REPORTS

RESEARCH AFTER THE WAR

AT the Cleveland meeting, September, 1944, a symposium was held under the auspices of the Committee on Science and Society of the American Association for the Advancement of Science on "Research After the War," a subject which has become increasingly important, especially since President Roosevelt's letter to Dr. Vannever Bush, of the Office of Scientific Research and Development (see SCIENCE, December 15, 1944).

The theme of the symposium was the need for a national policy for research, and the symposium group went on record as recommending that the Association, with, it was suggested, the collaboration of the National Academy of Sciences and the Society of the Sigma Xi, undertake to formulate a national policy for research, for discussion by scientists all over the country. In the discussion it was brought out that a national policy for research would be of value on the following points, among others:

(1) It would assert that research was a necessary, indispensable function in a progressive society, thereby affirming the place of research as more than an extraneous activity or a luxury or an ivory tower occupation. Progress in social order has been achieved largely by critical thinking and systematic, continuous research.

(2) It would declare the importance of extending systematic research into every field or activity of life, as a considered policy of critically examining whatever we believe and do, and proceeding to a revision of established assumptions and practices wherever research reveals they are required or desirable.

(3) It would recognize the implications of contemporary development of research under the diverse auspices and objectives of universities, of business and industry, and of government, and assert the obligations of scientists to maintain the standards and ethics of science, and the public interest wherever research is conducted.

(4) It would propose the careful evaluation of the use of patents by different organizations and agencies, university, business and government, in terms of their consequences for the future of science, as our cumulative cultural heritage or public domain.

(5) It would declare the need for adequate protection for the investigator from the pressures and the hazards to which he is increasingly exposed because of the growing social, political and economic significance of his research.

(6) It would emphasize the national importance, if not necessity, of providing stable and continuous financial support for research and a considered program of developing research workers according to the needs of such expanding responsibilities for research.

(7) It would recognize that the very progress of research in physical science and technology made it imperative that research in the social sciences and the humanities, especially into the traditional American patterns of thinking and action, be further developed and improved, since the growing discrepancy between our advancing technology and our established practices and organizations is one of the major threats to our free, democratic social order. The need for the exercise of critical thinking upon our folkways and our historically derived social, economic and political beliefs and patterns is no less than the need for critical thinking upon our industrial processes and technical equipment and practices.

(8) It would boldly propose research as the instrumentality which was peculiarly the resource of a free social order for resolving the conflict of aims and interests and for evaluating the objectives and practices of all groups and individuals in terms of their meaning and consequences for our democratic ideals. It may be many years before we will fully accept research in this role, but we may now project that goal ahead as one aim of a national policy for research.

(9) It would propose the establishment of governmental research as a coordinate function of government, equivalent in rank and authority to the legislative, the executive and the judiciary, recognizing that research is becoming the basis of governmental decisions and policies, just as law and the courts have been accepted over the centuries as the agency for determination of issues, the adjudication of conflicts and the formulation of orderly procedures for protecting human rights. The future of research in national life can be no less than that of the law and courts; already some of the functions of the law and courts are being performed by research to-day. A considered policy for research, as a fourth branch of government, would provide an alternative to the present uncoordinated dispersion of research among many different agencies and branches of government and the frequent subordination of research to immediate needs and expediencies.

(10) It would recognize that a national policy for research was as necessary to our survival as a nation, as is a foreign policy and a defense policy; it would urge the adoption of such a national policy to parallel the action of our principal allies, Great Britain, Russia and China, in establishing national policies for research.

(11) It would formulate for early and specific action the problems of greatest national urgency and propose that research on a scale commensurate with

those urgencies be initiated and extended through appropriate agencies in those areas. As a pattern for such research proposals, it would urge that we seek to establish in each area the relationship between research and practice in that area, which now exists between the physical sciences and engineering and between the biological-medical sciences and medicine. Moreover, it would recognize that the translation of research findings into the daily life, so that our beliefs and practices of living will be informed and guided by research, presents one of the most urgent problems, calling for systematic study of our cultural traditions and of the methods of re-education that will recognize the values in those traditions but provide more effective practices for their attainment.

(12) Finally it would mark the acceptance, by scientists and research workers of all kinds, of the need for developing some scientific statesmanship commensurate with the magnitude of the tasks ahead and with the responsibilities which research now bears and must increasingly carry in the orientation of our national life.

The issues involved in the development of a national policy for research go far beyond the many controversial questions now being debated. They relate to the more fundamental questions of insuring the continuation and the extension of critical thinking as our major resource for advancing human life and social order toward the enduring values of our cultural heritage. If we aspire to the democratic ideal of the value and worth of the human personality, the dignity of man and of woman, we should recognize that the critical thinking of research has been the instrument throughout the ages which has increasingly worked for the attainment of these human values and these democratic aspirations, as formulated in our religion and our arts.

To-day critical thinking and the powers of trained organized intelligence offer possibilities such as no previous age has ever had, for achieving human conservation and advancing our free social order. The instruments are here and their powers and scope are being rapidly enlarged. We must muster the courage and imagination to use those instruments constructively and with full realization of the long-term tasks we face. That is the purpose of a national policy for research, which is not a program or a scheme of planning and control, but a considered declaration of purpose and intentions and of basic aims, to inform individual and group action and institutional programs, to provide the criteria for their decisions and to solicit a commitment to these larger tasks, so that every one will be put on notice that what he does or fails to do will advance or obstruct our national policy for research.

The relation of science to society is more than a question of gadgets or even technology; it involves the provision of knowledge and the criteria by which we can continue the endless task of developing a social order dedicated to human needs and potentialities. This means learning to understand nature and man and his traditional culture and how man can create a way of life directed to his aspirations, as informed by critical thinking.

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SPECIAL ARTICLES

CALCIUM IN PREVENTION AND TREATMENT OF EXPERIMENTAL DDT POISONING

THE mechanism of the toxic effects of dichlor-diphenyl-trichlorethane (DDT) is imperfectly known, whether in invertebrates or vertebrates. Experiments with arthropods, particularly with insects, seem to indicate a poisoning of the nervous system. Many experiments have been made with various vertebrate species, such as pigeons, rats, rabbits, cats, dogs, horses, oxen, goats,[1] frogs and goldfishes.[2] Daily doses of 100 mg of DDT per kg body-weight for a given period are responsible for symptoms which seem to show intoxication of the nervous system. In our experiments with dogs we observed that the symptoms begin with fibrillar contractions of the muscles of the hind legs which afterwards spread through the muscles of the entire body. Continuous contractions of all voluntary muscles, muscle-incoordination and inability to stand are the symptoms then observed. The animal lies down, the muscular contractions persisting for from 12 to 24 hours. As a rule, the animal recovers spontaneously; the intensity and duration of the muscular contractions depend on the dose of DDT administered. It seems to us that these symptoms are similar to those observed in dogs treated with carbon tetrachloride. Minot,[3] who noted the similarity between the symptoms produced by carbon tetrachloride in dogs and those of tetany in children, investigated the effect of intravenous injections of calcium chloride solutions on dogs in state of convulsions and unconsciousness brought about by carbon tetrachloride intoxication. A few (15 to 20) minutes after injecting the calcium chloride solution, the dogs were

[1] A. A. Nelson, *et al.*, *Pub. Health Rep.*, 59: 31, 1944.
[2] M. M. Ellis, B. A. Westfall and M. D. Ellis, SCIENCE, 100: 477, 1944.
[3] A. S. Minot, *Proc. Soc. Exp. Biol. and Med.*, 24: 617–20, 1927.