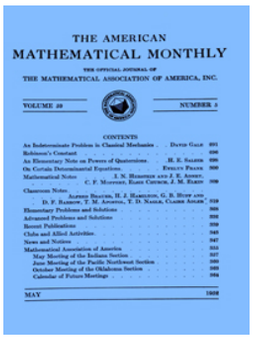

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The May Meeting of the Indiana Section

J. C. Polley (Secretary)

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has a position as Physicist with the Gaertner Scientific Corporation, Chicago, Illinois.

Assistant Professor G. M. Wing of the University of California at Los Angeles has been on leave of absence during 1951–52 and has been a staff member of the Los Alamos Scientific Laboratory, New Mexico.

Mr. R. G. Woodle, Jr., of the Missouri School of Mines and Metallurgy has been appointed to an instructorship at the University of Kansas.

Dr. R. A. Worsing of Iowa State College has joined the Physical Science Division of Boeing Airplane Corporation, Seattle, Washington.

Dr. F. H. Young, who was an AEC Research Fellow at the University of Oregon, is now at the Bureau of Ordnance, United States Navy, Washington, D. C.

Professor Emeritus W. B. Fite of Columbia University died on March 1, 1952. He was a charter member of the Association.

Professor F. G. Graff of Oberlin College died on February 22, 1952.

Dr. C. O. Lampland of the Lowell Observatory died on December 14, 1951. He was a charter member of the Association.

Professor V. S. Lawrence, Jr., of Virginia Polytechnic Institute died on February 20, 1952.

Professor Emeritus C. L. Poor of Columbia University died on September 27, 1951.

THE MATHEMATICAL ASSOCIATION OF AMERICA

Official Reports and Communications

THE EARLE RAYMOND HEDRICK LECTURES

Professor Tibor Rado of the Ohio State University will deliver a series of three expository lectures entitled "Derivatives and Jacobians" as the EARLE RAYMOND HEDRICK LECTURES at the meeting of the Association in East Lansing, Michigan on September 1 and 2, 1952. These lectures have been named in honor of Professor Earle Raymond Hedrick, one of the three organizers of the Association and its first President.

The Board of Governors has established the EARLE RAYMOND HEDRICK LECTURES in an effort to promote expository lectures and publications as significant activities of the Association.

Professor Rado's first lecture will be given at 4 P.M. on Monday, September 1. This lecture, to be devoted to a treatment of Jacobians, is intended to be an exposition which will be readily understood by anyone who is familiar with

advanced calculus and vector analysis as they occur in undergraduate courses.

The second lecture will be given at 9 A.M. on Tuesday, September 2. The first half of this lecture will be a continuation of the first lecture. The second half will be a description of relative Cech cohomology groups as the essential topological tool that is needed in the n-dimensional case. Professor Rado states that he has found a simple treatment of cohomology theory, and he hopes through these lectures to introduce this theory to the analysts for use in their work.

The third lecture will be given at 7:30 P.M. on Tuesday, September 2. This lecture, on a more advanced level than the other two, will be concerned with the transformation theory of multiple integrals in terms of the generalized Jacobians treated in the other two lectures.

Professor Rado states that the material of the three lectures will be published as a monograph of about two hundred pages. The manuscript will be ready for the printer in January, 1953.

The EARLE RAYMOND HEDRICK LECTURES for 1952 have been arranged by a special committee consisting of G. C. Evans, J. C. Oxtoby, and G. B. Price, chairman. At a later date this committee will recommend to the Board of Governors of the Association policies which will govern these lectures in future years.

PREPARATION OF PROBLEM AND SOURCE MATERIALS FOR THE MATHEMATICAL TRAINING OF SOCIAL SCIENTISTS

As readers of this MONTHLY probably know, a Committee on the Mathematical Training of Social Scientists has been at work for some time. The Committee includes representatives of twelve learned societies including the Mathematical Association of America.

As the result of a suggestion from this Committee, the Social Science Research Council is now sponsoring a small group to work during the summer of 1952. This group will attempt to compile from the literature of the various social sciences lists of problems, extracts from sources, and references to sources that illustrate varieties of uses of mathematics in the social sciences. These compilations are expected to serve a number of important ends—e.g., to provide mathematicians with material for use in texts and courses designed for social scientists, to indicate the general dimensions of the mathematical training appropriate for students of the social sciences now and in the future, and to facilitate the study of mathematics by social scientists for whom organized courses are not available.

This Committee believes that the group referred to would find it most helpful if it could start with a wide variety of suggestions from the various areas concerned. A general appeal for such suggestions is hereby made. They should be sent to Professor William G. Madow, Chairman, Committee on the Mathematical Training of Social Scientists, University of Illinois, Urbana, Illinois, as soon as possible.

Although the Committee does not wish to limit the suggestions to specific types of material, it would prefer greater emphasis on materials relating to the use of mathematics in the social sciences themselves than on those relating to statistics, since the materials necessary for statistics are better known. Finally, the Committee would appreciate learning where programs of mathematical training intended for social scientists are now in existence or in process of development, and where mathematics at the level of the calculus or higher is required for undergraduate or graduate degrees in the social sciences or may be substituted for another requirement for a degree in a social science.

THE MAY MEETING OF THE INDIANA SECTION

The twenty-eighth annual meeting of the Indiana Section of the Mathematical Association of America was held at Butler University, Indianapolis, Indiana, on Saturday, May 5, 1951. Two sessions were held at which Professor H. E. Crull of Butler University, Chairman of the Section, presided.

There were fifty-five in attendance including the following forty members of the Association:

W. C. Arnold, W. L. Ayres, Juna L. Beal, Stanley Bolks, C. F. Brumfiel, G. E. Carscallen, K. W. Crain, H. E. Crull, M. W. De Jonge, W. E. Edington, P. D. Edwards, J. L. Ericksen, R. A. Gambill, E. L. Godfrey, Michael Golomb, S. H. Gould, G. H. Graves, J. R. Hadley, J. F. Heyda, M. W. Keller, E. L. Klinger, Jacob Korevaar, P. J. McCarthy, Gladys B. McColgin, P. T. Mielke, J. T. Montgomery, P. W. Overman, M. O. Peach, J. C. Polley, Arthur Rosenthal, Sister Gertrude Marie, J. D. Speas, R. B. Stone, Anna K. Suter, A. D. Talkington, Jane A. Uhrhan, F. J. Wagner, M. S. Webster, K. P. Williams, H. E. Wolfe.

The following officers were elected: Chairman, M. W. Keller, Purdue University; Vice-Chairman, Florence Long, Earlham College; Secretary-Treasurer, J. C. Polley, Wabash College.

The chairman announced the election of Professor J. C. Polley of Wabash College to the Board of Governors as Sectional Governor for the three year period July 1, 1951, to June 30, 1954.

Professor P. D. Edwards, Chairman of the Committee on Awards, reported that the committee had awarded five Association medals, four for high mathematical achievement in the Indiana science talent search and one to the top ranking contestant in the final comprehensive contest in mathematics of the Indiana high school achievement program sponsored by Indiana University.

The annual meeting of 1952 will be held at Indiana University, Bloomington, Indiana, at a date to be announced later.

The following papers were presented:

1. *The geometry of ideal gas flows*, by Mr. J. L. Ericksen, Indiana University.

The Mach number, m, of a stationary, isoenergetic ideal gas flow in the plane was shown to satisfy a cubic equation of the form $\sum_{n=0}^{n=3} f_n(m^2-1)^n$, where the functions f_n are expressible in terms of the adiabatic exponent, the curvature of the streamlines, the curvature of the orthogonal trajectories of the streamlines, and certain derivatives of these curvatures. It is possible to obtain analytic conditions to determine whether or not a given congruence of curves can be streamlined for such a flow.

2. *Continuation of the sequence addition, multiplication, exponentiation, . . .*, by Professor S. H. Gould, Purdue University.

Since multiplication is addition with equal summands and exponentiation is multiplication with equal factors, it is natural to define a fourth operation, namely, exponentiation with equal exponents, and then a fifth, and so forth. The higher operations have been neglected on the ground that they are neither associative nor commutative. In the present note these properties were replaced by corresponding inequalities, leading to generalization of some familiar theorems. A compact notation was devised and unsolved problems were suggested. It was pointed out that the notation makes it easy to write numbers which are strikingly large.

3. *Q scores, a correlation study*, by Sister Gertrude Marie, Marian College.

The aim of this paper was to evaluate the mathematics scores of ten consecutive classes of college women in the National Sophomore Testing Program as a measure of mathematical ability and/or achievement. These scores were correlated with: (1) *Q* scores and *I.Q.*'s as given by the American Council of Education Psychological Examination; (2) science, reading comprehension, and total scores on the Cooperative General Culture and English Tests of the National Sophomore Testing Program; (3) high school and college mathematics achievement as indicated by number and kind of courses taken and class marks received.

4. *Linear dependence and the Wronskian*, by Professor M. S. Webster, Purdue University.

The purpose of this paper was to discuss the theorem "The functions of a set are linearly dependent if, and only if, their Wronskian is identically zero." Although the theorem is in general false, it is found in several texts including two published in the period 1940–1950. Peano and Bôcher recognized that the theorem is not valid and Bôcher published several correct theorems related to the false one. Theorems of this type and a necessary and sufficient condition involving the Gramian were discussed.

5. *Student and teacher*, by Professor G. H. Graves, Purdue University.

Since specialization implies cooperation, mathematicians and educators should work in close collaboration. The graduate student is particularly the victim of misunderstanding between these two groups. The relation between teacher and student is a personal one, not purely professional. The teacher must be profoundly interested in the development of the student's capabilities. When a student fails, the teacher fails with him. Suggestions were made regarding use of class meetings, conferences, psychological aids to study, administration of tests, and the subject of grading. The opinion that the teacher's objectives should include making himself unnecessary was expressed.

6. *The use of a fourth property of a right triangle in teaching mathematics*, by Professor E. L. Godfrey, Defiance College.

The following theorem is a natural addition to the corollaries concerning the lengths of the sides and the perpendicular to the hypotenuse of a right triangle which are included in the standard textbook presentation of Euclid's eighth proposition of book six. Corollary: The rectangle contained by the sides of a right triangle is equal to the rectangle contained by the base and the perpendicular drawn from the vertex of the right angle to the base. The formula for the altitude suggested by this property was shown to be useful frequently in college mathematics. Since the proof is obvious from a consideration of areas instead of similar triangles, it was suggested as a suitable and useful exercise to introduce in junior high school courses in arithmetic, algebra and/or general mathematics.

7. *On the zeros and asymptotic behavior of Bessel functions*, by Professors

Michael Golomb and Jacob Korevaar, Purdue University, and presented by Professor Korevaar.

In this paper completely elementary methods were used to derive the common results concerning the real and non-real zeros and the asymptotic behavior of Bessel functions; some new results were given on the location of the non-real zeros. No particular representations of the Bessel functions by power series, definite integrals or otherwise were used. For each problem a form of Bessel's differential equation was used which best suited the specific problem. The results then followed readily from the definition of Bessel functions as solutions of the differential equation and were therefore applicable to any (real-valued) solution of this equation, whether it be a Bessel function of the first kind, of the second kind, or a linear combination of such functions.

8. *Newtonian pattern of analysis*, by Professor M. O. Peach, University of Notre Dame.

The concepts of Newtonian mechanics are often extended to phenomena which are essentially non-mechanical. When this is done it should be done consciously and with precision if pitfalls are to be avoided. The author raised the general question: To what extent and under what conditions can non-mechanical phenomena be analyzed according to the pattern of Newtonian mechanics? Precise conditions were laid down for the introduction of the concept of force. A generalized definition of force, applicable to both mechanical and non-mechanical phenomena, was given. Necessary and sufficient conditions for the validity of the parallelogram law for adding forces and of Newton's third law were deduced. An application of these ideas to the theory of dislocations was briefly sketched. The incomplete nature of the answer given to the above question was emphasized, and several directions in which research of potential mathematical interest could be undertaken were pointed out.

9. *A theorem on improper integrals in abstract spaces*, by Professor P. T. Mielke, Wabash College.

In this paper the notion of improper integral is that used by H. Hahn and A. Rosenthal in *Set Functions*, the University of New Mexico Press, 1948. The theorem proved is one of several contained in the author's doctoral thesis, *Improper Integrals in Abstract Spaces*. The space E is to be considered a general space without any particular topological or metric structure; M a σ-field of subsets of E, $\phi(M)$ a totally additive set function in M which is assumed complete for ϕ. The function $f(x)$ is a point function, ϕ-measurable on a set $A \in M$. Theorem: If $\phi(A)$ is infinite and $f(x)$ is ϕ-summable on A, then, given $\epsilon > 0$, there exists a $\bar{\delta} > 0$ such that for every δ-scale $\{z_i\}$ with $\delta \leqq \bar{\delta}$

$$\left| L(f, \phi, \{z_i\}, A_\delta) - (A) \int f d\phi \right| < \epsilon$$

where $A_\delta = A[|f(\hat{x})| > \delta]$ and $L(f, \phi, \{z_i\}, A_\delta)$ is any of the four Lebesgue sums for f, ϕ, $\{z_i\}$, and A_δ.

Professor J. B. Irwin of the Department of Astronomy of Indiana University delivered by invitation an address entitled *The Possibilities of the Electronic Computer in Astronomical Research.* In this he discussed the nature and construction of recently developed computers and presented certain problems in astronomy to illustrate the possible use of the electronic computer in astronomical research.

J. C. POLLEY, *Secretary*