THE APRIL MEETING OF THE ROCKY MOUNTAIN SECTION

The fourteenth annual meeting of the Rocky Mountain Section of the Mathematical Association was held at the University of Denver, Denver, Colorado, on April 11–12, 1930. There were three sessions, Professor G. W. Gorrell acting as chairman at each.

The attendance was forty-two including the following twenty-seven members of the association: C. F. Barr, J. Britton, A. G. Clark, J. R. Everett, J. C. Fitterer, G. W. Gorrell, S. G. Hacker, C. A. Hutchinson, D. Jackson, H. Karnow, A. J. Kempner, Miss Claribel Kendall, A. J. Lewis, G. H. Light, A. S. McMaster, J. Q. McNatt, W. K. Nelson, Miss Greta Neubauer, Miss L. R. Odell, E. J. Purcell, E. D. Rainville, A. W. Recht, W. J. Risley, L. J. Rote, Miss Mary Sabin, C. H. Sisam, Miss Adela M. Thom.

The following officers were elected for the coming year: Professor Claribel Kendall, University of Colorado; Vice-Chairman Professor C. F. Barr, University of Wyoming.

The following papers were read:

1. "Fregier's theorem" by Professor Francis Regan, Colorado Agricultural College, by invitation.

2. "Predicting occultations" by Professor A. W. Recht, University of Denver.

3. "Foci of algebraic curves" by Professor Claribel Kendall, University of Colorado.

4. "On the invariance of certain types of areas" by Professor A. G. Clark, Colorado Agricultural College.

5. "A problem in partial correlation" by Professor G. H. Light, University of Colorado.

6. "Focal surface of a normal congruence of an ellipsoid" by Professor J. R. Everett, Colorado School of Mines.

7. "A formula in terms of greatest integers giving parcel post charges as a function of weight and distance" by Professor W. K. Nelson, University of Colorado.

8. "The elliptic modular group and applications to the theory of functions" by Mr. Earl Rainville, University of Colorado.

9. "Theory of numbers and the multiplication table" by Professor A .J. Kempner, University of Colorado.

10. "Formulas of correlation in several variables" by Professor Dunham Jackson, University of Minnesota.

Abstracts of these papers follow:

1. Mr. Regan presented Fregier's theorem: if a variable chord PQ of a conic subtends a right angle at any fixed point V on the conic it passes through a fixed point F which lies on the normal to the conic at V. The proofs for the parabola, ellipse, and hyperbola were given. The theorems dealing with the locus of the Fregier points of each conic were developed, and several corollaries

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growing out of the fundamental theorem were touched upon. All the work was developed from a purely analytic view point.

2. Professor Recht mentioned the value of occultations in determining the position of the moon and described an apparatus for making maps of the United States predicting within a minute the times of occultations.

3. In this expository paper Miss Kendall defined the foci of algebraic curves for the general case and for certain special cases. The four foci, two real and two imaginary, of the central conics were found. The finding of the real foci of a cubic which was the inverse of a hyperbola with respect to one of its vertices illustrated the theorem that foci always invert into foci. Mention was made of the locations of foci for cubics without singularities and for quartics with nodes at the circular points.

4. Professor Clark considered briefly the conditions under which the area cut from the curve $y = f(x)$, a polynomial, would be invariant. As an application of the conclusions, it was proved that the inflexion tangets of a general quartic cut equal areas from the curve.

5. This paper gives formulae for finding the grades that should be expected by a student who is taking mathematics, English, and history in his first year at college. The data were obtained from the actual grades for the first and second quarters.

6. Professor Everett outlined the general theory of linear congruences, and showed how linear congruences might be applied to normals of an ellipsoid. He also discussed the development and nature of the surfaces generated by normals of an ellipsoid.

7. The paper by Professor Nelson presented a formula using greatest integers which gives the parcel post charges in terms of weight and distance. The following refinements make the formula agree closely with the postal laws: (a) All packages of a given weight sent over 1800 miles have the same charges. (b) All packages of half a pound or less have postage charges dependent on the weight only. (c) When a package is sent to a point five miles either side of a zone boundary the charges are uncertain since the zones are not true circles. For such a distance the charges become indeterminate. (d) If the weight is over fifty pounds and the distance over three hundred miles, or the weight over seventy pounds regardless of the distance, the charges become infinite.

8. Mr. Rainville gave an expository account of some of the simpler outstanding properties of the elliptic modular group and the allied functions. Landau's proof of the restricted Picard theorem and some results from the work of Landau and Caratheodory were used as examples of the type of application to the theory of functions. Stress was laid on the fundamental importance of the modular functions in the general theory of analytic functions. The paper was based, in the main part, on Klein's *Theorie der Elliptischen Modulfunktionen* (1890); and L. R. Ford's *Automorphic Functions* (1929).

9. Professor Kempner explained how a large number of the elementary concepts of the theory of numbers (residues, Fermat's theorem, exponent to

which a number belongs, indices, primitive roots, etc.) can in a very simple and satisfactory manner be demonstrated by means of a square table which for a given fixed prime modulus gives both the residues of a^λ for λ fixed, a variable; and for a fixed, λ variable.

Some apparently new results will be presented on another occasion.

10. Professor Jackson's paper discussed applications of the geometrical interpretation of correlation coefficients less simple than those which are treated in papers published in recent volumes of the Monthly. In particular, it gave a geometrical derivation of the regression coefficients for a problem involving three statistical variables.

The members and friends of the association were guests of the University of Denver at a banquet on the evening of April 11. President Gorrell acted as toastmaster. The address of welcome was given by Chancellor Frederick Hunter of the University of Denver. The response was given by Professor A. J. Kempner of the University of Colorado.

Following this a very interesting and instructive address was given by the guest of honor, Professor Dunham Jackson, on "The significance of elementary mathematics in modern statistics."

A. J. LEWIS, *Secretary*

THE SEVENTH ANNUAL MEETING OF THE INDIANA SECTION

The seventh annual meeting of the Indiana section of the Mathematical Association of America was held on May 2–3, 1930 at Earlham College, Richmond, Indiana.

There were forty-five present at the meeting including the following twenty-three members of the Association: W. C. Arnold, R. W. Babcock, Gladys L. Banes, G. E. Carscallen, P. T. Copp, C. S. Doan, J. E. Dotterer, W. E. Edington, P. D. Edwards, E. D. Grant, G. H. Graves, H. E. H. Greenleaf, C. T. Hazard, D. F. Heath, Cora B. Hennel, Florence Long, Juna M. Lutz, T. E. Mason, J. A. Reising, C. K. Robbins, L. S. Shively, K. P. Williams, W. A. Zehring.

On Friday at 5:30 P.M. a reception was given to the visiting members and their guests. At 6:30 P.M. a complimentary banquet which was held in the dining room of the college was attended by sixty guests of the college. Professor E. D. Grant presided at the banquet and introduced President Denny of Earlham College, who made a brief address of welcome. Music was provided during the banquet by a trio of students of the college.

At eight o'clock a short pipe organ recital was presented in Stoddard Auditorium. The public lecture of the evening, under the auspices of Earlham College, was given by Professor Louis C. Karpinski of the University of Michigan