understanding of the role that invariance plays in various branches of mathematics. But the mathematician will learn that he must pay more attention to invariants when he embarks upon any physical application of mathematics, for in some form or another, invariants and their discovery are of fundamental importance in the development of any physical science. The fact that the heyday for the researcher in algebraic invariants passed with the discovery of Hilbert's basis theorem in no way reduces the importance of a conscientious search and high respect for invariant properties when working in physical mathematics. Thus, with the rapid development of plastics, glass, plywood, fabrics and wood products, a whole new study must be made to determine their invariantive properties, such as strength, brittleness, fatigue resistance, viscosity, crack-propagation and the influence of external conditions. The uncertainty in the application of the earlier theories of elasticity is a problem in this connection. Serious attention must be given to more general or new theories of elasticity, and along with this must come a search for an improved mathematics capable of describing adequately the theory and its adaptations to the use of engineers. Some of this theory may require a broader use of statistical and probability methods. Undoubtedly, lying moldering in the archives of libraries, there are general solutions to some of these problems already nearly worked out which, with some modernization and extension, may yet prove of real value. Real progress will not result until the practical problems of the engineer can be solved quickly in the form in which they arise in practice. Model studies have been useful, but there is still wide scope for true progress in this field.

(14) *Biophysics.* In recent years there have been many papers in mathematical biophysics which are concerned with quantitative theories of a wide variety of biological phenomena. Quantitative types of biological theory are many years behind their analogues in physical science. As these theories progress, it may well be that they require new mathematical theories or that they require a more expert use of known mathematical techniques than biologists and the medical profession can be expected to possess. This field may need the services of mathematicians with a training and interest in the biological sciences.

(15) *Hydrodynamics Aerodynamics.* Much of the mathematics which is being written on problems in aerodynamics and hydrodynamics can not adequately describe or predict such phenomena. Mathematicians who attempt to work in those fields should concern themselves with an understanding of the phenomena which can be treated by their theories. They should spend a considerable period in studying experimental data in order to adapt their theory more nearly to actual situations. Aside from a great multitude of aerodynamic problems which are still to be solved, the mathematician with good physical background will find large fields of research relating to the nature of the destructive action of cavitation, the behavior of blade profiles when the velocity approaches that of sound, or the theory of stress due to the collapse of vapor bubbles in a liquid. These, and other fields, are still scarcely touched.

(16) *Importance of This Program to the Nation. Summary.* It is without question most necessary for the national interest and for the preservation of peace in the years to come that we encourage and maintain a high level of research in this country, both in the pure and the applied sciences. Accordingly, I consider the program proposed herein to be of considerable importance.

I have indicated some of the directions in which mathematicians should concentrate their efforts. I consider the program suggested herein as intended to *supplement* the older philosophy which has prevailed for many years.

I have urged that pure mathematical research be given continued emphasis and encouragement, but in addition, it is most necessary that a new high level of research in physical mathematics be encouraged and maintained in the years to come to a far greater extent than ever in the past.

This program entails a new training program to produce new types of mathematicians; and this will require the whole-hearted cooperation of educational institutions and many businesses and industries.

It would then seem most natural for mathematicians to find their way into industry on a much larger scale than ever before, and for industry to take much greater advantage of existing mathematical knowledge and talent than ever before. So I say to mathematicians, "By your deeds prove your worth"; and to industry, business and research organizations I say, "Take fuller cognizance of mathematical methods and mathematicians, and by all means make a fuller and wiser use of them than you ever have before."

OBITUARY

RECENT DEATHS

DR. EDMUND BURKE DELABARRE, professor emeritus of psychology of Brown University, has died at the age of eighty-one years.

DR. JOHN C. GRILL, head of the department of pathology of the Marquette University School of Medicine at Milwaukee, died on March 17 at the age of fifty-two years.

DR. STEPHEN PATRICK BURKE, professor of chemical engineering at Columbia University, died on March 10 at the age of forty-eight years.

ALBERT HOWARD HORTON, chief of the Power Resources Division and district engineer of the U. S. Geological Survey, died in Washington, D. C., on March 4 at the age of sixty-nine years. He had been employed as a Federal engineer for nearly forty-seven years, of which nearly forty-two were spent in the Geological Survey, where he has been regarded as an authority on surface water and power resources.

HAROLD RYLAND SMALLEY, director of soil improvement work and for more than twenty-five years a member of the staff of the National Fertilizer Association, died on February 27 at the age of fifty-eight years.

HENRY KRIEGER MCCONNELL, vice-president of the Tobacco By-Products and Chemical Corporation of Louisville and Richmond, known for his work on the production of nicotine and its derivatives, died suddenly on February 25.

DR. ALBRECHT PENCK, professor of geography, emeritus, of the University of Berlin, has died in Prague at the age of eighty-seven years. Dr. Penck occupied the Silliman chair at Yale University in 1908 and acted as Kaiser Wilhelm exchange professor at Columbia University the following year.

SCIENTIFIC EVENTS

WILDLIFE CONSERVATION IN MISSOURI

THE activities of the University of Missouri in the field of wildlife conservation will be expanded to include studies on methods of increasing the fish population of the streams, lakes and ponds of the state. This expansion has been made possible by a bequest amounting to approximately $150,000 made by the late William James Rucker, who died at Charlottesville, Va., on December 19, 1941.

Mr. Rucker was a native Missourian, born at St. James in 1873. He was well known as a substantial contributor to the support of various hospitals, including St. Luke's Hospital in St. Louis and Martha Jefferson Hospital in Charlottesville; he was also active in his support of the Protestant Episcopal Church at Rolla, St. James and Charlottesville. He was deeply interested in wildlife conservation as an active member of the Izaak Walton League, and his bequest to the University of Missouri for the purpose of educating the youth of Missouri in wildlife conservation was apparently motivated by a desire to further the principles and plans formulated by the Missouri Conservation Commission.

As a memorial to Mr. Rucker the Board of Curators of the university has created a Rucker professorship of zoology, and has announced the appointment of Professor Rudolf Bennitt to the new professorship. Professor Bennitt, since 1927 a member of the faculty, holds degrees from Boston and Harvard Universities. With the organization of the Missouri Cooperative Wildlife Research Unit in 1937, he became chairman of its administrative committee.

The expansion of teaching and research in wildlife conservation will be principally in the field of aquatic biology and will be under the supervision of Dr. Robert S. Campbell, who was recently appointed assistant professor of zoology.

AWARD OF THE PITTSBURGH SECTION OF THE AMERICAN CHEMICAL SOCIETY

LEONARD H. CRETCHER, assistant director of the Mellon Institute of Industrial Research and head of the department of research in pure chemistry, as already announced in SCIENCE, received the 1944 award of the Pittsburgh Section of the American Chemical Society at a dinner meeting of the section on February 15. Dr. E. E. Marbaker, of Mellon Institute, presided as toastmaster. The program included brief speeches on various phases of Dr. Cretcher's professional career by Dr. Robert S. Tipson, of the department of research in pure chemistry of the Mellon Institute; Dr. W. W. G. Maclachlan, associate professor of medicine at the University of Pittsburgh and chief of medicine at Mercy Hospital, and Dr. E. R. Weidlein, director of Mellon Institute.

Dr. W. A. Gruse, who was chairman of the Pittsburgh Award Committee for 1944, presented the medalist to Dr. H. K. Work, chairman of the Pittsburgh Section, who conferred the award in recognition "of his eminence in the fields of organic and biochemistry, his successful investigations of the constitution of the carbohydrates present in marine vegetation, his outstanding achievements in the selection and synthesis of anti-pneumococcic and anti-malarial therapeutic agents, and his marked ability in the directing of theoretical and industrial research in the field of chemistry."

The following details in regard to Dr. Cretcher's life and career are taken from the official statement: