

ineffective strain. Both types of nodules arose at points which were potentially the initials of side roots. Experiments on nodule and root-tip excision had furnished evidence of an inhibitory activity centred in the growing-points of root and nodule, so that in effective symbiosis the first-formed nodules tended to suppress the development of nearby nodules and lateral initials, whereas ephemeral ineffective nodules had no such effect.

Developments in fungal enzymology, most of which had relation to industrial fermentations and food technology, were reviewed by Dr. R. K. S. Wood (Imperial College of Science and Technology, London). In contrast, the enzymological aspects of parasitism had been incompletely studied. No enzyme capable of attacking cutin was known, and it was not clear whether the death of cells which followed the enzymatic maceration of cell wall was due to the enzyme or to a specific toxic substance. The various types of pectolytic enzymes, he said, are as yet not clearly defined because of incomplete knowledge of the various kinds of pectic materials present in plants. Cellulolytic and proteolytic enzymes will probably also have to be taken into account.

Dr. F. T. Last (Rothamsted Experimental Station) described the behaviour of the mildew fungus, *Erysiphe graminis*, in relation to growth of the cereal plant as modified by application of nitrogenous fertilizer. The effect of the fertilizer was to increase the relative growth-rate of the host to a maximum, after which it fell, a series of changes which was paralleled by the curve of degree of infection per unit area of leaf. Growth-rate of host and susceptibility to mildew increased with increasing doses of nitrogen, large increases in infection being shown for small changes in relative growth-rate when the latter was high, and vice versa. When the same dose of nitrogen was given to nitrogen-deficient plants of two sizes, the initially smaller plants became more susceptible to mildew.

A report was given by Miss J. M. Wright and Dr. P. W. Brian (Butterwick Laboratories of Imperial Chemical Industries, Ltd.) of the isolation from some strains of *Alternaria solani* of a product—referred to as alternaric acid—which had antifungal properties and was also markedly phytotoxic. Dilute solutions (1 p.p.m. or less), when taken up by cut shoots of tomato or potato, produced lesions in stems and leaves which were similar to those formed in natural attack by the fungus. The water-absorbing efficiency of the plant was reduced, with consequent loss of turgor and desiccation. The presence of this substance has been demonstrated in tissues invaded by the fungus. No correlation, however, was obtained between the pathogenicity of various strains and their capacity to produce this acid. Strains of *A. solani* produced a variety of toxic substances, and it would be unsafe at the moment to associate pathogenicity with any one of these to the exclusion of the others.

Finally, Mr. I. A. S. Gibson (Overseas Food Corporation, East Africa) referred to a disease of groundnuts caused by *Aspergillus niger*. Experiments carried out with five members of the group to which *A. niger* belongs showed that they covered a wide range of pathogenicity and that there was a correlation between this and their acid-producing capacity. The acid primarily concerned was oxalic acid. Growth products from pathogenic strains gave the same effects on host tissue as the appropriate concentrations of oxalic acid. Invasion of the plant

by *A. niger* led to collapse and death of the cells in advance of fungal growth, thereby indicating the presence of a toxic precursor to invasion. It appeared, therefore, that oxalic acid played an important part in the establishment of this parasite in the host tissue.

W. BROWN

INTERNATIONAL COMMITTEE FOR ELECTROCHEMICAL THERMODYNAMICS AND KINETICS MEETING IN BRITAIN

THE fourth meeting of the International Committee for Electrochemical Thermodynamics and Kinetics (Comité International de Thermodynamique et de Cinétique Electrochimiques) opened in the Chemistry Department of the Imperial College of Science and Technology, London, on September 10 and continued during September 11–13 in the Department of Metallurgy, University of Cambridge. The aim of the Committee is to provide an international body of those interested in fundamental electrochemistry, especially electrode processes, and to promote contact between these workers and those interested in applied and industrial electrochemistry.

The organization of the London part of the meeting was carried out by Dr. J. O'M. Bockris and that at Cambridge by Dr. T. P. Hoar (vice-president). Among distinguished foreign visitors to the meeting were Profs. G. Charlot (Paris), H. Fischer (Berlin), K. Huber (Berne), E. Lange (Erlangen), R. Piontelli (vice-president, Milan), M. Pourbaix (secretary, Brussels), A. J. Rutgers (Ghent), A. U. Traghardt (Stockholm), G. Valensi (Poitiers), and P. van Rysselberghe (president, Oregon). Among the British electrochemists present in addition to Drs. Hoar and Bockris were Prof. W. F. K. Wynne-Jones and Drs. J. N. Agar and R. Parsons.

In London a lecture was given by Dr. Bockris on "Electrochemical Research at Imperial College", and in Cambridge a lecture by Dr. U. R. Evans entitled "Corrosion Research at Cambridge". About forty papers were presented at the meeting. P. van Rysselberghe treated the theory of polarization in terms of the thermodynamics of irreversible processes and showed how the laws between current and overpotential may be thermodynamically deduced at low current densities. Thermodynamic considerations can be of considerable application in the examination of the complex kinetic processes which occur in, for example, corrosion. The same author also showed how a consideration of the Peltier heats in concentration cells may open up a new approach to the old, but unsolved, problem of absolute electrode potentials. Difficulties preventing progress in the theory of the electric double layer were considered by J. O'M. Bockris. Among these are those connected with the inadequate definition of potential differences at phase boundaries. The independence of the capacity of the negative branch of the electrocapillary curve upon the cations present is still a difficult problem but may be explicable in terms of a model of the solvated ions in the double layer. The importance of attempts to calculate the surface potentials associated with adsorbed dipoles and electron overlap at metal solution interfaces was stressed.

H. Gerischer showed how the measurement of A.C. polarization resistance can help with the analysis of processes in metal deposition. Thus, in the case of silver ion deposition on silver from simple salt solution, it appears that the rate of the reaction is controlled by the building into the surface of the metal atoms and that discharge of the ions is rapid. Correspondingly, interesting data were presented by H. Fischer, who treated the various stages of action of an inhibitor in metal deposition in terms of the theory of crystal growth. T. P. Hoar described experiments which strongly suggest that dissolution of an anode which is undergoing polishing or brightening occurs through a compact solid film on the surface and that this film dissolves its outer surface as fast as it is formed at the metal/solution interface. This account summarized the points in favour of a theory which probably represents the essential solution of the long-standing problem of electropolishing. W. F. Franck showed that the polarization resistance measured at an attackable electrode suddenly changes at the equivalence point of a titration and illustrated how this property could be used in analysis.

Among other subjects treated were: the definition of a chemical potential in an electrochemical system; the influence of the electronic structure of a metal on the rate of an electrochemical reaction taking place at its surface; cathodic reduction of oxygen to hydrogen peroxide; the inhibition of corrosion; and the electrokinetic potentials of sols in silver iodide. The papers and the discussion material will appear in the *Comptes rendus* of the Committee, which is published yearly.

The Commission on Electrochemical Definitions and Nomenclature (J. O'M. Bockris, R. Defay, E. Lange, R. Piontelli, P. van Rysselberghe and G. Valensi) held several sessions in London and Cambridge and will publish a second report in the *Comptes rendus* for 1952. A Commission on Experimental Methods in Electrode Processes was formed, consisting of J. O'M. Bockris, H. Gerischer, R. Gauguin, R. Piontelli and G. Valensi, and will make its first report in 1953. The total attendance at the meeting was about seventy. The next meeting will be held at Stockholm in July of this year.

THE TIAN-CALVET MICROCALORIMETER IN SEED GERMINATION STUDIES

PROF. H. PRAT, of the Institute of Biology, University of Montreal, has described some preliminary investigations of thermogenesis in germinating seeds of various cereals, flax, tomato, etc., using the new Tian-Calvet calorimeter (*Canad. J. Bot.*, 30, 4, 379; 1952). The use and advantages of the new instrument are indicated.

The type of thermogenic curve obtained from the germination of wheat seeds seems likely to have a general application. Immediately upon the contact between the dry seed and water there is a quick, then a falling off, and then a more slowly developing, production of heat; that is, the curve shows a steep rise and fall and then a slow steady rise. The initial phase of rapid rise and fall in the curve is common to both living and dead seed and is ascribed to physico-chemical thermogenesis. The ensuing phase of depression may be endothermic or

weakly exothermic. The third phase of steadily increasing heat production, which corresponds to the onset of growth, with its concomitant respiration, is described as biological thermogenesis.

By using the new microcalorimeter it is possible to determine with considerable accuracy the effects on the thermogenic curve of such factors as temperature, dehydration of seed, ageing of seed, and additions of substances to the soaking water; for example, biological thermogenesis is increased by indoleacetic acid at low concentrations and diminished by alcohol and iron sulphate. A comparison of the thermogenic responses of different seeds opens a wide field of study: the interesting and suggestive preliminary data which are given seem likely to have both an academic and a practical importance.

RECENT MARINE BIOLOGY

THE first two numbers of Vol. 31 of the *Journal of the Marine Biological Association* cover a wide field in the studies of the seas and their inhabitants.

Three papers are further instalments in their respective series. Dr. G. P. Wells contributes his sixth paper on *Arenicola*, dealing with the proboscis of three species and its mode of action, in which there are beautiful photographs of both the exterior and interior of the proboscis. Dr. H. G. Vevers's fourth article on the biology of *Asterias rubens* describes the variation in the sex ratio; the highest percentage of females occurred in the period March-June and the lowest during January-February, and he found no trace of hermaphroditism. In his third paper on *Chaetopterus variopedatus*, Dr. J. A. C. Nicol discusses factors affecting the light response. Stimulation of the photogenic glands occurs through their nerve fibres; but augmentation of the response takes place locally in the glandular tissue itself. There is, however, a process of central facilitation in the nerve cord, most apparent in the posterior region of the body. The luminescent reaction is a triggered response which can be produced by a single stimulus.

There are three papers on Ascidians. Dr. R. H. Millar worked out the annual growth and reproductive cycle in *Diplosoma listerianum*, *Ciona intestinalis*, *Ascidella aspersa* and *Botryllus schlosseri*. Each species behaved as an annual, settling as a larva, breeding and dying within a period of from twelve to eighteen months; breeding occurred in summer. Miss P. Kott, in a résumé of certain compound Ascidians of the Plymouth area, with a description of two new species, considers that *Aplidium nordmanni* and *A. proliferum* are forms of the same species, and that Giard's *A. densum* is synonymous with the latter; Berrill (1950) regards them as distinct species. Obviously we require comparative details of specimens from different areas around the British coasts before lumpers or splitters are accepted as authorities.

Dr. J. S. Alexandrowicz has been able to complete his investigation, begun in 1931, of the innervation of the heart of *Ligia oceanica*. He found three systems of nerve elements—six neurons constituting a local system, a pair of nerves connecting this with the central system, and the nerves of the arterial valves; the alary muscles have their own innervation.

Dr. W. Wieser carried out an intensive population count of the microfauna inhabiting single tufts of seaweeds on the rocks below the Plymouth Labor-