinold and Ricker, 384; a Contribution to the Theory of the Perfect Influence Machines, J. Gray, 384; Experiments with a Ruhmkorff Coil, Magnus Maclean and A. Galt, 384; the Application of Interference Methods to Spectroscopic Measurement, Prof. A. Michelson, 385; on a Periodic Effect which the Size of Bubbles has on their Speed of Ascent in Vertical Tubes containing Liquid, Dr. F. T. Trouton, 385; on a Method of Determining Thermal Conductivities, C. H. Lees, 385; a Magnetic Curve Tracer, Prof. Ewing, 385; on a Magnetic Balance and its Practical Use, Prof. du Bois, 385; on Earth Current Storms in 1892, W. H. Preece, 385; on the Dielectric of Condensers, W. H. Preece, 385; on Polarizing Gratings, Prof. du Bois, 385; the Volume Effects of Magnetism, Dr. C. G. Knott, 385; an Estimate of the Rate of Propagation of Magnetization of Iron, Prof. Fitzgerald, 385; Experimental Proof that the Co-efficient of Absorption is not Affected by Density of Illumination, Dr. W. Peddie, 385; on Dispersion in Double Refraction due to Electric Stress, Dr. John Kerr, 385; on a Delicate Calorimeter, J. A. Harker and P. J. Hartog, 385; on Graphic Solutions of Dynamical Problems, Lord Kelvin, 385; Reduction of every Problem of Two Freedoms in Conservative Dynamics to the Drawing of Geodetic Lines on a Surface of given Specific Curvature, Lord Kelvin, 386; Application of Measurement of Density to Determination of Atomic Weight of Oxygen, A. Leduc, 387; Scientific Measuring Instruments, General Ferrero, 388; Propagation of Magnetic Impulses along a Bar of Iron, V. A. Julius, 392; on the Relative Contamination of the Water-Surface by Equal Quantities of Different Substances, Miss Agnes Pockels, 418; Investigation of the Phenomena which accompany the Burning of Carbon and Phosphorus in Oxygen, H. Brereton Baker, 431; Observations as to the Physical Deviations from the Normal, as seen among 50,000 children, Dr. Francis Warner, 433; Heat of Combustion of some Chlorine Compounds, MM. Berthelot and Matignon, 436; *Trattato di Fisico-Chimica secondo la Teoria Dinamica*, Prof. di Mombello, 439; Generalization of "Mercator's" Projection performed by Aid of Electrical Instruments, Lord Kelvin, F.R.S., 490; Aberration Problems, Dr. Oliver J. Lodge, F.R.S., 497; Caloric Distribution of Sun heat at surface of Northern and Southern Hemispheres of Earth, Le G. de Tromelin, 508; the Temperature of the Human Body, L. Cumming, 541; Measurement of High Temperatures, L. Holborn and W. Wien, 602; Expansion of Gases at Low Pressures, G. Melander, 602; Specific Gravity and Fusion of Ice, J. von Zakrzewski, 602; Thermal Radiation in Absolute Measure, Dr. J. T. Bottomley, F.R.S., 603; a Redetermination of the Mechanical Equivalent of Heat, C. Miculescu, 618; Polarization of Light of various Colours by Atmosphere, N. Piltschikoff, 627
 Physiology: the Temperature of the Brain, 17; Dr. J. S. B. Sanderson appointed Waynflete Professor at Oxford, 37;

- Movements of Minute Organisms Analysed by Chronophotography, M. Marey, 47; Residual Life, Gautier and Landi, 71; the Relations of the Motor Muscles of the Eyes to Facial Expression, Dr. G. T. Stevens, 86; the Embryology of *Angiopterus eucta*, J. B. Farmer, 92; the Shoulder-girdle in Ichthyosauria and Sauropterygia, J. W. Hulke, F.R.S., 93; the Development of the Stigmata in Ascidians, Walter Garstang, 93; Experiments to Determine Cause of Difference in Latent Period during Direct and Indirect Stimulation of Muscles, Dr. Boruttau, 96; Physiology of the Glands of Bohadsch in the Aplysiidae, G. F. Mazzarelli, 163; the Products of the Residual Life of the Tissues, Gautier and Landi, 167; Experiments on Respiration under Reduced Atmospheric Pressure, Prof. Loewy, 168; Williams's Frog Heart Apparatus, Prof. R. Kobert, 177; the Brain of the Gorilla, Dr. H. C. Chapman, 229; Physiological Effects of Mountain Climates, M. Vialt, 240; the Rotatory Movements of the Human Vertebral Column, Dr. A. W. Hughes, 262; Berlin Physiological Society, 263, 340; Dr. Monti's Experiments on Absorption of Oxygen by Tissues after Death, 263; Dr. Lillienfeld's Investigations on the Distribution of Phosphorus in Various Tissues, 263; a Phenomenon of Human Respiration, Prof. Litten, 263; Anatomy, Physiology, Morphology, and Development of the Blow-fly (*Calliphora erythrocephala*), B. Thompson Lowne, 267; Effect of Sudden Release on Animals placed in Compressed Air, G. Philippon, 312; Action of Paraffin Nitrites on Muscular Tissue, Dr. J. T. Cash, F.R.S. and W. R. Dunstan, 339; Pigment Cells of Retina, I. S. Boden and F. C. Sprawson, 339; Primitive Segmentation of Vertebrate Brain, B. H. Waters, 339; Oscula and Anatomy of *Leucosolenia clathrus*, E. A. Minchin, 339; Innervation of Cerata of some Nudi-branchiata, Dr. W. A. Herdman and J. A. Cluitt, 339; the Sense of Temperature, Dr. Dessoir, 340; Effect of Muscular Exertion on Alkalinity of Blood of Carnivora as compared with Herbivora, Prof. Zuntz, 340; Waste of Nitrogen from Excessive Fatigue, MM. Chibret and Huguot, 364; Prof. Waymouth Reid on Vital Absorption, 403; Prof. Rosenthal on Animal Heat and Physiological Calorimetry, 403; Dr. Lockhart Gillespie on Protein-hydrochloride, 403; Dr. E. W. Carlier on the Hibernating Gland of the Hedgehog, 403; Dr. G. Mann on the Functions, Staining Reactions and Structures of Nuclei, 403; the Physiology of the Invertebrata, Dr. A. B. Griffiths, F.R.S., 414; Effects of Absence of Light upon Animal Life, 421; International Congress of Physiologists, 449, 477; Removal of the Thyroid in the White Rat, H. Cristiani, 484; the Active Albumen in Plants, 491; Physiology of Epilepsy, M. Brown-Séquard, 507; Echinochrome, a Respiratory Pigment, A. B. Griffiths, 508; the Temperature of the Human Body, L. Cumming, 541; G. M. Stewart, Dr. W. Hale White, 588; on the Cause of Physiological Action at a Distance, Prof. L. Errera, 555; Respiratory Globuline in the Blood of Chitons, A. B. Griffiths, 580; the Comparative Physiology of Respiration, Prof. Simon Henry Gage, 598; the Movements of the Heart studied by Chronophotography, M. Marey, 604; the Structure and Functions of the Brain and Spinal Cord, Victor Horsley, F.R.S., 606; the Physiological Effect of a Farinaceous Diet on Animals, Prof. Voit, 618
- Pickering (E. C.), Appeal by Harvard Observatory for Donations to Construct Great Refracting Telescope, 548
- Pickering (Prof.), Active Lunar Volcanoes, 134; Colours on the Surface of Mars, 179; New Variable Stars, 334; Bright Streaks on the Full Moon, 476
- Picou (R. V.), Distribution de l'Electricité, 291
- Pictet (Raoul), Study of Physical and Chemical Phenomena under Influence of very Low Temperatures, 144
- Pilchards and Blue Sharks, Matthias Dunn, 368
- Piltchikoff (N.), Polarization of Light of Various Colours by Atmosphere, 627
- Pionchon (J.), Specific Heat and Latent Heat of Fusion of Aluminium, 312
- Place Names, Dr. J. Burgess, 406
- Plagues and Fevers, Epidemics, Hon. Rollo Russell, 413
- Planet Mars, the, 162; Colours on the Surface of the, Prof. Pickering, 179; Opposition of, 258, 400; J. Norman Lockyer, F.R.S., 443; Observations of, M. Perrotin, 482; Measures of the Diameter of, Camille Flammarion, 460; Earth Fractures and Mars "Canals," Prof. G. A. Lebour, 611
- Planet beyond Neptune, a, Prof. Forbes, 179; Mr. Roberts, 179
- Planet Victoria, Comparison Stars of the, Dr. Gill, 423
- Planet Venus, the, E. L. Trouvelot, 468
- Planets: Discovery of Three New Planets by Photography, 619
- Planisphere, a New, 177
- Plants or Animals, a Debatable Land, George Massee, 365
- Plants, New Contributions to the Biology of, 461
- Plants, the Active Albumen in, O. Loew, 491
- Plants, Herbaceous, Effect of Electric Light on, Gorton Bonnier, 580
- Platanina (Gaetano), the Recent Eruption of Etna, 542
- Pleiades, Photographic Measures of the, 161
- Plimpton (R. T.), Metallic Derivatives of Acetylene, 142
- Plumbing, Principles and Practice of, S. Stevens Hellyer, 584
- Plummer (Mr. W. E.), appointed Director of Liverpool Observatory, 276
- Pockels (Miss Agnes), on the Relative Contamination of the Water-surface by Equal Quantities of Different Substances, 418
- Pocock (R. J.) *Peripatus* from St. Vincent, 100
- Poincaré's Thermodynamics, 76
- Poincaré (H.), Propagation of Electrical Oscillations, 144
- Poincaré (Dr. Leon), Death of, 572
- Poisonous? are the Solpugidae, Henry Bernard, 223; W. L. Distant, 247
- Poisons, Arrow, used by the Ainos of Japan, Romyn Hitchcock, 475
- Poland (Henry), Fur-bearing Animals in Nature and Commerce, 605
- Polarization of Light of Various Colours by Atmosphere, N. Piltchikoff, 627
- Polarizing Gratings, on, Prof. du Bois, 385
- Political Economy, a Text-Book of, Prof. Alfred Marshall, 27
- Polynesian Society, 209
- Pope (W. J.), Crystalline Forms of Sodium Salts of Substituted Anilic Acids, 142
- Popper's (Señor Julio) Expedition to Argentine Tierra del Fuego, 135
- Port Erin, Opening of the Liverpool Marine Biological Station at, 155
- Porter (James): Aurora, 151; Stars' Proper Motions, 230; Cirro-stratus, 541
- Porter (T. C.), on a New Method of Viewing Newton's Rings, 80
- Portrush, at, James Rigg, 418
- Portsmouth Dockyard: Shipbuilding in, W. H. White, F.R.S., 337; Lifting and Hauling Appliances in, J. T. Corner, 338
- Posewicz (Theodore), Borneo: its Geology and Mineral Resources, 540
- Posterior, Cranial and Anterior Spinal Nerves in Mammals, Observations on the Development of the, Dr. Arthur Robinson, 405
- Potato in Australia, the Improvement of the, 617
- Pouchet's (Prof.) Visit to Jan Mayen and Spitzbergen, 453
- Poulton (Edward B., F.R.S.), Animal Coloration: an Account of the Principal Facts and Theories relating to the Colours and Markings of Animals, F. E. Beddard, F.R.S., 533
- Power Transition by Alternating Current, Gisbert Kapp, 430
- Prain (C.), the Species of Pedicularis of the Indian Empire and its Frontiers, the Genus *Gomphostemma*, 122
- Pratt (A. E.), to the Snows of Tibet through China, 150
- Preece (W. H., F.R.S.), the Arts of Internal Illumination by Electricity, 62; on Earth Current Storms in 1892, 385; on the Dielectric of Condensers, 385; Necessity for Connection between Stack Pipes and Earth, 430
- Prehensile Power of Infants, Dr. Louis Robinson, 433
- Prehistoric Archaeology and Zoology, the Coming Moscow International Congress of, 108
- Prehistoric Epochs, Edmond Bordage, 418
- Pre-Palaeolithic Flints, J. Montgomerie Bell, 432
- Prescott's (Prof. A. B.), Address to the American Association for the Advancement of Science, 408
- Preston (Mr.), Latitude Observations at Waikiki, 64
- Preston (H. L.), a Meteorite, 452
- Prince (Prof. E. E.), Development of the Pharyngeal Teeth in the Labridae, 405
- Prince (Prof. E. G.), on the Formation of Argenteous Matter in the Integument of Teleosts, 405

- Pritchard (Prof. Chas., F.R.S.), Researches in Stellar Parallax by the Aid of Photography, 612
 Problems in the Old Astronomy, some, J. R. Eastman, 424
 Proceedings of Royal Society of Victoria, 459
 Professorial University of London, 121
 Projectiles, Calculation of Trajectories of Elongated, Rev. F. Bashforth, 366
 Projection, Optical, Sir David Salomon, 625
 Prominence, a Remarkable, J. Fényi, 334
 Prominences, Remarkable, M. Trouvelot, 258
 Propagation of Magnetic Impulses along a Bar of Iron, V. A. Julius, 392
 Protection against Rain in the Elder, Alfred W. Bennett, 201
 Protective Device of an Annelid, the, A. T. Watson, 7
 Protective Mimicry, Rose Haig Thomas, 612
 Protective Resemblance, Rev. Canon Fowler, 24; W. L. Distant, 24
 Proteid-hydrochlorides, Dr. Lockhart Gillespie on, 403
 Protoplasmic Movements, on the Natural Relations between Temperature and, Dr. J. Clark, 404
 Prout's Hypothesis, a Modern Revival of, Henry Wilde, F.R.S., Prof. R. Meldola, F.R.S., 568
 Psychology: the Human Mind: a Text-book of Psychology, James Sully, 1; Hand-book of Psychology: Feeling and Will, James Mark Baldwin, 1; Text-book of Psychology, William James, 1; the Limits of Animal Intelligence, Edward T. Dixon, 392; C. Lloyd Morgan, 417; Dr. St. George Mivart, F.R.S., 466; the Method of Comparative Psychology, Prof. Lloyd Morgan, 404; Proposed Formation of an American Psychological Association, 419; International Congress of Experimental Psychology, 362; F. W. H. Myers and James Sully, 261; Prof. Sidgwick's Address to 362; the Association of Colour with Sound, Prof. Gruber, 363; Curious Case of Sudden Loss of Memory, &c. (L'Aboulle), Prof. P. Janet, 363; Hypnotic Cases at Amsterdam, Dr. F. van Eeden, 363; Hysterical Amaurosis, Prof. Bernheim and Dr. Berillon, 363; Hypnotism in Yorkshire Medical Practice, Dr. Bramwell, 363; Power of Somnambulist of Judging Time, Prof. Delboeuf, 363; Hallucination by Crystal Vision, F. W. H. Myers, Prof. P. Janet, 363; Report of Census of Hallucinations, Prof. Sidgwick, 363; Hypnotism in Education, Dr. Berillon, 364; Experiments in Thought-Transference, Mrs. H. Sidgwick, 364; Investigation of Laura Bridgman's Brain, Dr. Donaldson, 364; some Optical Illusions, Dr. Joseph Jastrow, 590
 Ptomaine obtained from Cultivation of *Micrococcus tetragenus*, A. B. Griffiths, 508
 Public Health, a Treatise on Hygiene and, T. Stevenson, 609
 Pulkova, Variation of Latitude at, B. Wanach, 524; S. Kostinsky, 524
 Pump, Bumping in the Lane Fox Mercurial, 394
 Punjab, Viticulture in the, 86
 Punjab; Casualties for 1891 from Wild Beasts and Snake Bites, 133
 Pupin (M. T.), the Coronoidal Discharges, 211
 Purdie (T.), Resolution of Lactic Acid into its Optically Active Components, 311
 Pardon (F.), a Tide-Motor, 429
 Purple, a Sparrow's Antipathy to, G. D. Haviland, 394
 Putnam (Prof. F. W.), the Native American Section at Chicago Exhibition, 454; Copper Implements and Ornaments in Ohio Mounds, 455
 Pygmies of Africa, the, Dr. H. Schlichter, 135
 Pyrometers, Platinum, H. L. Callendar, 115
 Pyrometer, a Modification of the Le Chatelier, Prof. W. C. Roberts-Austen, 526
 Quain's Elements of Anatomy, 6
 Quarterly Journal of Microscopical Science, 338
 Queensland, Remarkable Specimen of *Belonostomus* from, R. Etheridge, jun., 256
 Queensland, a Trip to, in Search of *Ceratodus*, Prof. W. Baldwin Spencer, 305
 Rabbit Destruction in New South Wales, a New Method of, 161
 Radiolarian Chert of Arenig Age, Messrs. Peach and Horne on the, 428
 Railway, Progress of Akka-Damascus, 279
 Railway, Jaffa-Jerusalem, Completion of, 477
 Railway, the Liverpool Overhead, J. H. Greathead, 526
 Railways, Electric, Magnetic Disturbances caused by, Prof. F. P. Whitman, 455
 Rain, Protection against, in the Elder, Alfred W. Bennett, 201
 Rain with a High Barometer, Robt. M. W. Swan, 442
 Rain-production, Means of Artificial, M. Faye, 24
 Rainbow, the White, M. Mascart, 532, 555
 Raindrops, E. J. Lowe, F.R.S., 95
 Rainfall in Formosa, Effect of, John Thomson, 406
 Rainbow (Mr.), a Sydney Bird-catching Spider, 474
 Raisin Industry in Victoria, Development of, J. Knight, 256
 Ram Bramha Sanyál, a Handbook on the Management of Animals in Captivity in Lower Bengal, 314
 Rambaut (Dr. A. A.), the New Royal Astronomer for Ireland, 615
 Ramsay (Prof.), on the Impurities in Chloroform, 401; Atomic Weight of Boron, 403
 Range of the Sanderling in Winter, Prof. Alfred Newton, F.R.S., 177, 222
 Rat, White, Removal of the Thyroid in the, H. Cristiani, 484
 Rats and Gooseberries, G. Reade, 550
 Rayleigh (Lord, Sec.R.S.), Waterston's Theory of Gases, 30; on the Relative Densities of Hydrogen and Oxygen, 101; Density of Nitrogen, 512
 Rea (A.), Discovery of Buddhist Antiquities at Bhatuprolu, 178
 Reade (G.), Rats and Gooseberries, 550
 Reade (T. Mellard), Causes of the Deformation of the Earth's Crust, 315; the Former Connection of Southern Continents, 77
 Recette, Conservation et Travail des Bois, M. Alheilg, 246
 Record, an International Zoological, F. A. Bather, 417
 Red Spot on Jupiter, J. J. Landerer, 229; W. F. Denning, 391
 Reese (Dr. C. L.), Influence of Swamp Waters in Formation of Phosphate Nodules of South Carolina, 67
 Reflection on Valley Fog, J. Edmund Clark, 514
 Refraction in Micrometric and Photographic Measures, Dr. S. C. Chandler, 401
 Refraction, Double, Fresnel's Theory of, L. Fletcher, 581
 Refuse-destroyer Question, G. Watson, 429
 Regel (Eduard von), Obituary Notice of, 60
 Reid (Prof. Waymouth), on Vital Absorption, 403
 Reignier (Ch.), a Property of Lamellar Bimetallic Conductors submitted to Electromagnetic Induction, 387
 Reindeer in Alaska, Acclimatization by Dr. Sheldon Jackson of, 109
 Reinold (Prof., F.R.S.), on the Specific Conductivity of Thin Films, 384
 Religion: Philadelphia Loan Collection of Objects used in Worship, 84
 Renault (B.), a New Genus of Permio-Carboniferous Stems (*G. Retinodendron rigolloti*), 412
 Research, Gift by Mr. Thomas Hodgkins to Royal Institution for Promotion of Scientific, 572
 Respiration under Reduced Atmospheric Pressure, Experiments on, Prof. Loewy, 168
 Respiration, the Comparative Physiology of, Prof. Simon Henry Gage, 598
 Retaining Walls and Masonry Dams, a Text-Book on, Prof. Mansfield Merriman, 415
 Retina, the Blood-vessels and Lymphatics of the, Dr. J. Musgrave, 404
 REVIEWS and OUR BOOKSHELF:—
 The Human Mind: a Text-book of Psychology, James Sully, 1
 Hand-book of Psychology: Feeling and Will, J. M. Baldwin, 1
 Text-book of Psychology, William James, 1
 Dynamics of Rotation: an Elementary Introduction to Rigid Dynamics, A. M. Worthington, 4
 Spinning Tops, John Perry, 4
 The Fauna of British India, including Ceylon and Burmah, W. T. Blanford, F.R.S., 5
 Tanganyika: Eleven Years in Central Africa, Edward Cooile Hore, 6

- Beginners' Guide to Photography, 6
 Quain's Elements of Anatomy, Edited by E. A. Schäfer, F.R.S., and G. D. Thane, 6
 Brachiopoden der Alpenen Trias, A. Bittner, 25
 Elements of Economics of Industry, Prof. Alfred Marshall, 27
 Elements of Materia Medica and Therapeutics; including the whole or the Remedies of the British Pharmacopœia of 1885 and its Appendix of 1890, C. E. Armand-Sempe, 28
 Elementary Lessons in Heat, S. E. Tillman, 28
 The Tel el-Amarna Tablets in the British Museum, with Autotype Facsimiles, 49
 A Manual of Physics, William Peddie, 52
 The Dietetic Value of Bread, John Goodfellow, 54
 Graduated Mathematical Exercises, A. T. Richardson, 54
 Bibliothek des Professors der Zoologie und vergl. Anatomie, Dr. Ludwig von Graff, in Graz, 54
 The Canadian Guide-book, Charles G. D. Roberts, 54
 Einleitung in die Theoretische Physik, Victor von Lange, 73
 Phases of Animal Life, Past and Present, R. Lydekker, 74
 Silk Dyeing, Printing, and Finishing, George Hurst, 75
 Phycological Memoirs, George Murray, 75
 Live Stock, Prof. Wrightson, 76
 The Grammar of Science, Karl Pearson, M.A., 97
 Laboratory Practice: a Series of Experiments on the Fundamental Principles of Chemistry, Josiah Parsons Cooke, 99
 Elementary Geography of the British Colonies, George M. Dawson, F.R.S., and Alexander Sutherland, 100
 Farmyard Manure, C. M. Aikman, 100
 Annals of the Royal Botanic Garden, Calcutta: (i.) Species of Pedicularis of the Indian Empire and its Frontiers, D. Prain; (ii.) the Magnoliaceæ of British India, G. King, F.R.S.; (iii.) the Genus Gomphostemma, D. Prain; (iv.) the Species of Myristica of British India, G. King, W. Botting Hemsley, 122
 Mathematical Recreations and Problems of Past and Present Times, W. W. Rouse Ball, 123
 Soils and Manures, J. H. M. Munro, 125
 Catalogue of the Specimens Illustrating the Osteology of Vertebrated Animals, Recent and Extinct, contained in the Museum of the Royal College of Surgeons of England, R. Bowdler Sharpe, 125
 A Treatise on Analytical Statics, Edward John Routh, F.R.S., Prof. A. G. Greenhill, F.R.S., 145
 The Elementary Part of a Treatise on the Dynamics of a System of Rigid Bodies, E. J. Routh, F.R.S., Prof. A. G. Greenhill, F.R.S., 145
 Supplementary Appendix to Travels amongst the Great Andes of the Equator, Edward Whymper, H. J. Elwes, 147
 A History of Epidemics in Great Britain from A.D. 664 to the Extinction of the Plague, Charles Creighton, 148
 Mineralogy, Frederick H. Hatch, 149
 To the Snows of Tibet through China, A. E. Pratt, 150
 Analyse des Vins, Dr. L. Magnier de la Source, 170
 An Introduction to Modern Therapeutics, T. Lauder Brunton, M.D., 172
 Elementary Hydrostatics, W. H. Besant, F.R.S., 172
 The Threshold of Science, C. R. Alder Wright, F.R.S., 173
 Key to J. B. Lock's Elementary Dynamics, G. H. Lock, 173
 English Botany, N. E. Brown, James Britten, 197
 Bacteriologisches Practicum zur Einführung in die praktisch-wichtigen bacteriologischen Untersuchungsmethoden für Aerzte, Apotheker, Studierende, Dr. W. Migula, Mrs. Grace C. Frankland, 198
 Neue Rechnungsmethoden der Höheren Mathematik, Dr. Julius Bergbohm, 199
 Neue Integrationsmethoden auf Grund der Potenzial-, Logarithmal-, und Numeralrechnung, Dr. J. Bergbohm, 199
 An Elementary Course in Theory of Equations, C. H. Chapman, 199
 The System of Mineralogy of James Dwight Dana, 1837-68; Descriptive Mineralogy, Edward Salisbury Dana, 217
 An Introduction to the Study of the Differential and Integral Calculus, Axel Harnack, Prof. A. G. Greenhill, F.R.S., 218
 Les Altérations de la Personnalité, Alfred Binet, 219
 Volcanoes: Past and Present, Edward Hull, F.R.S., 220
 Encyclopédie scientifique des Aide-mémoire, 221
 Résistance des Matériaux, M. Duquesnay, 221
 Étude Expérimentale Calorimétrique de la Machine à Vapeur, V. Dwelshauvers-Dery, 221
 Air comprimé ou raréfié, Al. Gouilly, 221
 Chambers's Encyclopædia, vol. ix., 221
 A Guide to Electric Lighting, S. R. Bottone, 221
 Outlines of Zoology, J. A. Thomson, 241
 Watts' Dictionary of Chemistry, Forster Morley and M. M. Pattison Muir, Sir H. E. Roscoe, F.R.S., 242
 Manual Instruction; Woodwork; the English Sloyd, S. Barter, 244
 Thermodynamische Studien, J. Willard Gibbs, 245
 Elements of Physic, C. E. Fessenden, 245
 Recette, Conservation et Travail des Bois, M. Alheilg, 246
 Country Thoughts for Town Readers, K. B. Bagh t de la Bere, 246
 A Synoptical Geography of the World, 246
 Essays and Criticisms, St. George Mivart, F.R.S., 265
 A Treatise on Physical Optics, A. B. Basset, F.R.S., Arthur Schuster, 266
 The Apodidæ, a Morphological Study, H. M. Bernard, Prof. E. Ray Lankester, F.R.S., 267
 Anatomy, Physiology, Morphology, and Development of the Blow-fly (*Calliphora erythrocephala*), B. Thompson Lowne, 267
 A Mendip Valley: its Inhabitants and Surroundings, Theodore Compton, 268
 Key to Elementary Dynamics, S. L. Loney, 268
 The Etiology and Pathology of Grouse Disease and Fowl Enteritis, E. Klein, F.R.S., 289
 Electric Light Cables, 290
 Distribution de l'Electricité, R. V. Picou, 291
 Popular Readings in Science, John Gall and David Robertson, 291
 Geometrical Deductions, J. Blaikie and W. Thomson, 291
 Tabellarische Uebersicht der künstlichen organischen Farbstoffe, Gustav Schultz und Paul Julius, R. Meldola, 313
 A Handbook on the Management of Animals in Captivity in Lower Bengal, Ram Bramha Sanyal, 314
 In Starry Realms, Sir R. S. Ball, F.R.S., 315
 A Monograph of the Myxogastres, George Masee, 365
 Atlas of Clinical Medicine, Byrom Bramwell, 389
 Hand-book for Travellers in Norway, 390
 Ostwald's Klassiker der Exacten Wissenschaften, 391
 Epidemics, Plagues and Fevers: their Causes and Prevention, Hon. Rollo Russell, 413
 The Physiology of the Invertebrata, A. B. Griffiths, 414
 A Text-book on Retaining Walls and Masonry Dams, Prof. Mansfield Merriman, 415
 Directions for Collecting and Preserving Insects, C. V. Riley, 416
 Die Grundzüge der Theorie der Statistik, Harald Westergaard, 437
 Trattato di Fisico-Chimica secondo la Teoria Dinamica, Enrico dal Pozzo di Mombello, 439
 The Microscope and Histology for the Use of Laboratory Students in the Anatomical Department of the Cornell University, Simson Henry Gage, W. H. Dallinger, 440
 An Elementary Text-book of Magnetism and Electricity, R. Wallace Stewart, 441
 Key to Arithmetic for Beginners, J. and E. J. Brooksmith, 441
 Beiträge zur Biologie der Pflanzen, Dr. Ferdinand Cohn, 461
 The Labrador Coast: a Journal of Two Summer Cruises in that Region, Adolphus Spring Packard, 462
 The Transactions of the Sanitary Institute, 1891, 463
 Cooley's Cyclopædia of Practical Receipts, W. North, 463
 Traité Encyclopédique de Photographie, Charles Fabre, 464
 Colour Vision, E. Hunt, 485
 A Pocket-book of Electrical Rules and Tables, John Munro and Andrew Jamieson, 486
 A Synonymic Catalogue of Lepidoptera Heterocera (Moths), W. F. Kirby, 487
 Grasses, C. H. Johns, 487
 Elementary Plane Trigonometry, R. C. J. Nixon, 488
 Paraguay: the Land and the People, Natural Wealth and Commercial Capabilities, Dr. E. de Bourgade La Dardye, 488
 The Speech of Monkeys, R. L. Garner, C. Ll. Morgan, 509

- Bees for Pleasure and Profit, G. Gordon Samson, W. Tuckwell 510,
A New Course of Experimental Chemistry, John Castell-Evans, 511
Die Pflanze in ihren Beziehungen zum Eisen, Dr. Hans Molisch, 512
Up the Niger, Captain A. F. Mockler-Ferryman, 512
Animal Coloration: an Account of the Principal Facts and Theories relating to the Colours and Markings of Animals, F. E. Beddard, F.R.S., Edward B. Poulton, F.R.S., 533
Sunshine, Amy Johnson, 537
The Locomotive Engine and its Development, Clement E. Stretton, N. J. Lockyer, 538
Sketches of British Insects, Rev. W. Houghton, 540
The Birds of Lancashire, F. S. Mitchell, 540
Borneo: Its Geology and Mineral Resources, Theodor Posewitz, 540
Essays on Heredity, Dr. A. Weismann, 558
The Standard Course of Elementary Chemistry, E. J. Cox, 559
Essai sur la Vie et la Mort, Armand Sabatier, 560
Contagious Foot Rot in Sheep, Prof. G. T. Brown, 560
How to Make Common Things, John A. Bower, 561
The Student's Manual of Deductive Logic, Theory and Practice, K. R. Bose, 561
A Text-book of Agricultural Entomology, Eleanor A. Ormerod, 561
The Optical Indicatrix and the Transmission of Light in Crystals, L. Fletcher, 581
Contributions to Horticultural Literature, William Paul, Dr. Maxwell T. Masters, F.R.S., 582
Life in Motion; or, Muscle and Nerve, John Gray McKendrick, F.R.S., 583
Principles and Practice of Plumbing, S. Stevens Hellyer, 584
A Lecture Course of Elementary Chemistry, H. T. Lilley, 585
Longmans' School Geography for North America, G. H. Chisholm and C. H. Leete, 585
Garden Design and Architects' Gardens, W. Robinson, 585
Fur-bearing Animals in Nature and Commerce, Henry Poland, 605
The Structure and Functions of the Brain and Spinal Cord, Victor Horsley, F.R.S., 606
Electrical Engineering as a Profession, and How to Enter it, A. D. Southam, 608
A Treatise on Hygiene and Public Health, 609
Lehrbuch der Botanik nach dem gegenwärtigen Stand der Wissenschaft, Dr. A. B. Frank, 610
Arithmetical Chemistry, C. J. Woodward, 610
Lessons in Heat and Light, D. E. Jones, 610
Elements of Magnetism and Electricity, John Angell, 610
Beiträge zur Theorie und Praxis der Desinfection, Prof. J. Maschek, Mrs. Percy Frankland, 613
Reyer (Prof. E.), on the Causes of the Deformation of the Earth's Crust, 224
Reynolds (J. E.), Action of Silicon Tetrachloride on substituted Phenylamines, 22
Reynolds (Dr. J. Emerson, F.R.S.), Fuels and their Use, 527
Rhinoceros, the White, W. L. Distant, 29
Richards (Dr.), Re-determination of the Atomic Weight of Copper, 134
Richardson (A. T.), Graduated Mathematical Exercises, 54
Richardson (Dr. B. W.), French and English Methods of Sanitation compared, 299
Richet (Ch.), Tuberculous Vaccination of Dogs, 168
Richmond (H. D.), Masrite and Masrium, 94; Geology of the Nile Valley, 190
Ridgway on the Humming-Birds, R. W. Shufeldt, 465
Rigaux (E.), Geology of the Bas Boulonnais, 109
Rigg (James), at Portrush, 418
Riley (Prof. C. V.), Locusts in America, 256; Directions for Collecting and Preserving Insects, 416; Fertilization of the Fig and Caprifigation, 455; the Transmission of Acquired Character through Heredity, 504
Rings, Newton's, on a new Method of Viewing, T. C. Porter, 80
Rings, Saturn's, Rev. A. Freeman, 150
Ristenpart (Dr. F.), Nova Aurigæ, 496
River, an Acoustic Method whereby the Depth of Water in, may be Measured at a Distance, Fred. J. Smith, 246
Roberts (Mr.), a Planet beyond Neptune, 179
Roberts (Charles G. D.), the Canadian Guide Book, 54
Roberts-Austen (Prof. W. C.), an Apparatus for Autographically Recording the Temperature of Furnaces, 526
Robertson (David) and John Gall, Popular Readings in Science, 291
Robertson (Prof. Geo. Croom), Death of, 520
Robinson (Dr. Arthur), Observations on the Development of the Posterior Cranial and Anterior Spinal Nerves in Mammals, 405
Robinson (Rev. J. A.), Association founded for Study of Hausa Language and People in Commemoration of, 572
Robinson (Dr. Louis), Prehensile Power of Infants, 433
Robinson (W.), Garden Design and Architects' Gardens, 585
Rock Structure, Sir Archibald Geikie, F.R.S., 317
Rogers (Prof. W. A.), the Hardness of Diamonds not Perceptibly Reduced by Cutting and Polishing, 257; a Standard Yard and Measure on Polished Steel, 455
Rolland (G.), Contributions to Knowledge of Saharian Climate, 144
Rolls, Chilled, Failures in Necks of, C. A. Winder, 527
Romanes (Dr. Geo. J., F.R.S.), Hairlessness of Terminal Phalanges in Primates, 247
Romano, Solar Observations at the R. Osservatorio del Collegio, Prof. Tacchini, 334
Rome, R. Accademia dei Lincei, 387
Rome, Solar Observations at, Prof. Tacchini, 476, 524
Roscoe (Sir H. E., F.R.S.), Watts' Dictionary of Chemistry, M. M. Pattison Muir and Forster Morley, 242; Obituary Notice of Dr. Carl Schorlemmer, F.R.S., 394
Rosenbaum (Herr), a new Theory of Sleep, 595
Rosenthal (Prof.), on Animal Heat and Physiological Calorimetry, 403
Rotation, Dynamics of: an Elementary Introduction to Rigid Dynamics, A. M. Worthington, 4
Roumania, Earthquake in, 594
Roumequère (M.), Death of, 61
Rousseau (G.), a Hydro-silicate of Cadmium, 144
Routh (Edward John, F.R.S.): a Treatise on Analytical Statics, 145; the Elementary Part of a Treatise on the Dynamics of a System of Rigid Bodies, 145
Row (Narasinga), Death of, 176
Rowland-Brown (H.), a *Colias edusa* Butterfly in London, 228
Royal Agricultural Society's Journal, 262
Royal Dublin Society, 71, 167
Royal Geographical Society, 258, 552; Anniversary Meeting of the, President's Address, 87; Royal Geographical Society's Soirée, 180
Royal Institution, Gift of Mr. Thomas Hogkins for Promotion of Scientific Research to, 572
Royal Meteorological Society, 95, 191
Royal Microscopical Society, 69, 165
Royal Society, 21, 69, 90, 140, 163, 187, 236, 339, 603; Royal Society's Committee on Colour Vision, Report of the, 33; Selected Candidates, 35; Royal Society's Soirée, 44; Model Illustrating General Phenomena of Explosions through Dust Particles, in Explanation of Colliery Explosions, Prof. T. E. Thorpe, 44; Miner's Safety Lamp converted into Instrument for detecting Coal-damp, Prof. Clowes, 44; Vacuum Tubes without Electrodes, Dr. Bottomley, 44; Musical Sands, C. Carus-Wilson, 44; Apparatus for measuring Colour-blindness, Brudenell Carter, 44; Captain Weir's Azimuth Diagram, 44; Electric Sparks in and to Water, Prof. Oliver Lodge, 44; Electric Retina, Prof. Oliver Lodge, 44; Experiments of Electric Currents of High Potential and Extreme Frequency à la Tesla, W. Crookes, 44; New Electrical Method for determining very High Temperatures, Prof. H. Le Chatelier, 45; Electric Tram Chronograph, Rev. F. J. Smith, 45; Photographs of Flying Bullets, Mr. Boys, 45; Photographs, &c., Illustrating Coral Reefs and Marine Fauna of Great Barrier District of Australia, W. Saville-Kent, 45; the Yearly Admissions to the Royal Society, Lieut.-General R. Strachey, F.R.S., 116; the Ladies' Conversazione of the Royal Society, 184
Royal Society of New South Wales, 191
Royal Society of Victoria, 459

- Rubens (H.), Refraction of Rays of Great Wave-length in Rock Salt, Sylvine and Fluorspar, 483
- Rücker (Prof., F.R.S.), the Discussion on a National Physical Laboratory, 383; on the Specific Conductivity of Thin Films, 384
- Rudge (W. A.), a Viper Bite, 270
- Ruffer (Armand), the Imperial Institute at St. Petersburg, 520
- Ruhmkorff Coil, Experiments with a, Magnus Maclean and A. Galt, 384
- Rumex occurring North of Mexico, Revision of the Species of, W. Trelease, 40
- Runge (Prof. C.), the Line Spectra of the Elements, 100, 200, 247
- Russell (Francis C.), Induction and Deduction, 586
- Russell (H. C.), Photographic Chart of the Heavens, 576; Proposed School of Practical Astronomy, 496
- Russell (Hon. Rollo), Epidemics, Plagues and Fevers, their Causes and Prevention, 413
- Russia, Mercury Mining in, 86
- Russian Monthly Meteorological Bulletins, Two New, 38
- Rutherford (Lewis Morris), Obituary Notice of, 206
- Rutherford (Prof. William, F.R.S.), Opening Address in Section D of the British Association, 342
- Rutherford Measures of Stars about β Cygni, Harold Jacoby, 619
- Sabatier (Prof. Armand), *Essai sur la Vie et la Mort*, 560
- Saccharine, Ants and, H. Devaux, 573
- Saharian Climate, Contributions to Knowledge of, G. Rolland, 144
- St. Andrews Marine Laboratory, 369
- St. Bernard, Great, Table showing Behaviour with regard to Cold of Small Lake at, Prof. Forel, 371
- St. Gervais les Bains, Terrible Glacier Slip Disaster at, 254; Theories of the Cause of, Profs. Duparc and Forel, 299; Causes of, 420; the Lava of July 12, 1892, P. Demontzey, 387
- St. John's, the Cause of the Great Fire at, 295
- St. Petersburg: Bulletin de l'Académie des Sciences de St. Petersburg, 68; Memoirs of St. Petersburg Society of Naturalists, 68; Dr. A. F. Batalin appointed Director of Botanic Garden at, 107; the Imperial Institute at, Armand Ruffer, 520; Laying Foundation Stone of New Chemical Laboratory of St. Petersburg University, 592
- St. Vincent, *Peripatus* from, R. I. Pocock, 100
- Sakurai (J.), Determination of Temperature of Steam from Boiling Salt Solutions, 94; Note on an Observation by Gerlach of the Boiling-points of a Solution of Glauber's Salt, 94
- Sal-Soda Manufacture in United States, Prof. C. F. Mabery, 332
- Salamander, on the Relationships and Rôle of the Archoplasmic Body during Mitosis in the Larval, J. E. S. Moore, 404
- Salet (G.), Stokes's Law (Spectrum Analysis), its Verification and Interpretation, 364
- Salmon Fungus, the Effect of Sea-water on the Vitality of the, A. P. Swan, 405
- Salomons (Sir David), Optical Projection, 625
- Samoa Calendar, Change in, 552
- Samson (G. Gordon) Bees for Pleasure and Profit, W. Tuckwell, 510
- Sand, Musical, T. S. Hall, 279; C. Carus-Wilson on, 44, 316
- Sanderling, Range of the, in Winter, Prof. Alfred Newton, F.R.S., 177, 222
- Sanderson (Dr. J. S. B.), appointed Waynflete Professor of Physiology at Oxford, 37
- Sangir, Volcanic Eruption at Great, 287; George Ormsby, 457
- Sanitation, French and English Methods Compared, Dr. B. W. Richardson, 299
- Sanitation, the Victorian Era, the Age of, Sir Charles Cameron, 472
- Sanitary Inspectors' Association, General Meeting, 299
- Sanitary Institute, the Thirteenth Congress of the, 449; Sanitary Institute and its Transactions in Review, 463; Sir Charles Cameron's Presidential Address, 472
- Saniter (E.), the Elimination of Sulphur from Iron, 527
- Sanscrit Birch-bark Manuscripts, Discovery by Lieut. Bower of, Dr. Hoerale, 370
- Sarasin (M.), Production of Hertz Oscillator Spark in Liquid Dielectric instead of Air, 532
- Satellite, Jupiter's Fifth, Prof. E. E. Barnard, 620
- Saturn's Rings, M. Bigourdan, 110; Rev. A. Freeman, 150
- Saville-Kent (W.), Photographs, &c., Illustrating Coral Reefs and Marine Fauna of Great Barrier District of Australia, 45; the Great Barrier Reef of Australia, 523
- Saw Fish, New South Wales, Fine Specimen of, Mr. Pedley, 257
- Scacchi (Prof. E.), the Crystallography of Certain New Salts (Fluoximolybdates of Copper and Zinc) obtained by Prof. F. Mauro, 162
- Scale for Measurement of Gas Pressures, Orme Masson, 294
- Schaeberle (J. M.), Photographic Magnitudes of Nova Aurigæ, 423; a New Variable Star, 620
- Scharff (R. F.), Land and Freshwater Shells peculiar to the British Isles, 173
- Scherren (Henry), a New Habitat for *Cladonema*, 541
- Schlichter (Dr. H.), the Pygmies of Africa, 135; Determination of Longitude by Photography, 407
- Schmitz (Prof. F.), Tubercles on the Thallus of *Cystoclonium purpurascens* and other Red Seaweeds, 555
- Schönland (Dr. S.), Zebra's Stripes, 6
- Schorlemmer (Dr. Carl, F.R.S.), Obituary Notice of, Sir H. E. Roscoe, F.R.S., 394
- Schultz (Gustav) und Paul Julius, Tabellarische Uebersicht der künstlichen organischen Farbstoffe, R. Meldola, 313
- Schur (Prof. Wilhelm), the Observations of Klinkerfues reduced, 452
- Schuster (Arthur), a Treatise on Physical Optics, A. B. Basset, F.R.S., 266
- Schuster (Prof. Arthur, F.R.S.), Opening Address in Section A of the British Association, 323; on Primary and Secondary Cells in which the Electrolyte is a Gas, 384
- Schutzenberger (P.), Contribution to History of Silico-Carbon Compounds, 96
- Schwalbe (Dr.), Observations, based on Synoptic Weather-Charts, on Anomalies of Temperature in Germany, 120
- Schwatka's (Mr.) Yukon Expedition, 180
- Science: the Grammar of Science, 221; Prof. Karl Pearson, 97, 199, 247; Edward T. Dixon, 269; Dr. St. George Mivart, F.R.S., 269; Science in America, the Walker Prize awarded to Prof. J. D. Dana, 158; the Threshold of Science, C. R. Alder Wright, F.R.S., 173; Popular Readings in Science, John Gall and David Robertson, 291; Scientific Investigation of the Scottish Fishery Board, 395; Science and the State, Right Hon. T. H. Huxley, F.R.S., 416; the American Association and Science in the United States, W. Kent, 494; a Century of Scientific Work, 504; Forthcoming Scientific Books, 505
- Scotland: Stag Smothered by Snow last Winter in, 228; the Birds of Sutherland and Caithness, T. E. Buckley, 279; Scottish Geographical Magazine, 302; Scientific Investigation of the Scottish Fishery Board, 395; a Sketch of the Scotch Fisheries, chiefly in their Scientific Aspects, during the Past Decade 1882-92, Prof. McIntosh, F.R.S., 404; on the Discovery of the Common Occurrence of Palæolithic Weapons in Scotland, Rev. Frederick Smith, 432
- Scott (Dr.) Observations on Secondary Tissues in Monocotyledons, 554
- Scott (Prof.), Cancer in Fish, 573
- Scott (Robert H., F.R.S.), Ice in the South Atlantic, 173
- Whirlwinds in the Indian Ocean, 294
- Scovell (J. T.), Measurement of Mount Orizaba by, 598
- Scudder (S. H.), the Tertiary Rhynchophora of North America, 256
- Sea, Dust Storms at, Prof. John Milne, F.R.S., 128
- Sea Fisheries, Prof. Ewart, 405
- Sea-gauges: Necessary Additive Correction for Sea-swell, J. Boussinesq, 288; Necessary Additive Correction for a Choppy Sea, J. Boussinesq, 312
- Sea-water, Varying Colours of the Mediterranean, 84
- Sea-water, the Effect of, on the Vitality of the Salmon Fungus, A. P. Swan, 405
- Searle (G. F. C.), a Compound Magnetometer for testing Magnetic Properties of Iron and Steel, 143
- Secondary Tissues in Monocotyledons, Observations on, Dr. Scott and Mr. Brebner, 554
- Seddall (late Rev. H.), Byssus Silk Industry at Malta, 229

- Seeley (Prof. H. G., F.R.S.), *Delphinognathus conocephalus*, 166; Further Evidence of *Endothiodon bathystoma*, 166; the Laurischia of Europe and Africa, 238
- Seelinger (H.), Nova Aurigæ, 552
- Seismology: the Great Earthquake in Japan, 1891, 34; Comparison of Earthquake Measurements in a Pit and on the the Surface, K. Sekiya and F. Omori, 85; Thunderstorms and Sunspots, 488
- Sekiya (K.), Comparison of Earthquake Measurements in a Pit and on the Surface, 85
- Semple (C. E. Armand), Elements of Materia Medica and Therapeutics, including the whole of the remedies of the British Pharmacopœia of 1885, and its Appendix of 1890, 28
- Sennett (A. R.), Sound-carrying Power of Water, 430; Smoke Prevention, 431
- Serum of Blood, the Germicide and Antitoxical properties of the, Herr Buchner, 495
- Servia, Earthquake in, 594
- Severn Valley Field Club, 572
- Sewage, Absorption and Filtration of, R. F. Grantham, 429
- Seward (A. C.), Myeloxylon from the Millstone Grit and Coal Measures, 555
- Sex, the Origin of, Dr. G. Mann, 404
- Sex in Education, Sir James Crichton-Browne, 13
- Seychelles: the Gigantic Land Tortoises of Aldabra Island, Risleley Griffiths, 398
- Shand (A.), the Volume Effects of Magnetization, 262
- Sharks, Blue, Pilchards and, Matthias Dunn, 368
- Sharpe (R. Bowdler), Catalogue of the Specimens illustrating the Osteology of Vertebrated Animals, Recent and Extinct, contained in the Museum of the Royal College of Surgeons of England, 125
- Shearman (T. S.), the Influence of Sunspots on Terrestrial Magnetic Conditions, 278
- Sheep, Contagious Foot Rot in, Prof. G. T. Brown, 560
- Sheep in Roumania, Carceag, an Enzootic Disease of, V. Babes, 436
- Shells, Land and Freshwater, peculiar to the British Isles, T. D. A. Cockerell, 76; R. F. Scharff, 173
- Shenstone (W. A.), Adhesion of Mercury to Glass in presence of Halogens, 22; Platinous Chloride as a source of Chlorine, 22
- Sherring's (Mr. R. V.) Collections: the Orchids of Grenada, 300
- Shield Tunneling in Loose Ground, G. F. Deacon, 429
- Ship Canal proposed between the Forth and the Clyde, D. A. Stevenson, 429
- Shipbuilding: Launch of the Cunard s.s. *Campania*, 472
- Shipbuilding in Portsmouth Dockyard, W. H. White, F.R.S., 337
- Schufeldt (R. W.), Ridgway on the Humming-birds, R. W. Shufeldt, 465
- Siberia, Russian Geological, &c., Expedition to East, 212
- Sibree (Rev. James), Imérina, the Central Province of Madagascar, 47
- Sidgwick (Prof. H.), Address to International Congress of Experimental Psychology, 363; Report of Census of Hallucinations, 363
- Sidgwick (Mrs. H.), Experiments in Thought-Transference, 364
- Siemens (Alex.), Two Electric Locomotives, 429
- Sight, Motion in the Line of, W. W. Campbell, 64
- Sikkim, Journey in, White and Hoffman, 477
- Silk Dyeing, Printing, and Finishing, Geo. H. Hurst, 75
- Silk Industry at Malta, Byssus, late Rev. H. Seddall, 229
- Silvering Glass Mirrors, Mr. Common, 597
- Simon (L.), Observation of a Meteor, 48
- Sisal Grass in Mexico, the Culture of, 63
- Skeletons, Ancient, from Medum, Egypt, Dr. Garson, 433
- Sketches of British Insects, Rev. W. Houghton, 540
- Sky, Photometric Observations of the Sun and, William Brenand, 284
- Slavonia, Destructive Wind-rush in, Prof. Mohorovićić, 450
- Sleep, a New Theory of, Herr Rosenbaum, 595
- Sloyd, the English, S. Barter, 244
- Smith (E. Wythe), Measurement of Internal Existence of Cells, 237
- Smith (Rev. F. J.): Electric Tram Chronograph, 45; Breath Figures, 236; an Acoustic Method whereby the Depth of Water in a River may be Measured at a Distance, 246; on the Discovery of the Common Occurrence of Palæolithic Weapons in Scotland, 432
- Smith (Dr. W. Ramsay), the Food of Fishes, 405
- Smithells (Prof.), Experiments on Flame, 402
- Smoke Prevention, A. R. Sennett, 431; Colonel E. Dulier, 431
- Snake, a Bird's-egg Eating, 185
- Snakes Sting, Origin of Idea that, Cyril Frampton, 418
- Snake-bites and Wild Beasts in Punjab, Casualties for 1891 from, 133
- Snake-Poison, Proposed Systematic Enquiry (in India) into, 14
- Snow (B. W.), Refraction of Rays of Great Wave-length in Rock Salts, Sylvine, and Fluorspar, 483
- Snow in Scotland, Stags Smothered last Winter by, 228
- Social Habits of Spiders, Dr. Henry C. McCook, 403
- Soil, Micro-organisms of the, Prof. Alfred Springer, 576
- Soils and Manures, John M. H. Munro, 125
- Soirée, the Royal Society, 44
- Solar Atmosphere, Researches on the, G. E. Hale, 192
- Solar Atmosphere, Hydrogen Spectrum in the, M. Deslandres, 401
- Solar Atmosphere, Thermal Absorption in the, E. B. Frost, 400, 455
- Solar Eclipse, the Total, April 15-16, 1893, 201
- Solar Halo, a, J. Edmund Clark, 222
- Solar Observations during First Quarter of 1892, M. Tacchini, 167
- Solar Observations at R. Osservatorio del Collegio Romano, Prof. Tacchini, 334
- Solar Observations at Rome, Prof. Tacchini, 476, 524
- Solar Phenomena, Photographs of, Prof. G. E. Hale, 452
- Solar Photography, Prof. G. E. Hale, 455
- Sollas (W. J.), the Origin of Land Animals, 271
- Sollas (Prof.), Palæozoic Rocks, 428
- Solpugidæ Poisonous? are the, Henry Bernard, 223; W. L. Distant, 247
- Somersetshire, the Recent Discovery of an Ancient Lake-Village in, Dr. R. Munro, 617
- Somerville (Mr.), Petrological Papers, 428
- Sonnblick Observatory, the, 332
- Sound-Carrying Power of Water, A. A. Sennett, 430
- South Kensington Museum, Reopening of the Wrought Iron Work Gallery, 133
- South London Entomological and Natural History Society, 46
- Southam (A. D.), Electrical Engineering as a Profession, and How to Enter it, 608
- Spain: a New Meteorological Journal, 616
- Sparrow's Antipathy to Purple, a, G. D. Haviland, 394
- Specific Conductivity of Thin Films, Profs. Reinold and Rücker, 384
- Spectrophotometer, Prof. Koenig's New, 263
- Spectrum Analysis: the Construction of a Colour Map, Walter Bailey, 23; the Line Spectra of the Elements, Dr. G. Johnstone Stoney, F.R.S., 29, 126, 222, 268; Prof. C. Runge, 100, 200, 247; Stars with Remarkable Spectra, 86; Researches on the Solar Atmosphere, G. E. Hale, 192; the Retardation in the Perception of the Different Rays of the Spectrum, Aug. Charpentier, 192; Comparative Spectra of High and Low Sun, 211; New Results as to Hydrogen, obtained by Spectroscopic Study of Sun, M. Deslandres, 340; Hydrogen Spectrum in the Solar Atmosphere, M. Deslandres, 401; the Lightning Spectrum, A. Fowler, 268; Stokes's Law, its Verification and Interpretation, G. Salet, 364; the Application of Interference Methods to Spectroscopic Measurement, Prof. A. Michelson, 385; the Photography of Spectra in Natural Colours, H. Krone, 449; Nebular Spectrums of Nova Aurigæ, Ralph Copeland, 464; the Spectrum of Nova Aurigæ, Herr E. von Gothard, 620; Recent Spectroscopic Determinations, G. Johnstone Stoney, 513
- Speech of Monkeys, the, Prof. R. L. Gardner, 451; R. L. Garner, C. Ll. Morgan, 509
- Spencer (Prof. Baldwin), the Ceratodus, 161; a Trip to Queensland in search of Ceratodus, 305
- Spherometer, Prof. Prof. Abbe's Improved, 472
- Spider, a Sydney Birdcatching, Mr. Rainbow, 474
- Spiders, the Social Habits of, Dr. Henry C. McCook, 403
- Spiders, Can they Prognosticate Weather Changes? Dr. H. C. McCook, 406
- Spinal Nerve-Impulses and Electromotive Changes, Victor Horsley, F.R.S., 606

- Sponge Deposits discovered near Pantelleria, 474
Spot, the Red, on Jupiter, J. J. Landerer, 229; W. F. Denning, 391
Spotted Woodpecker, the Lesser, Albert C. Mott, 77
Sprawson (F. C.), Pigment Cells of Retina, 339
Spring (W.), Formation of Trithionate by action of Sodine on mixture of Sulphite and Thiosulphate, 94
Spring's (Prof. W.), Brass made by Compression, Mr. Behrens, 216
Springer (Prof. Alfred), Micro-Organisms of the Soil, 576
Spruner von Merz (Dr. Karl), Death of, 598
Stack Pipes and Earth, Necessity for Connection between, W. H. Preece, F.R.S., 430
Stairs (Capt. W. G.), Death and Obituary Notice of, 180
Standards, Time, of Europe, Dr. Hugh Robert Mill, 174
Stansfield (H.), a Portable Instrument for Measuring Magnetic Fields, 93; Experiments on Magnetized Watches, 93
Starling, Imitative Habits of, D. L. Thorpe, 15
Stars: Photographic and Visual Magnitudes of Stars, Prof. J. C. Kapteyn, 41; Star Magnitudes, Captain Abney, 41; Declinations of Stars for Reduction of Variations in Latitude, 65; Distribution of Stars in Space, Kapteyn, 72; Stars with Remarkable Spectra, 86; Stone Circles, the Sun and the Stars, A. L. Lewis, 127; Stars' Proper Motions, J. G. Porter, 230; a New Nebulous Star, E. E. Barnard, 279; New Variable Stars, Prof. Pickering, 334; a New Variable Star, Prof. Schaeberle, 620; Variable Star T Cassiopeie, Cuthbert E. Peek, 443; Comparison Stars of the Planet Victoria, Dr. Gill, 423; Double Star Measures, S. W. Burnham, 496; Double Star Observations, Prof. Asaph Hall, 524; Rutherford Measures of Stars about β Cygni, Harold Jacoby, 619; in *Starry Realms*, Sir Robert S. Ball, F.R.S., 315
Stas (Jean Servais), Text of his Famous Address, 130; Obituary Notice of, 81
State, Science and the, Rt. Hon. T. H. Huxley, F.R.S., 416
Statistics: Die Grundzüge der Theorie der Statistik, Harold Westergaard, 437
Stead (J. A.), the Elimination of Sulphur from Iron, 527
Steel, Experiments with Basic, W. H. White, F.R.S., 114
Stellar Parallax, Researches in, by the Aid of Photography, Prof. Charles Pritchard, F.R.S., 612
Stevens (Dr. G. T.), the Relations of the Motor Muscles of the Eyes to Facial Expression, 86
Stevenson (Chas. A.), Notes on the Progress of the Dioptric Lens as used in Lighthouse Illumination, 431, 514
Stevenson (D. A.), Proposed Ship Canal between the Forth and the Clyde, 429; Petroleum Engines for Fog Signalling, 430
Stevenson (T.), a Treatise on Hygiene and Public Health, 609
Stewart (D. S.), Lepidoptera and the Electric Light, 550
Stewart (Dr. Hunter), the Ventilation of Public Buildings, 143
Stewart (G. N.), the Temperature of the Human Body, 588
Stewart (R. Wallace), an Elementary Text-book of Magnetism and Electricity, 441
Stock (Warrington), Aurora Borealis, 79
Stone (Mr.), Observations of the Moon, 179
Stone Circles, the Sun, and the Stars, A. L. Lewis, 127
Stone Houses, Ancient, in Easter Island, 259
Stone Images of Easter Island, 259
Stoney (Dr. G. Johnstone, F.R.S.), the Cause of the Absence of Hydrogen from the Earth's Atmosphere, and of Water and Air from the Moon, 71; the Line Spectra of the Elements, 29, 126, 222, 268; Recent Spectroscopic Determinations, 513
Strachey (Lieut. G. R., F.R.S.), the Yearly Admissions to the Royal Society, 116
Stratigraphical Geology, Prof. C. Lapworth, F.R.S., 372
Strawberries, Wild, in Ceylon, Mr. Nock, 494
Streitfeld (F. W.), Ethylene Derivatives of Diazoamido-Compounds, 189
Stretton (Clement E.), the Locomotive Engine and its Development, N. J. Lockyer, 538
Struve (H.), the Libration of Hyperion, 68
Stuhlmann (Dr.): Emin Pasha's Return Expedition to the Equatorial Lakes, 110; Additional Particulars of Emin Pasha's Expedition, 302
Sub-fossil Bones of Extinct Birds of New Zealand and the Chatham Islands, H. O. Forbes, 404
Submerged Forest, 128
Sugar-Cane Borers in the West Indies, 531
Sugar-School, the Nebraska, 210
Sully (James), The Human Mind; a Text-book of Psychology, 1
Sully (James), and F. W. H. Myers, International Congress of Experimental Psychology, 261
Sulphur, the Elimination of, from Iron, E. Saniter, J. A. Stead, 527
Sumatra and Engano, Dr. Modigliani's Recent Explorations in Central, Prof. Henry H. Giglioli, 565
Sun: Comparative Spectra of High and Low, 211; the Total Eclipse of the, 1893, John King, William M. Martin, 561; New Result as to Hydrogen obtained by Spectroscopic Study of the Sun, M. Deslandres, 340; Stone Circles, the Sun, and the Stars, A. L. Lewis, 126; Photometric Observations of the Sun and Sky, William Brennand, 284; our Sun's History, Lord Kelvin, P.R.S., 597; Calorific Distribution of Sun-heat at the Surface of the Northern and Southern Hemispheres of the Earth, Le G. de Tromelin, 508; Transmission of Sunlight through the Earth's Atmosphere, Part II., Scattering at Different Altitudes, Capt. W. de W. Abney, F.R.S., 69; an Unusual Sunset, Henry Crew, 391
Sunshine, Amy Johnson, 537
Sun-Spots: Prof. Tacchini, 16; Dr. Lohse's Photographs of, 258; the Influence of, on Terrestrial Magnetic Conditions, T. S. Shearmen, 278; Atmospheric Depressions and their Analogy with the Movements of, M. Camille Flammarion, 280; Observations of, at Lyons Observatory, E. Marchand, 340; Thunderstorms and, 488; Atmospheric Depressions and their Analogy with the Movements of, F. Howard Collins, 489
Sun-Dial, a Mean Time, Major-General Oliver, 230
Surface-Film of Water, the, and its Relation to the Life of Plants and Animals, Prof. L. C. Miall, 7
Survey of India, the Marine, Dr. A. Alcock, 549
Surveying, Photography and, Col. Tanner 407
Sutherland (Alexander), and George M. Dawson, F.R.S., Elementary Geography of the British Colonies, 100
Swan (A. P.), the Effect of Sea-water on the Vitality of the Salmon Fungus, 405
Swan (J. Wilson), Electro Metallurgy, 478
Swan (Robert M. W.), Rain with a High Barometer, 442
Sweden and Norway, Fall of Hail and Dust in, 108
Swift's Comet, 1892, 17; Spectrum of Swift's Comet, W. W. Campbell, 17, Prof. Konkoly, 17; Comet Swift, 1892 (March 6), 65, 87, 230, 258, 423, 453
Switzerland: Terrible Glacier Slip Disaster at St. Gervais les Bains, 254; Theories of Cause of St. Gervais Disaster, 420; Profs. Duparc and Forel, 299; the Lava of July 12, 1892, P. Demontzey, 387
Sydney: Royal Society of New South Wales, 191, 556
Sydney: a Bird-catching Spider, Mr. Rainbow, 474
Sydney Technological Museum taken over by Department of Public Instruction, 85
Symington (Dr. J.), on the Cerebral Commissures in the Marsupialia and Monotremata, 405
Synoptical Geography of the World, 246
Synthesis of Azomide N_3H , Inorganic, A. E. Tutton, 286
Synthesis, Electrolytic, Prof. Crum Brown on, 401
Tablets in the British Museum, the Tel el-Amarna, 49
Tacchini (Prof.), Sun-Spots, 16; Solar Observations during First Quarter of 1892, 167; Solar Observations at the R. Osservatorio del Collegio Romano, 334; Solar Observations at Rome, 476, 524
Tahiti, Pearl-shell Diving at, A. G. Howes, 301
Tait (Prof.), the Laws of Motion, Part II., 262
Tanganyika: Eleven Years in Central Africa, Edward Coode Hore, 6
Tanner (Col.), Photography and Surveying, 407
Tanner (J. E.), Habits of Parasol Ants, 595
Tanning with Chestnut Wood, Baron Bertrand-Geslin, 617
Tarr (R. S.), Origin of Terraces in Glaciated Regions, 311; Effects of Topography on Thunderstorms, 555
Tate (A. Norman), Obituary Notice of, 298
Taverny, Discovery of Remarkable Grotto at, 449
Tea, Lao, 593
Teall (Mr.), Petrological Papers, 428

- Tebbutt's Observatory, Report of, 576
 Technological Museum, Sydney, taken over by Department of Public Instruction, 85
 Teleosteans, on the Formation of Argenteous Matter in the Integument of, Prof. E. G. Prince, 405
 Telephone System in Belgium, the, 399
 Telephone, the Theory of the, Fred T. Trouton, 466
 Telephonic Currents, Improved Form of Electrodynamometer for Measurement of, P. J. Kipp and Sons, 399
 Telescope, Appeal by Harvard Observatory for Donation to Construct Great Refracting, E. C. Pickering, 598
 Tell el-Amarna Tablets in the British Museum, the, with Auto-type Facsimiles, 49
 Temperature of the Brain, Prof. Angelo Mosso, 17
 Temperature, Gas Compression and, a Question in Physics, Prof. H. A. Hazen, 55
 Temperature of the Human Body, L. Cumming, 541; G. N. Stewart, 588; Dr. W. Hale White, 588
 Temperature, the Report on Underground, 383
 Temperature, the Sense of, Dr. Dessoir, 340
 Temperature and Protoplasmic Movements, on the Natural Relations between, Dr. J. Clark, 404
 Tennyson (Lord), the Death of, 572
 Tercentenary Celebration, University of Dublin, 203
 Terminal Phalanges in Primates, Hairlessness of, Dr. Geo. J. Romanes, F.R.S., 247
 Terra-cotta Roofing Tiles, the Older Forms of, E. S. Morse, 474
 Terrestrial Latitudes, the Variation of, M. Antoine d'Abbadie, 65
 Testimonial, the Varley, 369
Tetrastemma in England, W. Blaxland Benham, 611
 Therapeutics: Elements of Materia Medica and, C. A. Armand Semple, 28; an Introduction to Therapeutics, T. Lauder Brunton, M.D., 172; a Shaking Cure for Nervous Complaints, Dr. Charcot, 451; Treatment of Cancer and Cholera by Testicular Liquid, M. Brown-Séquard, 484
 Thermal Absorption in the Solar Atmosphere, E. B. Frost, 400, 455
 Thermal Conductivities, on a Method of Determining, C. H. Lees, 385
 Thermal Radiation in Absolute Measure, Dr. J. T. Bottomley, F.R.S., 603
 Thermal Variation of Electrical Resistance of Mercury, C. E. Guillaume, 508
 Thermodynamics: a Question in Physics, Prof. H. A. Hazen, 55; Poincaré's Thermodynamics, 76; Thermodynamische Studien, J. Willard Gibbs, 245
 Thiroloix (A.), Pancreatic Diabetes, 412
 Tholozan (J. D.), Places of Origin of Cholera Epidemics, 555
 Thomas (Cyrus), Alleged Discovery of the Key to the Central American Inscriptions, 160
 Thomas (Rose Haig), Protective Mimicry, 612
 Thompson (Prof. Silvanus P., F.R.S.): Breath Figures, 236; Printing Mathematical Symbols, 513
 Thomson (Prof. Elihu), Prize for Development of Theoretical Knowledge of Electricity, 451
 Thomson (Dr. James, F.R.S.): Death of, 38; Obituary Notice of, 129
 Thomson (John), Effects of Rainfall in Formosa, 406
 Thomson (J. Arthur), Outlines of Zoology, 241
 Thomson's (Prof. J. J.) New Edition of Clerk Maxwell's Treatise on Electricity and Magnetism, 38; Pressure at which Electric Strength of Gas is a Minimum, 143
 Thomson's (Mr. Joseph) Journey to the Lake Bangweola Region, 620
 Thomson (William J.), Easter Island, 258
 Thomson (W.) and James Blaikie, Geometrical Deductions, 291
 Thoroddsen (Th.), Discovery of Unknown Lake in Iceland by, 477
 Thorpe (D. L.), Imitative Habits of Starling, 15
 Thorpe (Prof. T. E.), Model illustrating General Phenomena of Explosions through Dust Particles in explanation of Colliery Explosions, 44
 Thunderbolt, a so-called, Dr. Oliver J. Lodge, F.R.S., George H. Hewitt, 513
 Thunderstorms in New England during 1887, R. de C. Ward, 555; Effect of Topography on Thunderstorms, R. S. Tarr, 555
 Thunderstorms and Sun-Spots, 488
 Tibet, Little, Mrs. Bishop's Journey to, 135
 Tibet, Lesser, Mrs. Bishop, 405
 Tibet, to the Snows of, through China A. E. Pratt, 150
 Tidal Phenomenon at Kiangchow, Hainan, China, E. H. Parker, 63
 Tide-motor, a, F. Pardon and H. S. Walters, 429
 Tierra del Fuego, Argentine, Señor Julio Popper's Exp edition to, 135
 Tiles, Terra Cotta Roofing, the Older Forms of, E. S. Morse, 474
 Tillo (A. de), the Division according to Terrestrial Latitudes and Longitudes of the Geological Groups on the Earth, 24
 Timchenko's Anemometer, Prof. Klossovsky, 594
 Time, International, Major the Hon. E. Noel, 423
 Time Standards of Europe, Dr. Hugh Robert Mill, 174
 Tin District in Burma, the, H. Warth, 522
 Tite (G.), a Hydro-silicate of Cadmium, 144
 Toads, a Curious Habit of Horned, O. P. Hay, 596
 Toba Indians of the "Gran Chaco," Weapons and Articles of Clothing used by the, J. Graham Kerr, 432
 Tobacco Exhibit at the Chicago Exhibition, the Kentucky, 278
 Todas, the, 160
 Tooke (W. Hammond), the God of the Ethiopians, 78
 Tooth Culture and White Bread, Sir James Crichton-Browne, 229
Torpedo, *Gymnotus*, *Mormyrus*, and *Malapterurus*, on the Origin of the Electric Nerves in the, Prof. G. Fritsch, 404
 Tortoises of Aldabra Island, Seychelles, the Gigantic, Riseley Griffiths, 398
 Total Solar Eclipse, April 15-16, 1893, 201; John King, William M. Martin, 561
 Town Air, Impurities of, Dr. G. H. Bailey, 402
 Town Refuse, Disposal of, Prof. Geo. Forbes, 429
 Townsend (C. H.), Pearl Fishery of Gulf of California, 333
 Townshend (Chauncey Hare) Scholarships, the, 449
 Trajectories of Elongated Projectiles, Calculation of, Rev. F. Bashforth, 366
 Transformers, 90
 Transmission of Acquired Characters, the Bearing of Pathology upon the Doctrine of the, Henry J. Tylden, 302
 Transmission of Acquired Character through Heredity, Prof. C. V. Riley, 504
 Trapezium in the Orion Nebula, the, Dr. L. Ambronn, 334
 Traube (Dr. Wilhelm), Silver Salt of Sulphimide obtained by, 551
 Tree-Structure, Influence of Electric Light on, Gaston Bonnier, 532
 Trelease (W.), Revision of the Species of *Rumex* occurring North of Mexico, 40
 Triassic Fossils: Brachiopoden der Alpinen Trias, A. Bittner, F. A. Bather, 25
 Trigonometry, Elementary Plane, R. C. J. Nixon, 488
 Trinidad Field Naturalists' Club, 522
 "Triumph," the, a New Chain-making Machine, 527
 Tripp (W. B.), Levels of River Vaal at Kimberley, South Africa, compared with Rainfall of Watershed, 95
 Tromelin (Le G. de), Calorific Distribution of Heat of Sun at Surface of Northern and Southern Hemispheres of Earth, 508
 Tropical Cyclones, Maxwell Hall, 393
 Trouton (Fred T.), Wave-Propagation of Magnetism, 56; the Theory of the Telephone, 466
 Trouton (Dr. F. T.) on a Periodic Effect which the Size of Bubbles has on their Speed of Ascent in Vertical Tubes containing Liquid, 385
 Trouve (G.), Luminous Fountain built for Madame Patti at Craig-y-Nos by, 549
 Trouvelot (E. L.), the Planet Venus, 468; Remarkable Prominences, 258
 Tuberculous Vaccination of Dogs, Héricourt and Ch. Richet, 168
 Tuberculosis, Earthworms and, Lortet and Despeignes, 263
 Tuckwell (W.), Bees for Pleasure and Profit, G. Gordon Samson, 510
 Tunicata, on the Presence of Atrial Tentacles in Various Genera of Prof. W. A. Herdman, F.R.S., 405
 Tuning-fork, Direct Determination of the Gravitative Constant by Means of a, A. M. Worthington, 490

- Tuning-fork, Determination of G by Means of a, Prof. A. M. Worthington, 561
- Tupaia javanensis*, the Javanese Insectivore, 160
- Turacin, Prof. A. H. Church, F.R.S., 22
- Turkestan, Chinese: Discovery of an Ancient Birch-bark (Sancrit) Manuscript by Lieut. Bower, Dr. Hoernle, 370
- Turner (Dr. Dawson), Experiments on the Electric Resistance of Metallic Powders, 384
- Turner (F.), the Carob-Bean Tree in New South Wales, 210
- Turner (T.), Estimation of Slag in Wrought Iron, 189
- Turner (Sir William), Coiffure of a Kanaka Labourer, 433; Human Osteometry, 433
- Tutton (A. E.), the New Element, Masrium, 79; Inorganic Synthesis of Azoisimide N_3H , 286
- Tylden (Dr. Henry J.), the Bearing of Pathology upon the Doctrine of the Transmission of Acquired Characters, 302; Death of, 331
- Tyrol, South, Landslips in the, Miss Ogilvie, 428
- Uganda Question, the, 280
- Uganda, Return of Capt. Lugard from, 552
- Underground Temperature, the Report on, 383
- United Kingdom, an Ethnographical Survey of the, 615
- United States: University Extension Movement in, 15; Pacific Coast Fisheries, 63; difficulty of obtaining Iron adapted for Electrical Purposes in America, W. S. Key, 133; Sal-Soda Manufacture in the United States, Prof. C. F. Mabery, 332; Forestry in, the Annual Loss to Government through Thieves and Fire, M. Fernow, 454; Volcanic Craters of, Prof. R. T. Hill, 456; the American Association for Advancement of Science in the United States, W. Kent, 494; Coast Line of United States, 525; United States, Gas Engines in, 595
- Units, Discussion at British Association, Prof. Oliver J. Lodge, F.R.S., 368
- Units, Discussion on the Nomenclature of, Prof. Oliver J. Lodge, F.R.S., 383
- Universities: Chicago University, 594; the Proposed Laboratory for Electrical Engineering at University College, 227; Prof. Ramsay's Report as Dean of the Faculty of Science at University College, 253; Agricultural Education at University College of North Wales, Bangor, 474; University of Dublin: Tercentenary Celebration, 203; University Intelligence, 21, 140, 163, 186, 213, 338, 411, 579, 602, 627; University of Japan, Imperial, 551; a Professorial University of London, 121; New London University, 151, 169; the London University of the Future, 193; University Extension Movement in United States, 15; University Observatory, 301
- Unwin (W. Cawthorne, F.R.S.), Opening Address in Section G of the British Association, 355
- Urine, Estimation of Uric Acid in, F. G. Hopkins, 236
- Ussher (Mr.), Petrological Papers, 428
- Vacation Courses, the Edinburgh Summer Meeting, 449
- Vaccination of Dogs, Tuberculous, Héricourt and Ch. Richet, 168
- Vaillant (Léon), Alimentation in Ophidia, 364
- Valley Fog, Reflection on, J. Edmund Clark, 514
- Variable Nebulæ, E. E. Barnard, 211
- Variable, a New, T. E. Espin, 17
- Variable Star, a New, Prof. Schaeberle, 620
- Variable Star T Cassiopeiæ, Cuthbert E. Peek, 443
- Variable Stars, New, Prof. Pickering, 334
- Variation of Latitude, Dr. Chandler, 211, 476
- Variation of Latitude at Pulkova, B. Wanach, 524; S. Kostinsky, 524
- Variations in Latitude, Declination of Stars for Reduction of, 65
- Variations, Magnetic, William Ellis, 67
- Variations, Periodic, of Alpine Glaciers, F. A. Forel, 386
- Variation of Terrestrial Latitudes, the, M. Antoine d'Abbadie, 65
- Varley Testimonial, the, 369
- Vascular Cryptogams, Notes on the Morphology of the Spore-bearing Members in the, Prof. F. O. Bower, 555
- Vatican Observatory, Pubblicazioni (vol. ii.) of, 299
- Veley (V. H.), Conditions of Formation and Decomposition of Nitrous Acid, 188
- Veeder (Dr. M. A.), Aurora, 29
- Ventilation of Public Buildings, the, Dr. Hunter Stewart, 143
- Venus, the Planet, E. L. Trouvelot, 468
- Venus, Determination of Angle of Polarization of, J. J. Landerer, 240
- Vertebrates, Fossil, the Washington Collection of, R. Lydekker, 295
- Vesuvius, Mount, the Eruption of, 132, 277
- Vialt, (M.), Physiological Effects of Mountain Climates, 240
- Victoria, the Planet, Comparison Stars of, Dr. Gill, 423
- Victoria: Victoria Field Naturalists' Club; Excursion to the Grampians (Australia), 63; Development of Raisin Industry in Victoria, J. Knight, 256; Proceedings of Royal Society of Victoria, 459; Movement for Prevention of Wanton Destruction of Birds in Victoria, 495; Some Victorian Lepidoptera, Ernest Anderson, 595
- Vineyards of Europe, Statistics of the, 450
- "Viper" Bite, a, W. A. Rudge, 270
- Virchow (Prof.) on Learning and Research, 593
- Vision, a 5-Sensation Theory of, E. Hunt, 485
- Visual, Photographic and, Magnitudes of Stars, Prof. J. C. Kapteyn, 41
- Vital Absorption, Prof. Waymouth Reid, 403
- Viticulture in the Punjab, 86
- Vivisection at the Church Congress, 557
- Vivisection Controversy, the, 593
- Vogel's (Prof.) Method of Colour Photography, 263
- Voit (Prof.), the Physiological Effect of a Farinaceous Diet on Animals, 618
- Vole Plague in the Border Districts, the, 398
- Volcanoes: the Eruption of Mount Etna, 254, 276, 299, 331, 361, 371, 398, 450; the Present Eruption of Mount Etna, M. Wallerant, 460; Gaetano Platania, 542; Volcanic Eruption at Great Sangir, 287, 299, 332; the Eruption of Mount Vesuvius, 132, 277; Active Lunar Volcanoes, Prof. Pickering, 134; Volcanoes, Past and Present, Edward Hull, F.R.S., 220; Miss C. F. Gordon Cumming's Paintings of Volcanic District in New Zealand, 254; the Origin of Coon Butte, Arizona, Prof. G. K. Gilbert, 454; Craters of United States, Prof. R. T. Hill, 456; Further Notes on a Recent Volcanic Island in the Pacific, Capt. W. J. L. Wharton, F.R.S., 611
- Volga, Poisoning by Naphtha of the, 421
- Volucella*, the Alleged "Aggressive Mimicry" of, William Bateson, 585
- Vulcano, Eruption of, (August 3, 1888, to March 22, 1890), G. W. Butler, 117
- Wager (Harold), on the Structure of *Cystopus candidus*, 405
- Wahrlich (W. K.), Structure of Bacterial Cells, 39
- Waikiki, Latitude Observations at, Mr. Preston, 64
- Walcott (C. D.), Cambrian Rocks of Virginia, 311
- Wales, University College (Bangor) of North, Agricultural Education at, 474
- Walker Prize of Boston Natural History Society awarded to Prof. J. D. Dana, the, 158
- Walker (J.), Preparation of Alkyl Iodides, 312
- Walker (J. W.), Resolution of Lactic Acid into its Optically Active Components, 311
- Wallace (Dr. Alfred R.), Award of Linnean Society's Gold Medal to, 37; Correction in "Island Life," 56
- Wallace (Prof. Robert), Egyptian Agriculture, 15
- Wallaschek (Dr.), an Ethnological Enquiry into the Basis of our Musical System, 238
- Wallerant (M.), the Present Eruption of Mount Etna, 460
- Walters (H. S.), a Tide-motor, 429
- Wanach (B.), Variation of Latitude at Pulkova, 524
- Ward (F. W.), Report on the Relations of Australasian Fruit Production to the English Market, 39
- Ward (R. de C.), Thunderstorms in New England during 1887, 555
- Warrington (R., F.R.S.), the Nitric Organisms, 151
- Warner (Dr. Francis), Co-ordination of Cellular Growth and Action by Physical Forces, 404; Observations as to the Physical Deviations from the Normal as seen among 50,000 Children, 433
- Warth (H.), the Tin District in Burma, 522
- Washington Collection of Fossil Vertebrates, R. Lydekker, 295

- Wasp-life, a Wave of, G. W. Peckham, 611
- Water: the Surface-film of, and its Relation to the Life of Plants and Animals, Prof. L. C. Miall, 7; Variations in Temperature of Water suddenly Compressed to 500 Atmospheres between 0° and 10°, Paul Galopin, 240; an Aconstic Method whereby the Depth of Water in a River may be Measured at a Distance, Frederick J. Smith, 246; Sound-carrying Power of Water, A. R. Sennett, 430; Impure Water in Bread, 514; Electricity of Waterfalls, Ph. Lenard, 484; Water Supply, London, for September 1892, Profs. W. Crookes and W. Odling, 617; on the Relative contamination of the Water-surface by Equal Quantities of Different Substances, Miss Agnes Pockels, 418; Physical Condition of the Waters of the English Channel, H. V. Dickson, 384; Waterspouts in East Yorkshire, J. Lovel, 246
- Waters (B. H.), Primitive Segmentation of Vertebrate Brain, 339
- Waterston's (J. J.) Theory of Gases, 30
- Watson (A. J.), the Protective Device of an Annelid, 7
- Watson (Dr. Forbes), Death of, 331
- Watson (G.), Refuse-destroyer Question, 429
- Watson (Rev. H. W., F.R.S.), on a Proposition in the Kinetic Theory of Gases, 29; Maxwell's Law of Distribution of Energy, 100
- Watts' Dictionary of Chemistry, Forster Morley and M. M. Pattison Muir, Sir H. E. Roscoe, F.R.S., 242
- Wave of Wasp-life, a, G. W. Peckham, 611
- Wave-Propagation of Magnetism, Fred. T. Trouton, 56
- Waves, the Use of Oil for Calming, 228
- Weapons, Savage; a Peculiar form of Womerah, R. Etheridge, jun., 86
- Weapons and Articles of Clothing used by the Toba Indians of the Gran Chaco, J. Graham Kerr, 432
- Weather Changes? Can Spiders Prognosticate, Dr. H. C. McCook, 426
- Weeds, Worst, at Chicago, Projected Exhibition of, 14
- Weight, Prof. A. G. Greenhill, F.R.S., 247
- Weinek (Dr. L.), Lunar Photography, 257
- Weir's (Capt.), Azimuth Diagram, 44
- Weismann (Dr. A.), Essays on Heredity, 558
- Weissensee, the, Carinthia, Physical Conditions of, Dr. K. Grissinger, 525
- Welsh (Jules), Miocene Formations of Western Algeria, 628
- West Indian Fauna in South Florida, T. D. A. Cockerell, 458
- West Indies, Sugar-cane Borers in the, 531
- Westergaard (Harold), Die Grundzüge der Theorie der Statistik, 437
- Westminster Technical Institute: the Townshend Scholarships, 449
- Whaling Expedition, Sailing of the Dundee Antarctic, 477
- Wharton (Capt. W. J. L., F.R.S.), Further Notes on a Recent Volcanic Island in the Pacific, 611
- Whipple (G. M.), Comparison of Richard's Anémo-cinémographe with Standard Beckley Anemograph + Kew Observatory, 95
- Whirlwinds in the South Indian Ocean, Robert H. Scott, 294
- White Rainbow, M. Mascart, 532, 555
- White Rhinoceros, the, W. L. Distant, 29
- White (C.), Journey in Sikkim, 477
- White (William), Aurora Australis, 368
- White (W. H., F.R.S.), Experiments with Basic Steel, 114; Shipbuilding in Portsmouth Dockyard, 337
- White (Dr. W. Hale), the Temperature of the Human Body, 588
- Whitman (Prof. F. P.), Magnetic Disturbances caused by Electric Railways, 455
- Whitmore (John), Method of Increasing Range of Capillary Electrometer, 311
- Whyte (Alexander), Mount Milanji in Nyassaland, 482
- Whymper (Edward), Supplementary Appendix to Travels amongst the Great Andes of the Equator, H. J. Elwes, 147
- Wiedemann's Annalen der Physik und Chemie, 483, 602
- Wien (Dr.), Experiment on the Measurement of High Temperatures, 263, 602
- Wigham (J. R.), a New Giant Lighthouse Lens, 71
- Wilde (Henry, F.R.S.), on the Origin of Elementary Substances and on some New Relations of their Atomic Weights, Prof. R. Meldola, F.R.S., 568
- Williams's Frog Heart Apparatus, Prof. R. Kobert, 177
- Williams (Juliet N.), Carnivorous Caterpillars, 128
- Williams (W.), Relation of Dimensions of Physical Quantities to Directions in Space, 237
- Williamson (Prof. W. C., F.R.S.), Two Common Processes of Mineralization of Fossil Remains illustrated by Fossil Nautilus and Starfish, 70
- Willis (J. C.), Gynodiocism in the Labiatæ, 167
- Wilson (Sir Daniel), Death of, 361
- Wilson (Dr. Thomas), Analysis of Fossil Bones from the Natchez Bluff, Mississippi, 255
- Winder (C. A.), Failures in Necks of Chilled Rolls, 527
- Wines, the Analysis of, Dr. L. Magnier de la Source, 170
- Wingham (A.), the Elimination of Sulphur from Iron, 115
- Winnecke's Periodic Comet, 1892, 110
- Winter, Range of the Sanderling in, Prof. Alfred Newton, F.R.S., 177, 222
- Winternitz (Herr), the Antiseptic Properties of Milk, 550
- Wire Standards of Electric Resistance, Dr. Lindeck, 383
- Wister (Geo. I. T.), Endowment of Museum of Anatomy at Pennsylvania University by, 38
- Wolpai, a Maid of, Dr. Shufeldt, 451
- Women and Musical Instruments, Otis T. Mason, 561
- "Womerah," a Peculiar Form of, R. Etheridge, jun., 86
- Wood Hole Marine Biological Laboratory, the, 493
- Wood-work, the English Slöyd, S. Barter, 244
- Woods (E. H.), New Design of Electric Locomotive, 430
- Woodpecker, the Lesser Spotted, Albert C. Mott, 77
- Woodward (B. B.), Growth and Structures of Shell in Neritidæ, 215
- Woodward (C. J.), Arithmetical Chemistry, 610
- Woodward's (Prof. R. S.) Iced-bar Base Apparatus, 455
- World, Synoptical Geography of the, 246
- Worthington (Prof. A. M.): Dynamics of Rotation, an Elementary Introduction to Rigid Dynamics, 4; Direct Determination of the Gravitative Constant by means of a Tuning-fork, a Lecture Experiment, 490; Determination of G by Means of a Tuning-Fork, 561
- Wright (C. R. Alder, F.R.S.), the Threshold of Science, 173; Certain Ternary Alloys, vi., Aluminium, &c., 188
- Wrightson (Prof.), Live Stock, 76
- Wundt's Philosophische Studien, 133
- Yale College Observatory Report, Mr. Brown, Dr. Elkin, 280
- Year, Origin of the, J. Norman Lockyer, F.R.S., 104
- Yeast, Hydrolytic Functions of, J. O'Sullivan, 190
- Yellow Fever, Immunity of the African Negro from, Dr. C. Creighton, 200, 222
- Yemen, Journey through, Walker Harris, 408
- Vendell (Mr.), Light-Variations of Y Cygni, 134
- Yorkshire College, Leeds; the County (Agricultural) Lectures to Farmers, 300
- Yorkshire Naturalists' Union, 107
- Yukon Expedition, Mr. Schwatka's, 180
- Zakrzewski (J. von), Specific Gravity and Fusion of Ice, 602
- Zebra's Stripes, Dr. S. Schönland, 6
- Zehnder (L.), Method of exhibiting Hertzian Oscillations to a large Audience, 573
- Zoology: the Zebra's Stripes, Dr. S. Schönland, 6; Zoological Gardens, additions to, 16, 41, 64, 86, 110, 134, 161, 179, 211, 229, 257, 279, 301, 333, 362, 371, 400, 422, 451, 475, 496, 524, 551, 575, 597, 619; Zoological Gardens, the Madagascar Pratincole at the, 616; the White Rhinoceros, W. L. Distant, 29; Award of Linnean Society's Gold Medal to Dr. A. R. Wallace, 37; Bibliothek des Professors der Zoologie und Vergl. Anatomie, Dr. Ludwig von Graff, in Graz, 54; Zoological Society, 70, 142, 215; Phases of Animal Life, Past and Present, R. Lydekker, 74; *Peripatus* from St. Vincent, R. J. Pocock, 100; the Oviparity of the larger Victorian *Peripatus*, Dr. Dendy, 239; *Peripatus* rediscovered in Jamaica, Grabham and Cockerell, 514; the Coming Moscow International Congress of Prehistoric Zoology, 108; Zoological Society of Philadelphia, 133; Geographical Distribution of the Land-Mollusca of the Philippine Islands, Rev. H. H. Cooke, 142; Death and Obituary Notice of Hermann Burmeister, 176; A Bird's-Egg Eating Snake, 185; Growth and Structure of Shell in Neritidæ, B. B. Woodward, 215; Outlines of Zoology, J. Arthur Thomson, 241; Hairlessness

of Terminal Phalanges in Primates, Dr. Geo. J. Romanes, F.R.S., 247; a Handbook on the Management or Animals in Captivity in Lower Bengal, Ram Bramha Sanyal, 314; the Crinoids and Echinoids of the North Atlantic, Dr. Danielssen, 333; a Plea for an International Zoological Record, E. A. Minchin, 367; an International Zoological Record, F. A. Bather, 417; the Gigantic Land Tortoises of Aldabra Island, Seychelles, Riseley Griffiths, 398; Dr. Henry C. McCook on the Social Habits of Spiders, 403; Prof. Lloyd Morgan, the Method of Comparative Psychology, 404; J. E. S. Moore on the Relationships and Role of the Archoplasmic Body during Mitosis in the Larval Salamander, 404; Dr. G. Mann on the Origin of Sex, 404; Dr. J. Beard on Larvæ and their Relations to Adult Forms, 404; Observations on the Development of the Posterior Cranial and Anterior Spinal Nerves in Mammals, Dr. Arthur Robinson, 405; the Cranial Ganglia, Prof. J. C. Ewart, 405; Prof. W. A. Herdman,

F.R.S., on Geographical Distribution of Ascidians, and on the Presence of Atrial Tentacles in various genera of Tunicata, 405; Dr. J. Symington on the Cerebral Commissure in the Marsupialia and Monotremata, 405; Prof. J. Playfair McMurrich, the Early Development of the Isopods, 406; Prof. G. B. Howes and J. Harrison on the Skeleton and Teeth of the Australian Dagong, 406; Dr. H. G. McCook, Can Spiders Prognosticate Weather changes? 406; a Suggestion for the Indexing of Zoological Literature, T. D. A. Cockerell, 442; the West Indian Fauna in South Florida, T. D. A. Cockerell, 458; Animal Coloration: an Account of the Principal Facts and Theories relating to the Colour and Markings of Animals, F. E. Beddard, F.R.S., Edward B. Poulton, F.R.S., 533; Fur-bearing Animals in Nature and Commerce, 605
Zuntz (Prof.), Effects of Muscular Exertions on Alkalinity of Blood of Carnivora as compared with Herbivora, 340



A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE.

"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.

THURSDAY, MAY 5, 1892.

TEXT-BOOKS OF PSYCHOLOGY.

The Human Mind: a Text-book of Psychology. By James Sully, M.A., LL.D. Two Vols. (London: Longmans, 1892.)

Hand-book of Psychology: Feeling and Will. By James Mark Baldwin, M.A., Ph.D. (London: Macmillan, 1891.)

Text-book of Psychology. By William James. (London: Macmillan, 1892.)

IN his treatise on the "Human Mind," Mr. Sully has not attempted to supplant, but rather to supplement, his own admirable "Outlines of Psychology." The method in the two works is the same, and the arrangement of the subject-matter, though it differs slightly in some details, is, on the whole, essentially and in principle similar. A chapter has been added on the physical basis of mental life, dealing briefly with the nervous system and with neuro-psychical correlations. But the author wisely refers his readers to text-books of physiology or to manuals of physiological psychology for a full treatment of these matters. He also gives an adequate account of the recent experimental researches on the nature and conditions of some of the simpler responsive activities, but is not blind to the difficulties and uncertainties of this so-called experimental psychology.

It is well known that Mr. Sully lays great stress on the genetic method in psychology.

"It is evident," he says, "that we require a knowledge of these psychical elements [reached by analysis] and of the laws of their combination, in order to account for the complex products of the mature human consciousness. Now, the perfect account of a thing means the history of that thing from its first crude to its completed form. When the psychologist has succeeded by analysis, aided by objective observation and hypothesis, in obtaining the requisite data, he proceeds to reconstruct the course of psychical development."

From the standpoint of biology and evolution, this genetic aspect of psychology is of especial importance,

and we cannot be too grateful to Mr. Sully for his able, clear-headed, and, on the whole, cautious presentation of this view of the matter. But it is one which, as Mr. Sully himself well knows, is of peculiar difficulty. Few of us remember anything of the genesis of our modes of psychological procedure in the early days of our life; and when we do remember scraps here and there, we are only too apt to interpret them in terms of our adult procedure, with which we are so much more familiar. It is, moreover, well nigh impossible for the psychologist to realize the nature of the psychical processes of the child, so that infant psychology is a field wherein we may suppose much and can prove little. Mr. Sully again and again appeals to the supposititious child.

"The child, for example," he says, "begins to note that some varieties of living things, *e.g.* flies or birds, die. He then compares these results, and, extracting the common relation, finds his way to the more comprehensive generalization, 'All animals die.' Later on he compares this result with what he has observed of flowering and other plants, and so reaches the yet higher and more abstract generalization, 'All living things die.'"

Of course there may be a child here and there who proceeds, or, in the absence of all instruction in the matter, might proceed, thus. But children and uneducated persons very rarely reach a general and universal concept, properly so called. The child notes that its pets and other animals die or are killed: this begets a stronger and stronger expectation that other animals will likewise die or be killed some day; and the expectation may rise to practical certainty without anything like a universal concept taking even vague and indefinite shape in the mind. We therefore question the statement that "by induction the child reaches a large number of general or universal judgments," though it is unquestionable that he may have a large number of expectations which the logician may cast in universal form. He may even state them in universal form himself, and say, "Animals die," "Apples have pips," the language he uses being here, as in so many cases, in advance of his conceptions.

In the discussion of the development of the moral sentiment, the distinctively moral feeling is perhaps

hardly differentiated with sufficient care from the merely prudential. The prudential does not pass up into the moral on the same line of development; but the prudential and the moral are separate and sometimes widely divergent lines of development. It is sometimes said that the prudential is self-centred while the moral is social. But is not what is socially right different from what is socially prudent? Or, in other words, is not morality something other than social prudence? Remorse for wrong has a different psychological quality from regret for error, no matter what the social implications of the error may be. Mr. Sully does not seem to have sufficiently brought out this distinction in his account of the genesis of the moral sense.

But though there may be room for some difference of opinion as to the exact course of genetic development by which our more complex and more highly evolved psychological states have been reached, there can be no question that Mr. Sully's painstaking and thoughtful discussion of their possible or probable mode of evolution is and will long remain of real and sterling value. No living writer has paid more attention to this important aspect of psychology.

There is one more point on which we may comment before we pass on to Prof. Baldwin's work. It is the doctrine of residual fusion.

"The simplest form of assimilation," we read, "is to be found in that process by which a present sensation (or sensation complex) is re-apprehended or 'recognized' as something familiar. . . . What takes place here is the calling up by a present sensation of the trace or residuum of a past sensation (or sensations), which trace merges in or coalesces with the new sensation, being discernible only through the aspect of familiarity which it imparts to the sensation. . . . We have to conceive of the nervous process somewhat after this manner. A given central element or cluster of elements is re-excited to a functional activity similar to that of a previous excitation. The residuum of this previous activity or surviving 'physiological disposition' somehow combines with and modifies the new activity; which blending of nervous processes has for its psychical correlative the peculiar mode of consciousness known as recognition, sense of familiarity, or identification. Here, however, our physiological psychology seems to be more than usually conjectural."

And again—

"In recognition the percept and the image are fused, the presence of the latter being indicated merely in the peculiar appearance of familiarity which the percept assumes."

This so-called "fusion" of the percept and the image seems to us an awkward figure by which to describe the facts. The sequence of states of consciousness in the case of (a) practical or perceptual, and (b) reflective or conceptual recognition, seems to be briefly as follows. Suppose I recognize a man, A, as one whom I have met before, say at a dinner party. Then I have first a percept

A
 $g.n.s.y$, where A is the individual in question in the focus of consciousness, and $g.n.s.y$ the "fringe" generated by his present surroundings, more or less out of focus. This percept is immediately followed by the image

A
 $s.r.t.b$, where A appears amid different surroundings.

This constitutes practical or perceptual recognition. In

reflective or conceptual recognition there follows an act of introspection (or retrospection), whereby the common central element in the two states of consciousness is explicitly identified. There is no fusion in either case, except in so far as sequent states of consciousness have a central or focal element which is identifiable. If we simply recognize A as someone we have met somewhere, we do not remember where, there is associated with the focal image, A, an indefinite fringe of pastness serving to differentiate it from the percept with its fringe of present surroundings; and if, on the other hand, we recognize A as a quite familiar person whom we have seen again and again amid all sorts of surroundings, there is a fringe which we can only describe as involving both pastness and frequency. In the case of the animal or the child, recognition presumably does not pass beyond the practical stage—that is to say, a percept A with this fringe is followed by an image A with that fringe. Reflective recognition, involving retrospection and a comparison of the two images (A with this fringe and A with that fringe) and the identification of the element common to both, is a product of conceptual processes of later genesis.

In conclusion, it is sufficient to say that by his treatise on the human mind Mr. Sully fully sustains his reputation as a psychologist.

In his volume on "Feeling and Will," Prof. Baldwin has completed the survey of the mind begun in his "Senses and Intellect."

The first three chapters contain an adequate physiological introduction. There is, however, one statement which seems to us awkward if not misleading. After briefly noting the views that have been suggested as to the relation of consciousness to the so-called nervous conditions, Prof. Baldwin says:—

"It has become apparent that nervous activity, considered by itself alone, does not bring us into the range of psychological science. However we may decide the inquiry as to whether such activity is ever entirely free from consciousness, it is yet true that it may be quite outside of what is called the individual's consciousness. . . . In other words, the greater part of our ordinary nervous reactions are not above the threshold of our conscious lives. So we reach a distinction between sentience as a nervous property and sentience as a conscious phenomenon, between *sentience* and *sensibility*. Sensibility is synonymous with the usual consciousness of the individual's experience, and sentience is the nervous function which may or may not be accompanied by consciousness or inner aspect in general. . . . The transition from simple sentience to the full consciousness is through a stage of subconscious modification."

With no desire to be hypercritical, this does not seem to us altogether satisfactory. Sentience is spoken of as "the *nervous function* which may or may not be *accompanied by consciousness*." The words we have italicised seem to imply that sentience belongs to the physical, not the psychical order of existence. If so, the "transition from simple sentience to full consciousness" is a transition from the physical to the psychical order, and consciousness becomes a mode of energy. We do not think that this is the author's meaning; but in that case it would be well so to define sentience as to clearly show that though it may not rise to the level of consciousness, it is none the less of the conscious or psychical order.

When we leave the physiological and enter the psychical field, appeal is constantly made to the "principle of apperception" or "selective synthesis." But does not the author go somewhat beyond what is justified by our very imperfect knowledge of the facts of cerebral physiology when he asserts that "after we enter consciousness, we find a principle of apperception to which there is no analogy in physiological integration"? Elsewhere he says: "Now, as a fact, the great principle of mental organization, selective synthesis, finds no apparent counterpart in physics." In direct opposition to this view, we venture to contend that nothing is more remarkable than the parallelism (if it be no more) of selective synthesis in the physical and the psychical spheres. In the physical world this is best seen in the formation of chemical compounds and their segregation in crystalline form. In the psychical world it is seen in the so-called principle of apperception. This is, however, only the expression in the conceptual sphere of a principle which, stripped of all metaphysical implications, must be extended to the whole range of psychical life, as a general law of psychogenesis. In the organic world (at any rate the animal world) the two principles (if two they be) meet. And if, notwithstanding the splendid work done in bionomics, through the application of "natural selection" to the elucidation of the problem, we have not yet reached a scientific expression of selective synthesis in organic life and growth, this is no proof that there is no such selective synthesis.

In accordance with the general principles he adopts, Prof. Baldwin divides feeling into the two great classes of (1) sensuous feeling, and (2) ideal feeling. Sensuous feeling relates to the bodily functions. "Sensuous pleasure," says the author, "may be defined as the conscious effect of that which makes for the continuance of the bodily life or its advancement; and sensuous pain, the conscious effect of that which makes for the decline of the bodily life or its limitation." Ideal feelings, on the other hand, are the modifications of sensibility which accompany the exercise of the apperceptive function. Ideal pleasure may be defined as "the conscious effect of that which makes for the continuance of the apperceptive life or its advancement; and ideal pain, the conscious effect of that which makes for the decline of the apperceptive life or its limitation." But though sensuous feeling can have no reference to the conceptual or apperceptive life, ideal feeling has reference (however much we affect to despise or ignore the mere body) to physical as well as intellectual well-being. Hence Prof. Baldwin concludes "that ideal tone (pleasure or pain) refers to personal well-being as a whole."

We must pass over without comment an important and interesting discussion of "reality and belief," which is worthy of careful consideration, and may proceed to note the somewhat unusual sense in which the author uses the word "ideals."

"Ideals," he says, "are not mental constructions at all: if once constructed they would no longer be ideals: which only means that what we call ideals are emotional in their nature, expressing the drift or felt outcome of the constructive process, not any actual attainment of it. If my ideal man, for example, were an intellectual construction, I would be able to describe him. . . . Ideals, there-

fore, are the forms which we feel our conceptions would take if we were able to realize in them a satisfying degree of unity, harmony, significance, and universality."

This seems to us somewhat strained. It is a description of theoretically ideal ideals which have been emptied of all practical value. There are assuredly practical ideals which, though unattainable, can be definitely realized as intellectual constructions permeated with emotional tone. And it is these practical ideals which are influential on conduct.

The distinction between subjective and objective ends in ethics is carefully drawn. Subjective ends are the felt and more or less definitely realized motives of the voluntary process. They alone have psychological value as the immediate determinants of conduct. Objective ends are a matter of cognition.

"Even though it were granted that all voluntary action arose and survived by exclusive reference to pleasure or to self-realization, yet it would be a patent fallacy to say that the only voluntary end is either of them—that consciousness has all along been versed in our biology or our speculative ethics, and has aimed to fulfil the one or the other. Consciousness has no inkling of the *dōvapis* of Aristotle, or the *connatus* of Spinoza, or the *Trieb* of Wundt and Schneider; of the 'strife [*sic*] for existence' of Spencer, the theoretic 'reverence for law' of Kant, the 'self-realization' of Green, or the dialectical 'becoming' of Hegel. Let us discover these things if we may, but do not let us say that a man is not moral unless he has a realizing sense of them."

We have left ourselves no space to deal with Prof. Baldwin's discussion of the phenomena of the will. We do not by any means agree with all that he says thereon, but it is worthy of careful consideration.

Prof. James's "Text-book of Psychology" is a rearranged abridgment of his larger "Principles," with the addition of some description of the senses and sense-organs. We have so recently (*NATURE*, vol. xliii. p. 506) expressed our opinion of the value of the larger work, that we can, without injustice to Prof. James, afford to be brief in our notice of this abridgment, merely selecting the chapter on "Instinct" on which to offer a few comments.

Every organism comes into the world with an innate capacity to perform, more or less definitely, certain activities under the appropriate environing circumstances. Of these activities, a certain number which are (1) complex in character, and (2) performed (*a*) in a definite way, (*b*) without foresight of the end to be attained, (*c*) with no previous education in the performance, and (*d*) uniformly by all normal individuals of the species concerned, are now by pretty common consent described as instinctive. Clearly such instinctive actions are the outcome of the innate capacity of the animal which performs them; but they are a peculiar and special manifestation of this innate capacity: they have definite and clearly assignable characteristics. Now no one can question that man comes into the world with a relatively enormous store of innate capacity, and that he has innate tendencies to perform half a hundred particular activities. And yet he has but few instincts. He leads a life of hesitation and choice, an intelligent life. To say with Prof. James that this is "not because he has no instincts—rather because

he has so many that they block each other's path" is practically to abandon the position which has been painfully and slowly gained by those who have thought and written on instinct. Instinct is a definite and special manifestation of innate tendency: here the innate tendency is not manifested in this definite and special way, but is thwarted. To call both manifestation and non-manifestation alike instinct is, in our view, a retrograde step, which we regret that a psychologist of Prof. James's insight and influence should have taken.

We cannot, however, leave the book with a note of dissent; for we find far more in this text-book to agree with than to dissent from. Whether we agree or dissent, we always find Prof. James full of stimulating thought; and we advise all who are interested in psychology to read at least the chapters on "Habit," "The Stream of Consciousness," and "The Self," if they read no more.

C. LL. M.

DYNAMICS OF ROTATION.

Dynamics of Rotation: an Elementary Introduction to Rigid Dynamics. By A. M. Worthington. Pp. 155. (London: Longmans, Green, and Co., 1892.)

Spinning Tops. By John Perry. Pp. 136. (London: Society for Promoting Christian Knowledge, 1890.)

THE persistence of spinning tops and of running bicycles in rearing themselves erect are common examples of a wide class of dynamical phenomena which are influenced or governed by the presence of rapidly rotating parts, and which have a prominent place in all departments of physical science, from the relations of the systems of the stars down to molecular actions.

In formal treatises on abstract dynamics we are accustomed to find the properties of freely rotating systems relegated to an advanced part of the development of the subject, and expounded with all the powerful help which mathematical analysis can afford. If we are to have a complete theory of the circumstances which determine the stability and transformations of rotational motions, this analytical aid is none too extensive. But there is another mode of approaching a physical subject, which consists in learning from observation and properly varied experiment what are the phenomena that are persistent and stable, and then applying known dynamical principles to the elucidation of the properties of the motions thus known in fact to exist—a problem which need not in those simpler cases which are fundamental require any great amount of analytical knowledge.

As an additional reason for the customary abstract development of dynamics, there may perhaps be counted the historical fact that the questions that were of paramount importance when dynamical principles concerning extended systems of bodies were being evolved, related to the orbital and axial motions of the heavenly bodies, and their reconciliation with the law of universal gravitation. The absence of frictional resistances, and the long duration and delicacy of astronomical observations, had led to a minute knowledge of the motions of the solar system, which taxed all the resources of Clairaut, D'Alembert, Laplace, and Lagrange, to verify and explain.

Many of the dynamical principles which are now

treated as elementary and fundamental were thus come upon in special analytical investigations relating to physical astronomy. It was, for example, in this way that the principle of the conservation of angular momentum for the solar system was discovered by Laplace, and then generalized to a system with any kind of internal connections which is not subject to forces from outside it. How far a general principle of this kind, when divested of its analytical dress, enables us to see into the general causes of things is well known. A striking illustration is the *aperçu* of Prof. James Thomson, that when once the trade winds have been explained as a consequence of the earth's rotation, they involve of necessity the existence also of anti-trades or south-west winds in the temperate zone; for if the trades blew by themselves their friction against the earth would always be acting round in the same direction, and therefore would tend to stop the earth's rotation, not by wholly destroying its motion, but by transferring its angular momentum undiminished to the atmosphere, where it would continually accumulate. This simple remark thus shows that the trades blowing to the equator must be compensated by anti-trades blowing from it; and therefore also explains the existence of a region of high barometer between them. It will also occur to memory how much J. Purser, W. Thomson, and specially G. H. Darwin, have established in the tidal evolution of the earth-moon system, by studying the possibilities of development that are allowed subject to the conservation of its angular momentum and the degradation of its energy.

It has been reserved for our own half-century to bring out the wealth of general dynamical ideas that is contained in the magnificent analytical presentation by Lagrange of the results of the application of the laws of motion to systems of bodies, the number of variables or co-ordinates being of necessity (for analytical purposes) restricted to the number of degrees of freedom, and everything turning out to be expressible in terms of one fundamental function—the energy of the system. It will be apparent, on looking through Prof. Cayley's Reports on Dynamics to the British Association, how much the progress of this department of abstract dynamics was indebted to the necessities of astronomy. That science presented a problem which was in one sense quite definite and precise, on account of the smallness of the planetary masses, but which nevertheless required a minute explanation of the perturbations to which the planetary bodies are subjected owing to their mutual actions. The methods which proved comprehensive and efficient for this purpose also showed themselves, when they were examined from a more general standpoint, to reveal principles of a far-reaching character, that applied to dynamical systems however complicated. The final stage of analytical development was reached when the keen perception of Sir W. R. Hamilton saw that the whole subject could be removed from special considerations of space and time, and attached to the purely analytical treatment of a single varying action function; and the commentary of Jacobi showed precisely how to pass from this general differential analysis to the solutions of special dynamical questions.

At the present time there seems to be no danger of the interruption of progress by too close an adherence to the

calculus. The fact is, that nearly all the problems of the numerical calculation of perturbations which were urgent at the beginning of the century, in order to bind the solar system to the scheme of universal gravitation, have now been satisfactorily disposed of. There is no longer the same need for the greatest intellectual power to set itself to put right some periodic or secular inequality, which requires all the battery of analysis that is available, and often more. New ground has been broken since then, and there is the great array of the physical sciences, all struggling to become purely dynamical, but all hampered in this by the fact that the dynamical machinery, the phenomena of matter and motion, on which they depend, are to a great extent concealed from direct observation or exploration. Under such circumstances the method of progress is to carefully cherish, and reduce into a scheme such as will appeal directly to the understanding, all the general principles which have become evolved in the course of dynamical investigations relating to problems of which the data are thoroughly known; and to use them as a key for the dynamical interpretation of more recondite phenomena by the aid of analogies and the numerical verification of their results. The mode of progress has thus veered from the analytical to the synthetical, from the powerful inverse analysis of Laplace and Lagrange to methods more akin to those which were worked by Newton.

It may be stated as a general rule that the relations most directly intelligible and most flexible in this kind of application are properties of constancy, or of maximum and minimum, such as belong in fact to the more obvious features of the continuous growth of pure quantity. The conservation of energy, of linear momentum, of angular momentum, the minimum energy criterion of equilibrium, of steady motion, the maximum and minimum energy criteria which determine the motion following the application of impulses specified either by their actual amounts or by the velocities they produce at their points of application—these may all be cited in illustration. The crown of the edifice will be Maupertuis's principle of Least Action, whose range of exact application, initiated for dynamics by Lagrange and Hamilton, is now being extended into all departments of physics, thus working out an answer to the question—To what extent can the succession of phenomena in inanimate Nature from instant to instant be treated as governed by a principle analogous to that of minimum expenditure of effort in the sentient world?

The phrase from instant to instant is essential, for a path may—as, for example, a great circle on a sphere—be the shortest between two points within a given range of each other, but may cease to have that property when the starting point and the final point are taken too far apart on it. In a similar way, in statics, a certain region of stability is determined around each position of equilibrium, such that, if the system is not disturbed beyond that region, it will not leave the neighbourhood; while, in dynamics of a particle, such a region is more vaguely determined around each orbit by the nature of the enveloping curves or surfaces of the neighbouring orbits.

From the point of view of the direct appreciation of dynamical ideas, the small books at the head of this

article form a very welcome addition to the ordinary text-books. The work of Prof. Perry, popular lecture though it be—and one feels constrained, from the confident style, to believe that his audience of operatives understood every word of it—leads on the reader by vivid illustration into contact with the boldest flights of dynamical speculation. After the ordinary effects of spin have been copiously illustrated, we are taken into a world in which matter has two kinds of inertia; and, by aid of a chain of balanced gyrostats, we learn that a cord cannot ever transmit motion straight on without also twiddling about. It is fortunate for those of us who have to follow or teach mechanical pursuits that this new species of matter is not often heard of, and is only called up in relation to such unnoticeable, and practically insignificant, phenomena as rotation of the plane of vibration of light waves. The relations of ordinary mass to gravitation, and such like are sometimes intricate enough things to discuss; the introduction of a second kind of mass, and that of a vector character, might lead to despair.

The great pioneer in this field of work, of eliciting the concealed dynamical mechanism of tangible phenomena, is, of course, Lord Kelvin, by whom nearly all our knowledge on the subject has been originated, at any rate in its present exact form. Prof. Perry's book is all the more welcome and suggestive, in that it claims to be chiefly a connected account of what he has learned at first hand from the teaching of Lord Kelvin; an account which has possibly not been published before by anyone, at least in a consecutive form.

Prof. Worthington, after an elementary quantitative introduction to dynamical principles, has gone over the part of dynamics of rotation which relates to a single spinning solid, in the manner of a text-book with numerical illustrations; and there is no doubt that a mastery of his explanations would be a very valuable part of the outfit of a student of physics.

J. L.

THE MAMMALIA OF BRITISH INDIA.

The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Mammalia. Part II. By W. T. Blanford, F.R.S. (London: Taylor and Francis, 1891.)

IN our issue of September 27, 1888, we had the pleasure of bringing before the notice of our readers the first part of Mr. Blanford's valuable monograph on the Mammals of British India. The second part, completing this important work, has lately been published. The delay, as is explained in the preface, has been caused by the necessity Mr. Blanford has been under of spending much time in editing the five volumes of the same series that have appeared since the first part of the present work was issued. His labours in this respect have been increased by two unfortunate and unforeseen circumstances—the lamented death of Mr. Francis Day, and the expiration of the leave of Mr. E. W. Oates, in both cases before the termination of the portions of the work, on fishes and birds respectively, upon which they were engaged, and the completion of which has thus fallen upon Mr. Blanford himself.

In the preface of the present part, the origin of the series to which it belongs is thus related :—

"The need for new and revised descriptive works had, for some years before 1881, been felt and discussed amongst naturalists in India, but the attention of the Government was, I believe, first called to the matter by a memorial dated September 15 of that year, prepared by Mr. P. L. Sclater, the well-known Secretary of the Zoological Society, signed by Mr. Charles Darwin, Sir J. Hooker, Prof. Huxley, Sir J. Lubbock, Prof. W. H. Flower, and by Mr. Sclater himself, and presented to the Secretary of State for India. This memorial recommended the preparation of a series of hand-books of Indian zoology, and my appointment as editor. It is scarcely necessary to add that to the recommendation of men so highly respected and well known in the world of science, the publication of the present 'Fauna of British India' is greatly due, and that Mr. Sclater is entitled to the thanks of all interested in the zoology of India for the important part he took in the transaction."

We are also glad to learn from the same source that the series of works on the fauna of British India will not be confined to the Vertebrata, the preparation of three volumes on Moths by Mr. G. F. Hampson having been commenced. We trust that these will be followed by others dealing with those groups of which sufficient material is available, and for which authors may be forthcoming capable of treating them in a manner worthy to be placed by the side of those already issued.

The second part of the Mammalia contains the orders Chiroptera, Rodentia, Ungulata, Cetacea, Sirenia, and Edentata. It is fully equal to its predecessor in careful selection of the material which is most likely to be useful and attractive to those readers for whom the work is chiefly intended. The descriptions, geographical distribution, and accounts of the habits of the various species can be thoroughly relied upon. Nomenclature is always a thorny subject in zoology, and though Mr. Blanford is usually most careful and judicious in his work in this department, we cannot agree with him in substituting the specific name of *maximus* for the time-honoured and universally used *Elephas indicus*. The inconvenience of changing the name by which such a familiar animal is designated in thousands of books and museums, is so great that it can only be justified by some more imperious necessity than appears to exist in the present case. That *maximus* was applied by Linnæus to both the then known species, and that it is incorrect and misleading (the other existing, and many of the extinct, species being as large as, or larger than, the Indian elephant) are sufficient reasons, in our judgment, for leaving the name in the oblivion in which it has slept for nearly a century. Moreover, if *indicus* be rejected, the claims of Blumenbach's *asiaticus* cannot be overlooked.

The illustrations of the present part are far superior to those of the former one, and show a marked advance in the art of process-printing directly from the artists' drawings, without the intervention of the wood-cutter. Many of those by Mr. P. Smit, though printed from blocks in the text, have all the softness and delicacy of the finest specimens of lithography, and add greatly to the attractiveness of this valuable work.

W. H. F.

OUR BOOK SHELF.

Tanganyika: Eleven Years in Central Africa. By Edward Coode Hore, Master Mariner. (London: Edward Stanford, 1892.)

MR. HORE was for eleven years a member of the Central African Mission established at Lake Tanganyika by the London Missionary Society, his special task being to undertake all the work that could be most effectually accomplished by one who had the knowledge and experience of a master mariner. In the present book he gives an account of his labours. The narrative contains many elements of interest, and will be read with pleasure by all who like to think of devoted courage in the service of great moral ideas. Mr. Hore became very familiar with Lake Tanganyika, which he surveyed in the first instance on board a native boat. Afterwards the British supporters of the mission enabled him to build two vessels in which he had opportunities of doing his work in a style worthy of its magnitude and importance. Of the physical characteristics of the lake and the surrounding regions he gives an unpretending but sound and sometimes picturesque account. He has also much to say about the natives, whose confidence and good-will he seems to have had a rare power of winning. He has a very favourable opinion of their capacities, and knows of no good reason why they should ever be treated by Europeans otherwise than with kindness and patience.

Beginner's Guide to Photography. By a Fellow of the Chemical Society. (London: Perkin, Son, and Rayment, 1892.)

THIS very cheap and useful little guide has now reached its fourth edition. The reader is led through all the phases of manipulation that at first sight seem so bewildering, but which with clear explanations are soon rendered more simple and eventually mastered. All questions relating to "How to buy a Camera, and how to use it," may be said to be here fully answered, and by following the instructions an amateur may be saved from much disappointment and expense. The explanations throughout the book are both clear and explicit, and the omission of such technicalities as might confuse rather than enlighten a reader will be found distinctly advantageous.

Quain's Elements of Anatomy. Edited by E. A. Schäfer, F.R.S., and G. D. Thane. In Three Vols. Vol. II., Part 2. By Prof. Thane. Tenth Edition. (London: Longmans, Green, and Co., 1892.)

IT is necessary here only to record the fact that the publishers have issued the second part of the second volume of this magnificent edition of Quain's standard work. The editor is Prof. Thane, and the subjects dealt with are arthrology, myology, and angiography. There are no fewer than 255 illustrations, many of which are coloured.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

[The Zebra's Stripes.

ALMOST every writer who treats of the colours of animals refers to Galton's observations that in the bright starlight of an African night zebras are practically invisible even at a short distance; but there can be no doubt that their peculiar striped appearance is also of great protective value in broad daylight. On a recent zebra hunt near Cradock, in which I took part, several members of our party commented on the difficulties of seeing

zebras even at moderate distances, although there was nothing to hide them, the black and white stripes blending so completely that the animals assume a dull brown appearance quite in harmony with the general colour of the locality in which they are found, and in which, for instance, Rooi Rehbok (*Pelea capreolata*) is also well protected on account of its peculiar brownish coat. A member of our party, who on another occasion gave proof that he is possessed of excellent eyesight, and who has frequently hunted in similar localities, saw a zebra which was wounded in one of the front legs at a distance of about 400 yards, and strange to say he mistook it for a big baboon. In a letter which I received from him a few days ago, he said, "It galloped like a baboon from me, and I could only see that the colour was greyish-brown. At about 500 yards from me it ran on to a little krantz, and mounting the highest rock, drew its body together just as a baboon does when its four feet are all together on the summit of a little rock." His remark as to the greyish-brown colour of the animal is the more valuable, as I believe this gentleman, Mr. Wrench, A.R.M. of Cradock, is quite unprejudiced. In my own letter to him, which drew forth these remarks, I had only asked him for the distance at which he saw the zebra, and I did not ask him how it was that he mistook a black and white zebra for a brown baboon on a perfectly clear South African day. My own observations also confirm that the stripes of the zebra are of protective value. Riding along a slope I suddenly saw four zebras within 100 yards above me. They were galloping down the hill, but stopped when they caught sight of me. As soon as they stopped I saw their stripes pretty distinctly. After I had fired and wounded one of them, they started again galloping down the hill round me in a semicircle at a distance of about 70 yards. All this time they presented a dull brown appearance, no stripes being visible, although I had my attention fixed on this point. They disappeared beyond a ridge, went down a little valley, and I heard afterwards that they ascended the next slope, which was not more than 1500 yards away from where I stood with a native servant. Yet even this lynx-eyed native could not see them going up this slope. They had vanished from us.

Perhaps it may interest some of your readers that zebras are still fairly plentiful on the rugged hills west of Cradock. A troop of forty-one individuals was seen, on the very ground over which we hunted, a short time before we arrived. Our party saw eleven in two days, but I believe three were seen on two if not on three different occasions. This would reduce their number to eight, if not to five. They are protected by Government, and also by the farmers themselves, but I am afraid that in spite of that their days are numbered. They are said to be very destructive to wire fences, and as the inclosing of farms with wire fences is steadily on the increase in this colony, many a farmer will have, though perhaps reluctantly and in defiance of the law, to take up his gun and clear them off his property. There will then probably be an outcry by people who know the difficulties of South African farming only from books written by travellers who hurry through South Africa in a first-class railway carriage; but those who really know South Africa well will say it is a great, great pity, but it cannot be helped, unless Government provides speedily an abode for these and other animals threatened with extinction. The first step in the right direction would perhaps be the establishment of a Government Zoological Garden, but I hope others who are more competent than I am will stir the people of Cape Colony up before it is too late, so that something more than mere game-laws may be done to preserve them.

S. SCHÖNLAND.

Albany Museum, Grahamstown.

The Protective Device of an Annelid.

In September last I forwarded to NATURE the description of an effectual protective device adopted by a small tubicolous Annelid which had been sent to me from Jersey; the device consisting in the coiling-up of the end of the tube. I have recently been able to submit specimens to Prof. W. C. McIntosh, of St. Andrews, who has kindly identified the builder as *Sabella saxicava*, a form which he tells me is common in the Channel Islands, and occurs also on our southern coast. So far as I can learn, this peculiar and interesting habit of an Annelid had not previously been observed.

ARNOLD T. WATSON.

Sheffield, May 1892.

The General Circulation of the Atmosphere.

IN that excellent lecture by Dr. Pernter, delivered before the Scientific Club at Vienna, published by you in NATURE (vol. xlv. p. 593), the theory of the trade winds being occasioned by the rising of the rarefied air at the equator causing an upward current, while cold air from north and south flows in to supply its place, coupled with the earth's rotation to the east, is attributed to Dr. Dove. "Dove was the first person . . ." But that theory will be found distinctly enunciated by Sir John Herschel in his "Treatise on Astronomy" (1833), where he attributes it to Captain Basil Hall, "where this is distinctly, and, as far as I am aware, for the first time reasoned out." Herschel was not aware that it had been distinctly reasoned out by George Hadley, F.R.S., in the thirty-ninth volume of the Philosophical Transactions, a century before Basil Hall.

J. CARRICK MOORE.

THE SURFACE-FILM OF WATER, AND ITS RELATION TO THE LIFE OF PLANTS AND ANIMALS.²

IT is necessary to the exposition of my subject that I should begin by reminding you of some well-known properties of the surface of water. These are familiar to every student of physics, and are set forth in many elementary books. They are well explained and illustrated, for instance, in Prof. Boys's deservedly popular book on "Soap-bubbles." But there may be some persons here who have not quite recently given their thoughts to this subject, and it will only cost us a few minutes to repeat a few simple experiments, which will establish some fundamental facts relating to the surface-film of water.

The following experiments were then shown:—

(1) Mensbrugghe's float. Proves that the surface-film of water offers resistance to the passage of a solid body from beneath.

(2) Aluminium wire made to float on water. Proves that the surface-film of water offers resistance to the passage of a solid body from above. The resistance is proportional to the length of the line of contact of the solid with the water.

(3) Copper gauze made to float on water. Here, a number of intersecting wires are employed instead of a single wire, and the consequent increase in the length of the line of contact greatly increases the weight which can be supported.

(4) Frame with vertical threads, carrying a light plate of brass. The threads hang vertically at first, but when the whole is dipped into soapy water, the adhering film exerts a pull upon the sides of the frame, draws the threads into regular curves, and raises the brass plate. When the film is broken, the threads resume their previous vertical position, and the plate falls.

(5) Aluminium wire supported by vertical copper wires. Each end of the aluminium wire forms a loop, which fits loosely to one of the copper wires. When the apparatus is dipped into soapy water, the contraction of the film draws the aluminium wire upwards. After pulling it down with a thread, the wire can be again drawn up. This is another illustration of the tendency of the film to contract. We use soapy water, because the film lasts for a considerable time, but the surface-film of pure water, though less viscous than that of soapy water, is even more contractile. We have already seen that the surface-film clings with considerable tenacity to any solid body introduced into it, and that its hold increases with the length of the line of contact. It is for this reason that fine meshes offer so great a resistance to the passage of the surface-film. Air can pass through the meshes with perfect ease; water also, if not at the surface, can pass through readily enough, but the surface-film in contact with air will only pass through with

² Lecture given at the Royal Institution, March 4, 1892, by L. C. Miall, Professor of Biology at the Yorkshire College, Leeds. Some passages were omitted in delivery, for want of time.

difficulty, and if there is water behind it, the water may thus be restrained from passing through the meshes.

(6) Muslin bag hung in front of the lantern. Water poured into the bag (a large spoonful) does not flow out; but when the muslin beneath the water is rubbed with a rod, it becomes wetted, the surface-film passes to the outside of the bag, and the water trickles through.

There are many plants which take advantage of this property of the surface-film of water, viz. that it will not penetrate small spaces, in order to keep themselves dry. You must have observed how the hairy grasses repel water. The surface-film is unable to pass into the fine space between the hairs, and accordingly the water above the surface-film is kept from contact with the leaf. This simple artifice is often employed by plants which float at the surface of water. Here it is important that they should keep dry, not only for the purpose of respiration, but for another reason too. They commonly have great power of righting themselves when accidentally submerged, and this self-righting property depends upon the fact that the under surface of each leaf is always wet, while the upper surface is incapable of being wetted.

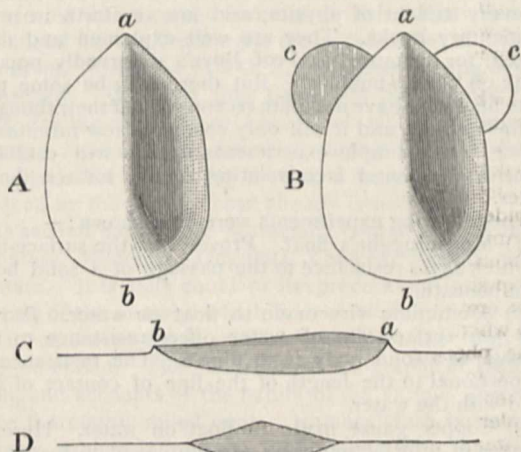


FIG. 1.—Duckweed (*Lemna minor*), magnified. A, single frond; a, scar of attachment to parent. A ridge extends from a to b across the upper surface of the frond, gently subsiding towards b. B, frond, budding-out two new fronds. C, longitudinal section from a to b (A), showing ascending capillary curves at a and b. D, transverse section, at right angles to the last. The margins of the frond in this plane are level with the surface of the water. N.B. The form of the fronds is somewhat variable. Minor inequalities occur along the margin, but the principal ascending curves, which are also centres of attraction, are at a, b, and c.

The microscopic hairs which thickly cover the upper surface are sufficient to exclude the water. A leaf of *Pistia* is now submerged, and shown as an opaque object in the lantern. You see by the gleaming of its surface that it is overspread by a continuous flat bubble of air, which looks like quicksilver beneath the water. I will next invert a leaf of *Pistia* by means of a rotating lever. It is now brought up beneath the surface of the water in an inverted position, and you see that, notwithstanding its buoyancy, it is unable to free itself and rise to the surface, because of the air-bubble, which adheres both to the leaf and to the disk at the end of the lever, and ties both together. Complete separation of the leaf from the disk would involve the division of the air-bubble into two smaller bubbles, one adhering to the leaf and the other to the disk. In this operation the surface-film would necessarily be extended directly in opposition to its natural tendency to contract. Several other water-plants exhibit the same properties as *Pistia*. I will mention two of the water-ferns—*Salvinia* and *Azolla*. *Salvinia* is found floating on still water in the warmer parts of Europe, as well as in other quarters of the globe. The leaves are attached on opposite sides of a horizontal stem. Long

hairy roots (or what look like roots, and really answer the same purpose) hang down into the water. *Salvinia* has in a remarkable degree the power of rising when submerged, of always rising with its leaves up and its roots down, and of rising with the upper surface of its leaves perfectly dry. It is obvious that these qualities are most useful to a plant which may be pressed under

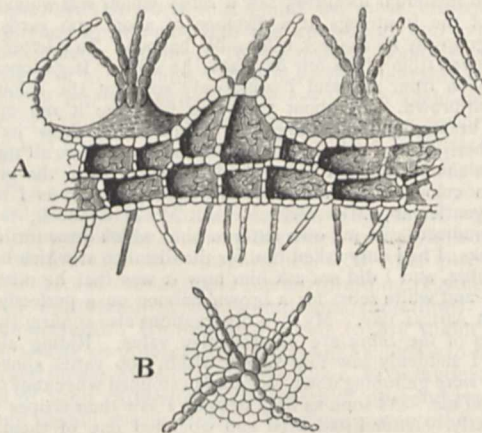


FIG. 2.—*Salvinia natans*. A, combined surface-view and section of floating leaf, modified from a figure in Sachs's "Botany," showing the air-cavities, the submerged hairs of the lower surface, and the groups of stiff hairs on the upper surface. These latter inclose spaces into which water cannot enter, even when the leaf is completely submerged. B, one group of hairs from the upper surface, seen from above.

water or drenched with rain. Its nutrition, like that of all green plants, depends largely upon substances extracted from the air; and to be overspread with water, which disappeared only by a slow process of evaporation, would be disadvantageous, especially if the water were not absolutely clean. Every leaf of *Salvinia* is, to begin with, excavated by a double layer of air-spaces, which lodge so much air as to give it great buoyancy. On the

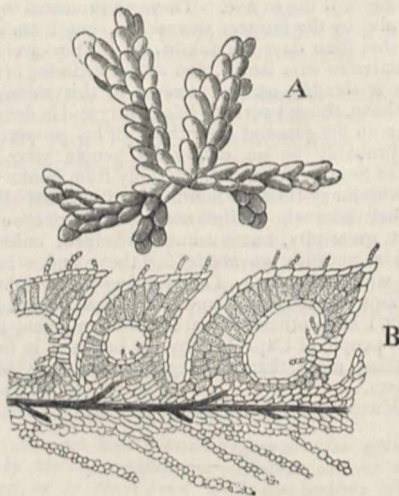


FIG. 3.—*Azolla caroliniana*. A, stem with leaves, magnified; B, longitudinal section through part of ditto, highly magnified. The air-cavities of the leaves are shown, the narrow spaces between the leaves, into which water cannot enter, the fine hairs of the upper surface, the submerged leaf-lobes, and the vascular bundles.

upper surface are placed at regular distances a number of prominences, each surmounted by a group of about four stiff, spreading hairs, which keep the water from reaching the surface of the leaf. When forcibly depressed, the *Salvinia* takes down with it a layer of air, which forms a flat bubble over the leaf, and of course gives great power of self-righting, for the specific gravity of the upper

side is greatly reduced, while the lower side is weighted, as before, by the long, water-logged roots. Once restored to the surface, the bubble bursts, and the little drops into which it is instantly resolved roll off like drops of quick-silver. Azolla, which is found in most hot countries, and is often grown in hothouses, behaves in a very similar way. Here the leaves are far smaller, and crowded together upon a branching stem of minute size. There are a few hairs upon the upper surface, and between the leaves are narrow clefts, connected with globular cavities, which occupy the centre of every leaf. These cavities, which are often closed, and never possess more than an outlet of extreme minuteness, are always filled with air; so are the clefts between the leaves. No water can lodge on the upper surface, apparently because the surface-film is stretched from the raised edge of one leaf to that of the next; and thus buoyancy, self-righting, and repulsion of water are efficiently secured.

Many plants which ordinarily float on the surface of the water (*Salvinia*, *Azolla*, *Duckweed*, *Potamogeton natans*, &c.) sink on the approach of winter. At this time it is very curious to see how completely they lose both their buoyancy and their power of repelling water. I do not know how this change is brought about, but the result is one of obvious advantage. The leaves, or in some cases the entire plants, sink to the bottom, and hibernate there, out of the reach of frost. Many perish; some are broken up by decay into isolated buds. When spring returns, the few survivors float up, and soon cover the surface with leaves. It would be interesting to know something of the mechanism by which these seasonal changes are effected.

One of the commonest objects in Nature, which is apt to escape our notice on account of its minute size, for it is less than one-quarter of an inch in length, is the egg-raft of the gnat. This was beautifully described 150 years ago by Réaumur. The eggs of the gnat are cigar-shaped, and 250 or 300 of them are glued together, so as to make a little concave float, shaped like a shallow boat. The upper end of each egg is pointed; the lower end is provided with a lid, through which the larva will ultimately issue into the water. The gnat in all stages, even while still in the egg, requires an ample supply of air. It is therefore necessary that the egg-raft should float at the surface; it is also necessary that it should always float in the same position, so as to facilitate the escape of the larva. This is effectually secured by a provision of almost amusing simplicity. Let us first notice how efficient it is. If we take two or three of these tiny egg rafts, and place them in a jug of water, we may pour the water into a basin again and again; every time the egg-rafts float instantly to the surface; and the moment they come to the top, they are seen to be as dry as at first. The fact is that the surface-film cannot penetrate the fine spaces between the pointed ends of the eggs. The cavity of the egg-raft is thus overspread by an air-bubble, which breaks the instant it comes to the top. The larva of the gnat, when it escapes from the egg, floats at the surface, and it is enabled to do so in consequence of the properties of the surface-film. When the larva changes to a pupa it becomes buoyant, and floats at the surface, except when alarmed. To enable it to free itself without unnecessary effort from the surface of the water, the respiratory tubes of the pupa are furnished with a valvular apparatus, which can cut the connection with the air in a moment, and restore it at pleasure, when the pupa again floats to the surface.¹

Another Dipterous insect, whose larva inhabits rapid streams, makes an ingenious use of the properties of the surface-film. This is the larva of *Simulium*, of which I have given some account in the lecture just quoted. At

the time of the delivery of that lecture, I was wholly unable to explain how one difficulty in the life of the insect is surmounted. The larva clings to the water-weeds found in brisk and lively streams. The pupal stage is passed in the same situation. But a time comes when the fly has to emerge. Now the fly is a delicate and minute insect, with gauzy wings. How does it escape from the rushing water into the air above, where the remainder of its life has to be passed? This was a question upon which I had spent much thought, but in vain. It appeared to me for many months completely insoluble. However, I was informed last year by Baron Osten Sacken of a paper written by Verdat, seventy years ago, in which the emergence of the fly of *Simulium* is described. Guided by Verdat's description, I had little difficulty in seeing for myself how the difficulty is actually overcome. During the latter part of the pupal stage, the pupa-case becomes inflated with air, which is extracted from the water, and passed through the spiracles of the fly into the space immediately within the pupal skin. The pupal skin thus becomes distended with air, and assumes a more rounded shape in consequence. At length it splits along the back, in the way usual among insects, and there emerges a small bubble of air, which rises quickly to the surface of the water and there bursts. When the bubble bursts, out comes the fly. It spreads its hairy legs, and runs upon the surface of the water to find some solid support up which it can climb. As soon as its wings are dry, it flies to the trees or bushes overhanging the stream.

A very interesting inhabitant of the waters, which makes use of the properties of the surface-film to construct for itself a home beneath the surface, is the water-spider (*Argyroneta aquatica*). This interesting little animal has been described by many naturalists, some of whom, judging from their accounts, had no personal acquaintance with its habits. But among the number is the eminent naturalist Félix Plateau, son of the physicist to whom we are so much indebted for our knowledge of the phenomena of surface-tension. I need hardly say that in his account of the water spider, Prof. Plateau gives a full and adequate account of the scientific principles concerned in the formation of its crystalline home.¹ Plateau remarks that the water-spider, like most other spiders, is an air-breathing animal. It dives below the surface, and spends nearly its whole life submerged. In order to do this without interruption to its breathing, the spider carries down a bubble of air, which overspreads the whole abdomen as well as the under side of the thorax. These parts of the body are covered with branched hairs, so fine and close that the surface-film of water cannot pass between them. The spider swims on its back, and the air lodges in the neighbourhood of the respiratory openings, which are placed on that surface which floats uppermost. When the spider comes to the top, as it does from time to time to renew its supply of air, it pushes the abdomen out of the water, and we can then see that this part of the body is completely dry. When it sinks, the water closes in again at a little distance from the body, and the bubble forms once more.

It would be inconvenient to the water-spider to be obliged to come frequently to the surface for the purpose of breathing. A predatory animal on the watch for its victims must lie in ambush close to the spot where they are expected to appear, and the water-spider accordingly requires a lurking-place filled with air, beneath the surface of the water. It has its own way of supplying this want. Relying on the fact, already illustrated by our muslin bag, that the surface-film of water will not readily pass through small openings, the spider proceeds as follows. It begins by drawing together some water-weeds with a few threads, in such a way that they meet at one or more points. It then fetches from the surface a fresh supply of air, and

¹ The larva and pupa of the gnat are more fully described in my British Association lecture on "Some Difficulties in the Life of Aquatic Insects," reported in NATURE, vol. xlv. p. 457.

² "Observations sur l'Argyronète aquatique," Bull. Acad. Roy. de Belgique, 2me. sér., tom. xxiii., 1867.

squeezes part of it out by pressing together the bases of its last pair of legs. The bubble rises, but is detained by some of the threads previously spun across its path. Then the spider returns to the surface to fetch another bubble, and repeats the operation as often as is necessary. Now and then she secures the growing bubble by additional threads, and before long has a bubble nearly as big as a walnut, inclosed within an invisible silken net, which imprisons the air as effectually as a dome of glass would do. The spider takes care to conceal her home from observation, and before long the minute *Algæ*, growing all the more vigorously because of the air brought to them, effectually conceal the habitation. The mouth of the dome, which is of course beneath, is narrowed to a small circle, and Plateau has observed a cylindrical horizontal tube, seven to eight millimetres in diameter, by which the spider is enabled to enter or leave her home without being observed. The air within is renewed as required, by the visits of the spider to the surface.

Besides this home, which is the ordinary lurking-place of the spider, another is required at the time when the young are hatched. The new-born spiders are devoid of the velvety covering of hairs, and would drown in a moment if placed in a nursery with a watery floor. The female spider therefore makes a special nest for this particular occasion, which floats on the surface of the water, rising well above it. It is bell-shaped and strongly constructed. The upper part is partitioned off, and contains the eggs. Beneath the floor of the nursery the mother takes her station, and watches over the safety of her brood, defending them against the predatory insects which abound in fresh waters. It is interesting to see how the faculty of spinning silk, used by the house-spider for her snares, and at other times for the fluffy cocoon in which the eggs are enveloped, furnishes to the water-spider the materials of her architecture. It is not less interesting to observe the economy of material which results from the use of the tenacious and contractile surface-film, in place of a solid wall.

We will next consider another property of the surface-film, which is turned to account in the daily life of the very commonest of our floating plants, I mean the duckweed, which overspreads every pond and ditch. A number of the green floating leaves of duckweed are now placed in a shallow dish in the field of the lantern, and I will ask you to observe how they are grouped. They have spontaneously arranged themselves in a very irregular fashion, forming strings and chains which spread hither and thither over the surface of the water. This is not the way in which most floating bodies behave. Let us remove the duckweed, and replace it by another dish of water in which I will put a number of small disks of cork.¹ You will see that the bits of cork are attracted one to another and crowd together in one place. Let us inquire why the floating bits of cork are thus attracted towards one another. If any solid capable of being wetted by water is partly immersed in water, the liquid rises round it in an ascending capillary curve. If the solid is not wetted by water, the curve will turn downwards. We may get ascending or descending capillary curves in other ways. If, for instance, I were to lay a sheet of paper upon water, and turn its edges up at certain places, we should get marked ascending curves at these points. The raising of some parts of the surface causes other parts to sink, and may bring about descending curves, or make previously formed descending curves more marked. We shall find it helpful in our experiments to notice one very simple plan of producing a descending capillary curve round the edge of a vessel. If we take a glass of water, and fill it until the water is level with the brim, we naturally speak of the glass as *full*; but if we are careful to avoid rude

shaking, we may still add a considerable quantity of water without spilling any. The glass will then become what we may call *over-full*, and its surface will be bounded by a descending capillary curve. Now, it is of immediate importance to us to observe that *like* capillary curves, whether ascending or descending, attract one another, and that *unlike* curves repel one another. The theoretical explanation of this point is not difficult, but it must not detain us here. To place the fact itself beyond dispute, we will try a little experiment. A circular dish of water is now placed in the field of the lantern, and we will introduce into it a small disk of wood. Both the disk and the side of the vessel are wetted by water, and an ascending capillary curve rises round each. The result is that the two bodies attract one another. Every time the disk is moved away it is powerfully drawn towards the side of the vessel. With a little syringe we will add water to the dish in sufficient quantity to raise the level above the edge of the vessel. You will observe that the wooden disk is now repelled by the edge of the vessel, and floats free in the centre. By sucking up a little water, it becomes attracted once more, and so we may go on, causing it to be attracted or repelled, according as we add or subtract a small quantity of water. But what has all this to do with the duckweed? In order to explain the behaviour of duckweed, I must ask you to examine a careful representation of its form. This common plant has not, to my knowledge, been faithfully represented in any botanical book. You will see that the leaf is of an irregular oval shape, broader at one end than at the other, and that the narrow end is pointed. A raised ridge extends along the length of the leaf, from the point to the middle of the opposite or rounded border. Duckweed almost invariably propagates itself by budding. New leaves are pushed out symmetrically on each side of the point. They grow bigger and bigger, and gradually free themselves. The point upon each leaf marks the place where it was last attached to the parent leaf. Sometimes the budding is so rapid, that, before a fresh pair of leaves have become free, they have already budded out a second pair, which we may call the grand-daughters of the parent leaf. The pointed end of the leaf, and also the opposite end of the ridge, are raised above the general level, and very marked capillary curves ascend from the general water-level to these points. The free edge of every bud is also raised above the general water-level, and a capillary curve ascends to meet it. Hence, when a number of leaves of duckweed are floating freely on water, they are powerfully attracted one to another at certain points, while at intervening points they are relatively inert. If you take a floating leaf of duckweed, and bring near it a clean needle or a pencil-point, or any similar object, provided that it is not greasy, you will see that the leaf is at once attracted towards the point, but it always turns itself so as to bring one of its ascending curves round to the needle or pencil. We all see in the lantern how readily a leaf of duckweed is made to rotate rapidly by causing a needle-point to revolve round it, without ever touching it. Let us now try to imitate the behaviour of the leaves by some rude models. I have here some elliptical paper floats, cut out with a pair of scissors, and having each of the pointed ends a little turned up. We place these one by one on the surface of the water, and you see in the lantern how they are attracted to one another, point to point, and how they form long chains, which have a tendency to break up into stars. It is the existence of such points of attraction on the margin of the leaves which causes the duckweed to form chains and strings, so long as there is any unoccupied surface in the pond. A moment's consideration shows how profitable this tendency is to the plant. Were the duckweed to crowd together like the floating bits of cork, the pressure towards the centre of any considerable

¹ In order to avoid the inconvenience caused by the attraction of the sides of the vessel, the dish should be over-full of water.

mass of plants would be so great that the new leaves budded out would find no room in which to expand; but, by virtue of one very simple provision, viz. the existence of inequalities of level along the edges of the leaves, clear spaces and lanes are left between the floating leaves, so long as any unoccupied space remains.

Long exposure to the air, especially in still weather, affects the life of duckweed in a material way. Dust and decaying organic substances give rise to a pellicle, which is most mischievous to floating plants; and I think I could show, if time allowed, how much the habits of duckweed have been altered thereby. But, apart from visible impurities, mere exposure to air gives, as Lord Rayleigh has taught us, a considerable degree of superficial viscosity to water. Hence, the leaves of duckweed, when the surface is contaminated, will tend to lie in whatever positions they may be thrown by accidental causes, such as wind, and the attractions due to capillarity will be more or less impeded. But the effect of the superficial viscosity will in time be overcome by the attractive forces, so that it probably does not in the long run greatly affect the distribution of the leaves over the surface of water.

Many other floating plants, but not all, behave more or less like duckweed, and for the same reason. As yet I know of none which space themselves quite so effectually, and the extreme abundance of the common duckweed, as well as its world-wide distribution, may be partly due to the completeness of its adaptation to capillary forces. Some dead objects may accidentally take a shape which causes them to spread out over water, but I have met with none which have particularly struck me. Floating natural objects, such as sticks or seeds, behave, in many cases at least, very differently, and become densely massed. My attention was first called to this subject by seeing how different was the grouping of duckweed from that of some seeds of *Potamogeton natans*, which were floating in the same pond.

The capillary forces which spread the leaves of duckweed or Azolla upon the surface of water are indirectly concerned in the transport of these and like plants to fresh sites. If we put a stick into water overspread with duckweed, we cannot fail to notice how the leaves cling to the stick. They cling in a particular way, which enables them to bear transport more safely. The wetted surface, for obvious physical reasons, is attracted to the wetted stick; and the water-repellent surface, which is that which best resists drying, is outwards. The tenacity with which duckweed clings to the legs of water-birds, and the position which it almost inevitably takes under such circumstances, may have a good deal to do with the safe transport of the plant to distant pools. It is not, I think, too much to say that the prosperity of duckweed depends very largely upon the capillary forces which come into play at the surface of water.

We have now exhausted our time, though I have been obliged to leave unnoticed many special adaptations of living things to the peculiar conditions which obtain on the surface of water. Had time allowed, I should have been glad to say something about the aquatic animals which creep on the surface-film as on a ceiling, and about the insects which run and even leap upon the surface-film without wetting their minute and hairy bodies.¹ All small animals and plants which float on water necessarily come into contact with the surface-film, and have to deal with the difficulties which result from it. We have seen that they generally manage in the long run to convert these natural difficulties into positive advantages.

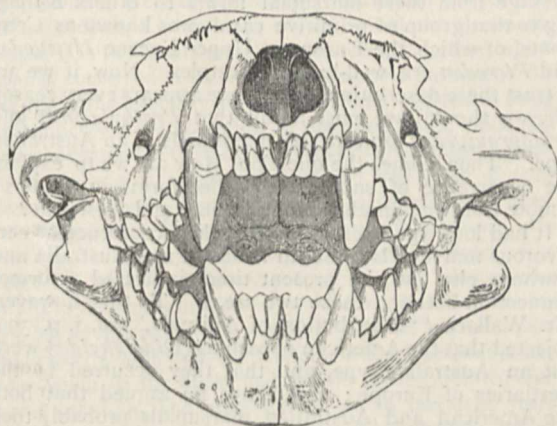
I have to thank my colleague, Dr. Stroud, for his frequent explanations of the physical principles upon which these adaptations depend, and also for much practical and valuable help in the preparation of suitable experiments.

¹ See NATURE, vol. xlv. p. 457.

THE DISCOVERY OF AUSTRALIAN-LIKE MAMMALS IN SOUTH AMERICA.

THE year 1891 proved a notable one in regard to marsupials. The existing mole-like marsupial (*Notoryctes*) from the deserts of Central Australia having been made known to us, news came of the discovery in the Tertiaries of Patagonia of remains of carnivorous marsupials closely allied to the existing pouched wolf, or Thylacine, of Tasmania. This discovery was immediately recognized as one likely to considerably modify some of our views regarding the distribution of mammals. A preliminary account of these new marsupials was given by Dr. Florentino Ameghino in a paper written for the new serial, *Revist. Argent. Hist. Nat.* This description seems to leave no doubt as to the correctness of the diagnosis of the fossil remains.

Before going further, it may be well to remind our readers that, with the single exception of the opossums (*Didelphyidae*) of America, all marsupials are now exclusively Australasian. The carnivorous types, such as the Thylacine (*Thylacinus*) and the Tasmanian Devil (*Sarcophilus*), are distinguished from all living mammals in that their upper cutting-teeth (incisors) are either four or five in number on either side, while in the lower jaw there are invariably three. This relation is shown in the figure of the skull of the Tas-



Front view of the skull of the Tasmanian Devil. (After Flower.)

manian Devil—a near ally of the Thylacine—where, between the large tusks of the upper jaw, we see the four pairs of incisors opposed to only three pairs in the lower jaw. In ordinary mammals, on the other hand, the number of pairs of incisors in each jaw does not exceed three, the number of those in the two jaws being usually equal. A further peculiarity of marsupials is that the cheek or grinding teeth comprise four true molars and not more than three premolars; whereas in ordinary mammals the typical number is three molars and four premolars, there being no known instance of the presence of four true molars except in some individuals of the fox-like *Otocyon*. Another peculiarity of most marsupials is the distinct inflection of the lower posterior extremity, or “angle,” of the lower jaw, while very frequently the bony palate of the skull has unossified spaces.

The new forms described by Dr. Ameghino were obtained from the lower part of that great series of freshwater formations with which so large an area of South America is covered. It has been inferred that the Patagonian deposits in question are as old as the Lower Eocene of Europe; but, although they are undoubtedly of considerable age, this inference can scarcely be regarded as an established

fact, since the occurrence of mammals allied to those of the European Lower Eocene is quite capable of explanation by their survival to a later period in South America.

One of the new Patagonian forms, to which Dr. Ameghino applies the name *Prothylacinus*, is stated to be an animal of the general conformation of the Thylacine, having apparently the same number of teeth, although the upper incisors are unknown. The main distinction of the fossil genus is, indeed, said to consist merely in the circumstance that the lower premolars are more widely separated from one another; the molars of the two forms being described as absolutely identical in character. The fossil likewise exhibits the marsupial inflection of the angle of the lower jaw. The absence of the upper incisors in the specimens of *Prothylacinus* is fortunately compensated in another genus described under the uncouth name of *Protoproiverra*. Here we find that the number of teeth is exactly the same as in the Thylacine, there being four upper and three lower incisors, a canine, three premolars, and four molars on each side of the skull. This dentition agrees numerically with that of the Tasmanian Devil; with the exception that there is an additional premolar in each jaw. These fossils also exhibit the inflection of the angle of the mandible, and the presence of unossified vacuities in the palate, which we have seen to be marsupial features.

As might have been expected to be the case, Dr. Ameghino also states that there appears to be a complete passage from these marsupial forms to others belonging to that group of primitive carnivores known as Creodonts, of which the European Upper Eocene *Hyænodon* and *Pterodon* are well-known examples. Now, if we are to trust these descriptions (and there appears every reason why we should), we must admit that *Prothylacinus* and *Protoproiverra* are veritable marsupials of an Australian type. Then comes the question, How are we to explain the occurrence of such closely allied forms in areas so remote from one another as Patagonia and Australia?

It had long ago been urged that the occurrence of carnivorous marsupials in South America and Australia and nowhere else (at the present time) indicated a former connection between those two areas. To this, however, Mr. Wallace ("Distribution of Animals," vol. i. p. 399) objected that the American opossums (*Didelphyidae*) were not an Australian type, and that they occurred in the Tertiaries of Europe; and hence he argued that both the American and Australian marsupials probably took their origin from the presumed marsupials of the European Jurassic rocks. This explanation, on Mr. Wallace's own showing, will not, however, hold good for the close resemblance stated to exist between the American *Prothylacinus* and the Tasmanian Thylacine, since it is quite impossible to believe that two such similar forms could have maintained their likeness in such remote regions after having diverged from a common European ancestor as far back as the Jurassic period.

It has, however, been long known that there are certain very remarkable relationships between the fauna and flora of all the great southern continents. For instance, among mammals, the rodent family *Octodontidae* is peculiar to South (including Central) America and Ethiopian Africa. Then, again, among fishes, the family of the *Chromidae* is confined to the rivers of South America and Africa, with one outlying genus in India; while the true mud-fishes (*Lepidosiren* and *Protopterus*) are solely South American and Ethiopian, the third representative of the same family being the Baramunda (*Neoceratodus*) of Queensland. Again, the connection between the flora of Africa and that of Western Australia is so intimate as to have induced Mr. Wallace (*op. cit.*, p. 287) to express his belief that there must have been some kind of land connection, although not necessarily a continuous one, between these two widely distant areas.

The connection between the fauna of India and that of Ethiopian Africa is now too well known to stand in need of comment. The matter does not, however, end here; for if we go back to the Mesozoic epoch there are equally striking evidences of the connection between the faunas and floras of the southern continents. For instance, the extinct saurian genus *Mesosternum*, which appears to have been allied to the Plesiosaurs of the Lias, is known from early Secondary strata in Brazil and South Africa, and nowhere else. Then, again, the remarkable Anomodont reptiles (*Dicynodon*, &c.) of South Africa are closely connected with those of India; while the respective alliances between the Labyrinthodont amphibians and the Mesozoic floras of South Africa, India, and Australia are too well known to need more than mention.

It appears, then, that, altogether apart from the new discovery, the common factors connecting the faunas and floras of the four great southern prolongations of the continental land of the globe undoubtedly point, not only to a more or less intimate connection between these several areas, but also to their more or less partial isolation from the more northern lands.

Reverting to the new discovery, it may be observed that our comparatively intimate acquaintance with the Tertiary faunas of Europe and North America renders it in the highest degree improbable that marsupials of an Australian type lived during that time in either of those areas. It is, however, quite possible that they may turn up at any time in Tertiary formations in Africa, while there is nothing to show that they may not also have existed in peninsular India. Indeed, if we put aside as improbable any connection by way of the Pacific between South America and Australia, it seems impossible to give any explanation of the occurrence of allied marsupials in Patagonia and Australia without the assumption that their ancestors existed in some part of the great area lying between eastern South America and Western Australia.

R. LYDEKKER.

PHOTOGRAPHY IN COLOURS.

THE *Comptes rendus* for February 2, 1891, contained a brief note on colour photography, describing the method employed by M. G. Lippmann, who had been able to produce photographically the image of the spectrum with all its colours. A summary of this note was given in NATURE at the time (see vol. xliii., p. 360).

M. G. Lippmann, who has been continuing his researches, has communicated further results, which appear in the *Comptes rendus* for April 25 (No. 17, vol. cxiv.). These results show that we are not far off the solution of a question which has been the aim of all the latest photographic researches. The following is a translation of the note in question:—

In the first communication which I had the honour to make to the Academy on this subject, I stated that the sensitive films that I then employed failed in sensitiveness and isochromatism, and that these defects were the chief obstacle to the general application of the method that I had suggested. Since then I have succeeded in improving the sensitive film, and, although much still remains to be done, the new results are sufficiently encouraging to permit me to place them before the Academy.

On the albumen-bromide of silver films rendered orthochromatic by azalin and cyanin, I have obtained very brilliant photographs of spectra. All the colours appear at once, even the red, without the interposition of coloured screens, and after an exposure varying from five to thirty seconds.

On two of these *clichés* it has been remarked that the colours seen by transmission are very plainly complementary to those that are seen by reflection.

The theory shows that the complex colours that adorn natural objects ought to be photographed just the same as the simple colours of a spectrum. There was no necessity to verify the fact experimentally. The four *clichés* that I have the honour of submitting to the Academy represent faithfully some objects sufficiently diverse, a stained glass window of four colours, red, green, blue, yellow; a group of draperies; a plate of oranges, surmounted by a red poppy; a many-coloured parrot. These showed that the shape is represented simultaneously with the colours.

The draperies and the bird required from five to ten minutes' exposure to the electric light or the sun. The other objects were obtained after many hours of exposure to a diffuse light. The green of the foliage, the grey of the stone of a building, are perfectly produced on another *cliché*; the blue of the sky, on the contrary, was represented as indigo. It remains, then, to perfect the orthochromatism of the plate, and to increase considerably its sensibility.

NOTES.

THE Royal Society's *soirée* is being held as we go to press. We hope to give next week some account of the principal objects exhibited.

THE Bureau des Longitudes is sending an expedition to Senegambia to observe the total solar eclipse of April 1893.

THE first session of the Institution of Mining and Metallurgy is to be held in the theatre of the Geological Museum, Jermyn Street, on Wednesday, May 18, when the President, Mr. George Seymour, will deliver the inaugural address. There will be an inaugural supper at the Criterion.

At the Royal Academy dinner Sir John Lubbock responded for science. He said that no class derived more benefit and enjoyment from works of art than men of science. Sir John referred also to the growing importance of art in relation to the material prosperity of the country. Our merchants and manufacturers, he said, could no longer rely entirely on excellence of material and solidity of workmanship, but had to look to artistic charm and beauty of design.

At the annual meeting of the Royal Institution on May 2, the following gentlemen were elected officers for the ensuing year: the Duke of Northumberland, President; Sir James Crichton-Browne, Treasurer; Sir Frederick Bramwell, Secretary.

It is reported from Melbourne that Sir Thomas Elder has decided not to send out another exploring expedition into Central Australia at present. He attributes the failure of his recent expedition, under Mr. Lindsay, to the severity of the season, the drought having been unusually trying.

ON May 7 the members of the Geologists' Association will make an excursion to Walthamstow, Mr. J. Walter Gregory acting as director. The object of the excursionists will be to examine sections on the Tottenham and Forest Gate Railway. The best section is about half a mile from St. James's Street, and shows the lower terraces of the Lea Valley gravels resting on a very eroded surface of London Clay. Masses of the London Clay stand up, which were probably once islets. The alterations in the position of the bed of the Lea are well shown by this cutting.

ON Tuesday next (May 10) Mr. Frederick E. Ives will begin a course of two lectures at the Royal Institution on photography in the colours of nature.

At the meeting of the Franklin Institute, Philadelphia, on March 16, Mr. John Carbutt made some remarks on the results achieved by Mr. Frederick E. Ives in the field of colour photography, which, in his judgment, so far as practical results were concerned, were far in advance of anything that had as yet been accomplished elsewhere. Mr. Carbutt urged that it was eminently fitting for the Institute to recognize the value of the work of one of its own members, and moved that the subject of Mr. Ives's investigations and results in the field of colour photography should be referred to the committee on science and the arts for investigation and appropriate recognition. The motion was carried.

SIR JAMES CRICHTON-BROWNE delivered the annual oration at the 118th anniversary meeting of the Medical Society of London, held on Monday evening. He chose as his subject "Sex in Education." He showed that the female brain is lighter than that of the male, not only absolutely, but relatively to the respective statures and weights of the two sexes; that the specific gravity of parts of the female brain is less than that of corresponding parts of the male brain; and that the blood supply, which in the male is directed more towards the portions which are concerned in volition, cognition, and the ideomotor processes, is in the female more directed towards portions which are mainly concerned in the discharge of sensory functions. Sir James urged the necessity of such structural differences being taken into account in the conduct of education; and, while disclaiming any intention of bringing a wholesale indictment against high schools for girls, he nevertheless held that some of their methods were capable of leading to great evils, especially when not controlled by a judicious and sympathetic mistress. He pointed out the difficulty of obtaining trustworthy information as to either the methods of many schools or their effects, more especially as the pupils themselves were often hostile to the inquiry; but he referred to one school at which he had been permitted to ascertain the facts, and in which he found that, out of 187 girls belonging to the upper and middle classes, well-fed and clad and cared for, and ranging from ten to seventeen years of age, as many as 137 complained of headaches, which in 65 instances occurred occasionally, in 48 frequently, and in 24 habitually. He cited the authority of Sir Richard Owen for the position that children have no business with headaches, and that something must be wrong in the school in which they frequently suffer from them. An account was given of the *modus operandi* of excessive brain work as a factor in the production of ill-health, and statistics were quoted to show the special liability of the female organism to disease at the period of life which the educator has seized on for his own. He attached great importance to loss of appetite, especially morning appetite, as a result of overstrain, and as one which was calculated to be itself the fruitful parent of other evils; and he strongly condemned the recent decision of the University of St. Andrews to open its classes in arts, science, and theology to women as well as to men, thus, as he declared, taking not a retrograde step, but a downhill step towards confusion and disaster. "What was decided amongst the prehistoric protozoa cannot be annulled by Act of Parliament; and the essential difference between male and female cannot be obliterated at a sweep of the pen by any *Senatus Academicus*."

THE weather during the past week has been unsettled generally, and showers of cold rain, hail, or sleet have occurred

in many districts. The day temperatures have been low, with sharp frosts at night; on April 29 the thermometer on the grass fell as low as 20° in London, and heavy snow fell at Wick. From official reports for the week ended April 30 the temperature was several degrees below the mean for the week in all districts, although the bright sunshine had exceeded the normal amount. Gales were experienced on our exposed north and west coasts, but for the most part the wind has been light. Bright aurora has again been seen at several places. On May 1 the thermometer rose to 60° or more at several inland stations, but this improvement was not maintained. The winds, which during a few days were northerly and north-westerly, again became easterly over the whole of the British Isles, with unsettled and unseasonable weather.

A SPECIAL meeting of the New England Meteorological Society was held in Boston on April 6, when the recommendation of the Council to transfer the weather service of the Society to the National Weather Bureau at Washington, with the object of forming a New England Weather Service under the direction of that Bureau, was formally ratified. The New England Weather Service will continue to gather and publish observations of temperature and rainfall, and the monthly *Bulletin* will be continued as heretofore. While that part of the Society's work, in which the greater number of persons is involved, is thus transferred to the New England Weather Service, the meetings and investigations of the Society will be continued as during the past eight years. Three meetings will be held annually, and the proceedings will be published in the *American Meteorological Journal*, while the investigations will be published in the *Annals of the Harvard College Observatory*. In the *Bulletin* for March, it is stated that it is the intention of the Weather Bureau to make a special study of thunderstorms during the coming summer. The observations are to be made in several States, from May to August inclusive.

THE Deutsche Seewarte (Hamburg) has recently issued an atlas of thirty-five charts, with introductory text, showing the physical conditions of the Indian Ocean, on a similar plan to that published for the Atlantic Ocean some years ago. The rich materials at the disposal of the Seewarte have been discussed by Dr. Köppen and others in every form that can be of use both to seamen and physicists. Several charts are devoted to the currents, temperature and specific gravity, winds and monsoons, while the magnetic elements have been specially investigated by Dr. Neumayer.

THE Indian journals received by this week's mails report that Mr. John Eliot, the Meteorological Reporter to the Government of India, has returned to Simla from Chaman and Murree, where he has been establishing new meteorological observatories.

ON Friday last Colonel J. F. Maurice, Professor of Military Art and History to the Staff College, read at the meeting of the Royal United Service Institution a most interesting paper on military geography. This he described as a science dealing with all those conditions of the surface of the world which affected armies, campaigns, and battles. He sought to show how in the case of each of the great European countries strategic methods are affected by geographical conditions.

OPINIONS are being expressed by scientific workers in India in favour of the making of systematic experiments with snake poison. The Committee for the Management of the Calcutta Zoological Gardens are constructing, from private subscriptions a snake-house with the most modern improvements, which will contain specimens of all the principal poisonous snakes in

the country. If the necessary funds were available, arrangements could be made to fit up a small laboratory in connection with the snake-house, for the purpose of conducting inquiries of all descriptions bearing upon the pathology of snake-bite and cognate subjects, and in future there would be no difficulty in arranging for the carrying out of any special experiments that might be required. It is understood that Dr. D. D. Cunningham, F.R.S., President of the Committee, would in that case be willing to take an active part in organizing and promoting such inquiries and carrying out such experiments, including the testing of the various alleged remedies for snake-bite which are from time to time brought to notice. A Calcutta paper, quoted by the *Pioneer Mail*, understands that if the Government of India will make a grant of Rs. 5000 towards this object, the Lieutenant-Governor will endeavour to meet the balance from Provincial funds.

THE well-known mycologist, Dr. Stephan Schulzer von Müggenburg, has just died at the age of ninety.

AT the coming "World's Columbian Exposition" at Chicago, it is proposed to have an exhibition of the "worst weeds" from all the States and Territories of the Union.

UNDER the editorship of Mr. E. M. Holmes a Catalogue has just been issued of the "Hanbury Herbarium" in the Museum of the Pharmaceutical Society. The collection consists of above 600 dried specimens of plants yielding products used in pharmacy, or believed to have medicinal properties, each specimen being labelled with its locality or the source whence it was obtained, and often accompanied by notes or extracts from letters of foreign correspondents. The collection was formed by the late Daniel Hanbury, F.R.S.; and, by the desire of his executors, who presented it to the Pharmaceutical Society, it is preserved in a separate room, known as the "Hanbury Room," on the premises of the Society in Bloomsbury Square.

THE second part of "Botanicon Sinicum," by Dr. Bretschneider, the learned physician to the Russian Legation in Peking, has just been issued in Shanghai in the Journal of the North China Branch of the Royal Asiatic Society. The work deals with the botany of the Chinese classics, the object being to identify as far as possible the plants mentioned in the writings of Confucius, Mencius, and the other great sages of ancient China. Dr. Bretschneider takes each name in succession, supplies all the information given by native commentators on these ancient writers, and by lexicographers; then he gives all that can be gleaned from Japanese authorities, and follows this by the identifications of European students; concluding with the results of his own study and observation. Those whom Dr. Bretschneider's labours for the past twenty-five years have taught to expect profound learning, research, and thoroughness from him will not be disappointed in this work.

AMONG the contents of the new number of the Journal of the Royal Horticultural Society are the interesting papers read at the Conference on asters and perennial sunflowers, held at Chiswick in October last. The proceedings of the Conference were opened by an address by Mr. J. G. Baker, which is now printed. In this excellent address, in which the general botanical outlines of the subject are sketched out, Mr. Baker mentions that aster as it stands at present contains 200 or 300 species, and is concentrated in the United States. Nearly all our garden Michaelmas daisies belong to the species that grow wild in the Eastern United States. There are forty species of aster in the Rocky Mountains and fifteen in California, most of which are different from the eastern species, and have not been brought into cultivation. The papers published with Mr. Baker's

address are on the genus aster, by Prof. G. L. Goodale; the Michaelmas daisy as a garden plant, by the Rev. C. W. Dod; perennial sunflowers, by Mr. D. Dewar; and the culture of sunflowers, by Mr. E. H. Jenkins.

THE "University Extension" movement has spread to the United States. We learn from the *Botanical Gazette* that Prof. J. M. Coulter, President of the University of Missouri, is lecturing to large University Extension classes in Evansville and New Albany, Indiana, and Louisville, Kentucky. Each course includes twelve lectures on the general morphology and physiology of plants.

AUSTRALIANS have had bitter experience of the mischief which rabbits are capable of doing, and now they seem likely to have trouble of a similar kind from the introduction of foxes. An Australian journal, quoted in the May number of the *Zoologist* says that foxes have already spread over a wide area, and are most destructive both to lambs and poultry. They attain greater size and strength in Australia than in England, and the mild climate is highly favourable to the increase of their numbers. "It must be very disheartening," says the writer, "to all who have stock of any kind to lose, to find themselves confronted by some new enemy introduced by thoughtless or selfish persons. If some energetic steps are not soon taken, nothing can prevent the spread of foxes over the whole continent."

MR. D. L. THORPE writes from Carlisle to the *Zoologist* that starlings in that district often reproduce the notes of the oystercatcher and curlew with wonderful accuracy. On April 3 he was surprised to hear the call of the landrail; it appeared to be the familiar "crake-crake" of that bird undoubtedly, but on further investigation he ascertained that a starling was reproducing the call-note of the rail. The bird had remembered his lesson of last summer remarkably well. Mr. Thorpe also mentions that, during severe weather in January last, a friend of his (the Rev. H. A. Macpherson) was astonished one day to hear the call-note of the common sandpiper repeated with such nicety as to completely deceive him, until the starling was detected in the act of rehearsing this summer cry.

A CAPITAL lecture on Egyptian agriculture was delivered by Prof. Robert Wallace at the meeting of the Society of Arts on April 27, and is printed in the current number of the Society's Journal. Referring to the Tewfikieh College of Agriculture, Prof. Wallace says that it was named in honour of the late Khedive (Tewfik Pasha), who took a special interest in its success. It had its origin in a desire which sprang up little more than two years ago in the Egyptian Government to develop the agricultural resources of the country by calling in the aid of science. The result has been a success far beyond the most sanguine anticipations. During the first year of its existence the College contained about 60 students, selected from about 300 applicants, and the numbers of the second, the current year, which began last October, have not fallen off. A number of the sons of large land-owners have taken advantage of the instruction offered, and it is hoped by this means to spread in all directions a knowledge of improved varieties of crop plants, improved rotations, improved implements, and improved methods, not necessarily altogether new to the country, but deserving of being more widely known.

MR. W. F. LIESCHING, writing in the new number of the Selborne Society's Magazine on ants in Ceylon, says he saw one day a string of ants streaming forth, evidently in search of "pastures new." He flicked away the leader, and waited to see the result. An immediate halt was made by the foremost ants, and a scene of the utmost confusion ensued. The ants from behind kept arriving at the scene of the catastrophe, and there

was soon a black crowd of ants huddling and jostling one another. Some detached themselves from the main group and took a turn round, trying to find traces of their leader. At last the tail end of the line arrived, and after brief consultation they all started off again, and a line soon began to unravel itself from the tangled mass moving back to the hole from which the whole company had so lately started on "pleasure bound or labour all intent." While Mr. Liesching was watching the return journey, a leech stung his leg. He took the creature off, and put it down in the line of march. Ants will carry off a worm, why not a leech? It was, however, most amusing to see how carefully all avoided the leech.

HENRY BRUGSCH PASHA read an interesting paper on Lake Mœris at the meeting of the Société de Géographie Khediviale on April 8. He had just returned from a visit to the neighbourhood of the supposed site of the lake, so that the subject was fresh in his mind. The *Times* has given a good abstract of the paper. M. Brugsch said there was abundant monumental evidence that at a very early period of Egyptian history there existed near the plateau of Hawara an immense basin of water, which gave its name to a whole province, the Fayûm, or "lake district." In ancient times there were forty-two divisions or nomes of Egypt, each having its own capital, local government, and *cultus*, and all more or less worshipping Osiris. From these the Fayûm was excluded. It was divided like the parent country into nomes with their governors, and save in the necropolis at Hawara was given over to the worship of Sebak, the crocodile god. It was known in the hieroglyphs as To She, the lake district, which in Coptic became P-ium, the maritime district, and survives to-day in the Arabic Fayûm. It is evident from the celebrated Fayûm papyrus, of which there are two copies, that the term Mer-uer, the great water or lake, was also applied to it; and perhaps herein lies the origin of the name "Mœris." The waters of this lake must have reached to the plateau of Hawara, the necropolis of the inhabitants of a town called Shed, on the site of which stands the modern city of Medinet-el-Fayûm. It was in ancient times a Royal residence, and contained a magnificent temple dedicated to Sebak, whose dimensions far exceeded those of the temples at Thebes. Tradition gives Amen-em-hat III. of the twelfth dynasty as the constructor of Lake Mœris, and his burial-place is the crude brick pyramid at Hawara; but fragments bearing the cartouches of Amen-em-hat I. and Usertsen II., found near Medinet, would prove it of more ancient date. Moreover, it was hardly possible that a town of such dimensions as Shed would be built at any distance from water. A canal named Hune, or Hunet, cut from the Nile, fed the lake and provided for the needs of the city; the mouth of it was called in the hieroglyphs La Hune, "the opening of the canal," a name which survives in the modern "El-Lahûn." There is an interesting allusion to this "opening of the canal" in the celebrated Stela of Piankhi, written about the eighth century B.C. M. Brugsch also suggested that Ra-pa-ro-hunet, "the temple of the mouth of the canal," might give us the derivation of the word labyrinth.

WE have received the third number of *Natural Science*, the new monthly review of scientific progress. Among the contributors are Prof. G. Henslow, Mr. G. A. Boulenger, Sir J. W. Dawson, and Prof. W. C. Williamson.

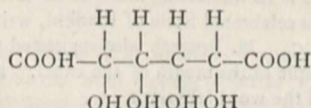
MESSRS. CHARLES GRIFFIN AND CO. have published the "Year-book of the Scientific and Learned Societies of Great Britain and Ireland." This is the ninth yearly issue. It presents lists of papers read before various Societies during the year 1891, together with information as to official changes. In most cases the Societies themselves have contributed the lists of papers. The names of those Societies concerning which no information has been received are entered in the index only.

MESSRS. W. AND A. K. JOHNSTON have issued, under the authority of the Royal Agricultural Society of England, a valuable series of eight diagrams representing the life-history of the wheat plant. The diagrams are reproductions of original drawings by Francis Bauer, now in the Botanical Department of the British Museum, and are printed in colours. With each set is sent a pamphlet by William Carruthers, F.R.S., consulting botanist to the Society, entitled "The Wheat Plant: How it Feeds and Grows." This pamphlet consists of notes explanatory of the diagrams.

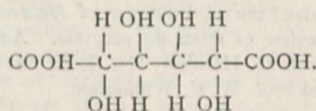
DR. L. MESCHINELLI AND DR. S. SQUINABOL announce for publication a Tertiary Flora of Italy.

FOUR lectures upon recent stellar spectroscopy and the new star in Auriga will be delivered in Gresham College, by the Rev. Edmund Ledger, at 6 p.m. on the evenings of May 10, 11, 12, and 13.

ANOTHER contribution to our knowledge of the sugars and their related compounds is published by Prof. Emil Fischer in the current number of the *Berichte*. It relates to the constitution of the group of substances at the head of which stands dulcitol, $\text{CH}_2\text{OH}-(\text{CHOH})_4-\text{CH}_2\text{OH}$, the hexahydric alcohol obtained from Madagascar manna, and prepared artificially by the reduction of milk sugar. It has already been established that the aldehyde corresponding to dulcitol is galactose, $\text{CH}_2\text{OH}-(\text{CHOH})_4-\text{COH}$, the glucose obtained from many gums, and which is formed when milk sugar is boiled with dilute acids. Moreover, it has long been known that, when either dulcitol or galactose are oxidized by means of nitric acid, a dibasic acid of the composition $\text{COOH}-(\text{CHOH})_4-(\text{COOH})$ is produced. This acid, although expressed by the same formula as saccharic acid, the acid obtained by the oxidation of common cane-sugar, differs considerably in properties from that acid, and has been termed mucic acid. It is now known to be a geometrical isomer of saccharic acid—that is to say, the two compounds only differ with regard to the relative positions of the atoms comprising their molecules. Saccharic acid, as obtained from cane-sugar, is probably unsymmetrically built up, for its solution rotates the plane of polarization of light to the left. The main result of the work now described has been to show that the molecules of mucic acid are, on the contrary, symmetrically constructed, and that its observed optical inactivity is due to this fact. Theoretical considerations, based upon the postulates of the Van 't Hoff-Wislicenus hypothesis concerning the arrangement of carbon, hydrogen, and oxygen atoms in space, lead to the view that, of the ten possible geometrically-isomeric dibasic acids of the constitution $(\text{CHOH})_4(\text{COOH})_2$, two must be optically inactive. These two optically inactive isomers would be represented respectively by the formulæ



and



One of these two was presumably mucic acid. It was evident that if the molecules possessed a configuration similar to that roughly indicated in one plane by either of the above formulæ, upon reduction to a monobasic acid there would be an equal number of chances of each of the two end carboxyl groups being attacked by the reducing agent and converted to CH_2OH groups. Consequently it was to be expected that equal quanti-

ties of two geometrically isomeric monobasic acids would be obtained, one dextro- and the other lævo-rotatory. Such has, indeed, been found by Prof. Fischer to be the case; for, upon reducing either the ethyl ester or the lactone of mucic acid (the acid itself being unattacked) by means of sodium amalgam, an optically inactive acid of the constitution $\text{CH}_2\text{OH}-(\text{CHOH})_4-\text{COOH}$ was obtained, which formed a salt with strychnine yielding two distinct kinds of crystals, resembling the well-known complementary racemates of Pasteur. From these two kinds of crystals solutions of the free acids were obtained, which were respectively dextro- and lævo-rotatory, and each was again converted into mucic acid upon oxidation. One of these, the right-handed variety, was identical with the common galactonic acid prepared by oxidation of galactose. Moreover, by further reduction of the inactive acid, an inactive glucose was obtained, from which eventually common dextro- and also lævo-galactose were isolated by fermentation; and finally, by still further reduction of the galactose, dulcitol itself was obtained. Hence, the symmetrical structure of the dulcitol group may be considered as proved, and the work also completes the artificial synthesis of these compounds; for, given the synthesis of any one by the method previously described by Prof. Fischer, any of the others may be prepared from it by the processes now described.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*) from India, presented by Miss Beatrice Raymond; a Wild Swine (*Sus scrofa* ♀) from Tangiers, presented by Mr. E. H. Banfather; a Great Kangaroo (*Macropus giganteus*) from Australia, presented by Mrs. Frazer; a Purple Heron (*Ardea purpurea*), European, presented by Captain Woodward; a Bateleur Eagle (*Helotarsus ecaudatus*), a Tawny Eagle (*Aquila navioides*) from Africa, presented by Captain Webster; a Raven (*Corvus corax*), European, presented by Mr. F. J. Stokes; seven Common Vipers (*Vipera berus*), British, presented by Mr. T. A. Cotton, F.Z.S.; a Rufous-necked Weaver Bird (*Hyphantornis textor*) from West Africa, purchased; an English Wild Bull (*Bos taurus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SUN-SPOTS.—In the March number of the *Memorie della Società degli Spettroscopisti Italiani*, there are some interesting notes relating to spots and prominences. Prof. Tacchini gives a tabulated statement of the solar observations made at the Royal Observatory for the last three months of the year 1891. The most frequent records of faculæ occurred in the zones $\pm 10^\circ \pm 30^\circ$, only one being seen as high as the zone $+40^\circ + 50^\circ$. As regards the spots, the greatest frequency of groups took place in the zones $\pm 10^\circ \pm 20^\circ$, 23 and 10 being observed in the north and south respectively.

Profs. A. Mascari and J. Fenyi both contribute some notes on the large group of spots visible in February last, the latter pointing out that the relation of the eruption to the large group was such that its centre was situated very near the side of the great nucleus of the south spot, but was entirely outside the spot itself.

M. H. Deslandres records also his observations with respect to the remarkable protuberance visible on March 3 at about 10 a.m. From spectroscopic observations he obtained a radial velocity of 200 kilometres per second, using the hydrogen and helium lines. He also obtained a photograph of the invisible ultra-violet region, which furnished him with "an exact image" of this protuberance. The H and K lines were extraordinarily brilliant, and the negative contained the entire series of ultra-violet rays of hydrogen. It may be mentioned that at the appearance of this large protuberance no special indication was registered on the curves of the magnetic instruments which M. Deslandres obtained from M. Wolt.

Prof. Tacchini communicated to the Paris Academy on April 25 the results of solar observations made at the Roman College during the first three months of this year. Spots and

faculae were observed on 56 days, viz. 19 in January, 19 in February, and 18 in March. The results are shown below:—

1892.	Relative frequency		Relative magnitude	
	of spots.	of days without spots.	of spots.	of faculae.
January ...	19'63	0'00	79'79	56'58
February ...	23'31	0'00	153'61	60'28
March ...	13'12	0'00	61'67	86'39

The following are the results for prominences:—

1892.	Days of observation.	Mean number.	Mean height.	Mean extension.
January ...	13	6'39	39'6	1'6
February ...	13	7'00	36'0	1'6
March...	14	8'14	36'4	2'3

The frequency and magnitude of spots during these months are much greater than during the preceding quarter, but prominences do not show a marked increase. No augmentation of this class of phenomena appears to have accompanied the great spot of February, if the mean numbers for the month be taken.

ECLIPSE OF THE MOON, MAY 11.—A partial eclipse of the moon will occur on May 11, and, if weather permits, it should be widely observed. The magnitude of the eclipse is 0'953, the moon's diameter being represented by 1. But although it is not total, important naked-eye observations can be made on the darkness of the shadowed moon for comparison with previous eclipses, and possessors of telescopes will doubtless take advantage of the occasion to obtain some new facts. The following times are from the "Nautical Almanac":—

	G.M.T.
	h. m.
First contact with the penumbra, May 11	7 55'9
" " " shadow	" 9 10'2
Middle of the eclipse	" 10 53'4
Last contact with the shadow	" 12 36'6
" " " penumbra	" 13 50'9

The first contact with the shadow occurs at 82° from the most northern point of the moon's limb, counting towards the east; the last contact at 41° from the same point, counting towards the west.

SPECTRUM OF SWIFT'S COMET (α 1892).—Mr. W. W. Campbell observed the spectrum of Swift's comet on April 6, by means of a spectroscope having one prism of 60° attached to the 36-inch of the Lick Observatory (*Astronomical Journal*, No. 262). The spectrum could be distinguished from about C to G. Three bright bands had the wave-lengths of their less refrangible edges determined as 5630, 5170'4, and 4723, by comparison with spark-spectra of iron and magnesium. The intensities of the bands were estimated to be in the ratio 1:6:2.

COMET SWIFT, 1892.—*Astronomische Nachrichten*, No. 3087, contains the following ephemeris of Swift's comet:—

1892.	For 12h. Berlin Mean Time.			log r .	log Δ .	B.
	R.A.	Decl.				
	h. m. s.	° ' "				
May 5	22 45 25	+23 41'7				
" 6	22 48 19	24 21'5				
" 7	22 51 12	25 0'5	0'0608	0'1115	0'70	
" 8	22 54 3	25 38'7				
" 9	22 56 53	26 16'2				
" 10	22 59 41	26 52'9				
" 11	23 2 28	27 28'9	0'0723	0'1236	0'62	

The brightness on March 10 is taken as unity.

On the 5th the comet will be found to form very nearly an equilateral triangle with the stars λ and μ in Pegasus, while on the 11th it will be near β in the same constellation.

COMET SWIFT, 1892.—The spectrum of this comet has been observed by Prof. Konkoly, who contributes his observations to the *Astronomische Nachrichten*, No. 3087. The spectrum on April 1 appeared very bright, and showed five bright lines whose intensities were as follows:—I. = 0'4; II. = 0'3; III. = 1'0; IV. = 0'2; V. = 0'1, the continuous spectrum extending from λ = 580 to λ = 440.

The following measures are the means of five direct scale readings of the above-mentioned lines:—

I. = 558'82 $\mu\mu$
II. = 544'94
III. = 516'30
IV. = 472'54
V. = 468'78

Similar observations were also repeated the next night, only by means of a larger telescope and spectroscope. The continuous spectrum was found to extend from λ = 559 $\mu\mu$ to λ = 449 $\mu\mu$. The intensities were I. = 0'5; II. = 0'3; III. = 1'0; IV. = 0'2; V. = 0'1.

The mean values of the five measures obtained for each line were:—

I. = 558'40 $\mu\mu$
II. = 543'82
III. = 516'26
IV. = 472'70
V. = 468'10

NOVA AURIGÆ.—*Astronomische Nachrichten*, No. 3083, contains some measurements and remarks by Prof. Konkoly relative to the spectrum of this Nova. Five lines were, according to him, very satisfactorily measured on March 20, and the means of six measures for each were as follows:—

I. = 531'80 $\mu\mu$
II. = 516'50
III. = 501'95
IV. = 492'30
V. = 486'15

Using a 10-inch objective prism on the 21st, he found that II. was the brightest line, III. being somewhat feebler; I. was very weak, while IV. was not bright, but broad; V., again, seemed quite visible. With regard to the dark lines, he was only able to suspect them in the region of C and F (especially the latter), owing to their feebleness. The hydrogen lines on the 21st appeared feebler than those in γ Cassiopeia.

A NEW VARIABLE.—A circular (No. 32) that we have received from the Wolsingham Observatory contains the following:—

The star D.M. + 55° 18'0—

16h. 39m. 49s.; +55° 12'; 9'2

was found 7'3; 7'7, April 26; 29. Variable. Spectrum like Mira.

T. E. ESPIN.

THE TEMPERATURE OF THE BRAIN.

THE Croonian Lecture was delivered this year by Prof. Angelo Mosso, Professor of Physiology in the University of Turin. His subject was the temperature of the brain, especially in relation to psychical activity. Prof. Mosso's earlier investigations on the human brain only related to the blood circulation.¹ He then found that the blood pressure rises during psychical work, and that during such more blood is sent from the peripheral parts of the body. Prof. Mosso also found that the blood circulation in the brain showed fluctuations which are not dependent on psychical activity. These and other variations in the brain circulation led him to suspect that Dr. Schiff's theory about brain temperature as introduced into physiology required revision. In a published work on fatigue,² Prof. Mosso gave his views on the influence of psychical work on the organism, especially on the muscular force. We do not yet know what form of phenomena subserves the first condition of thought. Fatigue caused by psychical activity acts as a poison, which affects all organs, but especially the muscular system. This is clearly demonstrated by Prof. Mosso's investigations on men who have been subjected to great mental strain. The blood of dogs, fatigued by long racing, acts as a poison, and when injected into other dogs they exhibit all the symptoms of fatigue. The characteristic phenomena of fatigue depend more on nerve-cell products than on a deficiency of suitable material.

During investigation into the physical conditions during psychical activity, Prof. Mosso's attention was directed to the subject of the temperature of the brain. To avoid errors arising from blood changes he endeavoured to keep the blood temperature and that of the organs in agreement with that of the brain. For such a purpose he found that the thermo-electric pile which Dr. Schiff employed would not suffice, and he had

¹ "Kreislauf des Blutes in menschlichen gehirne," Leipzig, 1881.

² "Die Ermüdung," Leipzig, 1892.

therefore made by Baudin, of Paris, some very sensitive mercurial thermometers. The investigations made with the help of these instruments on the brain and blood temperatures bring to light new evidences of activity in the nerve centres. There are sometimes very extensive temperature developments under the influence of special excitements quite independent of psychical activity. The change in the nutrition of the nerve-cells, and not their specific activity, seems to be the most important source of heat in the brain. Thus Prof. Mosso would explain the marked effect on brain temperature of ordinary irritants where the increase is far higher upon the introduction of such than upon any psychical work done by the brain.

The following is an abstract of Prof. Mosso's Croonian Lecture:—

In his investigations on the temperature of the brain the author

that of the blood in the arteries. This is due to the very great radiation of heat which takes place from the surface of the head.

The brain when subjected to the action of the ordinary interrupted current rises in temperature. The rise is observed earlier in the brain than in the blood, and the increase is greater in the brain than in the general blood-current or in the rectum. During an epileptic seizure, brought on by electrical stimulation of the cerebral cortex, the author observed within twelve minutes a rise of 1°C. in the temperature of the brain.

As a rule the temperature of the brain is lower than that of the interior of the body; but intense psychical processes, or the action of exciting chemical substances, may cause so much heat to be set free in the brain that its temperature may remain for some time $0^{\circ}\cdot 2$ or $0^{\circ}\cdot 3\text{ C.}$ above that of the interior of the body.

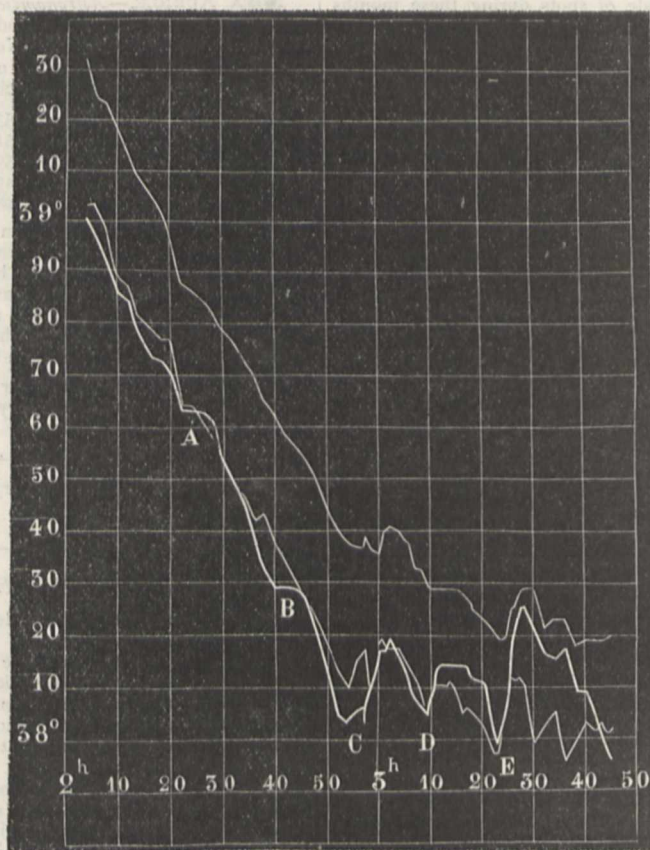


FIG. 1.—Dog rendered insensible with laudanum. The upper (thin) line represents the temperature of the interior of the body, the middle (thin) line the temperature of the blood in the carotid artery, the third (thick) line the temperature of the brain. A, injection of 3 c.c. laudanum; B, blast of a trumpet; C, D, E, electric stimulation of the brain. The ordinate is marked in tenths of a degree Centigrade, the abscissa in periods of ten minutes.

has employed, in preference to the thermo-electric pile, exceedingly sensitive mercurial thermometers, constructed specially for the purpose. Since each thermometer contains only four grams of mercury, the instruments respond very rapidly to changes of temperature, and a change of not more than $0^{\circ}\cdot 002\text{ C.}$ can easily be measured by means of them. The author has studied the temperature of the brain, comparing it with that of arterial blood, of the muscles, and of the interior of the body. His observations were made on animals under the influence of morphia or various anæsthetics, and also on man.

The curves of the observations made show that in profound sleep a noise, or other sensory stimulus, is sufficient to produce a slight development of heat in the brain, without the animal necessarily awakening.

In profound sleep the temperature of the brain may fall below

When a dog is placed under the influence of curare, the temperature of the brain remains fairly high, while that of the muscles and that of the blood falls. The difference of temperature thus brought about is great and constant. In one instance, the temperature of the brain was $1^{\circ}\cdot 6\text{ C.}$ above that of the arterial blood in the aorta. Such observations warn us not to regard the muscles as forming, *par excellence*, the thermogenic tissue of the body.

In order to show how active are the chemical processes in the brain, it is sufficient to keep the animal in a medium whose temperature is the same as that of the blood. When the effects of radiation through the skull are thus obviated, the temperature of the brain is always higher than that of the interior of the body, the difference amounting to $0^{\circ}\cdot 5$ or $0^{\circ}\cdot 6\text{ C.}$

Observations made while an animal is awake tend to show that the development of heat due to cerebral metabolism may be very considerable, even in the absence of all intense psychical activity. The mere maintenance of consciousness belonging to the wakeful state involves very considerable chemical action.

The variations of temperature, however, observed in the brain, as the result of attention, or of pain or other sensations, are exceedingly small. The greatest rise of temperature observed to follow, in the dog, upon great psychical activity was not more than $0^{\circ}01$ C. When an animal is conscious, no

sensible by an anæsthetic, one no longer obtains a rise of temperature upon stimulating the cerebral cortex with an electric current. These results cannot be explained as merely due to the changes in the circulation of the blood. The physical basis of psychical processes is probably of the nature of chemical action.

In another experiment, in an animal rendered insensible with chloral, the curves of temperature show that when the muscles of a limb are made to contract, the temperature of the muscles rises, but falls rapidly as soon as the stimulation ceases, soon returning to the normal. This is not the case, however, with

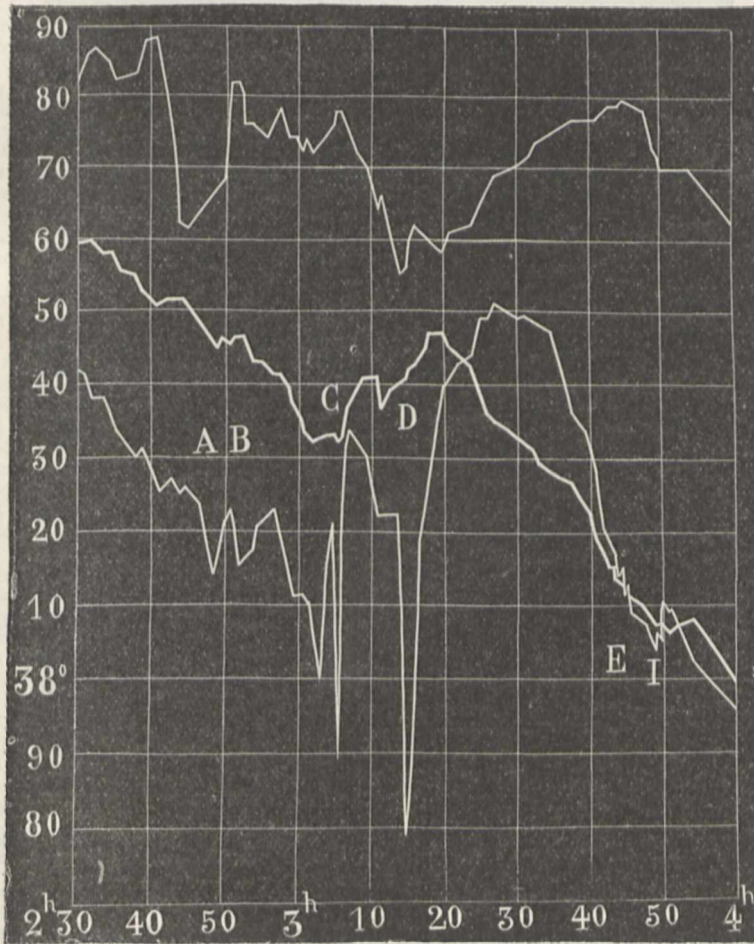


FIG. 2.—Dog (female) rendered insensible with chloroform and then with laudanum. The upper line represents the temperature of the vagina, the middle (thicker) line that of the brain, the lower that of the arterial blood in the carotid artery. 1A and B, psychical emotion; C, electric stimulation of the brain; D, injection of 14 c.c. laudanum (intravenous); E and I, electric stimulation of the brain.

change of consciousness, no psychical activity, however brought about experimentally, produces more than a slight effect on the temperature of the brain.

The author shows an experiment by which it is seen that, as part of the effect of opium, the brain is the first organ to fall in temperature, and that it may continue to fall for the space of eighteen minutes, while the blood and the vagina are still rising in temperature.

The author discusses the elective action of narcotics and anesthetics. He shows that these drugs suspend the chemical functions of the nerve-cells. In a dog rendered completely in-

the brain excited by an electric current. Here the stimulus gives rise to a more lasting production of heat; the temperature may continue to increase for several minutes after the cessation of the stimulation, indeed, often for half an hour. This may possibly explain why, upon an electric stimulation of the cerebral cortex, the epileptiform convulsions are not immediately developed, but only appear after the lapse of a latent period of several minutes.

This experiment may be made to show the elective action exercised upon the brain by stimulant remedies. The injection of 10 centigrams of cocaine hydrochlorate produces a rise of

temperature in the brain of $0^{\circ}36$ C., without any change in the temperature of the muscles or of the rectum being observed. In a curarised dog, the intervention of the muscles being thereby excluded, the action of the cocaine may produce a rise of as

the magnet was in oscillation, the force increasing, and reaching a maximum at 13h. 43m., after which it began to decrease, the minimum being reached at oh. 15m. on the 14th. Further abrupt movements occurred at 4h. 30m. on the 14th, the oscil-

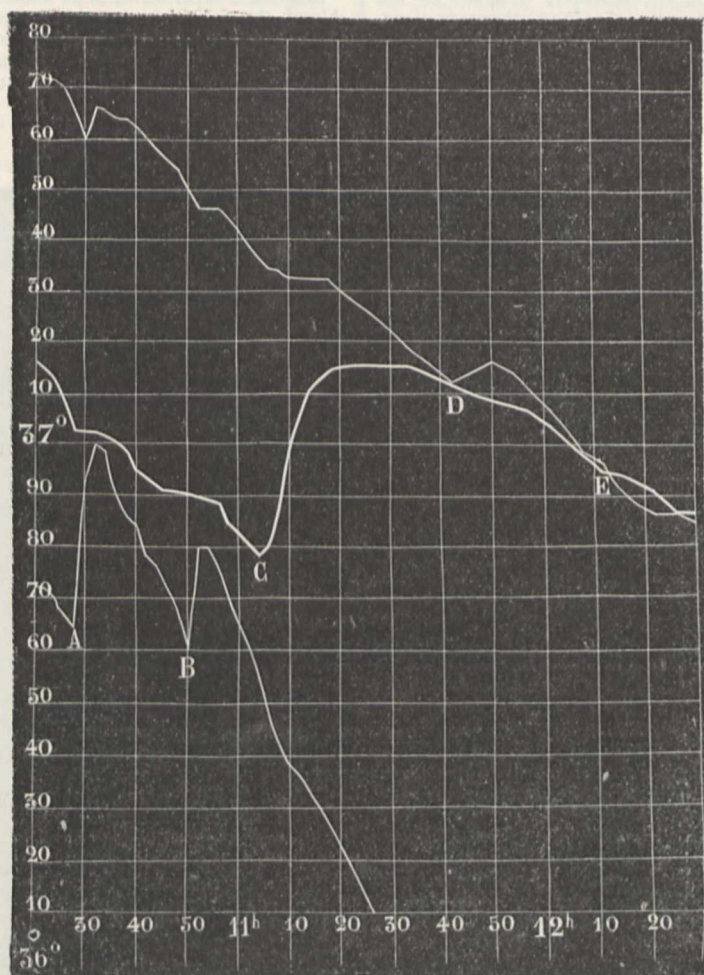


FIG. 3.—Dog rendered insensible with chloral. The upper line represents the temperature of the rectum, the middle (thicker) line that of the brain, the lower line that of the muscles of the thigh. A and B, electric stimulation of the muscles; C, injection of 10 centigrams of cocaine into the saphena vein; D, E, spontaneous variations in the temperature of the rectum.

much as 4° C. in the temperature of the brain, the author having observed a rise from 37° to 41° C. This shows that in arranging the calorific topography of the organism a high place must be assigned to the brain.

THE MAGNETIC STORM OF FEBRUARY IN MAURITIUS.

AT a meeting of the Meteorological Society of Mauritius, that took place on April 7, Mr. Meldrum read a short paper on the sun-spots, magnetic storm, cyclones, and rainfall of February 1892. The photographs of the sun that he exhibited, which were taken at the Royal Alfred Observatory from February 5 to 18, showed the very large group of spots, their approximate latitude on the 9th being from 6° to 16° south. Leading on to the occurrence of the great magnetic storm which began at 8h. 55m. on the 13th, he states that its commencement was distinctly recorded on the three curves, the horizontal force suffering the greatest disturbance. Up to 14h;

lations, as shown by the curves, being very numerous, but at 19h. the magnets became more steady, and were quiet by 3h. on the 15th. The ranges obtained at the Mauritius Observatory were the largest ever recorded there.

Cyclones were not absent during this month. One lasted from the 11th to the 14th, and another from the 25th to the 28th, while a third was also experienced on the 21st and 22nd, about 550 miles south of Mauritius. The rainfall for February, as shown by returns from the numerous stations, was from 4'30 to 16'96 inches above the average for periods of 7 to 29 years. At Antoinette the fall for the month amounted to 12'53 inches, while that at Cluny came to 34'37 inches. St. Aubin and Nouvelle France came in for a considerable quantity of rain, the falls in the 24 hours ending at 8 a.m. on the 13th reaching the figures 5'00 and 18'20 inches respectively. Referring lastly to the magnificent displays of auroræ that have been observed both in Europe and America, he mentions that, although at Mauritius the sky was overcast, under similar conditions with respect to solar activity and terrestrial magnetism, a great display was visible in 1872; Mr. Meldrum,

in his concluding remarks as to whether "there is a causal connection between solar activity (as indicated by outbursts on the sun) and magnetic disturbances, auroras, cyclones, and rain-fall," remarks that with regard to the two former there can hardly be any doubt, but with regard to the two latter he is of opinion that a very close connection does exist, there being a considerable preponderance of evidence in its favour.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—*Annual Abstract of Accounts*.—The abstract of accounts of the University for the year ending December 31, 1891, has just been published. It exhibits both the accounts of the Curators of the Chest and the financial position of the University institutions. The receipts show an income of £66,986 12s. 9d., against £65,175 17s. 2d. last year. The principal sources of internal income include estates £9978 12s. 8d., the University Press £5000, University dues £11,153 5s., examination fees £5659 1s., degree fees £9600. The Proctorial fines amount to only £313, nearly £100 less than last year. In connection with the present agitation against Proctorial jurisdiction this item is interesting. The total payments amounted to £64,557 6s. 3d. There was transferred to capital account £2225 16s. 4d., and a balance carried forward of £203 10s. 2d. In this item of expenditure, we find institutions and public buildings cost £19,085, the largest item under this head being the Bodleian Library £7772 4s. 4d., while the Taylor Institution absorbed £2245. The expenses in connection with lectures in large towns amounted to £729 11s. 8d., and the interest and sinking fund on loans for University purposes came to £6157 8s. 4d.

The loans account shows that the amounts remaining to be paid are £36,000 at 4 per cent. on the £60,000 New Schools Loan, and £7666 13s. 4d. at 2½ per cent. on the £10,000 Physiological Laboratory Loan.

The University and the County Councils.—The report on the peripatetic teaching in scientific and technical subjects carried on in various country districts under the supervision of the Oxford Delegates for University Extension, acting in concert with the Technical Instruction Committees of County Councils during last winter, has just been published. The report states that the Oxford Delegates for University Extension were requested by the representatives of eight County Councils in England to provide for the delivery of 227 courses, embracing 2271 lectures, on chemistry, agriculture, geology, botany, veterinary science, physiology, and hygiene. These courses have been regularly attended by more than 10,000 persons in all grades of society.

The relations between the University Extension Committees of the different Universities and the County Councils, in reference to the matter of technical instruction, has now become so important, that a Conference was summoned last week, under the presidency of the Provost of Queen's College, to consider this connection, and to profit by the experience already gained, an experience, which in some cases extends over two years. It was felt that there are certain mistakes, inevitable in the commencement of any large scheme, which might be advantageously removed, so as to promote greater harmony, and possibly more economy in the fuller development of the scheme. Many organizing secretaries and others interested in the scheme attended the Conference, which extended over two days.

Two principal subjects were under discussion, first, the provision of summer courses of instruction in Oxford, Cambridge, and other University towns for teachers in elementary schools; secondly, the methods of organization of peripatetic teaching in regard to hours of lectures, classes, cost, and local management. In connection with the first point, it was announced that Oxford, Cambridge, and the Yorkshire College, Leeds, would be prepared to offer accommodation to students this summer; the Victoria University has, however, made no such provision. The method of procuring instruction in practical agriculture and experimental farming occupied much of the attention of the meeting, and much stress was laid upon the importance of securing the co-operation of farmers to look after the experimental stations.

On the matter of peripatetic teaching, it was felt by some that no very great assistance could be expected from the elementary teacher, and that reliance must be placed upon the teacher supplied by the Universities, in some cases advantageously supplemented by the teachers in secondary schools.

Not the least important feature in the Conference was the

anxiety displayed by all present to urge on to the utmost of their power the great work of the dissemination of technical and scientific instruction, influenced solely by disinterested motives for the public service.

CAMBRIDGE.—Prof. Bonney, F.R.S., Fellow of St. John's College, will this year deliver the Rede Lecture in the Senate House, on Wednesday, June 15, at noon. The subject is "The Microscope's Contributions to the Earth's Physical History."

The Adams Memorial Committee have issued a circular inviting contributions towards the erection of a monument to the late Prof. J. C. Adams in Westminster Abbey. These may be paid to one of the treasurers (Dr. Searle, Master of Pembroke, and Prof. Liveing), or to one of the secretaries (Dr. Porter, Master of Peterhouse, Dr. Donald MacAlister, St. John's, and Dr. Glaisher, Trinity), or to the account of the Adams Memorial Fund at Messrs. Mortlock's Bank, Cambridge. We do not doubt that the invitation will meet with a generous response from the admirers of the great astronomer.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 28.—"On a Decisive Test-case disproving the Maxwell-Boltzmann Doctrine regarding Distribution of Kinetic Energy." By Lord Kelvin, Pres. R.S.

The doctrine referred to is that stated by Maxwell in his paper "On the Average Distribution of Energy in a System of Material Points" (Camb. Phil. Soc. Trans., May 6, 1878, republished in vol. ii. of Maxwell's "Scientific Papers") in the following words:—

"In the ultimate state of the system, the average kinetic energy of two given portions of the system must be in the ratio of the number of degrees of freedom of those portions."

Let the system consist of three bodies, A, B, C, all movable only in one straight line, KHL:

B being a simple vibrator controlled by a spring so stiff that when, at any time, it has very nearly the whole energy of the system, its extreme excursions on each side of its position of equilibrium are small:

C and A, equal masses:

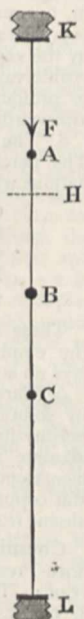
C, unacted on by force except when it strikes L, a fixed barrier, and when it strikes or is struck by B:

A, unacted on by force except when it strikes or is struck by B, and when it is at less than a certain distance, HK, from a fixed repellent barrier, K, repelling with a force, F varying, according to any law, or constant, when A is between K and H, but becoming infinitely great when (if at any time) A reaches K, and goes infinitesimally beyond it.

Suppose now A, B, C to be all moving to and fro. The collisions between B and the equal bodies A and C on its two sides must equalize, and keep equal, the average kinetic energy of A, immediately before and after these collisions, to the average kinetic energy of C. Hence, when the times of A being in the space between H and K are included in the average, the average of the sum of the potential and kinetic energies of A is equal to the average kinetic energy of C. But the potential energy of A at every point in the space HK is positive, because, according to our supposition, the velocity of A is diminished during every time of its motion from H towards K, and increased to the same value again during motion from K to H. Hence, the average kinetic energy of A is less than the average kinetic energy of C!

This is a test-case of a perfectly representative kind for the theory of temperature, and it effectually disposes of the assumption that the temperature of a solid or liquid is equal to its average kinetic energy per atom, which Maxwell pointed out as a consequence of the supposed theorem, and which, believed to be thus established, has been largely taught, and fallaciously used, as a fundamental proposition in thermodynamics.

It is, in truth, only for an approximately "perfect" gas—that is to say, an assemblage of molecules in which each molecule



moves for comparatively long times in lines very approximately straight, and experiences changes of velocity and direction in comparatively short times of collision—and it is only for the kinetic energy of the translatory motions of the molecules of the "perfect gas," that the temperature is equal to the average kinetic energy per molecule, as first assumed by Waterston, and afterwards by Joule, and first proved by Maxwell.

"Researches on Turacin, an Animal Pigment containing Copper; Part II." By A. H. Church, M.A., F.R.S., Professor of Chemistry in the Royal Academy of Arts, London.

This paper is in continuation of one read before the Society in May 1869 (Phil. Trans., vol. clix. pp. 627–36). It contains an account of observations made by other investigators on turacin and on the occurrence of copper in animals; a table of the geographical distribution of the Touracos, and a list of the twenty-five known species; a chart of turacin spectra (for which the author is indebted to the kindness of Dr. MacMunn); and a further examination of the chemical characters and the composition of turacin. The more important positions established by the present inquiry are these:—

1. The constant occurrence in eighteen out of the twenty-five known species of *Musophagide*, of a definite organic pigment containing, as an essential constituent, about 7 per cent. of copper.

2. The "turacin-bearers" comprise all the known species of the three genera, *Turacus*, *Gallirex*, and *Musophaga*; while from all the species of the three remaining genera of the family *Musophagide*—namely, *Corythacla*, *Schizorhis*, and *Gymnoschizorhis*—turacin is absent. Furthermore, the zoological arrangement of the genera constituting this family is in accord with that founded on the presence of turacin.

3. The spectrum of turacin in alkaline solution shows, besides the two dark absorption bands previously figured, a faint broad band on either side of line F, and extending from λ 496 to λ 475.

4. The spectrum of isolated turacin in ammoniacal solution shows, besides the three bands already named, a narrow fourth band, lying on the less-refrangible side of line D, and extending from λ 605 to λ 589. It probably arises from the presence of traces of the green alteration-product of turacin formed during the preparation of that pigment in the isolated condition; an alteration-product which is likely to prove identical with Krukenberg's turacoverdin.

5. Turacin in ammoniacal solution remains unchanged after the lapse of twenty-three years.

6. Turacin in the dry state, when suddenly and strongly heated, yields a volatile copper-containing red derivative, which, though undissolved by weak ammonia-water, is not only soluble in, but may be crystallized from, ether.

7. Turacin in the dry state, when heated in a tube surrounded by the vapour of boiling mercury, becomes black, gives off no visible vapour, is rendered insoluble in alkaline liquids, and is so profoundly changed that it evolves no visible vapour when afterwards strongly heated.

8. The accurate analysis of turacin offers great difficulty. The percentage composition, as deduced from those determinations which seem most trustworthy, is—

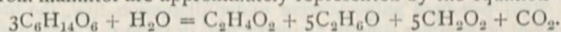
Carbon ...	...	...	...	53.69
Hydrogen ...	...	...	...	4.60
Copper ...	...	...	...	7.01
Nitrogen ...	...	...	...	6.96
Oxygen ...	...	...	...	27.74

These numbers correspond closely with those demanded by the empirical formula $C_{82}H_{81}Cu_2N_9O_{32}$, although the author lays no stress upon this expression.

9. Turacin presents some analogies with hæmatin, and yields, by solution in oil of vitriol, a coloured derivative, turacoporphyrin. The spectra of this derivative, both in acid and alkaline solution, present striking resemblances to those of hæmatoporphyrin, the corresponding derivative of hæmatin. But copper is present in the derivative of turacin, while iron is absent from its supposed analogue, the derivative of hæmatin.

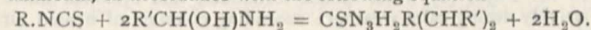
Chemical Society, April 7.—Dr. W. H. Perkin, F.R.S., Vice-President, in the chair.—The following papers were read:—The separation of arsenic, antimony, and tin, by J. Clark. The mixed sulphides of arsenic, antimony, and tin obtained in the ordinary course of quantitative analysis are dissolved in a strong solution of ferric chloride in hydrochloric acid, and the arsenic distilled off and weighed as trisulphide. The residual liquor contains the antimony as

trichloride, and the tin as stannic chloride, together with ferrous and ferric chlorides. Without removing the iron salts, the antimony is precipitated with hydrogen sulphide in a tepid solution containing from one-quarter to one-third of its volume of hydrochloric acid and a considerable quantity of oxalic acid. The precipitate, which is free from tin, is washed first with water, then with alcohol, and finally with carbon disulphide, and weighed as Sb_2S_3 after being dried at 130° . When the antimony precipitate is large, it must, after drying, be digested in carbon disulphide to extract the whole of the sulphur. To obviate this, the author reduces the excess of ferric chloride with thin sheet-iron, as soon as the yellow colour has disappeared the undissolved iron is removed, and the antimony which has come down is redissolved by cautiously adding ferric chloride till the solution is distinctly yellow, showing that all the tin is in the stannic state; a warm solution of oxalic acid containing about one-third of its volume of hydrochloric acid is then added, and the precipitated antimony trisulphide washed and weighed as above. After removal of the antimony, the hydrogen sulphide is expelled by boiling, the oxalic acid decomposed with potassium permanganate, the tin precipitated in a hot solution with hydrogen sulphide, and allowed to stand till cold. The stannic sulphide thus obtained is filtered, washed, ignited, and weighed as SnO_2 .—Platinum chloride and its use as a source of chlorine, by W. A. Shenstone and C. R. Beck. The authors have examined chlorine prepared from six specimens of platinum chloride of independent origin, and have found oxygen and hydrogen chloride to be present in them all. From these results they conclude that platinum chloride made by any of the processes hitherto recommended, including that lately suggested by L. Pigeon, contains a very perceptible quantity of some basic compound, which gives off water, together with the gases previously mentioned. It was also noticed that after mercury has been exposed to the action of chlorine, in the presence of a trace of water, it becomes capable of absorbing hydrogen chloride; it is not yet certain whether this action depends on the presence of oxygen or not.—Note on the adhesion of mercury to glass in the presence of halogens, by W. A. Shenstone. The author finds that carefully purified chlorine, bromine, and iodine affect mercury like ozone, causing it to adhere to glass in a remarkably perfect manner.—The decomposition of mannitol and dextrose by the *Bacillus ethaceticus*, by P. F. Frankland and J. S. Lumsden. The authors find that the products of fermentation of both mannitol and dextrose by *B. ethaceticus* consist of ethyl alcohol, acetic acid, carbon dioxide, hydrogen, and traces of succinic acid. A considerable quantity of formic acid is also formed when the fermentation proceeds in a closed space, whilst, in fermentations conducted in flasks merely plugged with cotton wool, formic acid, except in traces, is an exceptional product. This phenomenon has previously been found to occur with fermentations by means of *B. ethacetosuccinicus*. Formic acid is doubtless a primary product of the fermentation, but tends to break down into carbon dioxide and hydrogen. In the closed space, however, equilibrium is soon established between the formic acid and its decomposition products, and part of the formic acid is subsequently found in the solution. This view is supported by the fact that carbon dioxide and hydrogen are found in almost equal volumes. The proportions in which the several products are obtained from mannitol are approximately represented by the equation—



In the case of dextrose the products occur in the proportions: $2.5C_2H_6O : 1.5C_2H_4O_2 : 3CH_2O_2 : CO_2$. There is a close qualitative and quantitative resemblance between fermentations by *B. ethaceticus* and those occurring by means of the *Pneumococcus* (Friedländer), which renders it probable that this ethacetic decomposition is a very general and typical form of fermentative change.—The preparation of glycolic acid, by H. G. Colman. Glycolic acid may be readily prepared by boiling concentrated potassium chloracetate solution for 24–30 hours. The liquid is then distilled under reduced pressure, and the residue mixed with acetone. On evaporation of the filtered solution, glycolic acid crystallizes out in colourless crystals, containing only about 0.5 per cent. of ash. This acid would seem to be dimorphous. Glycolic anilide may be prepared by heating glycolic acid for some time to 240° , and boiling the product with aniline.—Researches on silicon compounds and their derivatives; Part vi. The action of silicon tetrachloride on substituted phenylamines, by J. E. Reynolds. Diphenylamine combines with silicon tetrachloride to form an unstable addition compound,

which is decomposed below the boiling-point of benzene. Ethylaniline is easily acted on by the tetrachloride, ethylaniline hydrochloride separates, and a compound having the composition $\text{Si}(\text{PhNEt})_4$ is formed. Diethylaniline is but feebly acted on by silicon tetrachloride; the compound PhNEt_2HCl is formed, and probably a substance of the composition $\text{Si}(\text{C}_6\text{H}_5\text{NEt}_2)_4$.—Chemistry of the compounds of thiourea and thiocarbimides with aldehyde-ammonia, by A. E. Dixon. The alkyl and allied thiocarbimides react with aldehyde-ammonia, in accordance with the following equation—

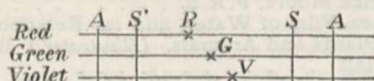


It was suggested that some connection might exist between the class of substances so formed and the compounds obtained by the action of thiourea on the aldehyde-ammonias. From the great similarity in behaviour of the compounds derived from the two sources, the author infers that they are members of the same class. Though thiourea and aldehyde-ammonia readily interact, it was found impossible, under any conditions, to cause substituted thioureas to act on aldehyde-ammonia. The author considers that this fact indicates that the monosubstituted

thioureas are of the form $\text{HN}:\text{C} \begin{smallmatrix} \text{NH}_2 \\ \text{SH} \end{smallmatrix}$ and not $\text{CS} \begin{smallmatrix} \text{NHR} \\ \text{NH}_2 \end{smallmatrix}$.

—The atomic weight of boron, by J. L. Hoskyns-Abraham. The deceased author determined the atomic weight of boron by estimating the amount of silver necessary to precipitate the bromine from a known weight of boron bromide. The mean atomic weight obtained is 10.816 ± 0.0055 . Silver is taken as 107.923, and bromine as 79.951.

Physical Society, April 8.—Dr. J. H. Gladstone, F.R.S., Past President, in the chair.—Mr. Walter Baily read a paper on the construction of a colour map. By the term "colour map," the author meant a diagram, each point of which defines by its position some particular colour. Captain Abney had shown that all colours, except the purples, could be formed by adding white light to some spectrum colour, whilst all except the greens could be made to produce white by the addition of some spectrum colour. There were, therefore, two ways in which colours, other than greens and purples, could be indicated. In one of these, the ordinate of a point might represent the spectrum colour by its wave-length, and the abscissa, measured to the right of a vertical spectrum line, the amount of white light to be added to the spectrum colour to produce the colour represented by the point. In the other, the abscissa of a point situated on the left of the spectrum line represents the quantity of white light produced by the addition of the spectrum colour to the colour indicated by the point. Regarding the spectrum colours as formed by mixing three primary colours (red, green, and violet) in varying proportions, three curves were drawn to the left of the spectrum line whose abscissae represented respectively the proportions of the three primary colours present in the corresponding spectrum colour. Horizontal distances from any point to these curves show the proportions in which the primary colours are to be mixed produce to the particular colour defined by that point. For points between the curves, the horizontal distances are not measured all in one direction, and therefore indicate abnormal or imaginary colours. The principle of the map was further illustrated by a sort of colour staff, consisting of three horizontal lines representing the three primary colour sensations (see figure) of such luminosities that equal lengths of



the three lines indicate white light. If points, R, G, V, be taken in these lines, then a cross line A will cut off lengths A R, A G, A V, whose mixture will produce a certain colour. If now A be moved parallel to itself towards the right, the colour will change by the addition of white light; moving A to the left means a subtraction of white light. When R, G, and V are properly chosen, a certain position, s, of the cross line, corresponds to a spectrum colour. The whole of the series of colours which can be obtained by adding white light to that spectrum colour can then be represented by sliding A towards the right. Positions s' and A' give colours complementary to s and A. The distinguishing features of such a series of colours are the differences $R - G$ and $G - V$, and the author calls the ratio $\frac{R - G}{G - V}$ the

"colour index." Passing up the spectrum from red to violet,

the index, which is first large and positive, diminishes and becomes negative between yellow and blue; it then passes through infinity, and becomes positive and decreases to zero. The subject of determining the indexes of colours resulting from the mixture in various proportions of two other colours whose indexes were known, was considered, and diagrams showing the various curves, exhibited. Experimental methods of determining the proportions of the primary colour sensations constituting the spectrum tints were described. A visitor inquired how the author's system provided for the class of colours outside the red and violet. He also desired a definition of "white light." He himself had never been able to produce pure white by mixture of colours, for a reddish violet generally resulted. On the other hand, he found it possible to match any other colour by mixture. Prof. Carey Foster thought Helmholtz was the first to propound the law which the author had attributed to Captain Abney. He wished to know how the amounts of colour sensation were supposed to be measured. White light he considered ought to be defined as light in which a normal eye, not fatigued, could perceive no preponderance of any colour. Mr. Blakesley said that if white light was a mixture, and only two unknowns were necessary, then any colour could be produced by the mixture of two other colours. Dr. Sumpner pointed out that white light was by no means a constant colour, but depended greatly on the source. He thought the author's map of a more absolute nature than that proposed by Maxwell. Dr. Hoffert inquired whether the intensities of each spectrum colour had been considered equal or otherwise taken into account, and also whether the results arrived at would be true for intensities other than those chosen. Mr. Baily, in reply, said Captain Abney had found the light from the crater in the positive carbon of an electric arc to be the most constant white, and in his method of experimenting errors due to variations of the source cancelled. The quantity of any spectrum colour was defined by the breadth of the band used, the breadth being small and measured on the scale of wave-lengths.—A paper on a mnemonic table for changing from electro-static to practical and C.G.S. electro-magnetic units was read by Mr. W. Gleed. In the table, which is given below, the abbreviations *Stat* and *Mag* are used to denote the electro-static and electro-magnetic units respectively, and v stands for 3×10^{10} :—

	Units of							
	Capacity.	Resistance.	Potential.	Current.	Quantity.			
Powers of 10 for practical and magnetic units	9	9	8	1	1			
Small unit	Stat	Mag	Mag	Stat	Stat			
Practical unit	Farad	Ohm	Volt	Ampere	Coulomb			
Large unit	Mag	Stat	Stat	Mag	Mag			
Factor for Stat and Mag	v^2	v^2	v	v	v			

To form the table, the numbers 981 in the middle of the second line give the value of g . The end numbers are duplicated, giving 99,811. Below them in the fourth line come the names of the practical units, the initials forming the word *fovac*. Remembering that the electro-magnetic units of resistance and potential were too small for practical use, one places Mag above both Ohm and Volt. Ohm's law and definitions then show that the practical units of capacity, current, and quantity must be less than the electro-magnetic units, hence Mag must be written below Farad, Ampere, and Coulomb. Since the practical units are intermediate in magnitude between Stat and Mag, the vacant spaces are then filled in by Stat. The v 's in the bottom line are added from memory. Several examples showing the use of the table are worked out in the paper accompanying the table.—A paper on the law of colour in relation to chemical constitution, by William Akroyd, was read by Mr. Blakesley. The author has observed that, in cases of compounds having a constant radical, R, and a variable radical R', the effect of an increase in the molecular weight of R is to make the colour of the compound tend towards the red end of the colour scale. Exceptions are, however, noted. Mr. H. M. Elder questioned the author's conclusions, saying that in many cases the colours tend towards blue.

Anthropological Institute, April 26.—Dr. Edward B. Tylor, F.R.S., President, in the chair.—Prof. R. K. Douglas read a paper on the social and religious ideas of the Chinese, as illustrated in the ideographic characters of the language. The paper begins with a short introduction, showing that the Chinese ideographic characters are picture-writings, and that as such they supply an interpretation of the meaning of words as these were understood by the inventors of the

characters representing them. Following on this is an account of the earliest or hieroglyphic form of the writing, with examples, and the development of this resulting in the ideographic characters. These are taken as being illustrative of the ideas of the people on political, social, scientific, and religious ideas. For example, the importance which was attached to the qualities of a sovereign is exemplified in the choice of the symbol employed to express a supreme ruler, the component parts of which together signify "ruler of himself." By means of the same graphic system a kingdom is shown as "men and arms within a frontier." Passing to the social habits of the people, their domestic life is illustrated by a number of ideograms descriptive of their household arrangements and relationships. In succession are traced in the written characters the ideas associated with men and women, their virtues and their failings; the notions associated with marriage; and the evidences of pastoral as well as of agricultural habits among the people. Turning to the popular religious faiths it is shown how prominent is the belief in the god of the soil, whose presence brings blessings, and whose averted countenance is followed by misfortune. The ideas associated with objects of nature are next treated of, and the paper concludes with references to the coinage of the country as described in the ideograms employed to represent its various forms.—Mr. Joseph Offord, Jun., read a paper on the mythology and psychology of the ancient Egyptians.

Entomological Society, April 27.—Mr. Robert McLachlan, F.R.S., Treasurer, in the chair.—Mr. C. G. Barrett exhibited, for Mr. Sabine, varieties of the following species: viz. one of *Papilio machaon*, bred by Mr. S. Bailey, at Wicken, in 1886; one of *Argynnis lathonia*, taken at Dover in September 1883; one of *A. euphrosyne*, taken at Dover in 1890; and one of *A. selene*, taken at St. Osyth, in 1885, by Mr. W. H. Harwood. He also exhibited a long series of *Demas coryli*, reared by Major Still from larvæ fed exclusively on beech, which he said appeared to be the usual food of the species in Devonshire, instead of hazel or oak. Mr. Barrett also exhibited, for Mr. Sydney Webb, a number of varieties of *Arge galathea*, *Lasiommata megera*, *Hipparchia tilthonus*, and *Ctenonympha pamphilus*, from the neighbourhood of Dover.—The Rev. J. Seymour St. John exhibited a variety of the female of *Hybernia progemmaria*, taken at Clapton in March last, in which the partially developed wings were equally divided in point of colour, the base being extremely dark and the outer portion of the wing very pale.—The Rev. Canon Fowler made some remarks on the subject of protective resemblance. His attention had been recently called to the fact that certain species of *Kallima* apparently lose their protective habit in some localities, and sit with their wings open; and Dr. A. R. Wallace had informed him that he had heard of a species sitting upside down on stalks, and thus, in another way, abandoning its protective habits. Mr. W. L. Distant referred to certain species of South African butterflies, which, when at rest, were protected by their resemblance to the plants on which they reposed, or by their resemblance to the rocks on which they settled, but which frequently abandoned their protective habit and sat with open wings. Mr. Barrett, Mr. McLachlan, Mr. Jacoby, Mr. Champion, Mr. H. Goss, Canon Fowler, and Mr. Frohawk continued the discussion.—Mr. Goss informed the meeting that, in pursuance of a resolution of the Council passed in March last, he and Mr. Elwes had represented the Society at the recent Government inquiry as to the safety and suitability of the proposed rifle range in the New Forest, held at Lyndhurst by the Hon. T. W. H. Pelham, on the 20th, 21st, 22nd, and 23rd inst., and that they had given evidence at such inquiry.

PARIS.

Academy of Sciences, April 25.—M. d'Abbadie in the chair.—On the photography of colours (second note), by M. G. Lippmann. In his first communication on colour photography, M. Lippmann remarked that the results would have been much better if isochromatic films had been employed. He has now obtained some new pictures, and presented them to the Academy. Silver bromide films, stained with azalin and cyanin, were used in connection with the arrangement previously explained. The solar spectrum appears to have been photographed in all its beauty with an exposure of about thirty seconds. On two of the plates the colours viewed by transmitted light are seen to be complementary to those given by reflected light. A photograph of a window containing red, green, blue, and yellow glasses appears to be very satisfactory. Others of a group of drapery and a parrot were obtained with an exposure of from five to ten

minutes. Several hours' exposure were given to a plate of oranges surmounted by a poppy, diffused light being employed. In all cases the forms of the objects were reproduced as well as the colours.—On the means employed in producing rain artificially, by M. Faye. The author states Espy's opinions on the formation of cyclones and other atmospheric disturbances, and quotes a letter on rain-making experiments carried out in Florida in 1857. He is of opinion that the theory which led to the experiments is wrong. For, according to M. Faye, (1) water-spouts, tornadoes, and cyclones move quickly during calm weather: ascending columns of heated air do not move. (2) Tornadoes and water-spouts whirl vigorously in a certain direction: ascending columns of air do not rotate, or only do so very faintly. (3) Tornadoes and water-spouts are cold in the centre: ascending columns of air are warm. (4) Tornadoes and water-spouts descend from clouds: ascending columns rise towards the clouds, &c.—On the division, according to terrestrial latitudes and longitudes, of the geological groups on the earth, by M. Alexis de Tillo. The following are the sums of the distribution of groups of rocks, &c., given in the tables for every ten degrees of latitude; the dimensions are expressed in millions of square kilometres:—

Pre-Cambrian	... 19'85	Glaciers	... 1'94
Primary	... 17'18	Igneous rocks	... 3'96
Secondary	... 19'85	Coral islands	... 0'02
Tertiary	... 8'71	Region { Explored	98'03
Quaternary	... 19'17	{ Unexplored	36'16
Gravels	... 7'35	Total	... 134'19

Tables are also given showing the proportion of the known surface of the globe occupied by each of the above groups, and also showing the distribution in longitude.—Observations of two new planets, discovered at Nice Observatory on March 22 and April 1, by M. Charlois. Observations for position are given.—Photography of the Ring Nebula in Lyra, by M. F. Denza.—Solar observations made during the first quarter of 1892, by M. Tacchini. (See Our Astronomical Column).—On a problem in mathematical analysis connected with equations in dynamics, by M. R. Liouville.—Direct and indirect measures of the angle which the surface of a liquid makes with glass, which it does not wet, by M. C. Maltézos.—On thermo-electric phenomena produced by the contact of two electrolytes, by M. Henri Bagard.—Addition to the law of the position of nervous centres, by M. Alexis Julien.—Analysis of a chromiferous clay from Brazil, by M. A. Terreil.—On the waters and muds of the lakes of Aiguebelette, Paladru, Nantua, and Sylans, by MM. L. Duparc and A. Delebecque.

CONTENTS.

	PAGE
Text-books of Psychology. By C. L. M.	1
Dynamics of Rotation. By J. L.	4
The Mammalia of British India. By W. H. F.	5
Our Book Shelf:—	
Hore: "Tanganyika: Eleven Years in Central Africa"	6
"Beginner's Guide to Photography"	6
Thane: "Quain's Elements of Anatomy"	6
Letters to the Editor:—	
The Zebra's Stripes.—Dr. S. Schönland	6
The Protective Device of an Annelid.—A. T. Watson	7
The General Circulation of the Atmosphere.—J. Carrick Moore, F.R.S.	7
The Surface-Film of Water, and its Relation to the Life of Plants and Animals. (Illustrated.) By Prof. L. C. Miall	7
The Discovery of Australian-like Mammals in South America. (Illustrated.) By R. Lydekker	11
Photography in Colours	12
Notes	13
Our Astronomical Column:—	
Sun-spots	16
Eclipse of the Moon, May 11	17
Spectrum of Swift's Comet (a 1892)	17
Comet Swift, 1892	17
Nova Aurigæ	17
A New Variable	17
The Temperature of the Brain. (Illustrated.) By Prof. Angelo Mosso	17
The Magnetic Storm of February in Mauritius	20
University and Educational Intelligence	21
Societies and Academies	21