of half a wave was found to be 30 centimetres. When a metallic parabolic mirror, 1 metre across its opening, was placed behind the apparatus used to produce the discharge, the action was propagated to a distance of 8 metres; and the action was greatly increased when a second concave mirror was placed behind the receiving apparatus. When a conductor was interposed, the action ceased, while non-conductors allowed the waves to pass. By interposing perforated metallic screens, it was found that the waves are propagated in straight lines; the waves passed through a dry wooden partition. Polarization of the waves could be determined in several ways. When the receiver was placed at right angles to the apparatus producing the waves, no action between them could be detected, the vertically produced waves not being picked up by the horizontally placed receiver. When the two pieces of apparatus were placed parallel to each other, and a wooden cube, with a number of insulated metallic wire rings wrapped round it, was placed in the path of the electro-dynamic waves, it produced the same effect as does a tourmaline plate on polarized light. When the wires were vertical, — that is to say, parallel to the exciting apparatus, — the action was not propagated through the cube; but it was, on the other hand, when the wires were horizontal. When the receiver with its mirror was placed horizontally, so that it did not record any action as reaching it, and the wire arrangement described above was placed in the path of the waves, no change took place in the receiver when the wires on the cube were either vertical or horizontal; but the receiver was affected when the wires were placed at an angle of 45°. The laws of reflection of electro-dynamic waves at metallic surfaces were found to be the same as those for the reflection of light at plane mirrors. Finally, Professor Hertz has determined the refraction which the waves undergo in a prism made of pitch, and finds that the refractive index of this substance for electric waves is 1.68. Dr. Ritter demonstrated by experiments the action of the ultra-violet rays of light on electric discharges in accordance with the experiments of Hertz, Wiedemann, and Eberts.

LIGHT MOTORS FOR AERONAUTIC EXPERIMENTS. — M. Trouvé has constructed several small and extremely light motors of the Gramme and Siemens type, in order to carry out some aeronautic experiments. One of these motors, while only weighing about three ounces, is capable of developing .026 brake horse-power. All the parts of the machine are of aluminum with the exception of the magnets. This motor, which could be contained in a box 1.2 inches each way, is able to lift itself twenty-five yards a second by means of a wire and a fixed support. A one-horse-power motor constructed on the same lines would weigh barely eight pounds. When furnished with a light screw, and attached to the arm of a balance, the motor is able to lift its whole weight, when connected with a source of electric energy equal to forty watts. In order to facilitate his experiments, M. Trouvé places his motor at one end of a long lever capable of a vertical and horizontal movement about its centre, the electrical connections being made with the motor through the lever and its supports.

IMPORTANT PATENT DECISION. — In England the court of appeals has just handed down its decision reversing the finding of the lower court in the Edison incandescent lamp patent case. The case had been decided against Edison, principally on the ground of insufficient specification. This last decision upholds the Edison patents, and puts the Edison Company in England in the same position that it enjoys in Germany, where the patents have been uniformly upheld.

NOTES AND NEWS.

THE American Association for the Advancement of Science will meet at Toronto, Aug. 27 to Sept. 3; the first general session to be held on Aug. 28; the council meeting, on the 27th.

— The thirteenth anniversary of the Johns Hopkins University will be commemorated on Friday, Feb. 22, 1889. The public exercises of the day will be held in the Mount Vernon Place Methodist Episcopal Church at eleven o'clock. The public are invited to attend, and no tickets of admission will be required. The exercises in the church will close before one o'clock. The trustees, faculty, alumni, students, and gentlemen personally invited, will assemble at the university at half-past ten o'clock, and proceed in a body to the church, where seats will be reserved for them. The alumni of the university will have a social gathering with a luncheon after the close of the exercises in the church. The physical laboratory will be thrown open from eight to ten o'clock in the evening to members of the university and their friends, and the chief instruments and pieces of apparatus will be shown to visitors. Professor Rowland will make an address to physicists in the hall of the physical laboratory at half past four o'clock, on "Modern Views with Respect to Electric Currents." Specials cards of admission will be required. Right Rev. Henry C. Potter, Bishop of New York, preached the annual sermon before the Christian Association of the university in St. Paul's Church (corner of Charles and Saratoga Streets) on Sunday, Feb. 17, at 8 P.M.: subject, "The Mastery and Mastering of Circumstances." All members of the university were invited to attend. The University Glee Club gave a concert in the Lyceum Theatre on Tuesday, Feb. 19, at 8 P.M.: tickets, fifty cents. The Athletic Association gave a gymnastic exhibition in the gymnasium on Thursday, Feb. 21, at 8 P.M. Tickets (fifty cents each) had to be obtained at the University Post-Office.

— At a meeting of the American Oriental Society, held at Philadelphia, October, 1888, Isaac H. Hall, Richard J. H. Gottheil, George F. Moore, Edward W. Hopkins, and Cyrus Adler were appointed a committee to obtain information respecting manuscripts that exist in America, written in the Oriental languages or connected with their study, with a view to the ultimate publication of a comprehensive catalogue of the same, in a worthy manner, and calculated to serve all the useful purposes of the Oriental catalogues of the great libraries of Europe. The manuscripts which are the subject of inquiry include all the ancient and modern languages and dialects of Asia, with those of Egypt and Ethiopia, whatever be the subject-matter of the manuscript, whatever be the character of the writing for elegance or negligence, whatever be the material upon which it is written, whatever be its state of preservation, or whatever be its length or size. The points of inquiry include the language of the manuscripts, if known; the style of writing, or the alphabet employed (as, if the manuscript be Arabic, whether in Cufic or Neskhi, etc.; if Turkish, whether in Greek, Arabic, or Armenian letters, etc.), and the material upon which written; the size and binding (or absence of binding); number of leaves, and other external particulars of the manuscript; or, if a roll, its dimensions, and the number and dimensions of its columns (of fragments, papyrus, etc., the mere dimensions); the history of the manuscript, as far as known, and how it came into its present hands; if the manuscript is in a public library, both its present catalogue marks, and information respecting any former labels, library marks, or notes of ownership (the latter, of course, are desired if the manuscript is in private hands); also the date of the manuscript, if known.

— The field-work of the irrigation survey of the arid region of the United States is being vigorously prosecuted in Colorado and New Mexico, notwithstanding many disadvantages arising from cold and stormy weather. From Colorado, Mr. W. D. Johnson, in charge, reports the completion of the Pueblo and Huerfano sheet in fifty-foot contours, and on a scale of two miles to the inch, and considerable work done on the Apishapa and Juniata sheets, all being in the Arkansas valley. Mr. Johnson's parties, living in tents, have experienced temperatures below zero, and encountered twenty inches of snow; but such attention has been given to the men, that, beyond a few frost-bites, no trouble has been experienced in prosecuting work on every day not actually stormy. Work in New Mexico on the Lower Rio Grande has been commenced; Mr. R. Henry Phillips, in charge, reporting the arrival of his party at El Paso, and the occupancy of points connecting this work with the base-line measured near Fort Bliss in 1878 by the United States Engineers.

—Mr. Edwin Chadwick, the pioneer of sanitary reform in England, and indeed throughout the world, will, on the anniversary of his ninetieth birthday, March 2, be presented with a congratulatory

address by the Association of Public Sanitary Inspectors of England, of which body he is president.

— The third volume of "Studies from the Laboratory of Physiological Chemistry of the Sheffield Scientific School of Yale University" has just been published, under the editorship of Professor R. H. Chittenden, Ph.D. It contains the following subjects: "Some Experiments on the Physiological Action of Uranium Salts;" "Elastin and the Elastose Bodies;" "The Influence of Urethan, Paraldehyde, Antipyrin, and Antifebrin on Proteid Metabolism;" "The Influence of Several New Therapeutic Agents on Amylolytic and Proteolytic Action;" "Casesses, Caseine Dyspeptone, and Caseine Peptone;" "Some Experiments on the Influence of Arsenic and Antimony on Glycogenic Function and Fatty Degeneration of the Liver;" "The Nature and Chemical Composition of the Myosin of Muscle Tissue;" "Myosinoses, and the Relative Absorption of Nickel and Cobalt."

— The trustees of the Johns Hopkins Hospital have decided to formally open the hospital on May 1, and they have confided its organization to President Gilman of the university. It is said that for one year, at least, President Gilman will reside in the hospital, and exercise a close personal supervision over its executive management.

— Dr. John Call Dalton, one of the foremost physiologists of the world, and a writer of one of the best text-books on physiology, died in New York City on Feb. 12, at the age of sixty-four years.

— The French Association for the Advancement of Science will meet in Paris, Aug. 8–15; and the Congress of Geography and Ethnography will meet there Aug. 5–12. As the great exposition will also be open during August, extra inducements are offered to American scientists visiting Paris this summer.

— The fifth volume of the "Transactions of the American Institute of Electrical Engineers" is now in the hands of the binder. Including the index of current electrical literature, it makes a volume of 638 pages, and is fully indexed. Hereafter the monthly numbers will be paged consecutively, and should be carefully preserved for binding by all who desire to preserve the complete files, as they will not be revised and issued as an annual, as has been done this year in the case of Vol. V. Temporary binders for filing the numbers as received will be furnished by the secretary at seventy-five cents each.

— We have received from Hon. F. G. Adams, secretary, the "Sixth Biennial Report of the Kansas State Historical Society." The number of volumes in the society's library at the present time is as follows: namely, 9,971 bound volumes, 30,353 unbound volumes, 7,981 bound newspaper files and volumes of periodicals; in all, 48,305 volumes. Of the newspaper volumes, 5,757 are of Kansas. The list and tables which the report contains show that there is being made up by this society, for the use of the people of Kansas, a library of history and reference, remarkable in its growth, and still more remarkable in the character and value of the materials which it contains. They show that the growth of the library and collections has steadily continued from year to year during the thirteen years of the society's existence, and that in that time there have been placed on the library shelves more than forty-eight thousand volumes of books, newspaper files, and pamphlets; and, in addition to these, this and former reports show a collection of manuscripts, pictures, statuary, relics, and objects of historical illustration of every kind and description almost countless in number.

— The American Institute of Electrical Engineers (5 Beekman Street, New York), in addition to the letters from the Institution of Civil Engineers and the Society of Arts, has received one from the Institution of Electrical Engineers of London, to the effect that the president and council of that institution, having been informed by Mr. W. H. Preece, one of its past presidents, that many of the members of the American Institute will be visiting the Paris Universal Exhibition this year, and will probably also visit London, will take pleasure in welcoming those gentlemen, and in doing all that is in their power to render their visit to England agreeable and instructive. Communications of the same tenor, addressed to the American societies of civil engineers, mechanical engineers, and mining engineers, led to the organization of an excursion, by which the members of those bodies were enabled to secure two special steamers, at the reduced rate of one hundred and ten dollars for the round trip to Liverpool. On account of the uncertainty as to proper accommodation in those steamers, and the early date of their departure (about June 1), the council of the American Institute does not deem it expedient for the electrical engineers to unite in the same arrangement, as the date fixed for the electrical conference at Paris (the latter part of August), together with the probability of the exhibition being in an incomplete condition, points to the desirability of fixing the date of departure about Aug. 1. Members who propose making the trip are, however, requested to notify the secretary as to the date of departure and return which would be most convenient for them; and, should it be found that a sufficient number agree approximately upon a date, an effort will be made to secure special rates. The regular excursion fare for first-class accommodations is one hundred and eighty dollars.

— In *The Microscope* for February, 1889, A. Clifford Mercer, M.D., describes a method of using with ease objectives of shortest working distance in the clinical study of bacteria. The working distance of homogeneous immersion objectives of short focus and great numerical aperture is little. In the clinical study of bacteria, sputa and other more or less fluid material are generally prepared on the under surface of cover-glasses, commonly, when not measured and assorted, so thick as to make examination with the above most suitable objectives impossible. To avoid this difficulty, Dr. Mercer dries and stains the material on the slide, drops homogeneous immersion fluid upon the preparation, and lowers the objective into the drop. Homogeneous fluid replaces both the balsam and the cover-glass with optical propriety. A twenty-fifth, which has been nearly useless over ordinary cover-glass preparations, is now used with gratifying freedom in manipulation over uncovered, but homogeneously immersed, slide preparations.

— The following is the list of the officers of the Kent Scientific Institute of Grand Rapids, Mich., for 1889: president, E. S. Holmes; vice-president, W. A. Gruson; recording secretary, C. W. Carman; corresponding secretary, E. S. Holmes; treasurer, C. A. Whittemore; director of the museum, W. A. Gruson; curator, C. W. Carman; librarian, E. L. Mosely; board of directors, Wright L. Coffinberry, W. A. Gruson, Samuel L. Fuller, E. S. Holmes, J. W. Jones, C. A. Whittemore; officers of the board, W. A. Gruson (chairman), E. S. Holmes (secretary), C. A. Whittemore (treasurer).

— The art schools of the Metropolitan Museum of Art have been established by the trustees of the Metropolitan Museum of Art, in order to furnish superior opportunities for thorough instruction in design, modelling, color, freehand, architectural, cabinet, and perspective drawing, chasing and hammered-metal work, carving in wood, painting on china, etc., especially to those who desire to acquire an artistic education applicable to industrial and commercial uses. Large, new, well lighted and ventilated rooms have been provided in a central position, with superior art material and instruction, and a liberal basis of admission. In order to offer all genuine students every facility in their work, a series of lectures have been added, the privilege of visiting the museum free of expense, prizes, diplomas, and opportunities for the sale of meritorious work; so that all may measure their progress by the degree of their industry and application. All payments are to be made in advance. Applicants for admission to the school must bring a letter of introduction from some resident of good standing. It is desirable that intending students should bring samples of their work to determine the degree of their proficiency. Those who follow the full course in each department receive diplomas upon passing a satisfactory examination at the close of the final term. The full courses are: — Drawing and painting, three seasons: 1st, Introductory class; 2d, "Antique" class; 3d, Life class. Sculpture, three seasons: 1st, In one of the drawing classes; 2d and 3d, In the modelling-room, with attendance at the anatomy lectures. Architecture, three seasons, the course to include architectural drawing, history and mathematics. It is intended that those who follow this course should be sufficiently advanced to pass the examinations of the

Paris Ecole des Beaux Arts. Diplomas will be issued to members of the normal, decoration, metal, wood-carving, and cabinet drawing-classes who have previously passed a season in one of the drawing-classes, and have shown satisfactory progress.

— A technical laboratory for special instruction in dyeing and bleaching, says *Nature*, has just been opened in connection with University College, Dundee. This technical portion of the chemical department consists of a completely fitted dye-house, a laboratory, and a museum for technical samples, more especially connected with the textile industries of the district. Practical instruction in the dye-house was begun by Professor Percy Frankland last week.

— It is well known that the aurora has a period of eleven years corresponding to that of terrestrial magnetism and of sunspots. It has recently been proved that the magnetical phenomena have a period of twenty-six days. This fact suggested to Mr. J. Liznar the plan of attempting to find a corresponding period in the frequency of the aurora. He subjected the hourly observations of the polar stations at Bossekop, Jan Mayen, and Fort Rae, in 1882–83, to an investigation, and found a very distinct period of this length, the maxima and minima of which corresponded exactly to those of the magnetic period. From this fact Mr. Liznar concludes that the connection between aurora and terrestrial magnetism is still closer than has been heretofore supposed.

— The tenth session of the International Congress of Anthropology and Prehistoric Archæology will meet in Paris Aug. 19–26. The programme, subject to additions, is as follows: (1) "The Erosion and Filling-up of Valleys and the Filling-up of Caves in their Relation to the Antiquity of Man;" (2) "The Periodicity of Glacial Phenomena;" (3) "Art and Industry in Caves, and the Value of Paleontological and Archæological Classification when applied to the Quaternary Epoch;" (4) "Chronological Relation between the Stone, Bronze, and Iron Ages;" (5) "Relations between the Civilizations of Hallstadt and the Other Danubian Stations and the Civilization of Mycenæ, Tirynthus, Issarlik, and the Caucasus;" (6) "A Critical Discussion of the Skulls and Quaternary Bones described in the Last Fifteen Years, with an Examination of the Ethnological Elements Characteristic of the Stone, Bronze, and Iron Ages in Central and Western Europe;" (7) "The Light which Ethnographical Survivals can throw on the Social State of the Early Populations of Central and Western Europe;" (8) "How far can Archæological or Ethnographical Analogies be used to support Hypotheses in Regard to Race Connections or Prehistoric Migrations?"

— The council of the Royal Meteorological Society, says *Nature*, have arranged to hold at 25 Great George Street, Westminster (by permission of the council of the Institution of Civil Engineers), on March 19–22 next, an exhibition of instruments connected with atmospheric physics invented during the last ten years, especially those used for actinic and solar radiation observations. The exhibition committee invite the co-operation of all who may be able and willing to send contributions. The committee will also be glad to show any new meteorological instruments or apparatus invented or first constructed since last March, as well as photographs and drawings possessing meteorological interest.

— *Germania*, a quarto fortnightly journal for the study of the German language and literature, edited by A. W. Spanhoofd, has just been published at Manchester, N.H.

— *Leif Erikson* is the title of a new journal to be published weekly at Chicago, under the editorial management of Miss Marie A. Brown, to prove, among other things, that the Norsemen discovered America, and that Columbus was an impostor.

— It is reported from north central Norway and Sweden, so says *Nature*, that wolves are very numerous this winter. They have re-appeared in districts where they have been unknown for many years.

— A new magazine for the blind, in raised Braille type, will shortly make its appearance in London under distinguished patronage. It will contain original articles and reprints of literary matter of a high class, by the best authors of the day, politics being excluded.

— Brentanos have opened a branch at No. 430 Strand, London, which they intend to make "the headquarters of Americans in Europe, as is already the case with their house in Paris, by offering them all possible facilities for keeping fully informed of the doings of American authors and publishers."

— The German Government has granted, according to *Nature*, the sum of £27,500 to repair the building of the University of Berlin, and to erect new lecture-rooms, staircases, and corridors, and for the heating and lighting apparatus. The government has also given £36,500 to the Natural History Museum, besides £2,500 for books. A further sum of £1,000 is to be devoted to the purchase of physical apparatus and an anatomical cabinet.

— We have received a specimen copy of the *Interpretor*, an international review for universal language, edited, with assistance of numerous linguists of different nationalities, by Karl Lentre (Leipzig, Flossplatz 310). It appears monthly, and the subscription price is 50 cents half-yearly. The movement for a world-speech has now entered a new phase of evolution. Whereas formerly only persons of very limited capacity of judgment in linguistic matters have taken up Volapük, the idea of a national artificial speech is now gaining ground more and more among linguists, who examine Volapük and other similar attempts critically and scientifically. This procedure, however, does not suit the Volapükists, who opine that the faults and failings of a system do no harm if only the invention itself can be used. This standpoint is, however, quite untenable, for a language which cannot bear the test of scientific criticism is not likely to possess qualities insuring its lasting success. The *Interpretor*, published in English, German, and French side by side, is to be a central organ for scientific criticism in the department of world-speech, and will also furnish to those who have as yet kept aloof from this movement an opportunity to form a judgment as to the characteristics of Volapük, contrasted with those of a real world-speech gradually to be evolved. The articles in the first number are conceived in this sense. The *Interpretor* is likewise well-adapted, by the way, for the pursuance of studies in German or French. Specimen copies may be had of the publisher, in America, of E. G. Hethorn, New York, P. O. Box 2571.

— The following are from the table of contents of the March number of *The Chautauquan*: "Gossip about Greece," by J. P. Mahaffy of Dublin University; "Alcibiades," by Thomas D. Seymour of Yale University; "Greek Art," by Clarence Cook; "Color in the Animal World," by the Rev. J. G. Wood; "Industrial and Social Effects of the Sewing-Machine," by Ernest Ingersoll; "The Care of Criminals," by the Hon. Z. R. Brockway, general superintendent of New York State Reformatory; "The Commercial Relations of American Countries," by Professor A. D. Morse of Amherst College; "Embezzlers and Defaulters," by John Habberton; "The Italians in the United States," by C. L. Speranza of Columbia College; "The Gladstone Fortune," by C. DeVarigny; "Water-Supply for Small Towns," by John S. Billings, M.D., surgeon United States Army.

— We learn from *Nature* that Professor Fitzgerald and Mr. Trouton have been conducting experiments confirmatory of Hertz's magnificent work. Lately, using parabolic mirrors after the manner Hertz recently described, they have observed the phenomenon of the polarization of radiations by reflection from a wall three feet thick. They observed long ago, and exhibited publicly at the opening meeting of the Experimental Science Association last November, that stone walls are quite transparent to these radiations, as they should be, and consequently should not reflect radiations polarized perpendicularly to the plane of incidence at a certain incidence. This is what has been observed, and it has been decided that the plane of polarization is the plane of the magnetic disturbance. They next tried reflection from sheets of glass, and obtained no results; but, as Mr. Joly suggested, the experimenters were practically observing the black spot in Newton's rings, for the sheet of glass was much thinner than a wave-length, which is about thirty centimetres. Some rough observations at various incidences from the wall seem to show interference at some and not at other incidence due to the same cause as Newton's rings.