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# Fourteenth Annual Meeting of the Indiana Section

P. D. Edwards (Secretary)

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## FOURTEENTH ANNUAL MEETING OF THE INDIANA SECTION

The fourteenth meeting of the Indiana Section of the Mathematical Association of America was held Friday and Saturday, April 30 and May 1, 1937, at DePauw University, Greencastle, Indiana.

Eighty persons registered at the different sessions including the following twenty-eight members of the Association: W. C. Arnold, L. G. Black, G. E. Carscallen, J. E. Dotterer, Olive M. Draper, W. E. Edington, P. D. Edwards, G. H. Graves, H. E. H. Greenleaf, S. G. Hacker, Lawrence Hadley, C. T. Hazard, F. H. Hodge, L. P. Hutchison, M. W. Keller, Mayme I. Logsdon, Florence Long, Juna M. Lutz, T. E. Mason, H. A. Meyer, D. H. Porter, H. R. Pyle, C. K. Robbins, C. G. Schilling, L. S. Shively, W. O. Shriner, Anna K. Suter, K. P. Williams.

At the business session on Saturday the following officers were elected for next year: Chairman, W. O. Shriner, Indiana State Teachers College; Vice-Chairman, Florence Long, Earlham College; Secretary, P. D. Edwards, Ball State Teachers College. The fifteenth annual meeting will be held at Indiana State Teachers College, Terre Haute, in May 1938.

Professor P. D. Edwards made the report for the committee appointed to encourage and recognize superior preparation for the teaching of secondary mathematics. On the basis of examinations conducted April 17 and April 24, 1937, a Certificate of Merit was awarded by the Indiana Section to Eugene Grenling of Butler University and Eugene Brazier of Earlham College.

Following the annual dinner on Friday evening the members of the Association met with the members of the Indiana Philosophical Association where the following joint program was presented:

1. "The logical structure of a four-dimensional space" by Professor Mayme I. Logsdon, University of Chicago.

2. "Mathematics and empirical science" by Professor Rudolf Carnap, University of Chicago.

Abstracts of these papers follow:

1. Preliminary to the discussion of the logical structure of a four-dimensional space Professor Logsdon compared the logical structure of Euclid's axiomatic geometry of three-space with the logical structure of an analytical geometry of three-space. The latter is a purely arithmetical theory and is logically equivalent to the former if suitable definitions of the distance function and of the sub-spaces are agreed upon. A space is curved if the angle sum of a triangle whose sides are geodesics is not 180°. A definition was given of a general analytical space, and it was observed that phenomena of our world of experience can be explained by more than one theory, and that it is unwise to accept the predictions of any mathematical theory with regard to situations which cannot be checked by observation.

2. Professor Carnap presented the view that theorems of mathematics sometimes have the same grammatical form as sentences with factual content

(*e.g.*, "7 is a prime number," like "Chicago is a large city"). However, their truth—like that of the theorems of logic—does not depend upon the existence of any facts but upon our conventions as to the structure of language. Within the whole of scientific language, mathematical symbols (*e.g.*, '1', '2', '+', '=', etc.) play the same role as logical symbols (*e.g.*, 'or', 'and', 'not', 'every', etc.); they do not refer to anything but serve to connect other symbols. The chief part of the scientific language consists of the synthetic, factual, sentences of empirical sciences. The theorems of mathematics and logic are instruments for facilitating the operations with such factual sentences.

At the sessions on Saturday the following program was presented:

1. "Vitalizing mathematics" by Professor W. E. Edington, DePauw University, retiring chairman of the Indiana Section.
2. "A class in Fluxions" by Professor H. E. H. Greenleaf and members of the Napierian Club, DePauw University.
3. "A new polynomial approximation for the Gamma Function" by Professor Cornelius Lanczos, Indiana University, introduced by Professor K. P. Williams.
4. "A problem in phase rule" by Zenon Szatrowski, Indiana University, introduced by Professor K. P. Williams.
5. "Homogeneous functionals and Euler's theorem" by Dr. Richard Duffin, Purdue University, introduced by Professor T. E. Mason.
6. "On the derivatives of polynomials" by Dr. A. C. Schaeffer, Purdue University, introduced by Professor T. E. Mason.
7. "What do students think of mathematics?" by Professor G. H. Graves, Purdue University.
8. "Mathematical prefaces and advertisements" by Professor T. E. Mason, Purdue University.

Abstracts of the papers follow, the numbers corresponding to the numbers in the list of titles.

1. Professor Edington presented the following five suggestions as possible means for improving the teaching of mathematics and counteracting the trend away from mathematics: (1) Conscious, continual and consistent reference to the analogies between mathematical processes and the ordinary processes met with in the work-a-day world; (2) Dissemination of information on the wide application of mathematics in the various fields of human endeavor, including not only the fields of physical science, engineering and business, but also such fields as agriculture, physiology, medicine and psychology; (3) Dissemination of knowledge of the parallel cultural development of mathematics with art, literature, and science; (4) Teaching of certain fundamental concepts of mathematics earlier in the student's training; (5) The use of favorable propaganda based on facts and on the opinions of authorities and others who have recognized the values of mathematics as a cultural as well as a utilitarian subject.

2. Professor Greenleaf and four members of the Napierian Club of DePauw University demonstrated the notation and language of Newton by conducting a class recitation using as a text "Principles of Fluxions" by Rev. S. Vince. This text was printed in America in 1812. Most of the demonstrations were in the form of Euclidean algorithms. This form of demonstration appears much more strange today than the difference in notation and raises the interesting question as to whether we profit by the retention of this form in the study of elementary geometry in the United States long after we have abandoned it in all other branches of mathematics and after its abandonment in the study of elementary geometry in the continental countries of Europe.

3. Professor Lanczos discussed a method by which the ordinary asymptotic series of Stirling in the expansion of the Gamma function may be replaced by a strictly convergent series representing the function with even accuracy in a large, finite, a priori given range. The expansion is arranged in Tchebychef's polynomials and yields for the logarithm of $\Gamma(x)$ in the range $1 \leqq x \leqq \infty$ the successive accuracies $10^{-4}$, $10^{-5}$, $4\ 10^{-7}$, $10^{-10}$ by using two, three, four and eight terms of the series. The coefficients of the approximation have been determined by the method of trigonometric interpolation, making use of the tabulated values of $\log \Gamma(x)$ at 12 selected points of the interval. The same series remains an effective approximation in large portions of the complex domain.

4. The problem discussed by Mr. Szatrowski is to find the composition of the vapor given off by a perfectly miscible binary liquid mixture. It was shown that the composition of vapor in equilibrium with a liquid mixture can be expressed as a function of (1) the composition of the liquid, (2) the composition of an amount of vapor given off during a definite change in the boiling temperatures, and (3) the rates of change of these compositions with the temperature. The composition of the vapor in equilibrium with the liquid mixture is determined by means of this relationship, where the composition of the liquid mixture and the composition of an amount of vapor formed during a definite change in the boiling temperatures have been determined experimentally.

5. Dr. Duffin spoke on the extension of Euler's Theorem to "homogeneous functionals." Suppose the product of two functions is integrated over a fixed region. If one of the functions is homogeneous, it may be replaced by Euler's well known expressions, but this replacement might be valid in some cases even if the function were not homogeneous. A modified definition of homogeneous was given which is a sufficient condition for this replacement. An application was given to potential theory.

6. Dr. Schaeffer acknowledged credit to Dr. Duffin for assistance in the preparation of this paper. Let $P(z)$ be a polynomial of degree $n$ with real coefficients and not greater than 1 in absolute magnitude in the interval $(-1, 1)$ of the real axis. The $n$th Tchebychef Polynomial, $T_n(z) \cdot \equiv \cdot \cos\ (n \cos^{-1} z)$, satisfies these conditions. It is shown that at certain points inside the unit circle of the $z$ plane and at all points outside the unit circle $|P^k(z)| \leqq |T_n^k(z)|$, superscripts denoting differentiation.

7. During three years twenty-one classes of students were asked, "What, in your opinion, are the values in studying mathematics?" The students were predominantly freshman and sophomore engineers, but there were two classes of science freshmen and three classes included juniors and seniors expecting to teach mathematics. Professor Graves stated there was much evidence that students were seeking to relate their study of mathematics to their total experience. Besides the predominant reply that mathematics is needed in engineering and science many emphasized that the procedure of solving a problem was of value in a wide range of situations. Most students seem to assume the transfer of training but some appreciate that the problem of transfer demands special attention.

8. Professor Mason discussed the changes that took place in the purposes of authors in writing mathematical books as illustrated by the prefaces in forty books distributed over the period from 1585 to 1859. Extracts from prefaces were quoted as illustrative of authors' purposes. He illustrated also the nature of advertisements printed in mathematical books during this period.

P. D. EDWARDS, *Secretary*

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## THE MAY MEETING OF THE ALLEGHENY MOUNTAIN SECTION

The eighth regular meeting of the Allegheny Mountain Section of the Mathematical Association of America was held at Waynesburg College, Waynesburg, Pennsylvania, on Saturday, May 1, 1937. Professor L. L. Dines, chairman of the Section, presided at both the morning and afternoon sessions. Following the afternoon session a very enjoyable social hour was spent at a tea arranged through the courtesy of the Waynesburg College department of mathematics. The date of the fall meeting was set for October 23, 1937, at the University of Pittsburgh.

The number of those in attendance was fifty-one, including the following twenty-seven members of the Association: C. S. Atchison, O. F. H. Bert, H. L. Black, A. M. Bryson, Helen Calkins, L. L. Dines, H. L. Dorwart, F. A. Foraker, C. H. Graves, R. P. Johnson, V. V. Johnston, A. V. Karpov, W. A. Klein, M. L. Manning, David Moskovitz, L. T. Moston, E. G. Olds, F. W. Owens, Helen B. Owens, J. B. Rosenbach, E. A. Saibel, S. R. Smith, E. M. Starr, R. G. Sturm, J. S. Taylor, Bird M. Turner, E. A. Whitman.

Following a welcoming address by President P. R. Stewart of Waynesburg College, the following five papers were read:

1. "Purposive selection" by W. A. Klein, Carnegie Institute of Technology.
2. "A theorem concerning certain surface paths on the rectangular parallelopiped" by V. V. Johnston, National Tube Company.
3. "Elementary electrodynamics of the cathode ray oscillograph" by E. R. Whitehead, Duquesne Light Company, introduced by the Secretary.