

eral lowering of the threshold eventuate in such phenomena as hyperexcitability, hyperactivity and increased variability; differential lowering, in fixed ideas, anancastic behavior, stereotypy and more serious disequilibrium?

One may also ask in passing what would be the effect of a low threshold of some natural system, such as sex or fear. I remember a patient for whom every situation was terrifying. She could give no adequate reason for being afraid in the staff meeting. "The doctors might torture me," but she didn't really expect they would. Their interested and sympathetic presence, like familiar street noises and less known situations, all indiscriminately evoked fear. The case, like most others, was perplexing enough in its details of diagnosis and treatment, but the main overt symptom was clear and clearly threatened a serious neurosis. If only there was available some specific drug that acted to raise the threshold of the fear system, that particular symptom might have been controlled. Instead, one must seek to control it and its reinforcing systems by some kind of reeducation, possibly with the aid of a general depressant of irritability.

As Freud and his pupils have pointed out, hyperexcitability of a specific sex system represents one of the most common sources of mental unbalance. But, exaggerated egotism and exaggerated feeling of inferiority, suspicion of infidelity, financial worry, hypochondria or any other hyperexcitable system may do almost equally as much harm in promoting unbalance.

Would not a general lowering of the threshold of the sex system tend to a spread of excitation to those systems from all sorts of remotely related stimuli with the definite expectation of such phenomena as fetish-

ism, promiscuity, Sadism, masochism, homosexuality and other abnormal systematizations of the sex life?

I am not suggesting any general principle of explanation but merely asking what would be the tendencies of abnormal excitability of any factor. The known tendency of neural excitation to spread to remote areas of the nervous system make it doubtful if any conditioned reaction represents an entirely new nervous connection. The commoner event probably is that directions of normal spread become emphasized and dominant, according to the principles of facilitation and inhibition that have been elaborately investigated by Pavlov and his pupils. The concept of emphatic or dominant neural bonds is not new. It dates back at least to Wundt's far-sighted analysis of the probable neural systems involved in speech. Recent psychoneurological experiments and clinical experience seem to confirm the soundness of his fundamental ideas.

The so-called anticipatory reaction now appears in a different light. Each case is really a phase of the reactive flux that arises from the systematic changes in threshold of some system leading to a spread of neural action to physiological neighbors before the suppositious specific external stimulus occurs.

This may follow the "conditioned reflex" schema. It may follow the plan of a neural short-circuiting of a series of external stimuli, as in Hull's analysis, but it is not conditioned alone by the sequence of external events. It may follow the course of logical or paralogical thinking or the invention of genius. It must follow the regular or irregular spread of neural impulse in central neural tissue according to the principle of a differential threshold.

A HISTORY OF THE NATIONAL RESEARCH COUNCIL 1919--1933

IX. RESEARCH INFORMATION SERVICE¹

By Dr. C. J. WEST

DIRECTOR

THE Research Information Service, in its present organization, is a committee of the Executive Board of the National Research Council, the main functional activities of which are: cooperation with the divisions of the Council through inter-office service, and the preparation of compilations which may be used as source books of a general scientific nature. Originally conceived as a war measure, it has passed through

several forms of activity, an outline of which will present briefly the scope of its accomplishments.

The following persons, under various titles, have been responsible for the conduct of the Service since its organization in 1918:

1918 —Graham Edgar, *Executive Secretary*
1919-1924—Robert M. Yerkes, *Chairman*
1924-1925—J. David Thompson, *Director*
1925-1933—C. J. West, *Director*

¹ This is the ninth of a series of ten articles prepared to describe briefly the nature of the activities with which the National Research Council has been engaged during the past fourteen years.

In December, 1917, by joint action, the Secretaries of War and Navy, with the approval of the Council

of National Defense, authorized and approved the organization, through the National Research Council, of a Research Information Committee in Washington, with branch committees in Paris and London, and later in Rome. The work of the committee, in cooperation with the Office of Military and Naval Intelligence, consisted in securing, classifying and disseminating scientific, technical and industrial research information, especially relating to war problems, and the interchange of such information between the allies in Europe and the United States.

With the signing of the Armistice, this type of service was no longer needed. The Research Information Committee then was reorganized as the Research Information Service, and its aims and activities became more adapted to the nation at peace. It undertook in the furtherance of its new aim, to be a national center of information concerning research work and workers, to keep in close touch with research activities in educational, industrial and governmental institutions, and with current work and projects in the natural sciences. It offered its services to all those interested in the advancement of science and technology.

But after a few years, during which a number of excellent projects were instituted, it became clear that such a plan could not be carried out without large sums of money. Requests for scientific and technical information were received in great numbers, ranging over all the sciences. This necessitated having on the staff specialists to handle them efficiently; and a large clerical force was needed for the files (as information to be information must be accessible).

Difficulties such as these grew more apparent, and in 1923 the idea of a clearing house was abandoned, and a smaller staff set to work in a more limited field of compilation and inter-office cooperation. The number of requests was allowed to decrease, and from that time on the emphasis was definitely placed on the compilation of material of general scientific nature.

Before presenting the work of the Service to-day, it should be said that many of the compilations now prepared annually, or revised from time to time, originated in the days of the larger organization, but an effort has consistently been made, even with a depleted staff, to continue those which seem to have found a niche in the laboratory or library.

As soon as information is collected in the Research Information Service, it is compiled and published either as a circular or bulletin of the National Research Council or in the scientific press, and is henceforth available to the public at all times.

Perhaps there is no better way of describing the present activities of the Research Information Ser-

vice than to give a brief résumé of the publications which it issues, and in the compilation of which the large part of its time is consumed.

In 1920 a list of research laboratories in industrial establishments² of the United States was compiled and published by the Council. The list, containing about 300 names, was avowedly incomplete, but it was felt that the interest aroused in the subject, as well as expected progress in research, would make a revision necessary in a relatively short time. This was proven true by subsequent events, and from 1920 to 1932 there were four editions issued, each one with an increasing number of laboratories, until in the last edition of 1932 there were 1,600 names. All these additions were not necessarily new laboratories, some having been inadvertently overlooked in previous publications; therefore no conclusions should be drawn as to the growth of industrial research from this increase. The 5th edition is now in progress. It will be of interest to note the effect of the present economic situation on the continuance of research.

The Research Information Service has compiled two bibliographies on industrial research,³ the first covering the years to 1920, and the next from 1926 to 1930. The intervening years were covered by a publication on the subject issued by the Division of Engineering.

The compilation of information on "Funds Available in the United States for the Encouragement of Research"⁴ grew out of the frequently recurring requests for financial help in scientific projects. Such funds are in the form of fellowships and scholarships, grants-in-aid, institutional and departmental funds, prizes and medals. The bulletin endeavored to give the names of the various funds, their purposes and amounts. Revision of this was made in 1928.

After the first issue in 1920 the material on fellowships and scholarships was revised as a separate bulletin⁵ and two editions issued, bringing the data

² "Industrial Research Laboratories of the United States, Including Consulting Research Laboratories," 85 pp. Compiled by A. D. Flinn. 1930. Second edition, 135 pp., revised and enlarged by Ruth Cobb. 1921. Third edition, 153 pp., revised by C. J. West and Ervye Risher. 1927. Fourth edition, 267 pp., revised by C. J. West and Callie Hull. 1931. Fifth edition, revised by C. J. West and Callie Hull. *In preparation.* (Bulletins Nos. 2, 16, 60 and 81.)

³ "A Reading List on Scientific and Industrial Research and the Service of the Chemist to Industry," 45 pp. Compiled by C. J. West. 1920. (Reprint and Circular Series No. 9.) "Five Years of Research in Industry, 1926-1930: a Reading List," 91 pp. Compiled by C. J. West. 1930.

⁴ "Funds Available in the United States of America for the Encouragement of Scientific Research," 81 pp. Compiled by Callie Hull. 1921. Second edition, 90 pp., compiled by Callie Hull and C. J. West. 1928. (Bulletins Nos. 9 and 66.)

⁵ "Fellowships and Scholarships for Advanced Work

up to 1929. There has also been compiled each year since 1929, for publication in the *News Edition of Industrial and Engineering Chemistry*, a list of fellowships and scholarships supported by industry,—an interesting light on the importance given to such projects by the industrial concerns themselves.

There seemed to be an increasing need among those interested in science for information concerning the societies of the country; so in 1927 a "Handbook of Scientific and Technical Societies of the United States and Canada"⁶ was issued. This bulletin listed 793 associations in the United States alone. The National Research Council of Canada cooperated by compiling information for that country, listing 91. The interpretation of a scientific or technical society, for the purpose of this bulletin, was one which contributed to the progress of science through publications or funds for research. The latest edition of this compilation appeared in 1930.

One of the most extensive projects undertaken by the Service has been the compilation by a number of persons of bibliographies of bibliographies in the sciences.⁷ The first one of this series issued was a "Catalogue of Published Bibliographies in Geology, 1896–1920," the second a "Bibliography of Bibliographies in Chemistry," to which two supplements have been added,⁸ bringing the information up to 1932. A "Classified List of Published Bibliographies in Physics, 1910–1922" was followed by a "Bibliography of Bibliographies in Psychology," and one for medicine is now in progress.

From 1923 to 1924 there were issued lists of bibliographies⁹ in manuscript form, and therefore

in *Science and Technology*, 94 pp. Compiled by Research Information Service. 1923. Second edition, 154 pp., compiled by Callie Hull and C. J. West. 1929. (Bulletins Nos. 38 and 72.)

⁶ "Handbook of Scientific and Technical Societies and Institutions of the United States and Canada," 304 pp. American section compiled by C. J. West and Callie Hull. Canadian section compiled by National Research Council, Canada. 1927. Second edition, 352 pp., 1930. (Bulletins Nos. 58 and 76.)

⁷ "Catalogue of Published Bibliographies in Geology, 1896–1920," 228 pp. Compiled by Edward B. Mathews. 1923. (Bulletin No. 36.) "Classified List of Published Bibliographies in Physics, 1910–1922," 102 pp. Compiled by K. K. Darrow. 1924. (Bulletin No. 47.) "Bibliography of Bibliographies on Chemistry and Chemical Technology, 1900–1924," 308 pp. Compiled by C. J. West and D. D. Berolzheimer. 1925. First supplement, 1924–1928, 161 pp. 1929. Second supplement, 1929–1931, 150 pp. (Bulletins Nos. 50, 71 and 86.) "Bibliography of Bibliographies on Psychology, 1900–1927," 90 pp. Compiled by C. M. Louttit. 1928. (Bulletin No. 65.)

⁸ "List of Manuscript Bibliographies in Geology and Geography," 17 pp. Compiled by Homer P. Little. 1922. (Reprint and Circular Series No. 27.) "List of Manuscript Bibliographies in Chemistry and Chemical Technology," 17 pp. Compiled by C. J. West and Callie Hull. 1922. (Reprint and Circular Series No. 36.) "List of Manuscript Bibliographies in Astronomy,

available only upon application to their compilers. These covered the subjects of geology, chemistry, mathematics, physics, astronomy and biology. They were useful as guides to research problems under way as well as for bibliographic reference, but the expense of assembling the information prohibited revisions.

There are a number of compilations which the Service has published annually: Doctorates conferred in the sciences by American Universities,⁹ a classified list giving the name of the recipient, the university granting the degree and the title of the thesis. "A Census of Graduate Students in Chemistry in American Universities,"¹⁰ originally begun in 1924 by the Division of Chemistry, was taken over in 1926 by the Research Information Service. This tabular compilation shows the trend of research in universities by a statistical summary of the number of graduate students in each institution according to the branch of chemistry in which they are working. The ninth census is now in progress.

Another project originating in the Division of Chemistry but now in the hands of the Service is the editing of the "Annual Survey of American Chemistry."¹¹ It contains hundreds of references to the literature of the current year and gives brief descriptions of the work accomplished. Author and subject indexes are included.

There are certain publications which are not issued as Council bulletins or reprints, but which appear in the scientific and technical press, or are published in connection with scientific bodies. One of these is the "Location List of Periodicals Abstracted by Chemical Abstracts,"¹² a cooperative project with the office of *Chemical Abstracts*, three times undertaken by Research Information Service. *Chemical Abstracts* pub-

Mathematics and Physics," 14 pp. Compiled by C. J. West and Callie Hull. 1923. (Reprint and Circular Series No. 41.) "List of Manuscript Bibliographies in the Biological Sciences," 51 pp. Compiled by C. J. West and Callie Hull. 1923. (Reprint and Circular Series No. 45.)

⁹ "Doctorates Conferred in the Sciences by American Universities." Compiled by C. J. West and Callie Hull. 1920–1923, 1926–1932. (Reprint and Circular Series Nos. 12, 26, 42, 75, 80, 86, 91, 95, 101 and 104.)

¹⁰ "Census of Graduate Research Students in Chemistry," 4 pp. Compiled by J. E. Zanetti. 1924. Second census, 3 pp., compiled by J. F. Norris. 1925. Third to eighth census, compiled by C. J. West and Callie Hull, 1927–1932. (Reprint and Circular Series Nos. 54, 63, 79, and 84.) Later ones in *The Journal of Chemical Education*, 6: 1388, 1929; 7: 1674, 1930; 8: 1374, 1931; 9: 1472, 1932.

¹¹ "Annual Survey of American Chemistry." Vols. 1–7. New York: Chemical Catalog Company, 1926–1932.

¹² "List of Periodicals Abstracted by *Chemical Abstracts*, with Key to Library Files and Other Information." Columbus, Ohio: American Chemical Society, 1922, 1926 and 1931.

lishes the list of journals, but all data concerning the library facilities are obtained and compiled by this office. It is a valuable aid to research workers.

An *Index* to the seven volumes of *International Critical Tables* has recently been completed and will be ready for distribution by April 1, 1933. The *Index* was made in this office, the director of the Service being one of the associate editors of the *Tables*. The *Index* is a volume of 323 pages and contains about 42,000 references and 9,000 cross references. It will be a great asset to users of the *Tables*.

These are examples of the type of compilation in which the Research Information Service is now engaged. No attempt has been made to list all the publications for which it has been responsible. A

complete list of these may be obtained from the Publications Office of the Council.

The Research Information Service has always had a very definite conception of its responsibility to the divisions of the Council. It has therefore cooperated at all times in furnishing information when called upon, has acted as agent in obtaining books from outside libraries, and maintains a small but valuable library of source books, such as abstract journals, periodical bibliographies, and reference material. No attempt has been made to go outside this limited field, but it is fitting to acknowledge at this time the indebtedness of the Service to the government libraries which are so generous in lending their books upon request.

SCIENTIFIC EVENTS

THE LEVERHULME SCHOLARSHIPS

As announced in the *London Times*, the trustees of the will of the first Lord Leverhulme, who died in 1925, have decided to devote £12,000 a year to the establishment of a scheme of research fellowships which are intended in the first instance for the assistance of experienced workers rather than to add to the provision already existing for workers in the early stages of their careers.

A statement has now been issued by the advisory committee which was appointed to select the fellows and for the general supervision of the scheme, and the committee reports that from the applications received 17 selections have been made by the advisory committee and approved by the trustees of the will of the late Lord Leverhulme and are for varying periods up to two years. The names of the fellows in the sciences and the subjects of the researches are as follows:

- E. C. BULLARD, B.A., Ph.D., demonstrator in geodesy, University of Cambridge.—“Gravity and magnetic measurements.” Research to be carried out in Great Rift Valley, East Africa.
- C. R. BURCH, B.A. (Cantab.), physicist, Metropolitan-Vickers Electrical Company, Limited.—“On the production of aspherical optical surfaces and on their imaging properties in combination.”
- F. FRASER-DARLING, Ph.D., chief officer, Imperial Bureau Animal Genetics, Edinburgh.—“An ecological study of a herd of Scottish red deer, with special reference to behavior.”
- C. S. ELTON, M.A., director of Bureau of Animal Population, University of Oxford, and university demonstrator in zoology.—“Fluctuations in numbers of wild mammal populations.”
- D. H. HAMMICK, M.A., fellow and tutor, Oriel College, Oxford.—“Investigations on the interaction of nitro-compounds with aromatic bases and hydrocarbons.”
- H. S. HATFIELD, Ph.D., London.—“The behavior of crystalline substances in electric and magnetic fields.”

L. S. B. LEAKEY, M.A., Ph.D., F.S.A., fellow of St. John's College, Cambridge.—“The pre-history of East Africa.”

D. L. R. LORIMER, C.I.E., M.R.A.S., F.R.G.S., lieutenant-colonel, Indian Army (retired), late of Foreign and Political Department.—“Anthropological and linguistic research in the Gilgit region of the Karakorum and Hindukush.”

A. G. LOWNDES, M.A., Marlborough College, Wilts.—“The polygraphic process. Ultra-rapid cinema photomicrography.”

MISS J. A. WALES, employment officer in the Ministry of Labor, secretary to Chelsea and Fulham Juvenile Advisory Committee.—“The study of methods of vocational guidance for young people, as at present used in Germany.”

W. F. K. WYNNE-JONES, B.Sc., lecturer in physical chemistry, University of Reading.—“The nature of acids and bases.”

AGRICULTURAL REORGANIZATION IN MEXICO

It is reported by Science Service that the most radical reorganization of the Ministry of Agriculture in Mexico's history along scientific, social and economic bases has been planned by government officials and technical experts, in an effort to turn national agriculture from its haphazard development of the past into directed channels.

Mexico is fundamentally an agricultural country, and yet imports fundamental food that she can raise herself. Her agricultural sanitation is so defective that she often can not sell her products to the United States or other countries. Although her location in the semi-tropics and tropics makes agricultural possibilities almost unlimited, most of the best lands are not advantageously utilized. To correct these and other defects, the federal government hopes to take her national agriculture in hand, direct it economically, socially and technically. This will be easier to