A SYMPOSIUM ON THE CALCULUS OF VARIATIONS

A SYMPOSIUM on the calculus of variations was held at the University of Notre Dame on April 7 and 8. The first of the four meetings under the direction of Dr. Marston Morse, of the Institute for Advanced Study, Princeton, was opened by some remarks of Dr. Karl Menger, of the University of Notre Dame, who described as the purpose of the symposium the establishment of further relations between the different directions in calculus of variations; metric methods which yield general existence theorems, as well as a new proof of Euler's equation, may be one of the means. Dr. Gilbert A. Bliss, of the University of Chicago, presented a paper on "Normality and Abnormality in the Calculus of Variations." Dr. Lawrence M. Graves, of the University of Chicago, spoke on "The Reduction of Certain Problems in the Calculus of Variations to the Problem of Bolza."

At the second meeting, which was directed by Dr. G. A. Bliss, Dr. Tibor Radó, of the Ohio State University, presented a paper on "The Method of Variation of the Independent Variable." He demonstrated how this method could be successfully applied to the solution of the problem of Plateau. In the discussion, Dr. S. Lefschetz and other speakers emphasized the importance of the application of the modern methods to two-dimensional problems. Dr. William T. Reid, of the University of Chicago, used expansion methods to obtain sufficient conditions for the one-dimensional problems in the calculus of variations. The last speaker of the second meeting was Dr. Sumner B. Myers, of the University of Michigan, who treated certain aspects of differential geometry in the large.

The following morning, on which Dr. Solomon Lefschetz, of Princeton University, presided, Dr. Marston Morse spoke on "Abstract Variational Theory." He explained his new general theory of stable curves, divided into a group-theoretical and a metrical part. Dr. Edward J. McShane, of the University of Virginia, presented his general proofs of existence theorems.

In the afternoon, under the direction of Dr. Lincoln LaPaz, of the Ohio State University, Dr. Karl Menger discussed the applications of his metric methods to the proof of very general existence theorems. The rest of the meeting was devoted to applications of the calculus of variations. Dr. Charles F. Roos, of New York City, dealt with applications to economics, in particular with problems to the building industry; he derived formulas which had yielded predictions for the last three years. Dr. Lothar W. Nordheim, of Purdue University, spoke on "Variational Problems in Quantum Electrodynamics." Dr. Arthur E. Haas, of the University of Notre Dame, presented a paper on "The Variation Principles of Maupertuis and Fresnel, and the Relation between Wave Mechanics and the Theory of Relativity."

On the first evening Dr. Lefschetz gave a popular lecture on the subject "What is Topology?"

The meeting was attended by a group of more than fifty visitors from all parts of the country.

KARL MENGER

SPECIAL ARTICLES

RESTORATION OF CARBOHYDRATE OXIDATION IN DIABETIC TISSUE IN VITRO[1]

SINCE Houssay's notable demonstration that pancreatic diabetes in the experimental animal is ameliorated by the removal of the hypophysis, it is no longer possible to regard diabetes mellitus as conditioned solely by a lack of insulin or to consider that normal carbohydrate metabolism is governed by this hormone alone. It is now generally held that the proper utilization of carbohydrate is under the control of two or more internal secretions in a delicate balance, insulin on the one hand, and on the other, a secretion or secretions elaborated in the pituitary or in other glands, as the adrenals (Long, Lukens) under hypophyseal control.

Experiments on the whole animal of various species have shown that the removal of the hypophysis following pancreatectomy results in a diminution or absence of glycosuria and ketosis, especially under fasting conditions, during which low blood sugar values are also found. Carbohydrate metabolism in these animals is not, however, entirely normal. Chambers, Sweet and Chandler[2] have shown that while the basal respiratory quotient is definitely higher in the Houssay dog than in pure pancreatic diabetes, they show an inconstant rise in the level of the respiratory quotient on receiving glucose.

Tissues removed from the same group of Houssay animals and studied in this laboratory in the Barcroft-Warburg micro-respiration apparatus have shown a more marked return to the normal than might have been anticipated from the results obtained with the whole animal. For example, strips of skeletal muscle

[1] From the Department of Medicine, Cornell University Medical College and The New York Hospital, New York City.

[2] Chambers, Sweet and Chandler, *Proc. Am. Physiol. Soc.*, Memphis, April, 1937.