

IV. In order to develop industries which especially require the services of scientific workers, adequate remuneration and improved prospects should be offered by the Government, by municipal corporations, and by manufacturers to men who have received an effective scientific training. Means should be found of compensating and rewarding persons whose researches have proved of decided national or public advantage without being profitable to themselves.

V. A knowledge of science should be regarded as an essential qualification for future appointments in the departments of the public service concerned with industrial, scientific, and technical developments. The Royal Commission on the Civil Service recommended in 1914 that a Committee should be appointed to consider the present syllabus of subjects of examination for clerkships (Class I.). This Committee should be constituted without delay, and science as well as other branches of modern learning should be adequately represented upon it, and upon the Civil Service Commission itself.

VI. Measures should be taken to revise the educational courses now followed in the public schools and the Universities of Oxford and Cambridge.

VII. In elementary and secondary schools supervised by the Board of Education, more attention should be given to scientific method, observation, and experiment, and to educational handwork.

THE NATIONAL RESEARCH COUNCIL OF THE UNITED STATES.

PRELIMINARY STATEMENT.

IN response to a request from the President of the United States, the National Academy of Sciences has undertaken to organise the scientific resources of educational and research institutions in the interest of national preparedness.

Public welfare and national security depend upon industrial progress and military efficiency, and these in turn result from practical applications of scientific knowledge. A superstructure, no matter how perfect, must have firm foundations, and thus the development of our industries must go hand in hand with the advancement of science through research.

Euclid, working out problems in pure mathematics in Alexandria, prepared the way for the calculations of the engineer. Galileo, discovering the satellites of Jupiter, convinced the world of the truth of the Copernican theory, broke down absurd medieval conceptions which prevented scientific progress, and stimulated exploration and advance in every field. Pasteur, studying the optical properties of certain crystals with no thought of practical result, was led to his investigations of bacteria and his epoch-making discoveries for the benefit of mankind.

Thus scientific research in the laboratory, whether for the advancement of knowledge or for direct industrial application, is a most fundamental form of national service, which should be encouraged by every possible means. Since the beginning of the war this fact has been recognised in England by the creation of a Scientific Council, and in Australia by the establishment of a National Institute of Science and Industry. Both bodies will devote their efforts to the promotion of scientific and industrial research.

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ORGANISATION OF THE NATIONAL RESEARCH COUNCIL.

During the Civil War the need of scientific advice was clearly recognised by our Government. Accordingly the National Academy of Sciences was chartered in 1863 by Act of Congress, which stipulated 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. . . ." During the war, and frequently in later years, the Academy has been consulted by Congress, by the President, and by various members of his Cabinet.

The Naval Consulting Board, recently appointed by the Secretary of the Navy, has recommended the establishment of a naval experimental and testing laboratory and taken steps of far-reaching importance in the mobilisation of the industrial resources of the nation. The National Academy is now requested by the President to organise the extensive scientific resources of existing research laboratories in the interest of preparedness. To this end it has established a National Research Council.

The *purpose* of the Council is to bring into co-operation existing Governmental, educational, industrial, and other research organisations, with the object of encouraging the investigation of natural phenomena, the increased use of scientific research in the development of American industries, the employment of scientific methods in strengthening the national defence, and such other applications of science as will promote the national security and welfare.

Membership.—The Council will be composed of leading American investigators and engineers, representing the Army, Navy, Smithsonian Institution, and various scientific bureaux of the Government; educational institutions and research endowments; and the research divisions of industrial and manufacturing establishments.

In order to secure a thoroughly representative body, the members of the Council are being chosen in consultation with the presidents of the American Association for the Advancement of Science, the American Philosophical Society, the American Academy of Arts and Sciences, the American Association of University Professors, and the Association of American Universities, and with the advice of a special committee representing the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Electrical Engineers, and the American Chemical Society. Members of the Cabinet will be asked to name the representatives of the various departments of the Government.

Research committees of two classes will be appointed: central committees, representing various departments of science, comprised of leading authorities in each field, selected in consultation with the president of the corresponding national society; local committees in co-operating institutions engaged in research.

The Council of the Academy will recommend to the National Research Council the following plan of procedure, subject to such modification as may seem desirable:—

(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 co-operating Government bureaux, 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 Defence.

(2) The preparation of reports by special committees, suggesting important research problems and favourable opportunities for research in various departments of science.

(3) The promotion of co-operation in research, with the object of securing increased efficiency; but with careful avoidance of any attempt at coercion or interference with individual freedom and initiative.

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

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

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

Co-operating Bodies.—Arrangements have been made which assure the Council of the hearty co-operation and support of members of the Cabinet and other officers of the Government; the officers of many national societies; the heads of the larger universities and research foundations; and a long list of the leading investigators in Government bureaux, research foundations, industrial research laboratories, and educational institutions.

From the cordial interest shown by all those who have learned of the work in its preliminary stages, it is evident that as soon as a widespread request for co-operation can be extended it will meet with general acceptance.

EDWIN G. CONKLIN,
SIMON FLEXNER,
ROBERT A. MILLIKAN,
ARTHUR A. NOYES,
GEORGE ELLERY HALE, *Chairman.*
(*Organising Committee.*)

PSYCHOLOGICAL EFFECTS OF ALCOHOL.¹

THE literature on the alcohol question is already vast, but it promises to be bigger still if the ambitious programme of Prof. F. G. Benedict and his colleagues is accomplished to the full. It must be more than thirty years ago that, feeling the tyranny of the ultra-teetotal party in America, the late Prof. Atwater founded a famous committee with the object of freeing, at any rate,

¹ "Psychological Effects of Alcohol: an Experimental Investigation of the Effect of Moderate Doses of Ethyl-alcohol on a Related Group of Neuro-muscular Processes in Man." By Raymond Dodge and Francis G. Benedict. Pp. 281+32 figures. (Carnegie Institution of Washington. Publication No. 232. 1915.) Price 2.50 dollars.

the scientific section of the community from the limitations of opinion and research on the question which the so-called temperance party sought to impose upon them. Excellent work they did, but in the intervening years the methods of research have been so improved that the work of that committee urgently needed revision. So in January, 1913, Prof. Benedict invited the co-operation of physiologists throughout the world to share in a gigantic investigation of the numerous problems presented by the dietetic use of alcoholic beverages, and obtained sympathetic answers from a large number of eminent people in all countries. In the present volume a long list is given of these, and grateful acknowledgment is made of friendly, helpful letters from the majority of them.

This appears to have completed the measure of their co-operation, and Prof. Benedict, so far as actual work is concerned, has been left to tread an almost lonely furrow. The brochure from the pen of himself and Dr. R. Dodge deals only with quite a limited branch of the subject, but the results obtained are of considerable importance. The experiments were performed with moderate doses of alcohol (30 to 45 c.c.), and were carried out with great perfection of technique and with proper controls. The majority of the subjects were normal young men, a few were psychopathic owing to previous misuse of alcohol, fewer still were the number of actual teetotalers who consented to lend themselves to the experiment, and one only was a confirmed heavy drinker; the results obtained with him can be left out of account, as he soon rebelled against a limitation of his usual supply of whisky. Otherwise, with differences in detail, the main results were the same in all cases.

The principal question investigated was whether or not these small doses of alcohol produced any delay of, or interference with, various neuro-muscular processes, and the selected processes were some of them simple, such as the knee jerk, others more complex, such as reflexes, in which the eyes were concerned, and others, still more complicated, involved mental operations, such as association of ideas and memory. Electrocardiograms and pulse records were also taken, and the cardiac acceleration noted was found to be due to a depression of the inhibiting mechanism. The answer to the main inquiry is certainly a rather unexpected one, so insistent are the claims of the teetotalers that even a moderate drinker is putting an enemy into his mouth to steal away his brains. For it was found that, whereas these small doses of the drug depressed the simplest reflex actions, such as the knee jerk, the more complex the neural arc involved in a reflex, the less was this effect manifested, whilst in operations involving mental work and memory the effect was either nil or an improvement was noted. In other words, the lower centres (*e.g.*, the vagus centre and the knee-jerk centre in the lumbar cord) are depressed most, and the highest least. "If alcohol had selectively narcotised the higher centres it would have been used as an anæsthetic centuries ago." W. D. H.