in the TRANSACTIONS OF THE AMERICAN MATHEMATICAL SOCIETY by a resident of the United States or Canada.

(2) The age of the recipient of the prize shall not be over forty years, and the prize shall not be awarded twice to the same person.

(3) The age and place of residence of a writer shall be reckoned as of the first day of the month of date of issue of the number of the TRANSACTIONS containing the article in question, or the first part of it.

(4) The second award, to be announced at the Annual Meeting of 1924, shall be made with reference to volumes 19 to 24 inclusive.

(5) The third award, to be announced at the Annual Meeting of 1928, shall be made with reference to the volumes beginning with that issued for the year 1923 and ending with that issued for the year 1927.

R. G. D. RICHARDSON,
Secretary.

SPECIAL MEETING OF THE SAN FRANCISCO SECTION

A special meeting of the San Francisco Section of the American Mathematical Society was held at the University of Washington, Seattle, on Saturday, December 22, 1923. The following seventeen members of the Society were in attendance:

Bell, Daniel Buchanan, A. F. Carpenter, DeCou, Feinler, Gavett, Griffin, Griffiths, Kent, McAlister, W. E. Milne, Moritz, Mullemeister, Neikirk, Smail, Stager, Winger.

Professor A. F. Carpenter, chairman of the Section, presided.

Titles and abstracts of the papers presented are listed below. Professor Cajori's paper was read by title, while the paper of Mr. Kelly and Miss Small was read by Professor Griffin, who introduced these authors to the Society.

1. Professor E. T. Bell: *On certain quinary quadratic forms.*

This paper has appeared in the March-April number of this BULLETIN.

2. Professor Daniel Buchanan: *Asymptotic satellites near the straight line equilibrium points (elliptic case).*

If two finite masses move in ellipses about their common center of gravity, there are five points, called *equilibrium points* or *points of libration,* at which an infinitesimal body will remain fixed, relatively to the moving bodies, if given proper initial projections. Three of these points are collinear and lie on the line joining the centers of gravity of the finite bodies. The other two lie in the plane of motion of the finite bodies at the vertices of the equilateral triangles described on the join of their centers of gravity.

The author determines orbits which approach asymptotically (1) the straight line equilibrium points, and (2) the two- and three-dimensional periodic orbits near these straight line equilibrium points which were obtained by Moulton in his *Periodic Orbits,* Chapter VII. The asymptotic orbits are somewhat similar to those obtained by the author in the corresponding circular case (AMERICAN JOURNAL, vol. 41, pp. 79–110).

3. Professor Daniel Buchanan: *Periodic and asymptotic satellites near the equilateral triangle equilibrium points (elliptic case).*

This paper deals with the periodic and asymptotic orbits near the equilateral triangle points of libration as the finite masses move in ellipses. Two- and three-dimensional periodic orbits are first obtained and later the orbits which are asymptotic to the three-dimensional orbits and to the points of libration themselves. As in the circular case determined by Buck (Moulton, *Periodic Orbits,* Chapter IX) the two-dimensional periodic orbits exist only when the ratio of the finite masses is small. The orbits, however, which are asymptotic to the equilibrium points exist, as in the corresponding circular case (Buchanan, TRANSACTIONS

OF THE CAMBRIDGE PHILOSOPHICAL SOCIETY, vol. 22, No. 15, pp. 309–340) only when the ratio of the finite masses is larger than in the case of the periodic orbits. Owing to the variation in this ratio, it has not been possible according to the methods employed in this paper to obtain orbits asymptotic to the two-dimensional periodic orbits.

4. Professor A. F. Carpenter: *Complex cones and cone-cubics of a ruled surface.*

In this paper four quadric cones are associated with each line of a ruled surface by means of the osculating linear complex. Their intersections, pair at a time, determine four space cubics, called primary cone-cubics, two of which lie upon the osculating quadric. Each of these cubics is shown to be projectively equivalent to the primary flecnode cubic. By an analogous process four secondary cone-cubics are defined. These bear to the primary cone-cubics the relation borne by the secondary flecnode cubic to the primary flecnode cubic. A number of theorems involving these curves are proved.

5. Mr. F. J. Feinler: *On the Bernoulli numbers.*

Adams calculated the Bernoulli numbers up to B_{124} by the help of the von Staudt and Clausen Theorem, requiring the tedious handling of fractions. There is no practical necessity to recalculate this series of valuable constants, except perhaps for checking Adams' results. Yet there remains always the theoretical interest in the genesis and the relations of these numbers. The denominators are found to present a very simple law for the reappearance of the prime number series. But if another slightly modified formula is used for the denominators, the tedious handling of fractions is altogether avoided. The values thus obtained are then reduced by the quotient of the two denominator formulas. The resulting series is found identical with that of Adams.

6. Miss Lois Griffiths: *Contact curves of the rational plane cubic.*

This account of contact curves of the rational plane cubic developed from consideration of the subject of involution as applied to rational curves. The determinate case is that in which the complete intersection of the contact curve of order n and the cubic is two distinct points, one a d-point contact p^d and the other a complementary contact p^{3n-d}.

Representative theorems for curves of this type are (1) All points of the cubic are related in sets of $3n$ each; within a single set d points are of one type, contacts p^d, and the remaining $(3n-d)$ are contacts p^{3n-d}, such that each of the $(3n-d)$ points is a complementary contact for each of the d points, and for no other point of the cubic, and vice versa. Thus all contact curves are related in sets of $d(3n-d)$ each. (2) Superimposed on each set of $d(3n-d)$ contact curves, when and only when n is even, is a non-contact curve of order n, cutting the cubic singly in each of the $3n$ contacts for that set of contact curves.

7. Professor F. C. Kent: *Note on the derivation and reduction of annuity formulas.*

The annuity formulas in which the nominal rate of j is convertible m times a year and the annuity is paid p times a year are reduced to simple standard forms which are readily adapted to computation by means of ordinary annuity tables. Also a simplified method is presented for deriving the standard formulas for the amount and present value of annuities certain.

8. Professor L. L. Smail: *A theorem on convergent factors in summable series.*

By making use of certain results of James (ANNALS OF MATHEMATICS, vol. 21, p. 123) and Schur (JOURNAL FÜR MATHEMATIK, vol. 151, pp. 79–111) on the general theory of summability, a theorem is obtained on convergence factors in series summable $(C, 1)$.

9. Professor Florian Cajori: *The growth of legend about Sir Isaac Newton.*

The author considers the growth of legend in accounts of the discovery of the law of gravitation, of the invention of the reflecting telescope, of the delay in the publication of the *Principia,* of action at a distance, and of the wave theory of light.

10. Mr. C. T. Kelly and Miss Dana Small: *Curves conjugate to conics with respect to lines and circles* (*Type* I).

The authors discuss in some detail the conjugate of given conics with respect to a straight line or circle as the basic curve, in the case where the relation between radii vectores is of the form $\varrho_c = \varrho_g = \varrho_b$ or $2\varrho_z$.

13. Professor R. M. Winger: *Note on the invariants of the ternary icosahedral group.*

The fundamental system of invariants of this group, given by Klein, *Ikosaeder*, includes a conic A and a set of six lines, say F. There is thus a pencil of invariant sextics $A^3 + \lambda F = 0$ which contains Klein's curve B ($\lambda = -1$), the author's rational sextic R ($\lambda = 27/5$), AMERICAN JOURNAL, 1916, and the sextic invariant of the Valentiner group (Wiman). The salient properties of the pencil are discussed. In particular it is shown that Klein's C which is a rational curve of order ten and class six is the projective dual of R.

14. Professor L. I. Neikirk: *Some non-associative algebras.*

Several examples of these finite linear algebras are given, Left handed division is always possible (except by zero) and is unique. Right-handed division is not always possible and when possible is not always unique. There may be one, two or four quotients. Some of these algebras have nilpotent elements, also elements with equations of the type $S^3 = S^2$. Here S^3 is a left-handed power and $S^3 = [S\cdot(S\cdot S)]$. Multiplication is distributive on the right and non-distributive on the left in some cases. Multiplication tables are given.

R. M. WINGER,
Secretary for the special meeting.