clams of the Great Barrier Reef, that weigh several hundred pounds, but even the smaller variety is dangerous to the unwary diver who has a foot or hand caught between the shells.

The Pearl Divers Group emphasizes the delicate beauty of the corals of the South Seas, the many varieties ranging through all the vivid colors of the rainbow—from rose to lavender, purples, blues and tans. Besides the hundreds of other brightly colored fishes which swim singly or in schools, the group contains vicious needle-toothed morays, lurking in crevices. These dangerous eel-like fishes bite at anything that comes near.

To simulate the shimmering under-surface of the water as a diver sees it from 25 feet or more underseas, sheets of chrome-plated copper were installed at the top of the group after several other materials had been considered by Dr. Miner to produce this effect. This also presented another engineering problem, for the contact of these sheets with the iron framework that supports the coral cliffs would cause them to corrode within a fairly short time. Dr. Miner solved this by attaching the chromed copper to the framework by means of aluminum supports—thereby guaranteeing the life of the roofing as long as the group exists. Air-shafts, leading from the group to open spaces underneath the balcony of the Hall of Ocean Life, also insure the preservation of the contents.

The Pearl Divers Group is the gift of the late Edith Haggin De Long, whose generosity made possible, not only the modeling and assembling of the group itself, but also the mural by Francis Lee Jacques on the gallery floor immediately above.

The expeditionary work for the group, under the leadership of Dr. Miner, was made possible through the cooperation of Templeton Crocker, of San Francisco, who accompanied the expedition and placed at the museum's disposal the facilities of his schooner yacht, the *Zaca,* at Tongareva. Contributions for this expedition were also made by Junius S. Morgan, George T. Bowdoin, Clarence L. Hay and Wyllys Rosseter Betts, Jr. The personnel of the museum consisted of Dr. Miner, leader, Mr. Betts, field associate, and Chris E. Olsen, departmental artist and modeler.

INDUSTRIAL RESEARCH

AMERICAN industry spends six per cent. of its net income on industrial research and has increased its research personnel forty-one per cent. in the last two years, according to a report on industrial research by the National Resources Planning Board which has been transmitted to Congress by President Roosevelt. It covers all phases of industrial research in the United States and is the second in a series on Research Resources of the Nation prepared by the board with the assistance of scientific councils and committees. The National Academy of Sciences and the National Research Council are responsible for the preparation of the present volume. Its conclusions are drawn from an extensive survey in which 2,350 companies reported 70,033 persons engaged in technical research in American industry at an average annual cost of $300,000,000.

Significant facts developed by the survey are:

The rate of increase of research personnel during the last two years is twice the average rate for the last twenty years.

The contribution by newly established laboratories to the increase of research employment within the last two years is insignificant.

Of the total research personnel reported, slightly more than half are professionally trained, principally as chemists and engineers. The remainder is about equally divided between technical and nontechnical workers.

A considerable number of small and medium-sized companies conduct research. However, most of the industrial research effort, as measured by personnel, is supported by a comparatively small number of large corporations.

In general, viewing industrial research as a national asset, its rapid growth in those areas where it is already established is most gratifying. The rate of expansion into additional areas appears to be decreasing rather than increasing. There remains a number of industries to which research methods could almost certainly be applied with profit on a larger scale than they now are. Finally, the total volume of industrial research being conducted by small and medium-sized companies is relatively small, as measured in terms of personnel.

In 1938 the largest number of research workers was employed in the chemical and allied industries. Next were petroleum, electrical communications, electrical machinery, apparatus and supplies, other machinery industries and rubber products. In that year more than half of those working in industrial research laboratories in the United States were employed by the chemical and petroleum industries and by the electrical industry, including communications, utilities, radio and the manufacture of electrical machinery, apparatus and supplies.

A breakdown of the professionally trained persons engaged in industrial research is as follows: chemists, 15,700; engineers, 14,980; physicists, 2,030; metallurgists, 1,955; biologists and bacteriologists, 1,955; other professions, 909—a total of 36,553. In other technical, administrative and clerical positions 33,480 persons were employed.

Commenting on close cooperation between government and private research agencies the report says:

The Federal Government maintains a large number of research laboratories from which help may be obtained in conducting research along lines that promise results re-

dounding to the public good. For instance, the laboratories of the Bureau of Agricultural Chemistry and Engineering have been most helpful in working out problems of general interest. The four new regional research laboratories now under construction by the United States Department of Agriculture will no doubt be anxious to render similar assistance under suitable cooperative arrangements.

The government agency most frequently called upon to aid trade-association research is probably the National Bureau of Standards. This agency, as its name implies, is most important in standardization research, but arrangements can be made with it to supply research associates for work on particular industrial problems. More often, however, a grant in money is made to the bureau to provide funds for a specified task. One particularly important phase of the bureau's work is the preparation and distribution of standard analytical samples and standard test specimens. The analyses and physical properties are carefully determined by the bureau so that they can be used by individual laboratories to check the accuracy of their own methods and determinations.

SUMMER COURSES IN APPLIED MECHANICS AT BROWN UNIVERSITY

A STAFF of sixteen experts from Europe and America, representing "the best men available in the fields of mathematics, engineering and physics," has been selected to take charge of summer instruction and research in applied mechanics at Brown University, where special problems in defense industry will be studied by prospective defense technicians. Beginning on June 23 and continuing through September 13, the summer session is designed to help overcome a bottleneck in the supply of men with highly specialized knowledge who are needed in defense industry.

The first program of its kind will bring together, according to a statement made by Dr. R. G. D. Richardson, dean of the Graduate School, those "who are now so widely scattered that their work is relatively ineffective for instruction purposes." The courses to be offered will deal largely with higher mathematics. They will include "Partial Differential Equations," "Fluid Dynamics," "Elasticity," and seminars in fluid dynamics and elasticity. The personnel of the staff has been chosen "for their practical knowledge and experience, the high degree of their past achievements; and their grasp of the fundamental problems in mathematics which are related to defense preparations."

There will be six full-time professors and ten visiting lecturers. In the group of professors, one is Polish, two are Russian and three are German by birth. The German specialists are among those who have left their native country since Hitler's rise to power and whose outstanding achievements in applied mechanics have helped bring about the high quality and efficiency of Nazi planes and other fighting equipment.

The professors are:

Richard von Mises, now lecturer on aerodynamics and applied mathematics at Harvard University, and formerly director of the Institute for Applied Mathematics at the University of Berlin. One of the most eminent European authorities on aerodynamics, hydrodynamics and the theories of elasticity and probability, von Mises is known particularly for his studies of airplane body shapes and vibrations. His book on aeronautics has gone through five editions.

Kurt O. Friedrichs, professor of mathematics at New York University and formerly professor of mathematics at the Technological Institute at Braunschweig. He is widely known for his work in applied mathematics, including his mathematical investigations of the stresses on thin metal plates, like those used in airplane construction.

Ivan S. Sokolnikoff, professor of mathematics at the University of Wisconsin and expert for the National Defense Research Committee. He is known for his work in the theory of elasticity, mathematical physics, partial differential equations and boundary value problems.

Jacob D. Tamarkin, professor of mathematics at Brown University, formerly professor of mathematics at the University of Petrograd and the Petrograd Electrotechnical School. An editor of the international journal, *Mathematical Reviews,* his field is pure mathematics, particularly the Fourier Series and Laplace integrals.

Willi Prager, professor of engineering at the University of Istanbul, formerly associated with the Aerodynamical Institute of Göttingen. He is a world-recognized authority on structural statics, the theory of vibrations, hydrodynamics and the theory of plasticity.

Stefan Bergmann, lecturer at the Massachusetts Institute of Technology and formerly instructor at the Institute for Applied Mathematics at the University of Berlin. His specialized studies deal with applied mathematics, the theory of elasticity, fluid dynamics and electromagnetic theory.

The lecturers will include Professor R. D. Courant, mathematics, New York University; R. M. Foster, Bell Telephone Laboratories; Dr. Thornton C. Fry, mathematical research director, Bell Telephone Laboratories; Professor James N. Goodier, mechanics of engineering, Cornell University.

Professor Robert B. Lindsay, physics, Brown University; Dr. A. L. Nadai, mechanical engineering, Westinghouse Electric and Manufacturing Company; Dr. Hillel Poritzky, mathematician, General Electric Company; Dr. Theodore Theodorsen, chief, physical research division, National Advisory Committee for Aeronautics, Langley Field.

Professor Stephen P. Timoshenko, theoretical and applied mechanics, Stanford University; Professor Norbert Wiener, mathematics, Massachusetts Institute of Technology.

THE UNIVERSITY OF CHICAGO FIFTIETH ANNIVERSARY SYMPOSIA

A CORDIAL invitation is extended to scholars and scientific men to attend a series of Symposia with the general title "New Frontiers in Education and Research" in celebration of the fiftieth anniversary of