

MATHEMATICS

Chairman: HAROLD E. WOLFE, Indiana University

Dr. J. C. Polley, Wabash College was elected chairman of the section for 1947.

ABSTRACTS

The American University at Shrivenham Barracks. P. D. EDWARDS, Ball State Teachers College.—Shrivenham American University, although created for army personnel awaiting redeployment, was a true American University operated on foreign soil. The faculty of more than 220 members represented 149 American institutions of higher education. About 150 were civilians who were sent to England for this purpose. The University was divided into eight sections which corresponded to the usual division of an American University into Schools. The faculty of the Mathematics Branch included fourteen civilians and seven members of the army all of whom were college teachers in civil life. The enrollment was approximately 4000 each term. Approximately three-fourths of the student body had had actual combat experience. A pure elective system prevailed, and under it the Mathematics Branch was exceeded in size only by one other branch. In spite of the unusual difficulties which prevailed very gratifying results were obtained.

The American University at Bairritz. J. C. POLLEY, Wabash College.—The American University at Bairritz, France, was operated from August 1945 until March 1946. The author discussed some of the difficulties encountered in establishing an American school in the midst of a French seaside city. Especial emphasis was given the program offered in Mathematics.

Application of the linear transformation. JOSEPH LASALLE, Notre Dame University.—Several applications of the linear transformation $(az+b)/(cz+d)$ to problems in electrical engineering were presented. A clear geometric picture of the variation of power transfer to a load with change of load or generator impedance and of the condition for maximum power transfer is obtained by means of the transformation $(1-z)/(1+z)$. The "circle" diagram which relates impedance to reflection coefficient can be used for this purpose. Though the concepts of reflection and transmission coefficients appear to be more natural than those of impedance and the resulting equivalent circuits, particularly for wave guides, only limited use of the former concepts have been made. This may be due to difficulties in applying the general linear transformation. Algebraic identities which simplify the application of this transformation are given.

The Force of Mortality Function. F. C. SMITH, Lincoln Life Insurance Co.—In this paper, the author discussed the definition of the Force of Mortality function, μ_x , and some of its properties. Several methods of approximating the values of this function are also presented. The importance of this function in the field of actuarial mathematics is stressed, and the effects of assuming the Gompertz and Makeham hypotheses are shown.

Recent progress in the theory of compressible fluids. RUFUS ISAACS, Notre Dame University.—Recent developments in aeronautics, gas turbines, etc., make the need for a workable theory of compressible fluids imperative. In the past, progress has been checked, first, by the complexity of the theory and, second, by the formidable amount of numerical computation needed to apply what theory is extant. The new approach of Bergman to the methods of Chaplygin now yields a useable theory when used in conjunction with such modern computational devices as the Aiken machine at Harvard University.

In two-dimensional incompressible flows, the stream function satisfies the Laplace equation. Thus each flow pattern can be determined from an analytic function of a complex variable by taking the imaginary part. In distinction, for compressible fluids the differential equation satisfied by the stream function is non-linear. But Chaplygin showed that in the hodograph plane where the velocity components are the independent variables the equation becomes linear, although complicated. Bergman has developed an operator for this equation, wherein a flow can again be obtained for each analytic function. This operator requires knowledge of a certain function sequence which may be (and now is being) calculated once and for all. With this apparatus, all flow patterns may be obtained with comparatively little labor.

Hodograph methods for compressible flow. M. E. SHANKS, Purdue University.—Dr. Shanks discussed the types of hodographs obtainable from flow past an airfoil and pointed out problems unsolved even for incompressible flows. The case of supersonic flows and the method of characteristics was also discussed.

The achievement of large classes in mathematics. H. F. S. JONAH and M. W. KELLER, Purdue University.—The authors discussed the achievement of large classes in Mathematics in comparison with the achievement of small classes as measured by uniform objective tests. The classes compared were those in algebra and trigonometry.

Engineering applications of spherical trigonometry. P. M. PEPPER, Notre Dame University.—In this paper the author described some of the engineering applications of spherical trigonometry. Since its inception, spherical trigonometry has been applied principally to the sciences of astronomy, geodesy and navigation. It is little known that spherical trigonometry can be useful to the tool engineer, first, to derive the usual formulas for "compound angles" and, second, to solve atypical problems of this nature. Certain of the compound angle formulas are identified with Napier's Rules for right spherical triangles, whereas certain of the non-standard problems lead to the laws of oblique spherical triangles.