lected Works, volume 1). Also the known criteria for the resolubility of such congruences can be put in partition forms.

7. The limit of the degree of a simply transitive primitive group which does not include the alternating group of that degree and which contains a given substitution is the object of investigation in Dr. Manning's paper. If the given substitution is of the (odd) prime order p and of degree pq, such a limit is given by the formula

$$(p+q)\left\{q + \frac{p-1}{p+1} + \mu(q-1)\right\} - \frac{p+\theta q}{\theta - 1}\theta^\mu,$$

where $\theta = 2p/(p-1)$ and μ is the characteristic of $\log_\theta q$.

<div align="right">W. A. MANNING,
Secretary of the Section.</div>

THE FIFTY–SEVENTH MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE fifty-seventh meeting of the American Association for the Advancement of Science was held in New York City during the convocation week December 27, 1906, to January 2, 1907. The president of the meeting was Dr. W. H. Welch, of Johns Hopkins University. The address of the retiring president, Professor C. M. Woodward, entitled "The Science of Education," was given in the auditorium of the Horace Mann School of Columbia University on the evening of the opening day. This address has been published in full in *Science* for December 28, 1906.

The meetings of Section A were not well attended, only about twenty members being present at the organization meeting. The officers of the section were: vice-president, Edward Kasner; secretary, L. G. Weld; councilor, G. B. Halsted; member of the general committee, James McMahon; press secretary, the secretary of the section; sectional committee, Ormond Stone, E. B. Frost, E. O. Lovett, Harris Hancock, A. N. Skinner, together with the vice-president and the secretary of the section.

The following mathematicians and astronomers were, upon nomination by the sectional committee, elected by the council to fellowship in the Association :

R. H. Baker, G. L. Brown, R. S. Dugan, J. B. Faught, Fannie C. Gates, O. E. Glenn, W. J. Graham, W. A. Granville, S. M. Hadley, Henrietta L. Leavitt, Percival Lowell, James Maclay, H. R. Manning, G. D. Olds, G. A. Plimpton, C. L. Poor, N. C. Riggs, L. G. Schultz, F. H. Smith, A. C. Washburne, N. R. Wilson, Anna S. Young.

The next annual meeting of the Association will be convened in Chicago on Thursday, December 26, 1907, under the presidency of Professor E. L. Nichols, of Cornell University. Professor E. O. Lovett will be vice-president of Section A.

The address of the retiring vice-president, Dr. W. S. Eichelberger, entitled, " Clocks, ancient and modern," was presented on the afternoon of Thursday, December 27, in Fayerweather Hall of Columbia University. This address has already been published in *Science* for March 22 of the present year.

A joint session of Section A with the AMERICAN MATHEMATICAL SOCIETY and the Astronomical and Astrophysical Society of America was held on Friday forenoon, December 28, in Schermerhorn Hall. The chair was occupied by Professor Simon Newcomb, past president of each of the participating societies. This was perhaps the most largely attended and the most generally interesting of any of the meetings in which any of the participating societies had a part. The following programme was presented : numbers (1) and (5) being contributed by the Mathematical Society ; (2) and (4) by the Astronomical and Astrophysical Society ; (3), (6) and (7) by Section A.

(1) Professor S. E. SLOCUM : "The rational basis of mathematical pedagogy."

(2) Professor E. E. BARNARD : "Photographic observations of the milky way."

(3) Professor JAMES McMAHON : "The stream function for a straight channel with a circular island."

(4) Professor W. H. PICKERING : " The tenth satellite of Saturn."

(5) Dr. F. L. GRIFFIN : " On the law of gravitation in the binary systems."

(6) Professor C. L. DOOLITTLE : " Latitude terms of long period."

(7) Professor EDWARD KASNER : "Dynamical trajectories."

Abstracts of (1) and (5) of the above papers appear in the current volume of the BULLETIN, pages 265, 266 ; abstracts of (2), (4) and (6) appeared in *Science,* April 12 and 19, in the report of the eighth annual meeting of the Astronomical and Astrophysical Society of America.   The other papers are further noticed below.

The full list of papers appearing upon the programme of Section A, with abstracts of such as deal with purely mathematical subjects, is given below.

(1) Professor C. L. DOOLITTLE : " An examination of the results of seven years' observation with the zenith telescope of the Flower Observatory for latitude terms of long period."

(2) Mr. PHILIP FOX : " A preliminary report on a solar rotative period investigation."

(3) Mr. A. O. GRANGER : " The retrograde motion of Phoebe."

(4) Professor G. B. HALSTED : " The sect-carrier and the set-sect."

(5) Professor HARRIS HANCOCK : " On a fundamental theorem of Weierstrass by means of which the theory of elliptic functions may be established."

(6) Professor EDWARD KASNER : " Dynamical trajectories."

(7) Professor JAMES McMAHON : " The stream function for a straight channel with a circular island."

(8) Dr. S. A. MITCHELL : " Preliminary wave-lengths of flash spectra taken in Spain, August 30, 1905."

(9) Professor G. A. MILLER : " On the minimum number of operators whose orders exceed two in any finite group."

(10) Professor DAVID TODD : " Results of physical observations on the saturnian system with the 18-inch Clark refractor of the Amherst College observatory."

4. The school of Plato fixed as the instruments for the solution of geometric problems, the ruler and compasses, the straight line and circle.   As in euclidean geometry the straight line is a circle (of infinite radius) and as Euclid unconsciously made in his very first proposition the ' assumption of the compasses,' that " If a circle have a point within and a point without another circle, it has two points on this other " (Halsted, Rational Geometry, VI, 2), the world has had to await the coming of the non-euclidean geometry to become conscious of the fact that elementary geometry has been carrying a wholly unnecessary ' rider.'

The compasses may be superseded by the simpler "trans-ferrer of line-segments," for which the name "sect-carrier" has been adopted. Thus without the circle or compasses all the problems of elementary geometry are solved in the first edition of Halsted's Rational Geometry. But a remarkable additional simplification has now been achieved, and this paper makes public for the first time the simple demonstration which makes it available for the elements of geometry. This advance is the substitution of the set-sect for the sect-carrier. The transference of only a single sect need be assumed for the solu-tion of all the problems of elementary geometry. Consequently the power to take a centimeter on a given straight line is found to be assumption enough to supersede the circle, the compasses, and even the sect-carrier. Nothing now is needed but a ruler and a set-sect.

5. The theorem discussed by Professor Hancock is stated by Weierstrass in the "Theorie der abelschen Funktionen" (*Crelle's Journal*, volume 52, § 7; and Mathematische Werke, volume 1, page 349).

By means of this theorem it may be shown that the $\wp$-function may be expressed as the quotient of two series which are both convergent for all values of the variable; the same is true of the functions $\sqrt{\wp u - e_\lambda}$ ($\lambda = 1, 2, 3$). It follows directly from Weierstrass's theorem that the σ-function may be expressed as a convergent series for all values of the variable.

The different series are calculated and it is interesting to compare the results usually obtained from the well known theorem, also due to Weierstrass, that every one-valued function that has not an essential singularity in the finite portion of the plane may be expressed as the quotient of two power series which are convergent for all values of the variable.

Weierstrass's theorem is also generalized and applied to dif-ferential equations of a higher order.

6. Professor Kasner discussed two general questions of inter-est in connection with celestial mechanics relating to the geom-etry of dynamical trajectories. The first is suggested by the problem of binary stars and Bertrand's discussion of the inter-dependence of Kepler's laws. It is shown that two distinct fields of force can have only a certain multiplicity of trajec-tories in common. It is then possible to determine a field from

a minimum number of trajectories.   In particular the new-tonian law may be deduced without assuming, as Bertrand does, that all the orbits are conics.

The second part of the paper relates to the problem of n bodies and extends some of the results which hold for a single particle (see *Transactions of the American Mathematical Society*, 1906, 1907).   For example, the locus of the centers of the oscu-lating spheres, under prescribed initial conditions, is a cubic curve ; in the case of a single particle, on the other hand, it is a straight line.   The results obtained are true for all interacting particles.

7. Professor McMahon's paper dealt with one of the stand-ing problems in two-dimensional fluid motion.   A solution is here obtained by imagining a doublet placed midstream in a uniform current so that the line from the source to the adjoin-ing sink points in the direction of the undisturbed current. The appropriate stream function is determined to suit the boun-dary conditions by the image method, and it is shown that one of the stream lines breaks up into the median line of the chan-nel and a symmetric oval.   The strength of the doublet can be so adjusted that this oval does not differ appreciably from a given circle when the latter does not occupy more than half the breadth of the channel.

9. Professor Miller's paper appeared in full in the February BULLETIN, pages 235–239.

With the exception of those papers which appear upon the joint programme of Friday morning, as given above, the papers of Section A were presented in connection with the programme either of the Mathematical or of the Astronomical Society, ac-cording to the subject matter treated in each case.   This arrangement was made in accordance with a resolution adopted at the Ithaca meeting to the effect that " the sectional com-mittee be empowered to turn over technical papers to the technical societies."

<div align="right">LAENAS GIFFORD WELD,
Secretary.</div>

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