lately shown the absurdity of the charge that scientific men are responsible for the evil uses that are sometimes made of their discoveries. But this responsibility is theirs, that they shall explain what they find so that their fellow-men know how they stand. The scientist can not be expected to see that discovery is rightly used, but no one except himself can rightly describe it. It is not to be expected that the best use will be made of what is imperfectly understood.

These are problems of tactics. They can not be fully solved while school and college still maintain an artificial division between two forms of teaching, naming one of them science and the other "humanities." They have far more in common than is generally recognized. There must, of course, be specialization, a divergence in the later stages. But the men of different types of mind must be kept together more than at present, so that when they meet in after-life they can understand each other. It happens too often now that the administrator makes mistakes because he can not understand his technician's advice, and the technician is incapable of expressing himself so that his administrator understands him. There ought not, in fact, to be a sharp distinction between the two. It is a fundamental point that humanities and science have joined hands in the service of mankind.

SUMMARY STATEMENT OF THE ACTIVITIES OF THE NATIONAL RESEARCH COUNCIL, 1937–1938

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BORDERLAND PROBLEMS

AMONG new activities of the National Research Council during the year, 1937–1938, a number of undertakings reflect the consideration which has been given in the Council for several years to so-called "borderland problems." These problems lie on the fringe of interest of the traditional fields of the fundamental sciences or in between these fields. Perhaps they might better be called problems of the combined sciences, since it is frequently the contributions from several adjacent fields which are amalgamated into the solution of these problems. They seem to arise particularly at this time partly because of the rapidly expanding range of scientific interests and partly because of the necessary use of knowledge from several sources in order to meet the increasingly complex social and technological questions of the day.

In the life sciences, for instance, due to the discussion of problems of common interest in conferences of the preceding year and to suggestions from other sources, several new combination projects have been undertaken. Among these is a reorientation of previous concern of the Council in parasitology under a new Committee on Medical Problems Common to Animals and Man. Others relate to the genetics of pathogenic organisms; to problems of cellular physiology and the changes in organisms due to old age; to aerobiology; and to the bearing of the results of studies of experimental neuroses upon problems of neurotic behavior and other researches in psychiatry.

In the relationships between physical and earth sciences certain problems of geology have led to undertaking the preparation of a handbook of the physical and chemical constants of the materials with which geologists have to deal, and to the coordination of studies of the movement of water currents of different densities through reservoirs and lakes. The scrutiny, itself, of the field of geology in the light of its physical and chemical phases has led also to the definition of a considerable list of other geological problems.

FELLOWSHIPS

A recently published list of the fellows of the Council for the past twenty years names 1,146 past and present fellows. Of these 263 (about 23 per cent.) carried on their fellowship work abroad or will do so. The total group was derived, with respect to undergraduate training, from some 260 educational institutions in the United States and Canada and from about twenty-five educational institutions abroad. The fellows have worked in about fifty universities and at many of the research institutions on this continent and at a large number of educational and research institutions abroad, mainly in European countries. Most of the past fellows are engaged in research work and over three fourths of the group are connected with research or educational institutions. For the current year 42 fellows are under appointment, selected last spring from 189 applicants. The fellowships are supported by funds provided by the Rockefeller Foundation.

SCIENTIFIC AIDS TO LEARNING

In the spring of 1937 the Council appointed a Committee on Scientific Aids to Learning at the suggestion

of the Carnegie Corporation. The purpose of this committee is to aid in the adaptation for educational purposes of the scientific and technological advances of recent years in such fields, among others, as radio, motion pictures, sound recording and reproduction, photography including microphotography for documentary purposes, and improved forms of calculating machines for the analysis of data for special research uses. While these new developments in science and technology find their application to the learning process in many fields the committee is concerned primarily with the classroom at its various levels and with research work. It is because these scientific aids to learning are relatively new and their educational uses are largely unexplored that their characteristics, possibilities and limitations need to be carefully studied in order that the best advantage can be taken of their potentialities in the educational process.

The program of the committee includes a study of the cost of furnishing auditory aids in the classroom, a study of broadcast receivers for school use, a study of the actual use of broadcast programs in the schools of a number of cities, the preparation and testing of phonograph records as aids to teaching particularly in rural areas, a similar experiment with sound slide films, a study of school experience with motion picture projection equipment, a report on equipment and supplies for microphotography, the consideration of a program for testing eye fatigue in the reading of micro-film, and assistance in the development of a highly specialized machine for the solution of mathematical problems involved in certain psychological investigations. The funds for the support of these investigations are supplied by Carnegie Corporation. Special offices are maintained by the committee in New York City (41 East 42d Street).

Monographs in the Physical Sciences

For many years the Division of Physical Sciences of the Council has maintained a program of publication for monographs upon current research topics in the advancement of the physical sciences. These publications include a series of six monographs upon the physics of the earth, and single monographs upon such topics as the quantum theory, problems of acoustics, theories of magnetism, radioactivity, molecular spectra in gases, the scale of the universe, celestial mechanics, hydrodynamics, critical potentials, chemiluminescence, algebraic numbers and functions, and the numerical integration of differential equations. In addition to these treatises certain bibliographies and other aids to research in these fields have been produced.

These treatises have been prepared under the sponsorship of special committees and many of the treatises consist of contributions from several authorities upon various aspects of the subject discussed. Most of the monographs have been issued in the *Bulletin* series of the Council. Some have been published commercially. The expense of the editorial preparation and publication of these books was met in the earlier years from appropriations from the Rockefeller Foundation. Later the Council added funds for this purpose and a considerable sum is still on hand accumulated from the sale of these *Bulletins,* which is to be used as a rotating fund for the publication of later monographs of this nature. Four of the books were published through a special revolving fund set up for the printing of mathematical books. For two of the monographs in the general series second editions have been issued, two others have been reprinted, and two have been translated into European languages. Altogether some 43 volumes have been issued in these ways. During the past year the seventh member of the series upon the physics of the earth, "Internal Constitution of the Earth," was completed, and this monograph is now in press. Several other monographs are also in preparation.

Highway Research

The work of the Highway Research Board in cooperation with the U. S. Bureau of Public Roads has been continued in accordance with its former program for coordinating information and encouraging investigations upon the planning, building and operation of highways. The seventeenth annual meeting of the board was held in Washington, D. C., on November 30 and December 1–3, 1937, with an attendance of about 475. Selected papers presented at this meeting have recently been published in a volume of *Proceedings* of some 534 pages, with a supplement upon "Soil-Cement Mixtures for Roads." The Board also issues a monthly serial, *Highway Research Abstracts* (in mimeographed form).

During the past year at the special request of the Bureau of Public Roads the board has devoted particular attention to the problem of highway safety. These studies have been carried on in cooperation with the highway organizations in a number of the states. The results of the studies were made the basis of the following series of reports presented to Congress by the bureau last spring:

Part 1: Non-uniformity of State-Motor-Vehicle Traffic Laws.
Part 2: Skilled Investigation at the Scene of the Accident Needed to Develop Causes.
Part 3. Inadequacy of State-Motor-Vehicle Accident Reporting.
Part 4: Official Inspection of Vehicles.
Part 5: Case Histories of Fatal Highway Accidents.
Part 6: The Accident-Prone Driver.

Among recommendations in these reports attention

was called to the need for (1) greater uniformity in motor vehicle traffic laws, (2) standardized methods of reporting highway accidents, (3) improved inspection services for cars, and (4) the expansion of highway patrol organizations. The studies have disclosed that our present knowledge of how and why highway accidents occur is wholly inadequate for a successful study of the problem of highway safety, especially with respect to the habits, capabilities and limitations of automobile drivers. These studies are being continued during the current year with special attention to (1) methods of testing drivers for proneness to accident, (2) speed control on rural highways, and (3) the analysis of case histories of fatal accidents.

In addition to the work of the Highway Research Board the Committee on the Psychology of the Highway of the Council's Division of Anthropology and Psychology has formulated a program of investigations upon (1) the drinking driver in relation to licensing authorities, (2) the effects of fatigue on driving performance and its relation to hours of labor, and (3) problems of headlight illumination.

INDUSTRIAL RESEARCH INSTITUTE

It is hardly more than fifty years since the first research laboratory was established by an industrial firm in the United States. The great development, however, of the industrial laboratory has taken place within the last twenty years, and at present there are well over 1,700 such laboratories in this country. Aside from technological matters, these laboratories have many problems of organization and management in common arising from the urge for making the industrial research unit render its maximum effectiveness to the concern of which it is a part, and for making the best use of the results of research work. While in industry the ultimate test is efficiency, the verdict as to what constitutes efficiency often depends upon how far to look ahead.

In order to provide a medium in which directors of research laboratories might study cooperatively these problems which are alike in many establishments, the Division of Engineering and Industrial Research organized last spring an Industrial Research Institute. This is a self-sustaining organization, under the auspices, at present, of this division of the Council. Its purpose is to provide coordinated facilities for examining common problems and for the compilation of information relating to industrial research developments and to the organization of research agencies in industry. Among the questions to which this institute will give attention are problems of research personnel and its working conditions as distinguished from production personnel, the selection and training of research men, laboratory construction and management, the keeping of research records, planning research budgets as separate from manufacturing budgets, means for keeping informed upon current progress in industry, and cooperation with universities and other research institutions. The institute is to hold several meetings a year. It carries on its studies in part through committees of its own membership and in part through special investigators.

REPRODUCTION OF RECORDS

The work on the reproduction of records, which is being conducted at the National Bureau of Standards in cooperation with an Advisory Committee of the Council, grew out of earlier investigations at the bureau upon the preservation of papers. This work has been turned during the past three years to studies of the durability of photographic film which is coming into increasing use for record purposes. Certain of these investigations have been devoted to the comparison of the usual emulsion-coated acetate film with a Cellophane-base film containing a light-sensitive dye for formation of the record image within the film. Other studies have covered the aging effects of light on film, preservatives and protective treatments to prevent scratching, favorable conditions for the storage of film, methods of testing the condition of old film, shrinkage and expansion of film and paper, especially that used in aërial photography, means for more completely removing hypo in the processing of film and a study of the effects of a small quantity of unstable cellulose nitrate usually present in the slow-burning or safety type of acetate film. The next stages of the work will be to arrange for the confirmation of findings recently obtained in testing the resolving characteristics of various types of film, to carry these resolution tests further by using a number of available commercial devices and to plan tests for the characteristics of commercial apparatus for photographing documents.

The investigations upon the preservation of paper were supported by the Carnegie Corporation cooperatively with the bureau, as were also the earlier stages of work upon record film. These studies for the past year, however, have been supported by contributions from the film and apparatus industry.

(To be concluded)

OBITUARY

MALCOLM LYONS

MALCOLM LYONS, instructor in animal industry of the University of Arkansas, was accidentally shot while hunting on Thanksgiving Day (November 24, 1938), thus ending a most promising scientific career. Although only 27 years of age, Lyons had published a