associated with the relaxation process in high polymers and suggested that this was because these were concerned with disturbances over large molecular areas of the material and not only with one bond.

Questions by Prof. Ubbelohde, Dr. Mansel Davies (University College, Aberystwyth) and Mr. B. Warburton (Distillers Co.) on matters arising from his paper were answered by Mr. Reddish. Dr. Greaverson (Shell) presented measurements on mechanical relaxation in polyethylene, Dr. G. Allen (University of Manchester) measurements on mechanical relaxation on rubber, and Dr. C. Brot (Paris) reported dielectric studies on liquid mono-alcohols of medium chain-length which showed three dispersion regions; these he interpreted in terms of molecular mechanisms.

In the second part of the meeting, Dr. J. H. Andrea (Imperial Chemical Industries, Research Department) presented results of ultrasonic relaxation measurements in liquids, ranging from low frequencies (100 kc./s.) where chemical equilibria involving rotational isomers may be perturbed by the sound wave and ultrasonic absorption observed, to the high frequencies (100 Mc./s.) where association-dissociation equilibria or slow redistribution of energy between translation and vibration may give rise to measurable ultrasonic absorption.

Dr. Andrea outlined ultrasonic measurements made by Dr. Lamb and his collaborators (Imperial College of Science and Technology, London) which gave values for the heats and entropies of activation in the passing from one rotational isomeric form to another, with particular reference to the substituted cyclohexanes. This gave a new method of measuring potential barriers hindering internal molecular rotation. He described the existence of an anomalous absorption region in toluene the origin of which is as yet unexplained.

Mr. J. Barlow (Imperial College of Science and Technology, London) described research in conjunction with Dr. Lamb, in which ultrasonic techniques were being used to determine the shear mechanical impedance of lubricating oils, as part of an investigation into the influence of the relaxation behaviour of molecules on lubrication. Measurements had been made for frequencies of the cyclic shearing stress in the region 10^4 – 10^8 c./s.: the effective range could be extended by variation of the temperature and pressure of the oil under test. All the experimental results for a given oil could be reduced to a single curve for each component of the complex shear modulus. This

information was then analysed in terms of a spectrum of relaxation times. Qualitative correlation could be made between the relaxation spectrum and the proportions of the various hydrocarbon types in the oil.

Dr. J. C. McCoubrey (Imperial College of Science and Technology, London) gave a résumé of work on ultrasonic relaxations in gases which could be used to give quantitative transition probabilities for the process in which a molecular vibration was de-excited from the first vibrational level to the ground-state by a collisional mechanism. Some theoretical explanation of these transition probabilities in terms of molecular parameters could be given, but this was inadequate to explain the dependence of ultrasonic relaxation times on temperature. A new technique involving the use of interferometry to study the changes in density across a shock front in gases in which ultrasonic relaxation had been observed could yield measurements of the translation-vibration transition probabilities at temperatures up to $3,000^\circ$ K., providing valuable tests for theories over a wide temperature-range.

In the general discussion, possible explanations of ultrasonic relaxation observed in toluene were suggested by Dr. J. A. Pople (National Physical Laboratory), Prof. H. C. Longuet-Higgins (Cambridge) and Dr. N. Sheppard (Cambridge). Some recent measurements on ultrasonics in gases were discussed by Mr. J. D. Lambert (Oxford), Dr. A. MacColl (University College, London) and Mr. T. L. Cottrell (Imperial Chemical Industries, Ltd.).

Finally, two new techniques giving information about relaxation times in energy transfer in gases were discussed. Dr. R. W. B. Stephens (Imperial College of Science and Technology, London) described an apparatus in which interrupted infra-red radiation is absorbed by a gas, and the vibrational energy taken up reappears as translational energy in the form of a pressure rise out of phase with the radiation input. The lag in phase depends on the relaxation time and this has been used to study relaxations in carbon monoxide and carbon dioxide.

Dr. A. G. Gaydon (Imperial College of Science and Technology, London) described an adaptation of the sodium-line reversal technique to the measurement of temperature changes in shock waves in gases showing relaxation. This procedure is probably capable of giving relaxation times at high temperatures more accurately than the interferometric study of density changes. J. C. MCCOUBREY

PLANT MORPHOGENESIS

A SYMPOSIUM on "Experimental Approaches to the Problems of Growth and Form in Plants", arranged by the Experimental Morphology Group of the Linnean Society, was held under the auspices of the Society in London during December 19–20. The symposium attracted a large and representative audience and was, in fact, an unusually interesting and successful occasion. It is probably true to say that this was one of the most varied and comprehensive treatments of plant morphogenesis that has been witnessed in Great Britain in recent years. (So considerable was the audience that the meetings had to be transferred to the rooms of the Geological Society.)

The papers presented at the symposium, some twenty in all, covered a wide range and explored the many aspects of morphogenesis by diverse experimental techniques. This wide spread of interest brought its own difficulties—the usual one on such occasions—that there was, unfortunately, all too little time for discussions.

It had been arranged that some of the longer contributions should be in the nature of general surveys. The opening paper, by Prof. C. W. Wardlaw, was of this kind, and dealt with observational, experimental and analytical methods which have contributed to our understanding of plant morphogenesis; Prof. L. J. Audus discussed both in general terms

and with citation of specific examples the mechanism of correlation in plant development; Prof. J. Heslop Harrison similarly dealt in broad outline and in some detail with certain concepts of the action of growth substances in flower morphogenesis; and Dr. P. W. Brian gave an interesting account of morphogenetic situations in which the gibberellic acids were more or less directly involved. Also in the category of more general surveys, Dr. L. C. Luckwell outlined the very considerable scope for work on the factors controlling the growth and forms of fruits, and outlined some of the contemporary studies and achievements.

Among the many investigations of growth and form presented to the meeting, it was interesting to note that the algae (Dr. E. M. Burrows), fungi (Dr. N. Robertson) and mosses (Dr. J. H. Tallis; Dr. E. Lodge) had attracted their share of attention, as, indeed, they well might. Perhaps the most evident omissions were papers dealing with the contributions of tissue- and organ-culture techniques to morphogenesis; little was said about the action of physical factors in morphogenesis and, with some exceptions, genetical factors tended, on the whole, to be taken for granted and treated, as it were, in passing.

Considerations of space do not admit of detailed reference being made to the many papers contributed to the symposium. A high standard of interest was certainly maintained throughout. In the circumstances, the scope and vitality of contemporary work on the many aspects of morphogenesis in British universities and horticultural institutes may perhaps be indicated by citing the titles to which reference has not already been made: effects of environment on leaf development in *Impatiens parviflora* (Dr. A. P. Hughes); some factors affecting the production of stolons in the potato (Dr. A. Booth); the study

of apical development in relation to etiolation (Dr. G. R. Lane and Mr. R. D. Butler); the experimental investigation of the pteridophyte life-cycle (Mr. P. R. Bell); changes in leaf arrangement in individual fern apices (Dr. E. G. Cutter); some growth responses to gibberellic acid (Dr. M. Y. Stant); the effect of very long days on the flowering of winter rye (Prof. F. G. Gregory and Dr. Olive N. Purvis); some effects of environment and hormone treatment on reproductive morphology in *Chrysanthemum* (Dr. W. W. Schwabe); floral morphogenesis in *Primula bulleyana* (Dr. F. Cusick); problems of juvenility and flowering in trees (Prof. P. F. Wareing); temperature-induced meristic and other variation in *Cannabis* (Dr. Y. Heslop Harrison and Miss I. Woods).

A complete number of the Linnean Society's *Journal of Botany* is being devoted to publishing the contributions to the symposium, and the papers are already in the hands of the printers. As it is anticipated that there will be a larger demand than usual for this number of the *Journal*, all those who are not Fellows or Associates of the Society, and who wish to have copies, should write for particulars, as soon as possible, to the General Secretary of the Linnean Society, Burlington House, Piccadilly, London, W.1. Early publication will not only make available a fund of valuable contemporary information but is also likely to provide a useful stimulus to further effort in this fascinating and central field of botanical science.

The officers of the Linnean Society are to be thanked for rendering a signal service by sponsoring the meeting. Thanks are also due to Prof. Heslop Harrison and Mr. P. R. Bell, who were responsible for the inception and arrangement of the symposium, and they are to be congratulated on the success of its meetings.

C. W. WARDLAW

SCIENTIFIC COUNCIL FOR AFRICA SOUTH OF THE SAHARA

THE report* of the Secretary-General to the ninth meeting of the Scientific Council for Africa South of the Sahara, held at Accra during August 7-16, which surveys the activities of the Council during the year, is supported by lists of forthcoming meetings and of publications in 1958, and by particulars of the conclusions and recommendations of the Conference. Among the general conclusions of the Conference may be noted the Council's view that the Foundation for Mutual Assistance in Africa South of the Sahara will become one of the most active elements of the Commission for Technical Co-operation in Africa, and the emphasis placed on the very careful examination of each request for technical assistance in Africa in order to determine the best way of meeting it effectively. The Foundation now incorporates the earlier organization for the exchange of scientists and technicians.

Concern is again expressed at the accelerated rhythm of useless destruction and inconsiderate exploitation of Nature and natural resources, and the attention of Governments is directed to the need for agreement at inter-African level in the protection of this common economic and scientific inheritance. Such protection must be based essentially on a policy

of rational utilization, and the Council recommended the urgent establishment of a committee for the conservation of Nature and natural resources in all African territories where no such organization exists; the appointment of an inter-African scientific correspondent responsible for ensuring liaison between the various territorial committees, to follow the evolution of common problems, and to keep the Commission and the Council informed; and the preparation of a charter for the protection of natural resources applicable to all territories in the African continent. The protection visualized by the Council comprises the management and supervision of areas which are properly exploited so that the amount of products consumed is commensurate with real social and economic needs and the possible renewal of resources; the establishment of adequate protective areas as indispensable reserves of flora and fauna; and the establishment of national parks and special reserves to protect certain resources of particular interest or value, which would otherwise become extinct or be rapidly exhausted.

Some change in the functions and activities of the Inter-African Bureau of Soils is recommended to the Third Inter-African Soils Conference to meet in the autumn of 1959, and the establishment of a panel of correspondents is recommended, as a matter of urgency, to cover physical oceanography, marine

* Scientific Council for Africa South of the Sahara. Publication No. 32: Ninth Meeting of the Scientific Council, Accra, 1958. Pp. 173. (London: Secretariat, C.C.T.A./C.S.A., 1958.)