VOL. XXXIX. MAY, 1917. NO. 5.

THE JOURNAL

OF THE

American Chemical Society

with which has been incorporated the

American Chemical Journal

(Founded by Ira Remsen)

THE NATIONAL RESEARCH COUNCIL AND ITS CHEMISTRY COMMITTEE.

A PRELIMINARY STATEMENT TO THE CHEMISTS OF THE UNITED STATES.

BY MARSTON TAYLOR BOGERT.

Received March 2, 1917.

Within the past few months, there has been launched an organization known as the "National Research Council," whose personnel, plans and purposes are of such a character as to merit the earnest attention and support of all men of science.

The main object of this organization is, as its name suggests, to aid in every way possible the cause of scientific research and, to the end that the chemists of our country may understand more clearly the character of this undertaking and in what ways it concerns them more particularly, the following statement has been prepared.

This presentation is necessarily in the nature of a preliminary report, for the work is only just getting under way, but it is believed that it will at least serve to point out some of the directions in which the National Research Council and its Chemistry Committee hope to be of assistance, and will help to bring out into bold and dominating relief the most important feature of the whole movement, which is that its activities are of such a nature that they are certain to be as beneficent to our country in time of peace as they are vital to it in time of war.

During the period of our Civil War, the Federal Government often felt very keenly the need of expert advice in scientific matters of all kinds, and it was to meet this need that Congress on March 3, 1863, by special enactment, created the National Academy of Sciences.

The third section of its Charter provides that "the Academy shall whenever called upon by any Department of the Government, investigate, examine, experiment and report upon any subject of science or art." In accordance with this provision, the Academy frequently has been called upon to serve the Government along the lines indicated, and its expert reports have been of great value.

The present World War has shown with startling vividness to what extent the military power of a nation is dependent upon its scientific and industrial preparedness; and the lack of a proper organization and utilization of our own scientific and industrial resources has been most humiliating. Civilization unarmed by science is at a fearful disadvantage in the event of a struggle for existence, and that arming cannot be done on short notice.

Through the coöperation of the 30,000 members of our great national engineering and technical societies, including the American Chemical Society, the Naval Consulting Board of the United States has recently completed a census of our industrial resources by gathering detailed information and statistics from the manufacturing establishments of the entire country. All of this huge mass of material has been carefully classified and indexed by experts and the information forwarded to the Federal Government. Many of these industrial plants have consented to turn out annually small orders of those munitions of war for the production of which their plants are best adapted. As expressed by the Committee who had the matter in charge, "this minimum annual production, in its nature educational to thousands of manufacturers, will be put through the factory in regular course and in such manner as not to disturb the ordinary flow of business. The producer will be kept attuned to the highest pitch of effectiveness and the men at the works will know what they are doing and finally every industry that is capable of serving the Government, and everything that goes into the common term munitions of war, will be coördinated, and a peaceful machine created which will require only the opening of the throttle to be set in motion on the outbreak of war."

This splendid piece of work, so admirably planned and efficiently executed, has received universal and enthusiastic commendation as the first great step in the direction of real preparedness and national self-containedness.

The next step necessary, and the one which is an essential supplement to that just mentioned, is a proper classification and census of the scien-

tific research resources of our country, for it is obvious that the industries can advance only as the sciences themselves advance upon which they are based.

The body to whom the Government naturally turned for assistance in handling this problem was its National Academy of Sciences and, at the request of the President of the United States, the Academy has organized a National Research Council "to bring into coöperation existing governmental, educational, industrial and other research organizations, with the object of encouraging the investigation of natural phenomena, the use of scientific research in American industries, the employment of scientific methods in the national defense and the application of science to such other purposes as will promote the national welfare."

The objects of the Council are stated in the following words:

(1) The preparation of a national inventory of equipment for research, of the men engaged in it, and of the lines of investigation pursued in cooperating Government Bureaus, educational institutions, research foundations and industrial research laboratories; this inventory to be prepared in harmony with any general plan adopted by the proposed Government Council of National Defense.

(2) The preparation of reports by special committees, leading to the statement of important research problems and the serving as a clearing house for the coördination of research in various departments of science.

(3) The promotion of coöperation in research, with the object of securing increased efficiency; but with careful avoidance of any hampering control or interference with individual freedom and initiative.

(4) Coöperation with educational institutions, by supporting their efforts to secure larger funds and more favorable conditions for the pursuit of research and for the training of students in the methods and spirit of investigation.

(5) Coöperation with research foundations and other agencies desiring to secure a more effective use of funds available for investigation.

(6) The encouragement in coöperating laboratories of researches designed to strengthen the national defense and to render the United States independent of foreign sources of supply liable to be affected by war.

This Council is at present composed of the following gentlemen:

Dr. Leo H. Baekeland, Naval Consulting Board of the United States; Past Pres. American Electrochemical Society, of the Institute of Chemical Engineers, and of the Inventors' Guild.

Dr. Marston T. Bogert, Prof. of Organic Chemistry, Columbia University, Past Pres. of the American Chemical Society, and of the Society of Chemical Industry (England).

Dr. John A. Brashear, Past Pres. American Society of Mechanical Engineers.

Dr. Walter B. Cannon, Professor of Physiology, Harvard Medical School.

Dr. John J. Carty, Chief Engineer, American Telephone & Telegraph Co.

Dr. Russell H. Chittenden, Director Sheffield Scientific School, Yale University, Past Pres. American Society of Naturalists, American Physiological Society, and American Society of Biological Chemists.

Dr. John M. Clarke, Director State Museum, Albany, N. Y.

Mr. Howard E. Coffin, Member Advisory Commission to Council of National Defense; Naval Consulting Board of the United States, Past Pres. Society of Automobile Engineers.

Dr. Edwin G. Conklin, Prof. of Zoölogy, Princeton University, Past Pres. American Society of Zoölogists, and of American Society of Naturalists.

Dr. John M. Coulter, Prof. of Botany, University of Chicago, Editor Botanical Gazette, Past Pres. Botanical Society of America.

Brig.-Gen. William Crozier, Chief of Ordnance, U. S. A.

Dr. William M. Davis, Professor of Geology, Harvard University.

Mr. Gano Dunn, President, The J. G. White Engineering Corporation, Past Pres. American Institute of Electrical Engineers, and United Engineering Societies.

Rear-Admiral Ralph Earle, Chief, Bureau of Ordnance, U. S. Navy.

Dr. Simon Flexner, Director Rockefeller Institute for Medical Research.

Dr. James D. Gatewood, Medical Director, Naval Medical School and Naval Hospital.

Maj.-Gen. William C. Gorgas, Surgeon-General, U. S. A.

Dr. W. F. M. Goss, Dean College of Engineering, and Director School of Railway Engineering and Administration, University of Illinois, Past Pres. American Society Mechanical Engineers.

Rear-Admiral Robert S. Griffin, Engineer in Chief, U. S. N.

Dr. George E. Hale, Director Mt. Wilson Solar Observatory.

Mr. Clemens Herschel, Pres. American Society of Civil Engineers.

Dr. William H. Holmes, Curator United States National Museum and of National Gallery of Art, Past Pres. American Anthropological Association, and National Society of Fine Arts.

Herbert Clark Hoover, Chairman Commission for Relief in Belgium.

Dr. W. W. Keen, Pres. American Philosophical Society, Trustee of Brown University, Past Pres. American Surgeons Association and of American Medical Association.

Mr. Van H. Manning, Director Bureau of Mines.

Dr. Franklin H. Martin, Member Advisory Commission to Council of National Defense.

Prof. Charles F. Marvin, Chief of U. S. Weather Bureau.

Prof. A. A. Michelson, Director Ryerson Physical Laboratory, Uni-

versity of Chicago, Nobel Laureate in Physics, Past Pres. American Physical Society.

Dr. Robert A. Millikan, Prof. of Physics, University of Chicago, Pres. Am. Physical Society.

Dr. E. H. Moore, Professor of Mathematics, University of Chicago.

Dr. Arthur A. Noyes, Director Research Laboratory of Physical Chemistry, Mass. Institute of Technology, Past. Pres. American Chemical Society.

Dr. Raymond Pearl, Head of the Dept. of Biology, Maine Agricultural Experiment Station, Past Pres. American Society of Zoölogists.

Prof. E. C. Pickering, Director Harvard College Observatory, Past Pres. Astronomical and Astrophysical Society of America, and of the American Association for the Advancement of Science.

Dr. Michael I. Pupin, Prof. of Electro-Mechanics, Columbia University.

Mr. Charles F. Rand, Pres. United Engineering Society.

Dr. Theodore W. Richards, Director Wolcott Gibbs Memorial Laboratory, Harvard University, Nobel Laureate in Chemistry, Past Pres. American Chemical Society.

Mr. C. E. Skinner, Engineer of Research Division, Westinghouse E. & M. Co.

Brig.-Gen. George O. Squier, Chief Signal Officer, U. S. A.

Dr. S. W. Stratton, Director Bureau of Standards.

Mr. Ambrose Swasey, Past Pres. American Society of Mechanical Engineers.

Rear-Admiral David W. Taylor, Chief Constructor, U. S. N.

Dr. Elihu Thomson, Member of Corporation of Mass. Institute of Technology, Past Pres. American Institute of Electrical Engineers.

Mr. Chas. R. Van Hise, Pres. American Association for the Advancement of Science, Pres. of the University of Wisconsin, Trustee Carnegie Foundation, Past Pres. Geological Society of America.

Dr. Victor C. Vaughan, Dean of Dept. of Medicine and Surgery and Director Medical Research Laboratory, University of Michigan, and Past Pres. Association of American Physicians, and of American Medical Association.

Dr. Charles D. Walcott, Secretary Smithsonian Institution.

Dr. William H. Welch, Pres. National Academy of Sciences, Pathologist Johns Hopkins Hospital, Pres. Board of Directors Rockefeller Institute for Medical Research, Trustee Carnegie Foundation, Past Pres. Association of American Physicians, American Association for the Advancement of Science, American Medical Association and National Association for the Study and Prevention of Tuberculosis.

Dr. W. R. Whitney, Director Research Laboratory, General Electric Co., member Naval Consulting Board of the United States, Past Pres.

American Chemical Society and American Electrochemical Society. Its membership is not limited to the National Academy, and includes representatives of the three important divisions—pure science, industry, and the military.

In recognition of this organization of the research men of the country, the Council of National Defense, at its meeting on Feb. 28, 1917, adopted the following resolution unanimously:

Resolved, That the Council of National Defense recognizing that the National Research Council at the request of the President of the United States has organized the scientific forces of the country in the interest of national defense and national welfare, requests that the National Research Council coöperate with it in matters pertaining to scientific research for national defense and to this end the Council of National Defense suggests that the National Research Council appoint a committee of not more than three, at least one of whom shall be located in Washington, for the purpose of maintaining active relations with the Director of the Council of National Defense.

Through the generous coöperation of the Engineering Foundation, its entire annual income of $5000 has been made available for the Council, together with the services of its Secretary and the use of his office in the United Engineering Societies building. To this amount, Mr. Swasey, the benefactor of the Foundation, has added a further $5000. This will all be needed for the work of the central office of the Council, and the various committees are endeavoring to raise additional funds for the prosecution of their own parts of the work.

For the more efficient and expeditious conduct of its business, the Council has appointed general committees for important sciences or groups of sciences, and each of these general committees in turn has organized by the creation of such sub-committees as it deemed requisite or expedient.

So soon as this organization is sufficiently advanced to justify it in the case of any general committee, a list will be published showing the names and addresses of the chairmen, and any investigator in that particular science will then know at once to whom to turn for special information or assistance in his work.

The Chemistry Committee of the Council is composed at present of the following:

Chairman, Dr. Marston Taylor Bogert, Prof. of Organic Chemistry, Columbia University, Past Pres. of the American Chemical Society, and of the Society of Chemical Industry, member Nat. Acad. Sci.

Dr. Carl Lucas Alsberg, Chief, Bureau of Chemistry, U. S. Dept. of Agriculture, Washington, D. C., Pres. Am. Soc. Biol. Chem.

Dr. Raymond Foss Bacon, Director of Mellon Institute and Dean of School of Chemistry, University of Pittsburgh.

Dr. Leo Hendrik Baekeland, Naval Consulting Board of the U. S., Past Pres. American Electrochemical Society, of the American Institute of Chemical Engineers, and of the Inventors' Guild.

Dr. Arthur Amos Noyes, Director Research Laboratory of Physical Chemistry, Mass. Institute of Technology, Past Pres. American Chemical Society, member Nat. Acad. Sci.

Dr. William Albert Noyes, Prof. of Chemistry and Director of Chemical Laboratories, University of Illinois, Editor *Journal of American Chemical Society*, member Nat. Acad. Sci.

Dr. Theodore William Richards, Director Wolcott Gibbs Memorial Laboratory, Harvard University, Nobel Laureate in Chemistry, Past Pres. American Chemical Society, Pres.-elect Am. Assoc. Adv. Sci., member Nat. Acad. Sci.

Dr. Julius Stieglitz, Chairman of the Chemistry Dept., University of Chicago, Pres. American Chemical Society, member Nat. Acad. Sci.

Dr. Willis Rodney Whitney, Director Research Laboratory, General Electric Co., member Naval Consulting Board of the United States, Past Pres. American Chemical Society and American Electrochemical Society.

Up to date, the following Sub-Committees in Chemistry have been organized, with Chairmen as indicated, and others are in process of formation:

ANALYTICAL Chemistry.—Dr. William Francis Hillebrand, Chief Chemist, Bureau of Standards, Washington, D. C.; Past Pres. Am. Chem. Soc., member Nat. Acad. Sci.

Chemical APPARATUS.—Arthur H. Thomas, Pres. Arthur H. Thomas Co., West Washington Square, Philadelphia, Pa.

BIOCHEMISTRY.—Dr. Alonzo Englebert Taylor, Rush Prof. of Physiological Chem., Univ. of Pa., Philadelphia, Pa.

CARBOHYDRATE Chemistry.—Dr. Claude S. Hudson, Bureau of Chemistry, U. S. Dept. of Agriculture, Washington, D. C.

Chemistry of CELLULOSE and PAPER.—Dr. Arthur Dehon Little, Pres. Arthur D. Little, Inc., 93 Broad Street, Boston, Mass.; Past Pres. Am. Chem. Soc., member Corporation Mass. Inst. Technology.

Chemistry of CEMENTS and related BUILDING MATERIALS.—Dr. Allerton Seward Cushman, Director Institute of Industrial Research, 19th & B Sts., N. W., Washington, D. C.

Chemistry of CERAMICS.—Dr. Edward Wight Washburn, Prof. of Ceramic Chemistry and Head of Dept. of Ceramic Engineering, Univ. of Illinois, Urbana, Ill.

Chemistry of DYESTUFFS.—Dr. Joseph Merritt Matthews, 5 Berwyn St., East Orange, N. J.; recently Head of Dept. of Chem. and Dyeing, Philadelphia Textile School, and Manager Dyeing Dept. New England Cotton Yarn Co.

ELECTROCHEMISTRY.—Prof. Wilder Dwight Bancroft, Cornell Univ., Ithaca, N. Y.; Past Pres. Am. Chem. Soc. and of Am. Electrochem. Soc., Editor *J. Physical Chem.*

Chemistry of EXPLOSIVES.—Dr. Arthur Messinger Comey, P. O. Drawer 424, Chester, Pa.; Director Eastern (Research) Laboratories of E. I. Du Pont de Nemours & Co.

Chemistry of FATS, FATTY OILS and SOAPS.—Dr. Martin H. Ittner, Chief Chemist, Colgate & Co., Jersey City, N. J.

Chemistry of FERMENTATION and FERMENTATION PRODUCTS.—Dr. John Harper Long, Prof. of Chem., Northwestern Univ. Medical School and Dean of School of Pharmacy, 2421 Dearborn St., Chicago, Ill.; Past Pres. Am. Chem. Soc.

FOOD Chemistry.—Dr. Carl Lucas Alsberg, Chief, Bureau of Chemistry, U. S. Dept. of Agriculture, Washington, D. C.

Chemistry of FUELS.—Dr. Raymond Foss Bacon, Director Mellon Institute, Univ. of Pittsburgh, Pittsburgh, Pa.

Chemistry of GLASS.—Dr. Arthur Louis Day, Director Geophysical Lab. of Carnegie Institution, Washington, D. C.; Home Secretary Nat. Acad. Sci.

Chemistry of GLUE and other COLLOIDS.—Jerome Alexander, Vice-Pres. Nat. Gum & Mica Co., 59th St. & 11th Ave., New York, N. Y.

INORGANIC Chemistry.—Prof. William C. Bray, Univ. of California, Berkeley, Cal.

Chemistry of LEATHER and TANNING.—Prof. Allen Rogers, Tanners Institute, Pratt Institute, Brooklyn, N. Y.

METALLURGICAL Chemistry.—Dr. Joseph William Richards, Prof. of Metallurgy, Lehigh Univ., So. Bethlehem, Pa.; Sec. and Past Pres. Am. Electrochem. Soc., Director Am. Inst. Mining Eng., member Naval Consulting Board of U. S.

MINERALOGICAL and GEOLOGICAL Chemistry.—Dr. Frank Wigglesworth Clarke, Chief Chemist, U. S. Geolog. Survey, Washington, D. C.; Past Pres. Am. Chem. Soc., member Nat. Acad. Sci.

ORGANIC Chemistry.—Prof. William Albert Noyes, Univ. of Illinois, Urbana, Ill.

Chemistry of PAINTS, VARNISHES and RESINS.—Henry Alfred Gardner, Vice-Pres. and Asst. Director, Institute of Industrial Research, 19th & B Sts., N. W., Washington, D. C.; Director Scientific Section Paint Mfrs. Assoc. of U. S.

PHARMACEUTICAL Chemistry.—Dr. Frederick Belding Power, Bureau of Chem., U. S. Dept. of Agriculture, Washington, D. C.; recently Director of Wellcome Chemical Research Laboratories, London, England.

PHYSICAL Chemistry.—Prof. Arthur Becket Lamb, Director Chem. Lab., Harvard College, Cambridge, Mass.

Chemistry of RUBBER and Allied Substances.—David Spence, Vice-Pres. Norwalk Tire & Rubber Co., Norwalk, Conn.

Chemistry of SOILS and FERTILIZERS.—Dr. Homer Jay Wheeler, 92 State St., Boston, Mass.; Past Pres. Assoc. Official Agricultural Chemists of U. S., and of Am. Soc. Agronomists; Agric. Chem. Expert of Am. Agric. Chem. Co.

Representative of Chem. Com. upon Com. on PUBLICITY.—Dr. Charles Holmes Herty, Editor *J. Ind. Eng. Chem.*, 35 East 41st St., New York, N. Y.; Past Pres. Am. Chem. Soc.

It will be seen at once that the gentlemen who have consented to take charge of these important branches of chemistry are recognized leaders in their chosen fields, and the Council is indeed fortunate in securing their coöperation.

The representative character of this organization for chemistry may be gathered from the fact that it includes the President and eleven Past Presidents of the American Chemical Society, as well as the Editors of the *Journal of the American Chemical Society*, the *Journal of Industrial and Engineering Chemistry*, and of the *Journal of Physical Chemistry;* the Secretary and four Past Presidents of the American Electrochemical Society; the Presidents of the American Society of Biological Chemists and of the American Association for the Advancement of Science; Past Presidents of the Association of Official Agricultural Chemists of the United States, of the American Institute of Chemical Engineers, of the Inventors' Guild, of the Am. Soc. Agronomists, and of the Society of Chemical Industry (of England); the Directors of the Mellon Institute and of the Institute of Industrial Research; three members of the Naval Consulting Board of the United States and eight members of the National Academy of Sciences.

The Chemistry Committee was created by joint action of the National Research Council and of the President of the American Chemical Society, the Council designating three members (Baekeland, A. A. Noyes and Whitney), and President Herty designating three (Alsberg, Bogert and Richards). To this number were added Messrs. W. A. Noyes, J. Stieglitz and Bacon to represent the Committee of One Hundred on Research of the A. A. A. S. As the National Research Council was appointed by the National Academy of Sciences, our Chemistry Committee is thus really a joint committee of the American Chemical Society, the National Academy of Sciences, the National Research Council and the A. A. A. S., for all matters which have to do with research work in chemistry.

It is believed that the Sub-Committees in the various sciences can function as the units for making up any desired combination for the study of scientific research problems of all kinds, whether these problems concern one science or many. A group of these Sub-Committees thus coöperating

constitute for the time being what is to all intents and purposes a special committee for the study of that particular problem. As the efficiency of a committee is usually in inverse proportion to its size, such special committees would probably be composed of a single delegate from each Sub-Committee concerned, either the Chairman himself or someone appointed by him to represent the Sub-Committee.

The vast majority of important scientific problems of course concern more than one science. The manufacture of Nitric Acid, for example, is of serious moment to agriculture, military operations, mining, engineering, and a vast group of the chemical industries; problems in the manufacture of Glass touch chemistry, physics, astronomy, navigation, photography, military operations, engineering and other sciences; the question of our Potash supply is a matter of interest to agriculture, the glass industry, chemistry, botany, mineralogy and geology; and such illustrations might be multiplied indefinitely.

There is great need of some agency which will aid research workers, who wish to do so, to coöperate more intelligently. It is believed that the General Committees of the Council can perform this service acceptably, and thus act as accelerating catalysts to the growth and development of our science by becoming great clearing houses for the chemical research work of the country and authoritative headquarters for information likely to be of value to the individual investigator, to our industries and to our Government.

It should be stated at once and most emphatically that the object of the Council and its Committees is to assist, not to direct; to be the servant of all, not the master. Its attitude towards the research worker is to say, "Here is what we are trying to do. Can we be of any assistance to you in these or in other directions? If so, we are at your command." It has no desire or intention ever to intrude with impertinent inquiries or suggestions, to interfere in the slightest with the freedom or initiative of the individual investigator or to attempt to "organize and coördinate" him. It can be stated further that coöperation with our Committees or Sub-Committees will not involve any change whatsoever in the liberty of action and independence of the coöperator, or lead to requests for communication of any data the disclosure of which might cause embarrassment. The Chemistry Committee prefers not to receive any information which cannot be disclosed to other loyal American chemists. Those who are willing to place at the service of our Government confidential information of any kind should communicate direct with the Secretary of the appropriate Department or with the Director of the Council of National Defense.

Burdened with our own responsibilities and engrossed in our individual occupations and interests, we pay but little heed to what our colleagues

are doing save when their investigations run parallel to or cross our own. We are frequently unaware, until the results have been published, that others have been working on problems closely related to, or perhaps even identical with those in which we have been interested. This means many unfortunate duplications and overlappings, lack of coöperation, and waste of time and energy, whereas advance information in such cases might lead to interested and enthusiastic collaboration.

I am conscious of the fact that this is a condition of affairs not peculiar to science, but which obtains in other walks of life as well. What I wish to emphasize is that we have come to a point where altruistic service is urgently needed not only for the more rapid development of science but also for the welfare and security of the nation.

It is manifest that work of this kind will make heavy demands upon the time of those directing it, especially of the chairmen of committees, and it is to be hoped that not all of this time will have to be taken from what little is now available for original investigation. Columbia University has always stood for service—service to the community and to the country—a fact of which I believe all Columbia men are justly proud, and has set an example in assisting the National Research Council which I hope will be followed by other institutions, in that she has released the Chairman of the Chemistry Committee from much of his routine teaching duties at the University in order that he may devote that time to the work of the Council. That is part of Columbia's contribution to this movement and is pretty good evidence that she believes an organized effort of this kind is worth while.

The members of the National Research Council, its Committees and Sub-Committees, like the members of the Naval Consulting Board, and those associated with these organizations, have responded to what they regard as their country's call and are giving generously of their time, strength, and abilities in the service of the nation without reward of any kind save the abiding satisfaction of being of some use to one's day and generation, and the scientists throughout the length and breadth of our land are coöperating loyally and most encouragingly.

In order to state with somewhat greater definiteness and detail just what such an organization can hope to accomplish that is not being adequately cared for already by existing agencies, the following illustrations are given:

In the first place, the Council with the assistance of the Research Committees it is organizing in all of our leading educational institutions, can aid in obtaining for an investigator better recognition on the part of the community and of his own institution and an amelioration of his lot, by securing for him more freedom and better equipment for research, adequate assistance, and a living wage. A deliberate and

carefully considered recommendation by an authoritative body, such as the National Research Council, with the weight of the National Academy and of the Federal Government back of it, and based upon information gathered by committees of leading experts cannot be lightly passed over and is apt to be productive of results.

Thus the Council might well point out to our educational institutions the serious shortage of men properly equipped for high grade research work in science; the fact that young men are being drafted into the industries, by present high wages, as soon as they graduate and before they have had any special training in research; that the future is being handicapped by the loss to these same industries of so many inspiring teachers and investigators; the need of new advanced textbooks and reference works in science in our own language; of colleges and schools devoted to highly specialized training and instruction in relatively narrow fields of pure or applied science; and of great scientific research endowments, like the Rockefeller Institute of New York, and the Mellon Institute of Pittsburgh.

I believe also that it is its duty to call the attention of our country to the great desirability of sending competent American scientists to the warring countries of Europe, to take full notes on the part science is now playing in warfare, to learn the various problems which have arisen and how these are being solved, and to gather information of any and every kind likely to be of value to us. Much already has been and is being accomplished in this direction by our medical men at the front, but in many other sciences, mainly because of lack of funds, practically nothing has been undertaken as yet in this direction. This is a work which cannot be deferred but which must be done at once or not at all.

One of the first tasks confronting the Council is that of securing an accurate and properly classified list of the scientific investigators of the country; showing where they are located, in what lines of research they are interested, and how their work can be aided and encouraged.

The plan adopted for accomplishing this is to send out a questionnaire to all our educational and research institutions, and it is particularly requested that all chemists who receive such questionnaires from the American Chemical Society, the National Research Council or from any of their committees, will fill them out and return them promptly to the proper office. The data received in reply will be sorted out and classified in the office of the general committee, and then forwarded to the chairmen of the appropriate sub-committees. The chairmen of these sub-committees will thus be put in possession of all information relating to their own particular fields, and will be then in a position to determine how best to help their fellow-workers. Reports on the situation in each branch of science will come periodically to the office of the

general committee, together with recommendations and suggestions from the heads of these sub-committees concerning important investigations now under way or which should be initiated.

The committees of the Council are already of great assistance in bringing together the problem and the man best qualified to attack it. Both the Government and our industries are frequently entirely at a loss as to who are the proper men to consult when important research problems confront them. On the other hand, many skillful investigators are delighted to find that certain of these same problems, of whose very existence they have remained in blissful ignorance, fit in admirably with the kind of research work they enjoy most, and the fact that the problem has direct practical bearing imparts to the work added zest and charm.

Certain investigations would have been suspended or abandoned through inability to secure raw materials or chemicals, had it not been that the committee was in a position to supply immediately information as to where the much-needed articles could be obtained. Convenient sources of raw material are often to be found in manufacturing wastes and by-products which can be obtained for little or nothing, but many investigators are entirely unfamiliar with the character and amount of material thus going to waste, and this is not only a direct loss to the community but in many instances it means also the pollution of our streams and tide-waters.

Another form of coöperation which will help in meeting this same difficulty is that inaugurated by the University of Illinois and which has since been introduced at other institutions giving instruction in Chemical Engineering. Briefly stated, it consists in having the Chemical Engineering students, for their summer work, manufacture fine chemicals for sale to investigators in other institutions. The students thus get practical experience in the manufacture of chemicals, receive pay for the work, and the product is sold at its approximate cost. This does not in any way invade the territory of the commercial manufacturing chemist, for the reason that the chemicals so produced by the universities will be only those which are used in such small amounts that they are of no interest to the manufacturer. Through the Chemistry Committee of the Council, duplications in this work can be reduced to a minimum, each institution producing a different list of research chemicals for which it has provided the requisite equipment, and the Committee can then tell an investigator at once to which institution to apply for the special chemical desired.

The Chemistry Committee is also in touch with the editors of the Chemical Directory of the United States, a publication which in-

cludes classified lists of all chemicals marketed by American manufacturers.

Another investigator is seriously handicapped in his research because his own institution does not possess and cannot afford to buy the special apparatus necessary and he has no means of knowing whether anything of the kind is available in this country or not.

Still another man may be wholly unaware until the fact is pointed out to him that his results are of very great interest and importance to workers in totally different and apparently unrelated fields.

A somewhat different case is that of the well-trained and brilliant young man, eager to take up original research, but who either is not sufficiently posted as to what are the really great problems of the day or cannot see how to fit his work in so as to aid in their solution, and who may then turn to relatively unimportant or even trivial investigations. Suggestions and advice from the appropriate sub-committee might help render that man's contributions to science of far higher value. The knowledge also that there is a national organization of research men interested in him and his work brings with it much of inspiration and encouragement, and the ever-brightening vision of how his work is advancing the science and is linking up with that of other investigators lifts him out of the rut and gives him a wider outlook over his chosen field and a better appreciation of its possibilities.

Another group whom the Chemistry Committee hopes that it can serve is composed of those older men whose burdens of responsibilities, physical infirmities or lack of opportunities have prevented them from keeping in touch with the latest theories and developments of the subject and who, therefore, are too often regarded by their younger colleagues as "back numbers," securely lodged upon the shelf and incapable of further useful service. And yet it is not wholly outside the realm of possibilities that a man may make valuable contributions to the Science of Chemistry and yet be unfamiliar with the electrolytic dissociation theory or the electron conception of valence. This group includes some very skillful and resourceful experimentalists, as well as many devoted and inspiring teachers. Not infrequently such men feel discouraged and abashed at not being able to discuss glibly with their younger associates the bearing of their results upon latest hypotheses. Many a man, disheartened by the feeling that he was no longer up near the band-wagon in the procession, has decided to drop out of line altogether and retire from the field in spite of the fact that he was still capable of much excellent work. To be able to enlist such men to attack problems which they are thoroughly qualified to solve, and in the solution of which they know that they are rendering a service to the community or to the Government, may

result in their remaining for many years more in the ranks of active workers, and thus increase our wholly inadequate army of scientific investigators. The size of an army may be augmented not only by new recruits, but also by postponing the time at which those already enrolled retire.

Perhaps the activities of the Chemistry Committee may aid also in bringing about some general agreement as to what kinds of chemical research work should be undertaken by Government, state or municipal laboratories, what by the universities, and what by private enterprises or individuals, so as to reduce as far as possible competition and friction in such matters. Industrial research laboratories and consulting chemists often feel that Government and university laboratories, instead of competing with them in the solution of problems of practical commercial importance and financial reward, should confine their attention to investigations not associated with the dollar sign. The opinion has also been expressed that the Government chemists should not undertake chemical investigations which can be carried out equally well in the universities, but should devote themselves to problems requiring a larger organization or greater resources.

One other matter which should be emphasized in this connection is that, as the Government will need urgently all of its chemical investigators for the study of problems affecting the security and defense of our land, such experts should not be asked or permitted to enlist in the rank and file of the Army but should be retained in an Industrial and Research Reserve where their special knowledge will be of the greatest value to the nation. To call off the investigator from his work on nitrogen fixation processes or a foreman from a munition plant, give him a rifle to shoulder and send him to the front, would be a most wasteful manner of treating one of our most valuable human resources, namely, brains.

These are some of the directions in which the Chemistry Committee of the National Research Council hopes to aid the cause of chemical research, and the Committee will be very grateful to any who will take the trouble to point out other ways in which it can help, or who will criticize or comment upon the above plans. The measure of the Committee's success will be determined chiefly by the extent and character of the support accorded by the chemists of the country. The committee is *your* Committee, gentlemen, and looks to you for active and effective coöperation.

All communications should be addressed to the Chairman of the Committee, Professor Marston Taylor Bogert, Columbia University, New York, N. Y.