

# NATURE

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## CONTENTS

	Page
Distribution of Scientific Man-Power . . . . .	199
Chemical Synthesis Made Easy. By Prof. J. W. Cook, F.R.S. . . . .	202
Biological Standardization of Vitamins. By Prof. S. K. Kon and Dr. P. White . . . . .	202
Vegetation of the Argentine. By G. M. Roseveare . . . . .	203
Gustav Fechner. By A. D. R. . . . .	203
Physical and Chemical Aspects of Rubber Technology. By Dr. L. R. G. Treloar and Dr. R. F. Naylor . . . . .	204
Nutrition of Athletes . . . . .	207
Shortage of Scientific Text-books in Cambridge. By R. Innes . . . . .	209
News and Views . . . . .	210
Letters to the Editors :	
Properties of a Hypothetical di-Neutron.—Prof. N. Feather, F.R.S. . . . .	213
Propagation of Pulses of Second Sound in Liquid Helium II.—D. V. Osborne . . . . .	213
Emission Schumann-Runge O <sub>2</sub> Bands.—M. W. Feast . . . . .	214
A Simple Result in Quadrature.—Sir K. S. Krishnan, F.R.S. . . . .	215
Physical Periodicity of the Periodic Table of the Elements in the Light of Statistical Theory.—Dr. G. Herdan . . . . .	215
X-Ray Scattering by Thermal Vibrations in Crystals.—Dr. Kathleen Lonsdale, F.R.S. . . . .	216
Interaction between Curare and the Potassium Ion at the Motor End Plate.—P. E. B. Holmes, D. J. Jenden and Dr. D. B. Taylor . . . . .	217
Effect of Drugs on Actin.—Dr. F. B. Straub, G. Feuer and I. Lajos . . . . .	217
Actomyosin Content of the Uterus.—Dr. A. Csapó . . . . .	218
Production of Riboflavin and Allied Substances during the Growth of <i>C. diphtheriae</i> .—A. J. Woiod and Dr. F. V. Linggood . . . . .	219
Sex and Organ Specificity in the Response of $\beta$ -Glucuronidase to Extrinsic Agents.—Lynda M. H. Kerr and Dr. G. A. Levy . . . . .	219
Aneurin-Pyrophosphate Content of Red and White Blood Corpuscles in the Rat and in Man.—Dr. E. Florijn and G. Smits . . . . .	220
A Hyaluronidase Unit.—Sv. Dalgaard-Mikkelsen, S. A. Kvorning and Prof. Knud O. Møller . . . . .	221
Indicator Yellow and Retinene.—Dr. H. J. A. Dartnall; S. Ball, F. D. Collins and Prof. R. A. Morton . . . . .	222
Total Synthesis of some Pyrethrins.—L. Crombie, M. Elliott, Dr. S. H. Harper and H. W. B. Reed . . . . .	222
Alkaloids of the Australian Rutaceae.—G. K. Hughes, Dr. F. N. Lahey, Dr. J. R. Price and L. J. Webb . . . . .	223
Determination of Mixing of Gas Streams by the Infra-Red Gas Analyser.—R. D. Collins and M. P. Newby . . . . .	224
Ionic Exchange and Fibre Contraction.—H. G. Ingersoll and A. A. Johnson . . . . .	225
The Potato Caterpillar Pest ( <i>Agrotis spec.</i> ) of Tristan da Cunha.—Dr. G. J. Broeckhuysen and W. Macnae . . . . .	225
Pore Canals in the Egg Membranes of <i>Locustana pardalina</i> Walk.—J. J. Mattheé . . . . .	226
Control of Intestinal Microflora.—H. Dalton . . . . .	227
Growth of <i>Culex molestus</i> under Sterile Conditions.—E. P. Lichtenstein . . . . .	227
Mosquitoes and Malaria.—Dr. J. H. Kenneth . . . . .	227
Chemistry Research Board . . . . .	228
Production of Indole by <i>Escherichia coli</i> . By Dr. Edwin A. Dawes . . . . .	229
Excitation Processes in Molecular Nitrogen. By R. W. Nicholls . . . . .	231
International Geological Congress . . . . .	232
Condensation of Interstellar Material into Stars . . . . .	233

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## DISTRIBUTION OF SCIENTIFIC MAN-POWER

FROM the national point of view, a proper balance must be struck between productive effort and research effort, as in any successful private business; it is the task of management to secure that the appropriate balance is achieved, and that it is achieved without diverting too many creative and fertile minds to the equally essential task of administration. This is the point of view from which the present organisation of scientific and industrial research in Great Britain must be considered. As Sir John Anderson rightly said in his lecture to the Society of Chemical Industry when he received the Messel Medal on July 14, Great Britain has been a pioneer among the nations in the organisation of scientific research; but nevertheless we must have the organisation of science in the public service constantly under review. In particular, it is essential that we should consider whether, by any changes in the existing organisation or by more careful use of our limited scientific man-power, we can rectify admitted weaknesses in the development of research results, and in the supply of trained scientific men and technologists.

It seems clear from its first report that the Advisory Council on Scientific Policy is concerning itself with this broad question; but it is equally important that the scientific and industrial world should be provided with adequate data on which to base a sound and independent judgment of the correctness of Government organisation and policy. That is the fundamental reason why early resumption of the publication of full reports from the Department of Scientific and Industrial Research is so important. Moreover, since a sound judgment cannot reasonably be made on the results of any one year, it is the more important that there should be available as early as possible a full account of the war effort, and especially before the Department is irretrievably committed to any schemes of expansion which involve large drains on man-power or equipment.

Admirably as the recent report from the Chemistry Research Board (see p. 228 of this issue) fills the need from one point of view—and there can be nothing but praise for much of the work done and also for the special attention being given to the development of new techniques for the benefit of both industry and science—a striking feature of the report illustrates the necessity for completing the picture. This is the way in which the work of the Chemical Research Laboratory is linked up with that of other Government institutions and departments. The Corrosion of Metals Section, for example, has collaborated with the Light Division of the National Physical Laboratory and with the British Iron and Steel Research Association, as well as with the Water Pollution Research Laboratory, the British Cast Iron Research Association and the British Non-Ferrous Metals Research Association, and has carried out work for the Ministry of Supply and the Ministry of Works. The High Polymers and Plastics Section has worked

with the Engineering Division of the National Physical Laboratory and the Forests Products Research Laboratory, and the Coal Tar Section with the Heat Section of the Physics Division and the Metrology Division of the National Physical Laboratory. The Chemistry Research Board itself directs attention to contacts maintained with other departments and to field trials by the Colonial Office on the control of nagana in Africa by the use of phenanthridinium compounds prepared in the Laboratory, as well as the development of the production of food yeast in Jamaica.

There can be no question as to the value of such collaboration in achieving economy of effort and equipment, and whatever doubts are entertained as to the value of the research association movement, there are *a priori* reasons for believing that the work of such institutions as the Chemical Research Laboratory is thoroughly sound, and that under the Chemistry Research Board it is making an important, and possibly a vital, contribution to the advancement of science and to industrial development, apart from the study of the specific scientific problems which arise in the public service. The very way in which it is interlocked with the work of other bodies, however, makes it important that we should consider the Government organisation of research as a whole. Otherwise there is danger that justifiable expansion at one point may have serious and undesirable repercussions on activities elsewhere which it is vital to maintain or even expand.

It was noticeable that, in his address at Edinburgh, Sir John Anderson was purely descriptive and neither commended nor condemned what he described, though those who followed his survey closely might perhaps have gained from his inflexions some idea of the general trend of Sir John's own mind. Neither can it be said that the Advisory Council on Scientific Policy has in its first report addressed itself to the broadest aspects of the question. The Council was asked by the Government to make recommendations on the specific questions, *inter alia*, of the appropriate organisation for scientific research within the Government, with special reference to research on building and on fuel and power, and the appropriate form of research effort to assist the maximum increase in national productivity during the coming decade. In regard to the former of these problems, the Advisory Council was asked to consider, in particular, what should be the respective functions of Government departments, of the research councils and of outside bodies (including the boards of socialized industries) in carrying out research.

The Advisory Council recognizes that on one hand research of the highest quality depends on a freedom which is difficult to reconcile with the normal conditions of Government work, and on the other hand, that close contact between the research worker and the user of the results of applied research is essential in order that the results obtained may be of practical value and supply data and a satisfactory foundation for the research itself. It therefore devoted considerable time at the outset to discussion of the general principles which should apply to the organ-

isation of Government research and its application, and as a result reached agreement on two general principles. First, the executive department should be responsible for identifying problems requiring research, settling their order of priority, deciding where the various investigations should be carried out and applying their results. Secondly, the research councils, and particularly the various branches of the Department of Scientific and Industrial Research, should continue to be free to initiate background research where they think fit, free from administrative control of the executive departments and consequently from considerations of day-to-day expediency.

Like Sir John Anderson in his lecture, the Advisory Council rejects the idea of a Ministry of Science and agrees that no attempt should be made to concentrate responsibility for carrying out all Government scientific research on the Lord President of the Council. It considers that this would intensify rather than diminish the old cleavage between science, administration and policy; although the Lord President should assume a particular concern for such branches of scientific research as have a wider application than to the problems of a particular department.

While there will probably be much general support for these views, it will be noted that the Advisory Council does not discuss in the present report the effectiveness or adequacy of the general structure, or whether its disposition as between Government and industry could be improved with advantage to the public welfare. This is the more important in view of the next conclusion, that if the executive departments are to discharge their considerable scientific and technical responsibilities thus defined, they will require to employ considerable scientific staffs, corresponding to the operational research units attached to the Service Ministries and Commands during the War. The appointment of a 'chief scientific officer' by the departments, provided with an adequate staff, however admirable in principle, may well be open to question on practical grounds at the present juncture. Can we really afford to withdraw such men from production while we are still awaiting the increase in scientific and technological man-power recommended by the Barlow Report?

The recommendation, it is true, is in line with the observations in the report of the Select Committee on Estimates, which in its third report for the Session 1946-47, dealing with expenditure on research and development, referred to the absence of sufficient provision for the identification of scientific problems in day-to-day administration as one of the greatest weaknesses in the Government organisation. The Select Committee itself recommended the appointment in all executive departments of scientific advisers who should have a high standing and direct access to the policy-forming level. There can only be welcome for any proposal which will give the scientific man more influence in guiding the formulation as well as the administration of policy, and for the recommendation that executive departments to the work of which science can contribute should assume a more positive role than hitherto in the organisation

and direction of research required for their own purposes and in supervising the application of its results. Nevertheless, however urgent and essential may be the appointment of chief scientific officers for the planning of the present Government research programme in the best way to meet national needs, the question must still be asked where the men are to be found, and whether there are not other activities which could be curtailed or discontinued to release men for such work.

These recommendations were submitted by the Advisory Council in a general report on May 22, 1947, and two such appointments have since been made, to the Ministry of Food and to the Home Office respectively. The same principles have been applied to the Council's consideration of the special requirements of building research. Here it recommends that the Department of Scientific and Industrial Research should retain full responsibility for scientific research and initial development in building, as well as its freedom to initiate research and undertake investigations at the direct proposal of the building industry. The Ministry of Works should retain the broad responsibilities indicated for executive departments in general, including that of keeping the technical development of the building industry under review, promoting the final stages of development, and encouraging the use by industry of the results of research. For the discharge of these scientific functions the Advisory Council recommends, in addition to the appointment of a 'chief scientific officer', a scientific advisory council of scientific men and representatives of the building industry in equal proportions, and such a Council on Building and Civil Engineering and Development was established on December 8, 1947. Under these proposals, the responsibility for identifying the problems requiring research and determining their priority, as well as for initiating research in the sociological or economic field, rests with the Ministry of Works. In like manner the Advisory Council recommended that the scientific and engineering staff of the Ministry of Fuel and Power should be substantially strengthened, and that a 'chief scientific officer' should be appointed with adequate status and with responsibility for making a broad strategic survey of the problems on which to base a general research problem for the fuel and power industries. He would be assisted by an advisory council including not only scientific men but also economists, administrators and men of wide practical experience in the nationalized industries. The Advisory Council has rejected a suggestion to transfer the Fuel Research Station to the Ministry of Fuel and Power; but advised that the Station should continue to act as an agent in carrying out such research as the Ministry may decide to allocate to it.

There can be no doubt that, under its terms of reference, the Advisory Council on Scientific Policy is discharging important functions not hitherto provided for, and its first report encourages the hope that the Council will go much more closely into such important questions as the appropriate pattern for the scientific organisation of Government depart-

ments in general as well as that of the general structure of the organisation of scientific and industrial research in Britain, the principles on which research in the nationalized industries should be organised and the overall requirements of scientific man-power and the appropriate measures for its recruitment and training. Meanwhile, its report should reassure those who fear that the conduct of scientific research by Government departments or the research councils will be over-planned. Its pronouncements on the status of 'chief scientific officers' will be welcomed by those who have urged, as has been done in these columns for many years, that the scientific man should be given the status which will enable him to make his voice heard effectively in the determination of policy where scientific factors are involved; and that the possession of scientific qualifications should not constitute a bar to advancement to positions of the highest administrative responsibility when the requisite administrative talent is joined to such qualifications.

Nevertheless, the report will inevitably cause some misgivings. As is rightly emphasized, to meet the urgent requirements of the economic situation the direction in which scientific research and development should be promoted cannot be determined solely from the point of view of science itself; and its gravity makes it essential to develop quicker and more efficient application of the results of fundamental research, demanding in turn an efficient scientific organisation in executive departments and a better supply of the type of technologist who can effectively apply the results of fundamental research. It is no easy task to strike the right balance between long-term and short-term interests, between the needs of academic and industrial research, between the requirements of science and Government; and however valuable the Advisory Council may prove in future in deciding such issues in terms of an overall scientific and economic policy, the present report will not satisfy those who believe that an excessive proportion of the general as well as the scientific man-power of Britain is being diverted from productive to non-productive occupations.

This is not to suggest that research is non-productive; but as we have already stressed, if too large a proportion of scientific workers is employed on research or the dissemination of its results, there will not be enough available to apply those results. The Advisory Council does not entirely ignore this question of production; but the special Committee on Research and Productivity appointed by the Advisory Council, with Sir Claud Gibb as chairman, and the functions of which have now been transferred to a new and independent Committee on Industrial Productivity, was concerned more especially with the human factor in production, and such matters as nutrition and production and the improvement of technical information services. The fundamental question of the proper distribution of the scientific man-power of Britain between defence and civil requirements is only touched upon in that part of the Advisory Council's report which deals with scientific man-power, and even here the vital issue of the distribution between productive industry and

other civil requirements, including services of all kinds, is not adequately examined. This, however, is really the most important section of the Advisory Council's report, and requires fuller discussion in the light of the revised estimates of university expansion and the prospective demand for scientific man-power which have appeared since the Barlow Committee reported in 1946.

## CHEMICAL SYNTHESIS MADE EASY

### Synthetic Methods of Organic Chemistry

A Thesaurus. By W. Theilheimer. Vol. 1: 1942-1944. Translated from the German by Hans Wynberg. Pp. x + 254. (New York and London: Interscience Publishers, Inc., 1948.) 30s.

**T**HIS is a new type of organic chemical publication. The volume under review is a translation of a German version published in Basle in 1946, and purports to cover the original literature of the period 1942-44. In fact, references to earlier publications are frequently given. Volume 2, covering the literature of 1945-46, has now been published in German, and presumably an English translation of this will appear in due course. If there is to be a series of volumes appearing at two-year intervals, then steps should be taken to reduce this time-lag between publication of the original Swiss edition and the appearance of its translation. The work is described as a "Thesaurus", a word which is defined by the Shorter Oxford English Dictionary as meaning a 'treasury' or 'storehouse' of knowledge. This savours somewhat of grandiosity, and it remains to be seen whether organic chemists will regard the work so highly as the description implies. For the present, they will be content to accept the commendation of Prof. Reichstein in the foreword which he contributes, and to give the volume a conspicuous place on their shelves of reference works.

The author's intentions are admirable. The present volume summarizes more than seven hundred reactions, with literature references, and the information collected will be of value not only to those who are interested in synthetic methods but also to those who have a general interest in organic reactions and their current applications. As Prof. Reichstein points out in his foreword, the actual methods of organic chemistry are not classified and recorded in such a highly systematic way as are new compounds. Until recently the best available reference book for methods was "Houben", which is now a little out of date, and although there are excellent newer books on methods, such as "Organic Reactions" and "Newer Methods of Preparative Organic Chemistry", these deal only with reactions in strictly circumscribed fields.

Dr. Theilheimer has attempted to give a systematic survey of reactions likely to be of value in organic synthesis. This has of necessity meant making a selection, based on personal preference. The supreme difficulty of the project has been to devise a system of classification sufficiently simple to enable the entries relating to the desired reactions to be found readily; and sufficiently elastic to allow for an increase in the range of reactions to be included in future volumes. To meet this difficulty the author has devised a new form of symbolism, based on the system of classification used by C. Weygand in his "Organisch-chemische Experimentierkunst" (also available in an

English translation). Probably familiarity with the system will enable the user to find at once the references to the reaction in which he is interested; but until he has acquired this familiarity the novice will be inclined to flounder rather helplessly, and will probably tend to rely on the index which, although good, is by no means perfect. It would have been of assistance if a table of contents could have been included, with page numbers of the main headings, such as "Formation of C-C Bond".

For the most part, the methods enumerated do not appear to be new, but are examples of reactions already known, taken from the literature of the period under review. It is doubtful whether the ideal system of classification has been found. The system used results: (a) in the grouping together of reactions which have very little in common except the nature of the linkage which appears in the product, and (b) in the wide dispersal of very similar reactions. As an example of the latter we find that reactions numbered 652 and 768 are of precisely the same type, namely, union of aromatic nuclei by elimination of hydrogen halide by means of potassium hydroxide. There are some inconsistencies. Aromatic rings are sometimes shown with Kekulé double bonds and sometimes not; it is curious to find potassium alcoholate listed in one place as a reagent for the preparation of  $\alpha$ -isonitroso-ketones and in another place sodium nitrite. Also, it is a little odd to find acetic acid and sulphuric acid among the reagents used for nitration. The formulæ appear to have been transcribed exactly from the Swiss edition, even to the errors which have been detected in the formulæ given under numbers 192 and 695. In some cases translation has been accompanied by the appearance of new errors. Thus, in section No. 147 the name of an author is spelt incorrectly and in section No. 152 2-acetylfluorene is erroneously given as 8-acetylfluorene. These, however, are minor matters, and the author is to be congratulated on a courageous attempt to fill a serious gap in the literature of organic chemistry.

J. W. Cook

## BIOLOGICAL STANDARDIZATION OF VITAMINS

### The Biological Standardisation of the Vitamins

By Dr. Katharine H. Coward. Second edition. Pp. vii + 224. (London: Baillière, Tindall and Cox, 1947.) 16s. net.

**S**INCE the early 1930's, Dr. Katharine Coward has worked untiringly to popularize sound methods of biological standardization of vitamins. The first edition of her book appeared in 1938. In bringing out the second she has the satisfaction of preaching to the almost converted. The last ten years have seen no spectacular change in the principles of biological assay of vitamins, but much refinement of technique and broadening of scope. Dr. Coward has catered for both, but has followed her original plan of discussing only those tests of which she has personal experience and only those vitamins for which international standards are available. This strictly orthodox approach is perhaps too harshly restrictive; of the whole gamut of the B vitamins now known in the pure form, vitamin B<sub>1</sub> is the only one considered; a mention of riboflavin, pyridoxin and pantothenic acid, for which reliable tests are available, would certainly have been useful.