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Section Meetings

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PROPOSED AMENDMENT TO THE BY-LAWS OF THE ASSOCIATION

The experience of the Mathematical Association is that the life membership fee has not in recent years been in accordance with actuarial practice. The Trustees have therefore authorized the Secretary-Treasurer to propose the following amendment to Article VII of the By-Laws, the amendment to be presented for adoption at the Annual Meeting in December 1938. In the meantime life membership fees will not be accepted on the old basis.

Section 6, Article VII shall read:

The life membership fee shall be the present value, according to the American Annuitants' Table (Male) based upon three and one-half ($3\frac{1}{2}$) per cent interest, of an annuity due of Four Dollars ($4) a year at the attained age of the member; an annual valuation of the life membership fund shall be made under the American Annuitants' Table (Male), three and one-half ($3\frac{1}{2}$) per cent; and the reserve thus computed shall be held as a liability.

W. D. CAIRNS, *Secretary-Treasurer*

THE OCTOBER MEETING OF THE ALLEGHENY MOUNTAIN SECTION

The ninth regular meeting of the Allegheny Mountain Section of the Mathematical Association of America was held at the University of Pittsburgh, Pittsburgh, Pennsylvania, on Saturday, October 23, 1937. Professor L. L. Dines, chairman of the Section, presided at both the morning and afternoon sessions.

Forty-six representatives from twelve colleges, three research laboratories, and twelve high schools attended the meeting, including the following twenty-four members of the Association: O. F. H. Bert, H. L. Black, A. M. Bryson, Helen Calkins, W. E. Cleland, Elizabeth B. Cowley, L. L. Dines, H. L. Dorwart, F. A. Foraker, H. C. Hicks, B. P. Hoover, R. P. Johnson, V. V. Johnston, H. R. Leifer, M. L. Manning, L. T. Moston, J. H. Neelley, E. G. Olds, J. B. Rosenbach, E. M. Starr, J. S. Taylor, R. W. Thomas, W. J. Wagner, E. D. Wells.

At the annual business meeting the following officers of the Section were elected: Chairman, H. L. Black, Westminster College; Secretary-Treasurer, J. S. Taylor, University of Pittsburgh; Member of the Executive Committee, H. C. Hicks, Carnegie Institute of Technology. Professor F. W. Owens, Pennsylvania State College, continues in office for the second year of his term as the additional member of the executive committee.

The following five papers were read:

1. "A problem in heat conduction with application to the ignition of gases" by H. G. Landau, Coal Research Laboratory, Carnegie Institute of Technology, introduced by the Secretary.

2. "Mathematics for the millions" by Professor W. P. Cunningham, California State Teachers College, introduced by C. S. Atchison.

3. "The Tarry-Escott problem" by Professor H. L. Dorwart, Washington and Jefferson College.

4. "An application of the derivative for classes in elementary calculus" by A. M. Bryson, University of Pittsburgh.

5. "Cryptography" by Professor H. C. Hicks, Carnegie Institute of Technology.

Abstracts of these papers follow, with the numbers corresponding to the numbers in the list of titles:

1. Mr. Landau's problem arose from a consideration of the processes which occur when a mixture of combustible gases is ignited by a local source, such as an electric spark. A heat conducting medium of infinite extent is initially at temperature T_0, except within a sphere of radius R, where the initial temperature is T_1. At the start this sphere is filled with active particles which diffuse through the medium; each active particle generates Q units of heat in unit time and they increase in number at a rate proportional to their concentration. It is desired to determine the condition for the temperature at the center of the sphere never to decrease. The partial differential equations for concentration of active particles and temperature are solved and from this the required condition is obtained.

2. A recent study made by the Committee for Curriculum Revision in the State Teachers Colleges of Pennsylvania revealed that the current practice of colleges is to minister chiefly to the needs of mathematics majors, with little or no provision for others. To meet this situation Professor Cunningham suggested that college teachers enrich their courses by introducing more of the applications of mathematics to science, industry, and the study of social phenomena.

3. This is a report of a portion of a joint paper of the same title by H. L. Dorwart and O. E. Brown which appeared in this MONTHLY, December 1937, pages 613–626.

4. Mr. Bryson developed a method suitable for classes in elementary calculus whereby approximate values of the elementary transcendental functions may be obtained to any desired accuracy from a known initial value of such a function and a knowledge of its derivatives. Not only does this treatment throw early illumination on the rôle and significance of the derivative, but by passing to the limit an opportunity is offered to introduce Taylor's series in a somewhat novel but straightforward manner.

5. In discussing code making and code deciphering Professor Hicks explained the nature of the different types of codes employed and methods of deciphering and presented many illustrations of historical interest. In particular he emphasized the practical feature that a code should be simple enough to permit its easy use without being decipherable quickly enough to destroy the purpose for which it was designed. In conclusion, Professor Hicks challenged the ingenuity of the audience in deciphering a code message appropriate to the meeting, which was based upon the key "The Mathematical Association of America."

J. S. TAYLOR, *Secretary*

THE MAY MEETING OF THE ALLEGHENY MOUNTAIN SECTION

The tenth regular meeting of the Allegheny Mountain Section of the Mathematical Association of America was held at the Sharon Works of the Westinghouse Electric and Manufacturing Company, Sharon, Pennsylvania, on Saturday, May 14, 1938. Professor H. L. Black, chairman of the Section, presided at both the morning and afternoon sessions, which were held in the auditorium of the new research building of the Sharon Works. The last paper on the program included a demonstration in the special laboratory for the production of artificial lightning.

The meeting was attended by sixty-eight representatives from eleven colleges, ten research laboratories and industrial concerns, and two high schools, including the following seventeen members of the Association: C. S. Atchison, H. L. Black, Helen Calkins, W. E. Cleland, L. L. Dines, H. L. Dorwart, C. W. Foard, B. P. Hoover, V. V. Johnston, A. V. Karpov, M. L. Manning, L. T. Moston, C. T. Oergel, E. G. Olds, J. S. Taylor, W. J. Wagner, E. D. Wells.

Following a welcoming address by W. M. Dann, assistant manager, Transformer Engineering Department, Westinghouse Electric and Manufacturing Company, the following five papers were read:

1. "Scientific approach to engineering problems" by A. V. Karpov, chairman of Committee on Fundamentals Controlling Structural Design, American Society of Civil Engineers; Consulting Engineer, Pittsburgh.

2. "The content of a course in higher algebra for prospective secondary school teachers of mathematics" by Professor W. H. Erskine, Bethany College, introduced by the Secretary. Leader of discussion: Professor E. G. Olds, Carnegie Institute of Technology.

3. "Use of mathematics in engineering" by H. V. Putman, manager, Transformer Engineering Department, Westinghouse Electric and Manufacturing Company, introduced by Mr. Manning.

4. "Analysis of transient voltages in transformer networks" by P. L. Bellaschi and A. J. Palermo, Westinghouse Electric and Manufacturing Company, introduced by Mr. Manning.

5. "Demonstration of laboratory lightning" by M. L. Manning, Westinghouse Electric and Manufacturing Company.

Abstracts of these papers follow, with the numbers corresponding to the list of titles:

1. Mr. Karpov outlined in a comprehensive fashion the similarity in the present day developments of the fine arts, science, and engineering. The method of carrying human knowledge beyond the perceptual world by the introduction of a conceptual world was discussed and illustrated by significant examples in these fields. The mathematical bases of the exact sciences were outlined, as well as their application to engineering problems. Particular attention was given to the concept of stress, its limitations, and the necessity of extending this concept.

2. Professor Erskine gave a description of the aims, content, and methods of a course in higher algebra given at Bethany College during the current year for

prospective secondary school teachers of mathematics. The aims were to widen the high school teacher's interest in and appreciation of the subject matter of algebra and arithmetic. The content included topics from the theory of integers and the fundamental concepts of algebra and arithmetic; the method involved lectures, assigned readings, and exercises showing the dependence of algebra and arithmetic upon fundamental concepts, and included the experimental contact with algebras differing from that taught in high schools. The discussion, led by Professor Olds, brought out many other features of general interest.

3. Mr. Putman thought it might be possible in mathematics classes for engineering students to place greater emphasis on the application of mathematics than on manipulative technique. Comparatively few engineers attain great proficiency in the real use of mathematics, and much of what is learned is forgotten because of inability to apply it. It was even suggested that for students who do not go to college it might be possible to develop a high school course in elementary calculus and linear differential equations which would be less difficult than some parts of intermediate algebra and much more useful. A summary of mathematical applications in transformer design was included to show the importance of a thorough training in mathematics in this branch of engineering. In response to the suggestion that an endeavor be made to evaluate the usefulness of different branches of mathematics in engineering fields in order that students may select those courses likely to be of greatest value to them, a motion was passed that the Society for the Promotion of Engineering Education be informed of the interest that would attach to such a study.

4. This investigation by Mr. Bellaschi and Mr. Palermo was a study, both from an engineering and a mathematical analysis viewpoint, of transformer networks subjected to lightning. The solution for the response of the network showed completely the amplitudes and periods of natural oscillations. A geometric method of approach aids materially the analytic work. The mathematical analysis formulated a complete system of solutions for obtaining the network responses. A pattern of "alpha" operators was developed which reduced the work to relatively simple algebra. To form this pattern, only the operational solutions for one and two mesh networks were required. From this pattern solutions can be directly written for networks having any specified number of meshes. The analysis was applied to transformer windings and is applicable to many fields of electrical engineering.

5. Following a description of the laboratory equipment by Mr. Manning, the most important of which are the high voltage generator (3,000,000 volts) and a heavy current generator (150,000 amperes), a very spectacular demonstration was given. A wood pole used for distribution service was badly splintered when subjected to a discharge from the generator. A similar lightning stroke was then applied to a distribution transformer protected by deion gaps; the transformer was unharmed. The paper concluded with a discussion of the many developments which lightning stroke generators may aid in producing.

J. S. TAYLOR, *Secretary*

FIFTEENTH ANNUAL MEETING OF THE INDIANA SECTION

The fifteenth annual meeting of the Indiana Section of the Mathematical Association of America was held Friday and Saturday, May 6 and 7, 1938, at Indiana State Teachers College, Terre Haute, Indiana.

Eighty-one registered at the meetings including the following twenty-three members of the Association: W. C. Arnold, Juna Lutz Beal, C. S. Doan, J. E. Dotterer, Olive M. Draper, W. E. Edington, P. D. Edwards, Louis Green, H. E. H. Greenleaf, W. R. Hardman, L. C. Karpinski, M. W. Keller, Cornelius Lanczos, Florence Long, T. E. Mason, Karl Menger, H. A. Meyer, H. R. Pyle, C. K. Robbins, L. S. Shively, W. O. Shriner, L. H. Whitcraft, K. P. Williams.

At the business session on Saturday the following officers were elected for next year: Chairman, C. K. Robbins, Purdue University; Vice-Chairman, L. S. Shively, Ball State Teachers College; Secretary, P. D. Edwards, Ball State Teachers College. The sixteenth annual meeting will be held at Ball State Teachers College on April 28 and 29, 1939.

Professor K. P. Williams of Indiana University 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 23 and April 30 a Certificate of Merit in Mathematical Preparation was awarded to Margaret Stump of Butler University.

Following the annual dinner on Friday night the following program was presented:

1. "Report on the work of the Joint Commission of the Association and the National Council on the place of mathematics in the secondary schools" by Professor K. P. Williams, Indiana University.

2. "Report on the study of a committee of the American Association of Teachers Colleges on desirable attainments for teachers of secondary mathematics" by Professor L. H. Whitcraft, Ball State Teachers College, introduced by the Secretary.

3. "The need for greater emphasis on the mathematics of finance" by Professor W. O. Shriner, Indiana State Teachers College.

At the meetings on Saturday the following program was presented:

4. "The three classical problems of geometry" by Professor Karl Menger, University of Notre Dame.

5. "Sources of material which we present in freshman mathematics" by Professor L. C. Karpinski, University of Michigan.

6. "Interpolating and extrapolating power series" by Professor Cornelius Lanczos, Purdue University.

7. "A practical general formula for annuity problems" by Professor H. E. H. Greenleaf, DePauw University.

8. "Concerning a certain functional equation" by Professor K. P. Williams, Indiana University.

9. "Abstract group definition for groups of finite order" by Professor W. E. Edington, DePauw University.

10. "Fractional radices" by Professor H. A. Meyer, Hanover College.

11. "A solution of the quartic equation" by M. E. Gamble, Purdue University, introduced by Professor Robbins.

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

1. Professor Williams gave a discussion of the work of the Joint Commission of the Mathematical Association of America and the National Council of Teachers of Mathematics, which is studying the place of mathematics in the secondary schools. He commented upon the first four chapters of the Preliminary Report which had already appeared, and gave an outline of the contents of the remaining part, which was to appear about July 1, 1938.

2. Professor Whitcraft gave an account of the method employed to secure a list of desirable attainments for teachers of secondary mathematics. The attainments were classified under the headings: (a) Subject matter, (b) Professional understanding and skills relating to mathematics, and (c) Personal qualifications. The study originated in the Teachers College Conference Group at the University of Chicago, 1937, with fourteen mid-western institutions cooperating.

3. With the mathematics of finance as the central theme, Professor Shriner stated that high school algebra could be made the most vital part of secondary education and an essential part of the general education of every adult. The algebraic principles involved in analyzing problems in home finance, savings, installment buying, amortization, depreciation, insurance, *etc.*, reveal the need for all the topics of elementary algebra.

4. Professor Menger pointed out that the answer to the questions whether one can double the cube, trisect the angle, and square the circle depends, of course, on the means of construction allowed. A conchoidograph allows us to construct exact solutions for the first two. An involutograph, of which simple forms have recently been devised, enables us to construct, from a circle, with radius r, a segment of length πr, and consequently πr^2. Approximate solutions of great accuracy are possible for all three problems by means of ruler and compasses. Noteworthy among them is a simple trisection of the angle with an inaccuracy of less than $20''$ due to Kopff.

5. The mathematical material presented to freshmen in American colleges is directly connected by Professor Karpinski with the most ancient mathematical documents of the Babylonians and Egyptians. Recent discoveries touch vitally the story of the progress of algebraic and trigonometric ideas. The intensive development of algebra and the applications of its methods to geometry have been extended backwards in time to some two thousand years before the Christian Era. The new problems are concerned primarily with the perimeter and with linear, quadratic, and even cubic functions of the sides of triangles and rectangles. Arithmetical series are involved in the division into trapezoidal areas of triangles and trapezoids. Trigonometric development, notably computation of chords in a circle by the Pythagorean theorem, are now definitely connected

with the highly scientific Babylonian astronomy. The progress of geometrical algebra and trigonometry in Greece, and similar work among the Arabs, is made a natural continuation of the Babylonian ideas. European and modern developments are revealed as vitally bound to the past by the new material. The analytic geometry of Descartes and Fermat is indicated as another phase of the fruitful association of geometry and algebra as begun in Babylon and Egypt and as continued in Greece, India, and the Mohammedan World.

6. The different nature of extrapolating and interpolating series was discussed by Professor Lanczos. The Taylor series and the so-called "asymptotic expansions" illustrate the former, the Fourier series the latter. The Tshebysheff polynomials permit the Fourier series to be transformed into an ordinary power series and thus increase the convergence of both Taylor and asymptotic expansions, by transforming then into interpolating series. For the Taylor series a mere re-arrangement of the series in Tshebysheff's polynomials yields a series which approximates closer in a given range with the same number of terms, for the asymptotic expansions trigonometric interpolation is necessary to obtain an "economized" series. Illustrations were given.

7. Professor Greenleaf presented a simple symbol which has proved useful in teaching the solution of practical problems in annuities. This symbol, used with three simple rules for reducing it to tabulated symbols, helps eliminate many of the errors frequently made.

8. It is well known that if H_n is a spherical harmonic of order n then H_n/r^{2n+1}, where $r^2=x^2+y^2+z^2$, is also a solution of the Laplace equation. Professor Williams considered the question of determining m from a functional equation in such a way that H_n/r^m will satisfy the equation of Laplace. The equation arrived at is $f(n)+f(n-f(n))=0$. Some of the properties of this equation were noted and different solutions were given. If $g(n)=n-f(n)$, then $g(g(n))=n$, or $g(n)=g^{-1}(n)$, so that $g(n)$ is its own inverse, and $y=g(x)$ is symmetric with regard to $y=x$.

9. Professor Edington surveyed some of the work that has been done in the definition of finite abstract groups defined by two operators whose product is of the second or third order in which one additional condition is imposed. He stated a number of theorems and relations that are useful in determining the orders of operators. The existence of groups and systems of groups was made to depend on substitutions and the use of mathematical induction.

10. The use of number systems with base other than ten is familiar to mathematicians. Professor Meyer demonstrated the peculiarities of such systems in case the base is a proper fraction.

11. Mr. Gamble gave a general solution of the quartic equation in which he derived the resolvent cubic by a method somewhat more straight-forward than in the solution of Ferrari.

P. D. EDWARDS, *Secretary*