this subject. A few preliminary remarks are necessary to explain this. The linear transformation of a single straight line into itself may be studied from precisely the same point of view as we adopted above in the case of two dimensions. Three cases would again present themselves : one in which the two fixed points are imaginary, and two in which they are real. In one of these last the transformation cannot be regarded as a real motion, while in the other two it can. Now the extension of our theory which suggests itself to us here depends upon the fact that the complex points of a straight line can be conveniently represented in a plane of which the line is the axis of reals. The linear transformation of the line will then give us a corresponding transformation of the plane which of course should not be confounded with the collineation discussed above. The coefficients here need no longer be real to give us a real transformation. This new transformation of the plane may also be regarded as a mode of motion and has been so treated by Klein in his lectures for a number of years (see an article by Prof. Cole in the *Annals of Mathematics* for June, 1890, and part II. chap. I. of the recently published *Modulfunctionen* of Klein-Fricke). The idea cannot fail to suggest itself that the transformation of the plane which we have called collineation should be generalized in a similar way by representing the complex as well as the real points of the plane. I do not know of this subject having been treated; it would of course lead us into four dimensional space.

HARVARD UNIVERSITY, *June*, 1892.

NOTES.

A REGULAR meeting of the NEW YORK MATHEMATICAL SOCIETY was held Saturday afternoon, June 4, at half past two o'clock, the president in the chair. The following persons having been duly nominated, and being recommended by the council, were elected to membership: Dr. James Whitbread Lee Glaisher, Trinity College, Cambridge, England; Mr. Ferdinand Shack, New York, N. Y. The following papers were read : "An expression for the total surface of an ellipsoid in terms of σ- and p- functions, including an application to the surface of a prolate spheroid," by Professor J. H. Boyd; "On collineation as a mode of motion," by Dr. Maxime Bôcher; "On Peters' formula for probable error," by Professor W. Woolsey Johnson.

THE meeting of the *Deutsche Mathematiker-Vereinigung*, which will be held this summer as usual in conjunction with that of the *Gesellschaft deutscher Naturforscher und Aerzte*, will take place at Nurenberg, September 12 to 18. Special interest attaches to the meeting this year on account of the organization by the Union of an exhibition of medals, charts, apparatus and instruments used in pure and applied mathematics. The Bavarian government will lend its aid to the enterprise, which has already secured the co-operation of several eminent mathematicians, of the leading publishers, instrument makers etc., and of a large number of high-schools and polytechnic institutes. The object of the exhibition is "to extend the use of the various auxiliaries in the shape of models, apparatus and instruments, which are of advantage for instruction and investigation in pure and applied mathematics, and to forward the interests of this kind of scientific work." A recent prospectus contains a preliminary classification of articles, giving as the main heads: (1) geometry and theory of functions, (2) arithmetic, algebra and integral calculus, (3) mechanics and mathematical physics.

PROFESSOR PEANO, the editor of the *Rivista di Matematica*, has undertaken a very interesting work, the parts of which will appear as supplements to his journal. It is an extended collection of the formulas and results of mathematics, expressed throughout in the language or notation of symbolic logic. The first signature of the work accompanies the number of the *Rivista* for April, 1892 (vol. II., No. 4).

THE publication of the collected works of the late Professor Weber has been undertaken by the Göttingen Academy of Sciences. The collection will probably fill six large octavo volumes, and it is to be completed by 1894. T. S. F.

DR. ARTHUR SCHÖNFLIES, *privatdocent* at the University of Göttingen, has been appointed professor *extraordinarius* at the same university.

HARVARD UNIVERSITY. Besides the more elementary courses, the class-room work in which will amount to twenty-three hours a week throughout the year, the following mathematical courses are offered for the year 1892–93:

By Professor J. M. Peirce; Algebraic plane curves; Quaternions (second course); Theory of functions (first course); Linear associative algebra, and the algebra of logic.

By Professor C. J. White; Planetary theory.

By Professor Byerly; Trigonometric series, and spherical

harmonics; Problems in the mechanics of rigid bodies (second course).

By Professor B. O. Peirce; Potential function; Wave motion.

By Dr. Osgood; Higher algebra; Theory of functions (second course); Theory of substitutions; Invariants.

By Dr. Bôcher; Mathematical seminary on geometrical topics; Functions defined by differential equations; Curvilinear co-ordinates and Lamé's functions.

Each of the above courses extends throughout the whole academic year, and in most of them the instructor lectures three hours a week. A number of courses largely mathematical are also offered in the departments of Physics and Engineering, as for instance a course on the mathematical theory of electrostatics and electromagnetism by Professor B. O. Peirce.

M. BÔ.

NEW PUBLICATIONS.

COMPILED BY B. WESTERMANN & CO., NEW YORK.

ARBEITEN, Astronomische, des K. K. Gradmessungs-Bureau. Band III. Längenbestimmungen. Wien 1892. gr. 4. 180 pg. M. 16.00

BAUER (C.). Uebersichtstafel zur Vergleichung der Tageslänge und Sonnenstände nach mitteleuropäischer und Ortszeit für das Gebiet zwischen 7° 30′ u. 8° 30′ östlicher Länge. Speier 1892. 1 Tafel in qu. fol. M 0.40

BENTOBAL Y URETA (H.). Teoría elemental de las Superficies Regladas. Madrid 1892. 4. 23 pg. M. 1.50

BREUSING (A.). Das Verebnen der Kugeloberfläche für Gradnetzentwürfe. Leipzig 1892. gr. 8. 76 pg. m. 6 Tafeln u. 18 Figuren. M. 3.00

BRODMANN (C.). Untersuchungen über den Reibungscoefficienten von Flüssigkeiten. Göttingen 1891. 8. 87 pg. M. 2.00

BRÜCKNER (J. M.) Das Ottojanosche Problem; eine mathematisch-historische Studie. Leipzig 1892. gr. 4. 25 pg. m. 1 Tafel. M. 1.00

CELLÉRIER (CH.). Cours de Méchanique. Paris 1892. gr. in-8. avec nombreuses figures. 12 fr.

CHAMOUSSET (F.). Nouvelle Théorie élémentaire de la Rotation des Corps. Gyroscope, Toupie, etc. Paris 1892. 8. 22 pg. av. 1 planche. 2 fr.

DAMKE (J.). Beiträge zur theoretischen und rechnerischen Behandlung der Ausgleichung periodischer Schraubenfehler. Berlin 1892. gr. 8. 3 u. 46 pg. M. 2.00