purchased by authority of the finance committee, leaving a balance of $5,570.72 in the treasury from the two items. After taking into account all the special non-recurring items, the cash in the treasury at the close of the year exceeded that at the beginning by $4,570.72. If this amount were all invested in securities, the income from it would barely make up for the loss of income due to the fact that securities purchased now bear considerably lower rates of interest than those which were retired.

PERMANENT SECRETARY'S REPORT

Under a provision of the constitution and by action of the council, the permanent secretary collects all dues of members and pays all operation expenses of the association.

The following is a condensed statement of income and expense of the office of the permanent secretary for the fiscal year ended September 30, 1939.

INCOME (FROM PERMANENT SECRETARY'S REPORT)

Annual membership dues and fees	$93,803.50
Contributions from members	240.00
For journal subscriptions[1]	1,668.00
Interest and miscellaneous	681.40
Total income	$96,392.90

EXPENSE (FROM PERMANENT SECRETARY'S REPORT)

Journal subscriptions, including foreign postage	$57,922.09
Salaries (8 persons)	20,237.05
Office equipment and supplies	720.75
Printing and stationery	1,553.33
Postage	2,171.50
Telephone and telegraph	134.78
Miscellaneous office expenses	531.74
General secretary's office	679.08
Treasurer's office	400.00
Allowances to Pacific and Southwestern divisions	2,256.00
Richmond meeting (net)	1,145.37
Milwaukee meeting (net)	1,921.32
Reserve for publication of proceedings	1,000.00
Miscellaneous section expenses	305.09
Travel expenses (exec. com. and perm. sec.)	516.44
Miscellaneous expenses	300.16
Circularization for new members	5,484.75
Total expense	$97,279.45
Deficit for fiscal year ended Sept. 30, 1939	886.55

By far the largest item of expense of the association is the subscriptions to SCIENCE and *The Scientific Monthly* for its members. Not all of this amount is an expense in the ordinary sense of the term, for a part of it is payment on the purchase of the journals and therefore in the nature of capital investment. The agreement between Dr. Cattell and the association does not define the amount of this advance payment in numbers, but it is several times the deficit. Consequently the operations of the association are not leading it into financial difficulties. It is hoped, however, that even on the present system of accounting there will be no deficit this year.

The items for printing, stationery and postage are also large, perhaps surprisingly large for those who have not thought through the necessary expenses for these things. Even to send out one letter to every member of the association costs about $1,600. From last October 1 to December 31 approximately 175,000 pieces of mail, or about 2,000 pieces daily, were sent out from the office of the permanent secretary, part of which was for circularization and part for the symposia of the association. The expenses for the latter are charged directly to the symposia accounts.

It will be observed that the meetings of the association cost substantial amounts after crediting them with the registration fees and the profit from the scientific exhibition, for the association is responsible for all expenses for arrangements and for providing equipment, both for its sections and for the societies that meet with it. This is one of its services to its affiliated and associated societies. Another is the sponsoring and publishing of symposia, the accounts for which are not included in these statements because they are special projects that are expected to be self-liquidating.

The foregoing statements will probably be clearer when reduced to the member basis. The natural question for the member is what becomes of the money he pays as dues. The following condensed table tells the story:

DISTRIBUTION OF MEMBER'S ANNUAL $5 DUES

Journal	$3.000
Salaries, office of perm. sec.	1.002
Circularization	.272
Printing, stationery, postage	.184
Allowances to divisions	.112
Meetings (net)	.152
Reserve for proceedings	.049
Other expenses	.273
Total	$5.044
Deficit	0.044

There are several ways in which the deficit of 4.4 cents per member might have been avoided. For example, the large expenditures for circularization for new members might have been reduced, a question which will be discussed in a later report on membership. Or a larger percentage of the members of affiliated societies for which the association provided facilities at its meetings might have registered. Or, finally, the members who carelessly neglected to pay their duties until duplicate bills had been sent them might have paid them more promptly. In fact, if all members had paid their bills within three months of the time they were billed there would have been practically no deficit.

A question every member of the association may ask is whether his dues of a little less than 1.4 cents per day is a wise investment in his own satisfaction and in the advancement of science.

F. R. MOULTON,
Permanent Secretary

SURVEY OF RESEARCH IN INDUSTRY

WITHIN the past few months the National Research Council has been requested by the National Resources Committee (now organized as the National Resources

[1] From the treasurer for life members and emeritus members whose memberships are endowed.

Planning Board) to undertake a survey of scientific research in industry. This request was made of the Research Council as an operating agency of the National Academy of Sciences, since it is a basic function of the Academy, expressed in its Congressional Charter, to advise the Government upon scientific matters when called upon. The proposed examination of the research resources of industry is a part of a comprehensive plan of the National Resources Planning Board to study and evaluate the resources and facilities for scientific work in the United States in various types of institutions. A report, for instance, upon the research work of the Federal Government was published by the Board a year ago (entitled, "Research—A National Resource; I. Relation of the Federal Government to Research"). A similar survey is now in progress dealing with research in economics and the social sciences as developed in financial and commercial organizations of the country. The universities, also, constitute another major group of research agencies. A clarified understanding of the nature of the work that these several types of institutions are best equipped to do would, it is believed, contribute to the effective utilization of organized knowledge in the progress of industry and in service to society. The National Research Council has undertaken this survey of research in industry with the hope that the findings will be of benefit to science and of advantage to industry. Industry and business are clearly coming to depend more and more upon the use of scientific knowledge.

While the funds for the survey are to be provided by the National Resources Planning Board, the Council has been given full freedom by the Board as to the conduct of the survey. The study will consist not of a census of scientific men or of an inventory of equipment, nor yet of an enumeration of the projects of research in which industrial laboratories are now engaged. Rather it is desired to visualize the significant trends which the development of research has taken through these laboratories in various industries, many of which in newer fields are based largely on the direct application of scientific knowledge to manufacture. Discussion of the present relation of research to the growth of a number of the major industries will be included. Another portion of the survey will deal with the extent to which the recognized disciplines of science—physics, chemistry, mathematics, metallurgy, the several fields of engineering, biology and certain borderline fields—are applied in different industries. A history of the development of the research idea in industrial operations and certain economic aspects of the development of research in industry and a comparison of industrial research abroad with its growth in this country will also be included in the report.

In effect, the occasion of this survey is an opportunity for industries in which science is an integral part to undertake a critical and constructive scrutiny of the present utilization of science in manufacturing, in communications, in transportation and other fields of industrial activity. It is intended that the study be an untrammeled analysis of the situation, committed only to the purpose of encouraging the best use of science in relation to human welfare.

To take charge of this survey the Council has appointed a committee of which Mr. F. W. Willard, of the Nassau Smelting and Refining Company, is chairman. The committee is composed largely of industrial executives and research directors and representatives of universities active in industrial research. The immediate direction of the survey has been placed by the Council in the hands of Mr. Raymond Stevens, vice-president of the firm of Arthur D. Little, Inc., of Cambridge, Massachusetts. With him will be associated Mr. Dexter North, of Washington, D. C., and Dr. Caryl P. Haskins, president of the Haskins Laboratories, in Schenectady, New York, as assistant directors of the survey. A score or more of forward-looking men representing the interests of industrial laboratories, universities and special research institutions have been requested to prepare sections of the report. The report when approved by the Council is to be delivered to the National Resources Planning Board in printed form.

One feature of the survey will be the revision of the Directory of Industrial Research Laboratories, six editions of which have been issued by the National Research Council during the past twenty years. The last edition of the directory, presenting data for 1938, lists 1,769 industrial research laboratories in the United States, in which about 50,000 men are employed. The revision of this directory is being undertaken in connection with this survey in order to provide the factual data needed for the survey and to make available a more complete directory than any which has been issued heretofore. The compilation of the directory is at present the only statistical work being planned on an extensive scale in connection with the survey.

The membership of the Research Council's committee in charge of the survey is as follows:

F. W. Willard, *chairman*, president, Nassau Smelting and Refining Compaany, 50 Church Street, New York City.
C. L. Alsberg, director, Giannini Foundation of Agricultural Economics, University of California, Berkeley.
C. H. Bailey, professor of agricultural chemistry and vice-director, Agricultural Experiment Station, University of Minnesota, St. Paul.
Herbert A. Baker, president, American Can Company, 230 Park Avenue, New York City.
Henry A. Barton, director, American Institute of Physics, 175 Fifth Avenue, New York City.

L. W. Bass, assistant director, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Carl Breer, director of research, Chrysler Corporation, Detroit, Mich.

O. E. Buckley, executive vice-president, Bell Telephone Laboratories, Incorporated, 463 West Street, New York City.

G. H. A. Clowes, research director, Eli Lilly and Company, Indianapolis, Ind.

W. D. Coolidge, director of research, General Electric Company, Schenectady, N. Y.

F. G. Cottrell, 3904 Ingomar Street, N. W., Washington, D. C.

M. H. Eisenhart, president, Bausch and Lomb Optical Company, Rochester, N. Y.

Charles N. Frey, director, Fleischmann Laboratories, 810 Grand Concourse, Bronx, New York City, N. Y.

George R. Harrison, professor and director of the Research Laboratory of Experimental Physics, Massachusetts Institute of Technology, Cambridge, Mass.

Maurice Holland, director, Division of Engineering and Industrial Research, National Research Council, New York City.

Harrison E. Howe, editor, *Industrial and Engineering Chemistry*, Mills Building, Washington, D. C.

Jerome C. Hunsaker, professor of aeronautical engineering, Massachusetts Institute of Technology, Cambridge, Mass.

Martin Ittner, research director, Colgate-Palmolive-Peet Company, Jersey City, N. J.

Frank B. Jewett, vice-president, American Telephone and Telegraph Company; president, Bell Telephone Laboratories, Incorporated, 195 Broadway, New York City.

John Johnston, director of research, United States Steel Corporation, Kearny, N. J.

Virgil Jordan, president, National Industrial Conference Board, 247 Park Avenue, New York City.

F. T. Letchfield, consulting engineer and assistant vice-president, Wells Fargo Bank and Union Trust Company, San Francisco, Calif.

L. W. Wallace, director, Division of Engineering and Research, Crane Company, Chicago, Ill.

E. R. Weidlein, director, Mellon Institute of Industrial Research, Pittsburgh, Pa.

Frank C. Whitmore, dean of the School of Chemistry and Physics, Pennsylvania State College, State College, Pa.

R. R. Williams, chemical director, Bell Telephone Laboratories, Incorporated, 463 West Street, New York City.

ROSS G. HARRISON,
Chairman, National Research Council

SPECIAL ARTICLES

THE INACTIVATION OF EPIDEMIC INFLUENZA VIRUS BY NASAL SECRETIONS OF HUMAN INDIVIDUALS[1]

CERTAIN difficulties have been encountered in attempting to explain susceptibility or resistance to epidemic influenza in terms of circulating antibodies to influenza virus. For example, some persons who possess little or no demonstrable antibody escape infection under the same conditions of exposure which result in the infection of other individuals with relatively high titers of neutralizing antibody. For this and other reasons, attention has been directed to the possibility that mechanisms resident in the respiratory tract itself might play a significant role in the prevention of the natural disease. An instance of local, non-immunological immunity was discovered while studying the processes of injury and repair in the respiratory mucous membrane of the ferret infected with influenza virus. It was found that, following the acute necrosis which occurs early in the disease, repair was associated with the formation of a squamous epithelium, which was refractory to further damage even by severe iontophoresis with zinc sulfate. This anatomical change was but a temporary one, although the tissues thereafter always exhibited the capacity of accelerated repair.[2]

[1] This study conducted under a grant from the International Health Division of the Rockefeller Foundation.

[2] T. Francis, Jr. and C. H. Stuart-Harris, *Jour. Exp. Med.*, 68: 789, 803, 813, 1938.

Over the last fifteen months the nasal secretions of human subjects have been studied to ascertain whether they possessed any capacity to inactivate epidemic influenza virus. Material from 31 patients in the first day or two of an acute afebrile common cold and from two hay-fever patients was collected by allowing the nasal discharge to drain directly into a bottle. The collections were ground individually with alundum and centrifuged. The supernatant fluid was removed, and 0.3 cc of it was mixed with 0.3 cc of a 1:2,000 suspension of mouse passage virus of the PR8 strain. After incubation at 37° C. for 30 minutes, 0.05 cc of the mixture, containing approximately 1,000 lethal doses of virus, was given intranasally to each of three mice. The mice were observed for ten days, all deaths recorded and the presence or absence of virus lesions in the lungs of survivors was determined at autopsy.

Secretions were obtained from fifteen normal individuals by inserting a loose pack of absorbent cotton well back into the nostrils until it became saturated. It was then removed and the clear liquid expressed. This material was tested in the same manner as the common cold secretions. Saliva from the normal individuals was also tested.

The degree of virus inactivation has been classified as complete when the mice survived without pulmonary lesions; almost complete, when the mice survived but exhibited only mild lesions; partial, when extensive