ordinates are introduced and used in the discussion of dyadics and strains.

The second part, on applications to physics, begins with a very interesting discussion of the general principles of dynamics, from which it is interesting to note the absence of Lagrange's equations and Hamilton's principle. This is followed by applications to electrical theory, a short chapter on the Lorentz theory of electrons, and one on the transmission of light through crystals.

H. B. PHILLIPS.

NOTES.

THE fourth regular meeting of the Southwestern Section of the AMERICAN MATHEMATICAL SOCIETY will be held at the University of Nebraska on Saturday, November 26. Titles and abstracts of papers should be in the hands of the Secretary of the Section as early as November 10.

THE seventeenth annual meeting of the AMERICAN MATHEMATICAL SOCIETY will be held in New York December 28–29. The winter meeting of the Chicago Section will be held at Minneapolis, Minnesota, in affiliation with the sixty-third meeting of the American Association for the advancement of science, on December 29–30. Titles and abstracts of papers to be presented at these meetings should be in the hands of the respective secretaries by December 10.

AT the meeting of the London mathematical society held on June 9, the following papers were read: By W. H. YOUNG, "A new method in the theory of integration," and "On semi-integrals and oscillating successions of functions"; by G. T. BENNETT, "The composition of finite screw displacements"; by M. J. M. HILL, "Note on the theory of linear differential equations"; by P. MILNE, "The generation of cubic curves by apolar pencils of lines."

AT a meeting of the International Commission on the Teaching of Mathematics held at Brussels on August 8, 1910, thirty delegates were present. These included Professor KLEIN, of Göttingen, President; Sir GEORGE GREENHILL, of London, Vice-President; and Professor FEHR, of Geneva, Secretary.

Representatives were present from Germany, France, Belgium, Switzerland, Russia, Holland, Spain, Hungary, England, and the United States. In the absence of the American Commissioners, Professor C. B. UPTON was delegated as their representative. Reports were presented showing the status of the work in the various countries, together with the methods of procedure. Germany's plan is to issue a considerable number of monographs prepared by specially selected individuals. England has arranged to follow the same plan. The work in France is organized somewhat as in America, with a number of committees and sub-committees. Owing to the highly centralized system in France it has taken some time to secure permissions for undertaking all of the investigation. These permissions have now been granted and the plan in that country is to publish the reports at one time in about five volumes. Holland has practically finished the work for that country, and the reports will soon be published. Spain has already published two or three sub-reports, and in the various other countries a number of reports will appear in the course of a few months.

The investigation in the United States has been carried on by means of committees and sub-committees, and most of the reports have now been practically finished. It is expected that they will be edited during the present year and that the Bureau of Education at Washington will be able to arrange for their publication.

The next general meeting of the Commission will be held next year in Europe, the place and date being as yet unsettled. It is expected that the International Congress at which the reports will be offered will be held the latter part of August, 1912, at Cambridge, England.

A full report of the Brussels meeting appeared in the September number of the *Enseignement Mathématique*.

AT the meeting of the British Association for the advancement of science which was held from August 31 to September 7, considerable discussion took place on the possibility of avoiding highly technical papers, and some progress was made. A notable feature of the session was the number of joint meetings of sections with the natural result that subjects of general interest were more freely discussed. In its résumé of the work of the Association the London *Times* (September 9, 1910) says that in Section A, mathematical and physical science, the presidential address by Professor E. W. HOBSON, F.R.S., on the "Tendencies of modern mathematics," proved exceedingly

interesting and it put the point of view of the pure mathematician perhaps more distinctly than it has ever been put before a general audience. Sir J. J. THOMSON'S paper on positive electricity brought out one of the most important and interesting announcements of the Sheffield meeting; he stated that his experiments on positive rays led him to infer properties in the positive electron corresponding to those previously discovered by him in the negative electron. Among other papers which attracted special attention in this section were those of Sir W. RAMSAY and Dr. R. W. GRAY on the "Molecular weight of radium emanation"; by Dr. J. A. CROWTHER on the "Number of electrons in the atom"; and the very important paper by Professor HICKS on the "Relation of spectra to the periodic series of the elements." Professor Hicks' paper has proved useful in bringing together the pure mathematician and the chemist and physicist, who of late years have tended to drift apart. In any mention of papers that by Dr. CHREE on "Atmospheric electricity," which excited admiration for its excellence and clearness, must not be omitted. In this section there have been three discussions, in each of which some man of science was asked to introduce a subject. This introduction was not necessarily done by means of a paper containing new results, but was a résumé of the state of knowledge at the present day. This is considered to be one of the most important and valuable parts of the work of the section, and it will be developed in the future. There was quite a good attendance of working physicists in Section A, and their informal conversations have proved very helpful. In short, this section, which is necessarily a highly specialized one, has thoroughly justified itself this year.

THE annual meeting of the French association for the advancement of science was held at Toulouse, August 1 to 6, under the presidency of Professor GARIEL, with Mr. E. BELOT as chairman of the section of mathematics and astronomy. Besides a number of papers in astronomy, the following mathematical papers were read: E. LEBON, "Darboux and Picard;" M. LITRE, "The problem of the composition of rotations," and "The principle of Galileo;" G. TARRY, "Note on hyperbolic angles;" M. JOLIVET, "A new demonstration of Fermat's theorem;" A. GÉRARDIN, "Notes on the theory of numbers;" F. BOULAD, "Arithmetic resolution of a certain quintic equation;" E. N. BARISIEN, "Resolution

of the equation of the third degree;" A. PELLET, "Concerning equations having real roots;" M. FONTANEAU, "D'Alembert's principle and its application to hydrodynamics." The next meeting will be held at Dijon, the chairman of the section of mathematics again being Mr. Belot.

THE annual list of American doctorates published in *Science* presents for the academic year 1909–1910 353 names, of which 178 are credited to the sciences. The following 23 successful candidates offered mathematics as major subject (the titles of the theses are appended): M. J. BABB, Pennsylvania, "The second category of the groups of order 2^m which contain self-conjugate sub-groups of order 2^{m-4}"; Miss E. R. BENNETT, Illinois, "Primitive groups with a determination of the primitive groups of degree 20"; H. B. CURTIS, Cornell, "Hyperabelian functions expressible by theta series"; F. F. DECKER, Syracuse, "On the order of a restricted system of equations"; G. C. EVANS, Harvard, "Volterra's integral equation of the second kind with discontinuous kernel"; A. B. FRIZELL, Kansas, "Foundations of arithmetic"; F. T. H'DOUBLER, Wisconsin, "On certain functional equations"; T. H. HILDEBRANDT, Chicago, "A contribution to the foundations of Frechet's calcul fonctionnel"; F. L. HITCHCOCK, Harvard, "Vector functions of a point"; J. E. HODGSON, Johns Hopkins, "Orthocentric properties of the plane directed n-line"; J. K. LAMOND, Yale, "Improper multiple integrals depending on a parameter"; H. F. MACNEISH, Chicago, "Linear polars of the k-hedron in n-space"; E. J. MILES, Chicago, "The absolute minimum of a definite integral in a special field"; H. H. MITCHELL, Princeton, "The sub-groups of the linear group $LF(3, p^n)$"; U. G. MITCHELL, Princeton, "Geometry and collineation groups of the plane $PG(2, 2^2)$"; Mrs. H. B. OWENS, Cornell, "Conjugate line congruences of the third order defined by a family of quadrics"; Mrs. A. J. PELL, Chicago, "Biorthogonal systems of functions with applications to the theory of integral equations"; R. S. POND, Kansas, "Collineations in space of four dimensions"; J. E. ROWE, Johns Hopkins, "A complete system of invariants for the plane rational quartic curve, and other facts in regard to rational curves"; H. A. RUGER, Columbia, "The place of analysis in the curve of efficiency"; E. W. SHELDON, Yale, "Critical revision of de Haan's tables of definite integrals, two volumes"; L. L. SILVERMAN, Missouri, "On various defini-

tions of the sum of a divergent series"; H. W. STAGER, California, "On numbers which contain no factors of the form $p(kp + 1)$."

The largest list for any preceding year contained 21 names (1905).

THE Danish academy of sciences announces the following prize problem, for the best solution of which the academy's gold medal will be awarded:

To explain a method of transformation of an asymptotic series into a convergence series which will be applicable to most asymptotic series already known. In particular, the question should be discussed, what interpretation should be given to the expansion when the real variable is supposed complex within a convenient domain.

Competing memoirs must be written in Latin or any modern language of northern Europe, and should be sent to the secretary, Professor H. G. Zeuthen, Copenhagen, before October 31, 1911.

THE physico-mathematical society of Kasan announces that two Lobatchevsky prizes of 500 roubles each will be awarded by the society in 1912. The first will be given to the author of the most meritorious work on non-euclidean geometry which has been published during the last six years in one of the following languages: Russian, French, German, English, Italian, or Latin, and submitted to the society.

For the other prize the society announces the problem: The study of the general integrals of the equations of Painlevé (differential equations of the second order and of the second degree, whose general integrals have fixed critical points). A detailed study of one of the types of these equations is desired. Literature: Painlevé, *Comptes Rendus*, volume 126, *Bulletin de la Société mathématique de France*, 1900; Gambier, *Acta Mathematica*, 1909.

Competing memoirs either printed or in manuscript, should be sent to the society before November 4, 1911.

CAMBRIDGE UNIVERSITY. (Michaelmas term (M) begins October 13, Lent term (L) January 19, Easter term (E) April 24.)—By Professor E. W. HOBSON: Integral equations, three hours (M); Fourier's series and other representations of functions by series and integrals, three hours (L); Spherical harmonics and allied functions, three hours (L).—By Professor

Sir G. H. DARWIN: Gravitational potential and attractions (M); Lunar theory (Hill's method) (L). — By Professor Sir R. S. BALL: Celestial mechanics, three hours (M); Spherical astronomy, three hours (L). — By Professor Sir J. LARMOR: Electricity and magnetism (M); General electrodynamic and optical theory (L); Thermodynamics and molecular theory (E).— By Dr. H. F. BAKER: Introduction to theory of functions, three hours (M, L); Algebraic geometry (three dimensions), three hours (M). — By Mr. J. H. JEANS: Higher dynamics (M); Theory of probability with reference to physical problems (M); Kinetic theory of gases and matter (L). — By Mr. R. A. HERMAN: Hydrodynamics (M, L, E); Differential geometry (L). — By Mr. H. W. RICHMOND: Algebraic plane geometry (M); Synthetic geometry (L). — By Mr. T. I'A. BROMWICH: Theory of potential with electrical applications (M); Electric waves (L, E). — By Mr. W. E. BARNES: Linear differential equations (L). — By Mr. R. R. WEBB: Vibrations and sound (M). — By Mr. A. BERRY: Theory of differential equations (M); Elliptic functions (L, E). — By Mr. G. T. BENNETT: Line geometry (L). — By Mr. J. H. GRACE: Theory of numbers (M); Theory of invariants (L). — By Mr. BIRTWISTLE: Hydromechanics (L).

PROFESSORS G. A. MAGGI and P. PIZZETTI, of the University of Pisa, have been elected national members of the Accademia dei Lincei; Professor J. H. POYNTING, of the University of Birmingham, has been elected foreign member, and Professor F. SEVERI, of the University of Padua, corresponding member of the same academy.

PROFESSOR V. VOLTERRA, of the University of Rome, has been elected foreign member of the royal society of London.

PROFESSOR U. DINI, of the University of Pisa, has been elected president of the Italian society of sciences (the "forty"); Professor T. LEVI-CIVITA, of the University of Padua, has been elected to membership in the same society.

DR. M. CARRUS, in charge of the mathematical conferences at the University of Besançon, has been appointed professor of the calculus.

DR. A. VILLAT has been appointed in charge of mathematical courses at the University of Caen, and Dr. L. AUBRY of those at the University of Algiers.

A BRONZE statue of Lord KELVIN by Mr. Bruce-Joy is being erected at Belfast, Ireland. The figure holds a gyroscope and by its side is a Kelvin compass.

MR. FRANK WATSON DYSON, F.R.S., astronomer royal for Scotland and formerly chief assistant at Greenwich, has been appointed astronomer royal in succession to Sir W. CHRISTIE, who will retire on October 1.

ON the occasion of the Sheffield meeting of the British Association, the University of Sheffield conferred the degree of doctor of science on the chairman of each section; Professor E. W. HOBSON, of Cambridge University, was chairman of section A, mathematics and physics.

PROFESSOR OSKAR BOLZA, of the University of Chicago, has been appointed honorary professor of mathematics in the University of Freiburg.

PROFESSOR E. W. STANTON, of the Iowa State College, has been elected acting president of that institution.

PROFESSOR R. J. ALEY, of Indiana University, superintendent of public instruction of the State of Indiana, has been elected president of the University of Maine.

AT the University of Chicago, Professor L. E. DICKSON has been promoted to a full professorship of mathematics, and Dr. A. C. LUNN to an assistant professorship of mathematics.

AT Purdue University Professor WILLIAM MARSHALL has been promoted to an associate professorship of mathematics, and Dr. W. H. BATES to an assistant professorship.

DR. F. T. H'DOUBLER has been appointed professor of mathematics at Miami University.

DR. J. E. ROWE has been appointed instructor in mathematics at Goucher College, Baltimore, Professor W. H. MALTBIE having resigned to enter the profession of law.

PROFESSOR P. P. BOYD, of Hanover College, Indiana, has been granted a year's leave of absence to study at Cornell University.

AT the University of Illinois, Dr. E. B. LYTLE has been promoted to the rank of associate in mathematics; Mr. J. H. MINNICK and Mr. W. H. TAYLOR have been appointed assistants in mathematics.

AT the University of North Carolina, Dr. G. R. CLEMENTS, of Williams College, Massachusetts, has been appointed professor of mathematics, and Mr. T. R. EAGLES, of Bethany College, West Virginia, has been appointed instructor in mathematics.

MR. W. J. RISLEY, of Harvard University, has been appointed professor of mathematics at Milliken University.

DR. J. B. FAUGHT, of the State Normal School, Marquette, Mich., has been appointed head of the department of mathematics at the State Normal School at Kalamazoo, Mich.

PROFESSOR F. H. HODGE, of Parsons College, Fairfield, Ia., has been appointed professor of mathematics at Franklin College, Franklin, Ind.

AT the Agricultural College of Kansas, Mr. E. BARTHOLOW and Mr. C. H. CLEVENGER have been appointed assistants in mathematics.

MISS GRACE CAMPBELL has been appointed instructor in mathematics at the Oregon Agricultural College.

PROFESSOR G. A. BLISS, of the University of Chicago, is in Japan on leave of absence. He will spend the winter months at the University of Paris.

PROFESSOR EUGENE ROUCHÉ, examiner of the Ecole Polytechnique of Paris, died August 19th, at the age of 78 years.

CATALOGUES of second-hand mathematical books: A. Hermann et Fils, 6 rue de la Sorbonne, Paris, catalogue 104, about 4,000 titles.—Max Weg, Königstrasse 3, Leipzig, catalogue 125, 1,600 titles in exact sciences.