

An informative analysis was given of the different methods of bush-clearing employed in the Groundnut Scheme in Tanganyika, together with the costs of each operation. Much of the heavy equipment, particularly that used for the removal of roots, caused severe damage to the soil, and the current view is that lighter implements should be used wherever possible. Dr. Bunting concluded by saying that it is not generally appreciated how much detailed information on the bush-clearing techniques had been obtained in Tanganyika and that this information would be of great value in the planning and execution of clearing projects.

The second paper, entitled "The Present Role of Arborescences in Bush and Forest Clearance", was given by Mr. J. D. Fryer, of the Agricultural Research Council Unit of Experimental Agronomy, University of Oxford. The paper was in two parts. The first section reviewed the development of chemicals for killing individual trees or scrub either by individual treatment or by overall spray application. The second part summarized some work on arborescences carried out in Tanganyika and Kenya by members of the Unit of Experimental Agronomy working in conjunction with various organizations in East Africa.

Of the many chemicals that have been tested, arsenical compounds have proved to be by far the most successful, and they are at the present time widely employed in forestry and plantation work for the local treatment—in frill girdles, bark notches or auger holes—of unwanted trees. There is, however, a definite need for non-poisonous substitutes, and much work has been done during the past ten years in an attempt to find materials that are both efficient and safe. The most promising is undoubtedly ammonium sulphamate; but the synthetic growth regulators 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) have also given good results when applied in the same way as arsenical compounds, particularly with smaller trees. These phenoxyacetic acids also show promise when applied in an oil carrier to the bark of the trunk as a basal band of one or two feet. This treatment in effect 'girdles' the stem by killing the bast and cambium and may also destroy dormant buds, thus preventing or reducing regeneration.

During the past few years considerable advances have taken place in the destruction of bush or scrub by arborescences. Extensive areas of scrub along roadsides, under power and telegraph lines and in grassland are being sprayed each year in the United States and Canada with good results; this practice is being developed in other countries, particularly New Zealand. The chemical most commonly used for this work is 2,4,5-trichlorophenoxyacetic acid, generally as a long-chain ester, applied either alone or mixed with 2:4-dichlorophenoxyacetic acid. For overall applications from the ground, oil/water emulsions are often applied in a relatively high volume per unit area; but when application is made by aircraft more concentrated oil solutions or emulsions are employed. Ammonium sulphamate in an aqueous solution is also being widely used as an overall application from the ground.

The investigations in East Africa have been mainly of two types: the development of arborescences for the control of regenerating bush of the types found in tsetse-fly barrier clearings in Tanganyika, or for the destruction of *Isobertinia-Brachystegia* bush in Nyasaland, which is characteristic of large areas where

shifting cultivation is practised by the natives; and secondly, the testing and assessment of the value of chemicals as defoliant of woodland as an aid to tsetse-fly control. The results to date of spraying regenerating bush indicate that a complete kill is unlikely to be obtained with the existing arborescences because they are not transported in toxic quantities to the roots and because the species which are adapted to frequent cutting and firing sucker freely from the roots. The overall spraying by aircraft of the butyl ester of 2,4,5-trichlorophenoxyacetic acid on to an area of forest in Kenya resulted in defoliation and death of a great many woody species, including large *Ficus* trees and two succulent species of *Euphorbia*. The role of a defoliant in increasing the light intensity and thereby allowing the rapid growth of the grasses during the rainy season was of particular interest, since a normally unburnable vegetation was destroyed by fire during the following dry season. Further work on arborescences in East Africa is now being carried out in conjunction with the Unit of Experimental Agronomy at Oxford.

After a short discussion, the meeting was closed by Sir Harold Tempary, who said that there is no doubt that, if world food production is to keep pace with the increasing population, extensive clearing of land will have to be undertaken prior to agricultural development and that the techniques and principles of bush and forest clearing discussed during the meeting are likely to have a very real value.

SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES ANNUAL CONGRESS

At the invitation of the Maidstone Scientific and Antiquarian Society and the Mayor and Corporation of Maidstone, the South-Eastern Union of Scientific Societies held its fifty-ninth annual congress at Maidstone during June 10-13 under the presidency of Dr. Glyn Daniel. The local committee for the Congress was under the chairmanship of Sir Garrard Tyrwhitt-Drake, with L. R. A. Grove as local secretary. At the young naturalists' evening Maxwell Knight lectured on "The Hand Rearing of a Cuckoo", illustrating his remarks with lantern slides.

The presidential address to the Archaeological Section, on "The Present State of Monastic Archaeology in Kent", was given by F. C. Elliston Erwood, who dealt with the development of monastic buildings, using Kentish examples to illustrate his points. In mentioning the difference between usual monastic buildings and those of orders of military origin, he emphasized the scope for the examination of the latter within the county. G. E. Newell gave the presidential address to the Zoological Section, his subject being "Animal Zones of the North Kent Coast". He said that the physical environment, the exposure of animals for long periods by tidal action twice daily and large thermal differences demand a toughness in the faunal population. The direction of the beach drift is from east to west, opposite to that often suggested as existing in the Thames Estuary.

Dr. Glyn Daniel's presidential address to the Union was on "The Art of the Megalith Builders". He commenced by saying that although Stonehenge had been examined and studied for a great number of years, it had only recently been noticed that some

of the stones had engravings, or decorations, upon them. He then spoke of the engravings on Megalithic stones in Anglesea (circles, lozenges and wavy designs), suggesting they may have been derived from Irish sources, and he compared them with similar patterns on examples in Brittany, Spain, Portugal and along the northern Mediterranean shore to its eastern limit, where engravings of an anthropomorphic character are well advanced. His address was illustrated by excellent lantern slides of subjects very difficult to photograph.

J. E. Lousley, as president of the Botanical Section, spoke on "The Amateur Botanist in 1954", saying that although botanical work now is so highly specialized that, besides expert knowledge, a modern laboratory is necessary, there still remains a great deal of work which can be successfully undertaken by the amateur. Mass observations on species and habitats are needed, and examples where amateurs can assist in collaboration with professional botanists are: a rose survey (charts would be provided and specialized knowledge is unnecessary); records of plant distribution within the vice-counties (plotting species upon maps using the 10-km. grid scale and marking with dots within the grid squares); noting the variation in numbers of a species in a known colony over a number of years; and the study of life-histories and of the method of conveyance of plants to new habitats, especially by the germination of seeds from bird droppings collected after careful observation. H. E. P. Spencer chose, for his presidential address to the Geological Section, the theme of "The Pleistocene Period and Work for the Amateur Geologist", and dealt with his recent work in East Anglia. He said that much remains to be investigated regarding the correlation of the fauna of the interglacial periods, and he suggested that amateurs could render considerable help by recording and collecting from temporary exposures. Norman Cook addressed the members on "Early English Antiquaries":

At the general assembly of the Union schemes for the development of its work were discussed and subjects for investigation outlined. Despite bad weather conditions, the full programme of excursions was carried out. The archaeologists visited the Roman villa in course of excavation at Lullingstone, the Keep at Eynsford Castle now being excavated by the Ministry of Works, and Bodiam Castle. The botanists and zoologists went to Funton Creek, Queendown Warren, Bedgebury Pinetum and the Maidstone Zoo at Cobtree Manor. The geologists had an excursion to the Peninsula of Hoo to study the Tertiaries, the Chalk outcrop and the history and development of the North Kent marshes.

The sixtieth annual congress of the Union will be held next year in Folkestone during April.

BASIC SCIENTIFIC RESEARCH AND PUBLIC POLICY IN THE UNITED STATES

DESPITE the concern still being expressed in the United States regarding the adequacy of support for fundamental research, of which Dr. W. D. Coolidge's plea for more fundamental research effort (see *Science*, 119, 110; 1954) is a recent example, there is not the same sharp note of anxiety on this score in the third annual report of the National

Science Foundation*. Removal by Congress of the 15 million dollar ceiling upon annual appropriations to the Foundation has permitted the Foundation to assume greater responsibility for the support of basic research; and the Board of the National Science Foundation has been encouraged by the sympathetic understanding of its problems by many members of Congress, although misunderstanding of science and its methods is still widespread. Wider public understanding of science, scientists and the implications of scientific development is of vital concern, in the view of the Board, not only to the Foundation itself, but also to the Federal and State Governments, academic institutions and industrial concerns.

The limits of expenditure on fundamental research are now set, the Board believes, not by financial resources but by the numbers of men and women with the capacity, interest and willingness to pursue science. They constitute a restricted section of the population, and science is not the only profession calling for high intelligence and disciplined ability. Accordingly, solutions to many current problems reside in the long-term functions of the National Science Foundation, and in his foreword to its annual report, Mr. Chester I. Barnard, chairman of the Board, makes it clear that the Foundation is increasingly concerning itself with these long-term functions.

Fundamental research has three relatively immediate consequences: the production of scientific workers; the production of new knowledge, much of which may prove useful in ways unforeseeable to-day; and the application of the results of research to the solution of practical problems. These consequences could encourage a tendency to utilize the Foundation for secondary purposes and administrative convenience, or else government interposition in science to an extent which, by attempting to dominate, might destroy it. Mr. Barnard insists that the Board is alive to these dangers and determined to operate so as to minimize them; and this contention is fully supported by the most important section of the director's report, namely, that dealing with science and public policy.

The detailed work of the Foundation during the year is described by Dr. A. T. Waterman. Studies carried out by the Foundation of the Federal Research and Development Budget on which he here comments have already been noted in *Nature* (172, 575; 1953). Dr. Waterman states specifically that it will be desirable to review periodically the relative support furnished to fundamental and applied science; but he points out that centralization of support of fundamental research in the Foundation will not be in the best interests of science unless, together with other research agencies, the Foundation can provide sufficient support for fundamental research to bring it in balance with the support given to applied research and development. Moreover, if operating agencies are to carry on fundamental research programmes directly related to their operating functions, they must be assured of a continuous direct flow of fundamental knowledge relating to their practical problems, and their staff should be in effective touch with other scientific workers.

Dr. Waterman's report indicates certain steps already taken by the Foundation towards the

* The Third Annual Report of the National Science Foundation. Year ending June 30, 1953. Pp. vii+110. (Washington, D.C.: Gov. Printing Office, 1953.) 40 cents.