

primordia, which may be orientated abnormally, continue to be formed on the meristem; but one or more buds may also arise. The observations reported here indicate that a zone at the periphery of the apical meristem is particularly reactive when the apical cell group is damaged, the majority of buds being induced in this region. The extent of damage to the apex may affect the sequence of organogenesis: when damage is extensive buds tend to be formed immediately, subsequent primordia developing as leaves; when the damage is confined to the apical cell, or extends to only a few of its segments, bud formation tends to be delayed. It is concluded that the effect of the apical cell on organ formation is exercised through the growth and organization of the apex as a whole.

E. G. Cutter (*ibid.*, 485) has also observed that in the shoot apex in *Dryopteris aristata*, maintained under conditions of progressive starvation for periods up to a year, the apex decreases very markedly in size; the size of leaf primordia at their inception decreases, but their size relative to the shoot apex increases; the rate of inception of leaf primordia decreases; the rate of morphological development of leaf primordia increases; there is a reduction in the system of phyllotaxis towards that characteristic of sporelings; the vascular system of the attenuated axes is dictyostelic, but there is a reduction in the number of meristemes in the axis and in the leaves.

## THE SCIENTIFIC CIVIL SERVICE PROMOTION OF INDIVIDUAL RESEARCH WORKERS

**S**PECIAL posts have been created in the Scientific Civil Service, as in previous years, under provisions included in the White Paper (Cmd. 6679: 1945), designed to provide for the promotion of individual research workers of exceptional merit. The promotions are effective from July 1, 1955.

### Chief Scientific Officer

Dr. P. B. Walker spent five years as a designer in the aircraft industry after postgraduate research in the University of Cambridge on fluid motion. Then in 1935 he joined the Royal Aircraft Establishment, Farnborough, and was a pioneer of the rational scientific approach to aircraft structural design in place of the old empirical formulæ. During the Second World War he was responsible at the Ministry of Aircraft Production for the supervision of the design of gliders and paratroop aircraft. Dr. Walker returned to the Establishment in 1945 as head of the Structures Department, where he concentrated on building up first the Flutter Division, and secondly the Aircraft Structural Fatigue Division, into flourishing teams with widespread reputations. In particular, his work on aircraft fatigue was of great importance in connexion with the investigation of the Comet aircraft, for which he was made C.B.E. In 1951 he delivered the Wright Brothers Lecture in Washington, D.C.

### Deputy Chief Scientific Officers

Mr. E. H. Cooke-Yarborough entered government service in 1940 and worked on the development of

airborne radar. Later he concentrated on radio counter-measures and also on guided weapons. In 1946 he became interested in atomic energy, and eventually joined the Atomic Energy Research Establishment, Harwell, where he is at present deputy head of the Electronics Division. Mr. Cooke-Yarborough is well known as a specialist in the design of electronic circuits, and during recent years he has been associated with the design of digital computers and the use of transistors; a new computer employing transistors as circuit components is now in use at Harwell.

Mr. B. Sykes joined the Royal Aircraft Establishment, Farnborough, in 1925 from the Imperial College of Science and Technology, London, and his early work was in the field of aircraft electrical engineering, covering such problems as electrically heated flying clothing and the design of a self-regulating generator for aircraft. During the Second World War he played a considerable part in the design and setting up for production of predictor gunsights, and since the War he has been increasingly concerned with general problems of air fighting.

Dr. P. C. Thonemann graduated from the University of Melbourne in 1940 and worked first at the Munition Supply Laboratories, Victoria, and then at the Research Laboratories of Amalgamated Wireless of Australasia, where he was concerned with propagation problems. Later he gained a Commonwealth research fellowship at the University of Sydney, studying physical phenomena in ionized gases, and assisted in the development of gas-discharge modulator switches. At the Clarendon Laboratory, Oxford, he continued to study gas-discharge phenomena and their applications in nuclear science, and this led to the production of the radio-frequency type of proton source which is now used almost universally in laboratories equipped with high-voltage sets for the acceleration of ion beams. Since 1949 he has directed the work of a group investigating the properties of highly ionized gases.

Dr. D. Williams entered the Royal Aircraft Establishment, Farnborough, in 1924 from industry, where he had served as a pupil apprentice after graduating in mechanical engineering from University College, Cardiff, in 1922. Following a few years on stress calculations and the supervision of experimental aircraft contracts, he began work in 1930 on aeronautical structural research. During recent years his research has covered a wide field, including the first complete mathematical theory of 'sandwich' construction, the response of aeroplane structures to dynamic loading, aero-elastic calculations, pressure-cabin problems, and the dynamic instability of systems incorporating pneumatic-tyred wheels.

### Senior Principal Scientific Officers

Mr. G. K. Adams graduated in chemistry from the University of Bristol in 1942 and then joined the Armament Research Department of the Ministry of Supply, where until the end of the Second World War he worked on the thermal decomposition of explosives and the evaluation and combustion of pyrotechnic compositions. In 1946 he joined the Explosives Research and Development Establishment, where he has carried out theoretical and experimental researches on combustion processes, especially on rates of flame propagation and of chemical reactions in flames.

Mr. R. Benjamin graduated in 1944 from the Imperial College of Science and Technology, London, and immediately joined the Admiralty Signal and Radar Establishment, where he is still serving. He has been mainly concerned with research in the fields of radar and electronics, and is the author or co-author of some ninety scientific reports and memoranda ranging from circuit design to the evolution of complete new radar systems. For security reasons the more important of his researches have not yet become available for open publication; but his theoretical ability and his exceptional skill in the practical solution of complex electronic problems are well known among workers in this field.

Mr. G. F. Clarke entered the electronics industry on graduating from the University of Birmingham in 1928, and after holding several posts he joined the Bawdsey Research Station in 1938, whence he went to the Radar Research and Development Establishment. Eight years later he transferred to the Royal Aircraft Establishment, where much of his work has been concerned with radar and guided weapons, but has not been published. As an investigator and adviser on widely varied problems, his knowledge combines both theory and practice.

Mr. D. R. Davies graduated in chemistry from University College, Cardiff, in 1924 and held a number of appointments in biochemical and medical research covering such subjects as the biochemical aspects of mechanisms of detoxication, brain enzyme systems with particular reference to narcotics, the metabolism of drugs in abnormal mental states, phosphatase of spleen and blood, and studies of physique and mental disorders. During the Second World War he held a commission and worked for the War Office on the analysis of causes of casualties and assessing the efficacy of therapeutic measures. He joined the Chemical Defence Experimental Establishment in 1947, where he has built up a flourishing biochemical section and has become a leading authority on the cholinesterases and their inhibitors.

Mr. R. A. Fairthorne joined the Royal Aircraft Establishment, Farnborough, in 1927, and six years later gained a first-class honours degree in mathematics as a result of private spare-time study. Of the many facets of his work, mention may be made of his studies on scientific and mathematical films, library organization and bibliography, the use of commercial punched-card techniques for scientific computing purposes and the application of statistical methods to aeronautical research. During recent years his notable work has been done on the theoretical principles underlying the handling, classification and communication of technical information.

Dr. A. F. Gibson joined the staff of the Telecommunications Research Establishment, Malvern, after graduating in physics from the University of Birmingham in 1944, but remained at Birmingham for research on luminescence in solids in collaboration with Dr. G. F. J. Garlick. He went to Malvern in 1948, working originally on infra-red photo-conductors, and in 1951 he took charge of the newly formed transistor physics research group. He is an outstanding experimentalist, equally at home in both pure and applied physics.

Dr. G. N. Harvey began his career as an officer in the Royal Navy, in which he again served during the Second World War, having in the meantime acquired both business and industrial experience. During his naval service he was closely associated

with degaussing and was made O.B.E. In 1945 he joined the Admiralty Compass Department and worked on the theory and correction of errors in compasses. In 1947 he joined the Fighting Vehicles Research and Development Establishment, and there he has made important advances in such different fields of applied research as optics, navigational systems and servo-mechanisms.

Mr. C. E. Hubbard first went to the Royal Botanic Gardens, Kew, in 1920 as a student gardener and soon after became a technical assistant in the Herbarium under Dr. Otto Stapf, an authority on grasses. On the latter's retirement, Mr. Hubbard was appointed to take charge of this group, which he has made his special study ever since. He spent six weeks studying the flora in Spain in 1924 and a year in Australia during 1930-31 to assist the Queensland Government in the study of the indigenous grasses. He was made O.B.E. for services to science and agriculture in 1954.

Dr. J. L. King joined the Admiralty Research Laboratory in 1942 after studying mathematics in the University of Cambridge, and four years later was assimilated into the newly formed Royal Naval Scientific Service. Dr. King is the author of some twenty scientific reports ranging in subject-matter from hydrodynamics to atomic weapons, most of which, however, have not been published because of security regulations. One notable exception is a dissertation "On the Motion of an Elastic String", which is a basic study related to aircraft catapults. In the near future Dr. King will be returning to the hydrodynamics field as leader of a team which will be primarily concerned with fundamental theoretical investigations into the motion of bodies under water.

Dr. W. J. Kramers studied chemistry at the University of Oxford, and before joining the Ministry of Supply in 1949, he held appointments in industry and at the British Coal Utilization Research Association. His work in the Armament Research Establishment, and more recently the Atomic Weapons Research Establishment, is centred on the development of new ceramic materials. He was responsible for the development and preparation of cerium monosulphide—a material which had not been studied in Britain previously—and other novel ceramic compositions including various metal oxides; this latter work has led to the possibility of developing new high-temperature ceramics.

Dr. F. P. O. Kubaschewski joined the National Physical Laboratory, Teddington, in 1947, where he has made thermodynamical investigations concerning the possibilities of new methods of producing titanium, vanadium and zirconium. He has also been interested in the thermochemistry of metallic alloys in relation to the phase equilibria existing in metallic systems, and has developed novel methods of measuring directly the heats of formation of alloys in the solid state which are of importance in connexion with the mechanism of bonding. He is the joint author, with Mr. E. Ll. Evans, of "Metallurgical Thermochemistry" and, with Mr. B. E. Hopkins, of "Oxidation of Metals and Alloys".

Mr. W. Lawrence took the Mechanical Sciences Tripos at the University of Cambridge in 1926, and then spent several years in radio transmission work in industry. He joined the Signals Research and Development Establishment of the Ministry of Supply in 1941, where he worked originally on the development of mobile telecommunications equip-

ment, and later on cables and special measuring apparatus. During recent years he has been concerned with research on data transmission and speech problems, and in the field of speech synthesis, in particular, his scientific understanding and experimental skill have led to notable advances.

Dr. Roy Markham joined the staff of the Agricultural Research Council Virus Research Unit in 1940 after graduating from the University of Cambridge. His work has been mainly concerned with the biochemistry of viruses, and in particular the function of nucleic acids in virus nucleo-proteins. He has been responsible for the development of a number of techniques for the analysis of nucleic acids and the determination of their structure.

Mrs. B. Naylor, who is a graduate in electrical engineering of the University of Manchester, entered the Royal Aircraft Establishment, Farnborough, in 1936, where for much of her career she has been concerned with research on aircraft engines and accessories and test-plant for them. During more recent years she has worked on combustion problems, on ram-jet development, and on the cooling of supersonic aircraft. She is a qualified pilot and therefore brings first-hand knowledge to the aircraft problems with which she deals. She was made O.B.E. in 1949.

Dr. K. P. Oakley, of the Department of Geology, British Museum (Natural History), is an authority on human and near-human fossil remains, his handbook, entitled "Man the Tool-Maker", on the British Museum's post-war exhibition on man as a tool-making primate being widely used in British and American universities. In co-operation with the staff of the Government Chemist's Department, he has investigated the geological age of a number of fossil human remains of disputed age by fluorine-dating and other methods, and has obtained some remarkable results. In 1953 Dr. Oakley investigated fossil Hominid sites in South Africa and obtained data bearing on the age of the Australopithecines and the Rhodesian and Saldanha skulls.

Dr. G. M. Roper studied mathematics at Cambridge and then was a school-teacher for several years before becoming a mathematics lecturer at the Chelsea Polytechnic in 1941. After doing aerodynamics research in her spare time at the Imperial College of Science and Technology, London, for which she gained a Ph.D., she joined the Royal

Aircraft Establishment in 1941, where, in addition to being in great demand as a mathematical consultant, she has done valuable research in the theory of supersonic flow, especially in the study of delta and swept-back wings.

Dr. W. B. Thompson graduated in mathematics and physics from the University of British Columbia in 1945 and later gained his Ph.D. at the University of Toronto for a thesis on thermal convection and the Earth's magnetic field. After part-time research at the Chalk River Laboratories on the energy distribution of plutonium fission fragments, he went to Britain with a senior research fellowship at Harwell, where he has been mainly concerned with the theoretical analysis of the physical properties of highly ionized gases. In addition, he has published papers on thermal conduction in magnetic fields and on the acceleration of cosmic-ray particles.

Dr. D. P. Wilson has been engaged in research at the Plymouth laboratory of the Marine Biological Association since 1926. He first studied extensively the development of polychaete worms, and this led him to examine the external factors controlling settlement and metamorphosis. He has also shown that sea water from some areas is less favourable for larval development than that from others, thus making more understandable the regional differences in the distribution of different species of bottom-living animals. Dr. Wilson is a graduate of the University of Manchester, gaining his doctorate in 1949.

Mr. F. P. W. Winteringham's work at the Pest Infestation Laboratory of the Department of Scientific and Industrial Research has led to the application of radioactive tracer and paper-chromatographic techniques to two lines of investigation concerned with the use of insecticides in the protection of stored foodstuffs: the contamination of food resulting from treatment with fumigants and contact insecticides; and the study of insecticidal action within the body of the insect. In connexion with the latter it has been found possible to label not only the insecticide under investigation but also the enzymes and metabolites in the living insect. This makes it possible to isolate and determine quantitatively, by chromatographic techniques, the component parts and by-products of different metabolic cycles, first in the normal insect and then in the insect affected by the insecticide.

## OCCURRENCE OF *BEIJERINCKIA* SPECIES IN THE 'PHYLLOSPHERE'

By DR. J. RUINEN

Traub Laboratory, Kebun Raya Indonesia, Bogor

IN 1949 Derx<sup>1,2</sup> started an investigation into the occurrence of nitrogen-fixing organisms in tropical soils—a question up to then much disputed; but after incidental research in the first half of the century once more of importance in view of the increasing need of fertilizers in a region notoriously poor in nitrogen. After establishing the carbohydrate source and pH required for their culture, Derx succeeded in isolating a number of nitrogen autotrophic bacteria from soil and water, namely, *Azotobacter chroococcum* Beijerinck, *A. vinelandii* Lipman, *A. agilis* Beijerinck and *A. indicum* Starkey et De. The last-mentioned species was segregated

from the others and placed in the new genus *Beijerinckia* because of differences in the physiological, cultural and morphological properties. The presence of *B. indica* (Starkey et De) Derx and *B. mobilis* Derx has been demonstrated in the acid and slightly alkaline soils of Indonesia, of Nigeria, of the savannahs of the Belgian Congo, of the upland rice-fields in Tonga, and of the rice-fields of Surinam<sup>3</sup>. A similar occurrence was reported by Kluyver and Becking<sup>4</sup>. Besides the first isolations from Indian<sup>5</sup> and Malayan<sup>7</sup> soils, the presence of *Beijerinckia* in soils in the tropics, in particular North Australia, was reported by Tchan<sup>8</sup>, while Döbereiner cultivated