U.S. NATIONAL SCIENCE FOUNDATION SUPPORT FOR THE DISSEMINATION OF SCIENTIFIC INFORMATION

A PAMPHLET on the dissemination of scientific information, issued by the National Science Foundation *, outlines the Foundation's programmes to discharge the responsibilities for interchange of scientific information and support of the dissemination of such knowledge placed on it by the Congress Act of 1950, and extended in 1958 by directives from the Congress and from the President. An Act of 1958 also established a Science Information Council to be an advisory group to the Foundation's Office of Science Information Service. The Foundation's programmes have two fundamental objectives: promotion of newer and better techniques for handling and disseminating scientific information, and making existing systems more effective. Its scientific information activities are carried out under five programmes organized in two Sections: the Studies and Support Section, which includes programmes of basic studies, improved processes and systems and support of communication; and the Science Information Co-ordination Section, which includes programmes of Federal science information and of the domestic and foreign science information.

Under the first section, support is provided for research development, experimental application and evaluation of systems of information retrieval, mechanical translations, libraries and publications, with the principal emphasis on improving basic understanding of general problems rather than on establishing particular systems. The Foundation continues to support long-range research on systems for the automatic processing of natural language text with the eventual aim of mechanizing procedures for indexing, abstracting, organizing and storing information. Research in mechanical translation is a part of this broader field, while, in the work on publication systems, projects have been undertaken to analyse the part played by computers in scientific publication and to investigate machine recording of textual information during the publication of scientific periodicals.

As part of the Foundation's general programme for strengthening the science library network of the country, the information systems programme is seeking ways to improve the effectiveness of those libraries which provide substantial science information services. The publication support programme provides support for journals publishing results of original research, as well as temporary financial assistance for the cover-to-cover and selective translation of research published in Russian, Japanese and Chinese. Any publication considered favourably for support must be making, or showing good promise of making, a significant contribution to the scientific research literature; moreover, its proposed mechanics of publication must be efficient and economically sound.

The principal interests of the programmes for science information co-ordination are to promote non-Federal science information activities in the United States and to co-ordinate these with developments in foreign countries. Two major federal information centres are supported and administered. The first is the Science Information Exchange, which acts as a clearing house for information on current research, while the second is the National Referral Center for Science and Technology, located at the Library of Congress.

* National Science Foundation. *Programs for Improving the Dissemination of Scientific Information.* (*NSF*–64–22.) Pp. 15. (Washington, D.C.: National Science Foundation, 1964.)

RESEARCH ON SHELTER IN AGRICULTURE AND HORTICULTURE

THE effects of exposure to wind are of direct concern to agriculture, horticulture and forestry, and the practice of using shelterbelts and non-living windbreaks to reduce local levels of wind is of long standing. The broad picture of reduced windiness, altered microclimatic conditions and improved production of crops in the vicinity of windbreaks is generally established; the detailed analysis of these influences is, however, still incomplete. Research into the effects of shelter on microclimate and crop yields began in the early years of this century in a few countries, gained momentum in the United States and U.S.S.R. during the 1930's and, after 1945, attracted much wider interest and support. Early research was concentrated on determining the most suitable type of windbreak for a particular situation and providing a local measure of the benefit likely to be derived from shelter. More recently, it has become necessary for a more fundamental approach to the understanding of the nature and value of shelter: better definition of the physical environment near the ground arising as a result of shelter, and of the relationships between environment and biological processes in both crops and animals. Consequently, it is appreciated that further developments in the field of shelter research must be reviewed periodically in the light of developments in other environmental studies such as agronomy, ecology, micrometeorology, plant and animal physiology and nutrition.

In order to provide for closer communication between research workers in the various fields relevant to the question of shelter, the Ministry of Agriculture, Fisheries and Food, through its Shelter Research Planning Group (now Shelter Research Committee), arranged a first symposium on shelter research at Aberystwyth in 1962 (*Nature*, **194**, 1130; 1962). The success of this venture led to a second symposium arranged in co-operation with the Department of Agriculture and Fisheries for Scotland and held at Edinburgh on September 15–16, 1964.

In the second symposium, sessions were again divided between horticultural and field crop aspects of shelter, meteorological developments associated with shelter, and shelter in relation to livestock. In a paper on wind speed and plant growth, Dr. R. M. Wadsworth (University of Reading) dealt with the effect of wind on plant environment and on plant growth as measured by such parameters as relative growth rate, net assimilation rate and leaf-area ratio. Laboratory experiments under controlled wind conditions have suggested that the optimum wind speed for plant growth varies according to other environmental conditions, being between 0·5 and 3 m/sec for very favourable conditions and lower for less favourable conditions. Since wind affects growth to a greater extent when plants are isolated, windbreaks may be more essential in the early life of a crop than later. Low light intensities may also suggest a greater need for wind reduction, whereas light winds are likely to prove increasingly beneficial as light intensity increases in order to prevent reduction in CO_2 availability.

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Mr. W. H. Hogg (Meteorological Office, Bristol) reviewed recent horticultural investigations at Rosewarne and Stockbridge House Experimental Horticultural Stations. At Rosewarne, variations in the local climate between shelter hedges have been observed over a 3-year period. Although higher rates of wind speed and evaporation than at the control station were found with certain wind directions, air temperatures and soil temperatures at 2-, 4- and 8-in. depths were consistently higher than in the controls. At Stockbridge House changes in the degree of shelter in relation to the height growth of a young shelterbelt are being examined.

On the subject of shelter effect on crops, Prof. J. N. Black (Department of Forestry and Natural Resources, University of Edinburgh) pointed out that the Agricultural Research Council was financing a new research programme at Edinburgh, which it was hoped would reveal the role of wind in limiting crop production in the exposed arable and pastoral areas. Reviewing previous work in this field from the point of view of future investigations on crop aspects, Dr. J. M. Caborn (University of Edinburgh) suggested that it was necessary to explore the manner in which environmental changes near windbreaks are translated into crop growth and development. A suitable approach might be a detailed study of the heat and water balance of a sheltered area in conjunction with growth analysis of the protected crop.

In the livestock shelter session, papers were presented on present research projects at the Hannah Dairy Research Institute, the Hill Farming Research Organization and the Rowett Research Institute. Drs. K. L. Blaxter, J. P. Joyce and A. J. F. Webster (Hannah) discussed four aspects of their investigations of environmental stress in sheep and cattle: the effect of wind and rain on metabolism; radiation heat loads on sheep as related to incident radiation on a horizontal surface; the time taken by sheep to attain metabolic equilibrium on exposure to cold; and the derivation of a general equation for estimating the thermal demand of an environment. The effects of heavy rain and of wind are approximately similar so far as heat losses are concerned, and the immediate effect of heavy rain has been found to increase heat production by about 30 per cent, provided the ambient temperature is below the animal's critical temperature. The heat derived from total solar radiation at 55° North under clear skies in mid-winter appears to be about a quarter of that produced by metabolism, whereas in mid-summer it is 10 times as great. Part of the cold stress in Scotland may stem from overcast conditions and consequent diminution of the heating effect of solar radiation. Heavily fleeced sheep also take a longer time than shorn animals to adjust to cold. It is encouraging to note that a rational formula has now been derived which enables heat losses of sheep to be predicted from fleece length, solar radiation, air temperature and wind velocity.

Turning to management aspects, Dr. J. M. Doney (Hill Farming Research Organization) felt that the response to climatic exposure, both physiological and in terms of economic production, was complicated by the nature of the annual cycle of nutrient intake and by the animal genotype involved. At levels of production provided by prevailing hill farm management systems, centred around the present well-adapted hill breeds, the provision of shelter could be quite uneconomic in terms of production increase; on the other hand, changes in management affecting the annual nutrient cycle might demand a change of breed structure and, hence, of the need for shelter. Dr. E. Cresswell (Rowett) reported that energy conservation, in the form of better gains and/or less food consumption, in fattening sheep provided with shelter had not been found so far in their studies. In the discussion which followed it was suggested that, although much of the research in this field so far has concentrated on shelter for the animal, more attention might be given to improving the herbage on hill land, and in this context shelter might be important.

Dr. R. W. Gloyne (Meteorological Office, Edinburgh) surveyed recent developments in instrumentation available for field experiments on shelter and the problems of analysis of data from long-term investigations of the influence of a series of shelterbelts on the climate of a previously exposed hill in North Wales.

In a closing address, the chairman of the Shelter Research Committee, Mr. R. G. A. Lofthouse, referred to the value of these meetings in co-ordinating research related directly or indirectly to shelter, in exchanging information and ideas and, particularly, in reviewing from time to time the present state of research and future needs.

J. M. Caborn

WEIGHTS AND MEASURES

TWELFTH GENERAL CONFERENCE

THE twelfth General Conference of Weights and Measures was held at the Centre International des Conférences in Paris during October 6–13, 1964, under the chairmanship of M. Poivilliers, President of the Paris Academy of Sciences, and was opened by M. Louis Joxe, Minister of State, deputizing for the Minister of Foreign Affairs of the French Republic. Delegations from 37 of the 40 States signatory to the Metric Convention took part in the conference, the United Kingdom being represented by the Director of the National Physical Laboratory and the Superintendent of the Standards Division, National Physical Laboratory. The business of the conference is best summarized by reference to the ten resolutions which were adopted; six were concerned with units and standards of measurement and the remainder with administrative and financial matters.

In the first category the most important was resolution 5 (standard of time-interval) which expressed the need to adopt an atomic or molecular frequency standard for accurate measurements of time-interval but stated that, despite the advances made with the caesium frequency standard, the moment had not yet come to discard the astronomical definition of the second*. This was because the hydrogen atom (and possibly the thallium atom) might furnish a standard more precise even than the caesium atom, which already provides a frequency standard reproducible in different laboratories to the order of 1 part in 10^{11} (equivalent to 1 sec in 3,000 years). Nevertheless, as recognition of the use of atomic and molecular frequency standards in physical measurements of time could not be further delayed, the resolution authorized the International Committee of Weights and Measures to designate atomic or molecular standards for temporary usage for this purpose; it also invited those organizations and laboratories which are expert in this field to continue their investigations so that a final recommendation for an atomic or molecular definition of the second may be prepared in due course.

In the declaration made later by the International Committee the first standard to be so designated is the transition between the hyperfine energy levels $F =$

* The second, adopted by the International Committee of Weights and Measures in 1956 and ratified by the Eleventh General Conference in 1960, is equal to the fraction 1/31 556 925·974 7 of the tropical year for 1900. January 0 at 12 h ephemeris time. This ephemeris second is made available in practice with the aid of atomic clocks, but only retrospectively as an average value over several years, by means of observations of lunar position; it is reproducible at present to the order of 2 parts in 10^9.

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