

This paper also describes an experimental investigation at a wave-length of about 1.25 m. of the radiation pattern produced by a half-wave-length aerial in a corner reflector with angles of 90°, 60° or 45°. Using sheets one and a half wave-lengths high and two wave-lengths wide, it was found that the radiation distribution is not appreciably modified if the apex of the reflector is amputated and the resulting hole closed by a flat sheet. Such a modified reflector affords a saving in space and also shows that the pattern is insensitive to the shape of the back of the reflector. Other experiments showed that the performance of this type of aerial system was inappreciably affected if the continuous reflecting sheets were replaced either by wire netting with a mesh about one fortieth of a wave-length inside, or by a comb of open rods about half a wave-length long.

In the course of the second paper, H. Page described some measurements of the performance of various horizontal dipole arrays operating on wave-lengths in the region of 15–20 metres as used at stations of the British Broadcasting Corporation. The main method of measurement adopted consisted in elevating a calibrated frame receiving aerial by means of a captive balloon; by varying the height and position of the balloon, the field strengths in different directions from the transmitting array were determined. In a second method, a frame aerial at ground-level was used; this gave only relative values of field strength and was used mainly to determine variations in the performance of the aerial array as the radio frequency in use was altered over a small band.

It was found that for an aerial array radiating over a flat site free from obstacles, there was good agreement between the theoretical and measured performance: the maximum field strength was of the order of 0.8–0.9 of the theoretical value. A sloping site or the existence of other nearby arrays may, however, cause appreciable departures from the theoretical characteristics. In particular, it was found that the loss of power in radiating through other aerial array systems may be as much as 40 per cent in some cases; and this loss is not necessarily associated with a resonant condition in the obstructing array.

It is concluded from this work that, in order to obtain the best efficiency in short-wave transmitting aerial arrays, these should be erected on as flat a site as possible and should be arranged to avoid radiation through other arrays; distant obstructions which intercept part of the main lobe of radiation should also be avoided.

## 'MINOR' ELEMENTS IN PLANT NUTRITION

OUR knowledge of the precise physiological functions of the so-called 'minor' elements in plant nutrition has not kept pace with the growing realization of their importance in agricultural and horticultural practice. A number of papers in the *Proceedings of the American Society of Horticultural Science* report the effects of certain minor elements on crop growth and behaviour. R. D. Dickey and M. Drossdoff (42, 74; 1943) show that 2 lb. of manganese sulphate per tree applied to the soil cured frechening of the leaves of the tung (*Aleurites fordii*), due to manganese deficiency. The same authors

(42, 79; 1943) describe a 'cupping' of the terminal leaves of the tung, which are reduced in size and show an interveinal chlorosis and sometimes an apical and marginal browning. This may be followed by leaf abscission and shoot die-back; the condition can be cured by applying copper sulphate (1/16 oz. per tree) to the soil. That the disease is due to copper deficiency and the ameliorative effects of the soil dressings of copper sulphate are not due to any indirect effect, is shown by the fact that spraying with copper sulphate is equally effective in curing the disease.

J. G. Maclean, W. C. Sparks and A. M. Binkley (44, 362; 1944) in a manurial experiment with potatoes in an alkaline soil (pH 8.5) supplied the sulphates of iron, copper, zinc and manganese (25 lb. per acre) alone and in all possible combinations, in addition to adequate dressings of nitrogen, potash and phosphate. Besides noticeable effects on crop yields due generally to effects on tuber size rather than the number of tubers, all the treatments, except copper + iron + zinc, copper + zinc + manganese, iron + zinc, copper + manganese, and zinc + manganese, increased the thickness of the periderm of the tuber significantly. Whether or not a thickened periderm will reduce tuber damage during harvest and marketing remains to be seen, but the possibilities in this direction need no stressing. Effects of minor elements on skin colour of tuber of Red McLure potatoes are reported by W. C. Sparks (44, 369; 1944), who found that all combinations of minor elements tried increased tuber colour in the field, but the effect was greatest when iron, alone or in combination with copper or copper and manganese, was supplied.

Significant effects on carrots and turnips of application of borax, copper sulphate, manganese sulphate and zinc sulphate, to soils in which the crop showed no deficiency symptoms, are described by G. H. Harris (43, 219; 1943). The effect varied on the different soils (but copper always increased root yield) and yield, sugar content and keeping qualities of the roots were all affected by the treatment.

## CYTOPLASM, VACUOLE AND CELL-WALL MAGNITUDES IN DIPLOID AND TETRAPLOID BARLEY

IN the larger cells of a 'gigas' or 'semi-gigas' allo-tetraploid, is the increase due to proportionate increases in the cytoplasm, the vacuoles and the cell-walls, or is it mainly due to an increase in one alone or in two of these? By careful analyses of the water, ash, sugar, 'protein', nitrogen, etc., contents of diploid and tetraploid plants of a single variety of barley, *Hordeum vulgare*, grown under constant nutrient conditions in photothermostats, I. Ekdahl (*Arkiv för Botanik* (Stockholm), 31, No. 5, 1; 1944) is able to draw some interesting conclusions. Tetraploid leaves assimilate more slowly but have a higher proportion of their dry weight as sugar and ash than diploid leaves, but if this extra sugar and ash is deducted from the total dry weight, a 'residual' dry weight for 'protein', cell-wall, etc., is obtained which is the same in both tetraploid and diploid leaves. Calculated on the residual dry weight, fresh tetra-

ploid leaves contain about 30 per cent more water than the diploids; the roots, on the other hand, have approximately the same composition in tetraploids and diploids, whether calculated on fresh weight or residual dry weight. Thus, "The difference between the leaf structures of tetraploid and diploid barley, apart from the difference in volume, appears to be that the tetraploid leaf cells contain comparatively more water, sugar and ash, while the amounts of cytoplasmic substances are proportionally the same. In the root cells it is mainly only the cell volume which is changed."

By correlating the analyses with measurements of the cell dimensions in a number of organs and tissues, it seems that when the cell volume increases as a result of doubling the number of chromosomes, in the leaf, the 'thickness' of the cytoplasmic layers and cell walls is uniformly increased but not to the same extent as the cell dimensions, that is, the cells have a larger proportion of their volume as vacuole. In the roots, however, the 'thickness' of the cytoplasmic layers and cell-walls increases to the same degree as the general cell dimensions.

## FORTHCOMING EVENTS

### Monday, January 22

INSTITUTION OF ELECTRICAL ENGINEERS (at Savoy Place, Victoria Embankment, London, W.C.2), at 5.30 p.m.—Discussion on "Applications of Electricity to Water Supply" (to be opened by Mr. J. F. Shipley).

### Tuesday, January 23

INSTITUTION OF CIVIL ENGINEERS (at Great George Street, Westminster, London, S.W.1), at 5.30 p.m.—Mr. S. R. Raffety: "Rural Water Supplies".

ROYAL AERONAUTICAL SOCIETY (at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1), at 5.30 p.m.—Discussion on "Civil Aviation".

### Tuesday, January 23—Wednesday, January 24

IRON AND STEEL INSTITUTE (joint meeting with the LINCOLNSHIRE IRON AND STEEL INSTITUTE) (in the Technical School, Cole Street, Scunthorpe), at 7.30 p.m.—Mr. G. D. Elliot: "Ironmaking at the Appleby-Frodingham Works of the United Steel Companies, Limited".

### Wednesday, January 24

ROYAL SOCIETY OF ARTS (at John Adam Street, Adelphi, London, W.C.2), at 1.45 p.m.—Mr. James B. Firth: "Forensic Science".

SOCIETY OF CHEMICAL INDUSTRY (joint meeting of the PLASTICS GROUP with the BRITISH RHEOLOGISTS' CLUB and the FARADAY SOCIETY) (at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1), at 2.30 p.m.—Dr. G. W. Scott-Blair: "The Rheology of Plastics".

TELEVISION SOCIETY (joint meeting with the RADIO SECTION OF THE INSTITUTION OF ELECTRICAL ENGINEERS) (at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2), at 5.30 p.m.—Mr. Donald G. Fink: "American Television Broadcasting Practice, 1927-1944".

BRITISH ASSOCIATION OF CHEMISTS (BIRMINGHAM SECTION) (in the Large Hall, Chamber of Commerce, New Street, Birmingham), at 6.30 p.m.—Discussion on "Social Security for Chemists".

### Thursday, January 25

LONDON MATHEMATICAL SOCIETY (at the Royal Astronomical Society, Burlington House, Piccadilly, London, W.1), at 3 p.m.—Prof. J. Hadamard: "Psychological and Personal Recollections of a Mathematician".

### Friday, January 26

INSTITUTION OF MECHANICAL ENGINEERS (at Storey's Gate, St. James's Park, London, S.W.1), at 5.30 p.m.—Mr. J. Foster Petree: "Mechanical Engineering in the Shipyard" (Seventeenth Thomas Lowe Gray Lecture).

INSTITUTE OF FUEL (SCOTTISH SECTION) (at the Royal Technical College, Glasgow), at 5.45 p.m.—Dr. J. M. Ferguson: "The Insulation of Open-Hearth Furnaces and Blast-Furnaces".

### Saturday, January 27

ASSOCIATION FOR SCIENTIFIC PHOTOGRAPHY (at Caxton Hall, Westminster, London, S.W.1), at 2.30 p.m.—Mr. H. K. Bourne: "Electric Discharge Lamps for Photography".

## APPOINTMENTS VACANT

APPLICATIONS are invited for the following appointments on or before the dates mentioned:

SENIOR EXECUTIVE ENGINEER by the Public Works Department, Trinidad—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. E.1304.A) (January 24).

ENGINEER for the Public Works Department, Government of Trinidad—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. E.1299.A) (January 25).

HEAD OF THE DEPARTMENT OF SCIENCE of the South-East Essex Technical College and School of Art, Dagenham—The Chief Education Officer, County Offices, Chelmsford (January 27).

PLANT ENGINEER (must have general scientific educational background, degree in physics or mechanical engineering; some precision engineering experience essential) by a firm in Middlesex—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. C.2321.XA) (January 27).

CONTROLLER OF MATERIALS in the Directorate-General of Aircraft in India—The Ministry of Labour and National Service, Central (T. and S.) Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. C.2430.A) (January 30).

ASSISTANT TO THE ADVISORY CHEMIST for the South Eastern Province under the scheme of the Ministry of Agriculture and Fisheries—The Acting Principal, South-Eastern Agricultural College, Wye, Ashford, Kent (January 30).

SENIOR RESEARCH CHEMIST with experience in manufacture of or research on petroleum products (Reference No. F.2777.XA), a RESEARCH CHEMIST with chemical engineering qualifications (Reference No. F.2778.XA), and a RESEARCH CHEMIST with laboratory experience in petroleum or heavy chemicals (Reference No. F.2779.XA), in the Research and Development Department of a British Oil Company at its Refinery in N.W. England—The Ministry of Labour and National Service, Central Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting the appropriate Reference No.) (February 12).

ASSISTANT ENGINEERS (temporary) by the Kenya Government Public Works Department, for water supply schemes—The Ministry of Labour and National Service, Appointments Department A.3.(B.), Room 5/17, Sardinia Street, Kingsway, London, W.C.2 (quoting Reference No. E.1317.A) (February 12).

UNIVERSITY READERSHIP IN LOGIC AND SCIENTIFIC METHOD, tenable at the London School of Economics and Political Science—The Academic Registrar, University of London, c/o Richmond College, Richmond, Surrey (February 26).

LECTURER IN VETERINARY PARASITOLOGY—The Registrar, The University, Liverpool (February 28).

DIRECTOR OF MUSEUMS—The Town Clerk, Municipal Buildings, Dale Street, Liverpool, 2 (February 28).

CHAIR OF GEOGRAPHY, and the CHAIR OF GEOLOGY—The Registrar, The University, Sheffield (March 31).

UNIVERSITY READERSHIP IN ENTOMOLOGY, tenable at the London School of Hygiene and Tropical Medicine—The Academic Registrar, University of London, c/o Richmond College, Richmond, Surrey (July 31).

ASSISTANT (medical graduate) IN ANATOMY—The Secretary, The University, Aberdeen.

## REPORTS and other PUBLICATIONS

(not included in the monthly Books Supplement)

### Great Britain and Ireland

Scheme for a Degree Course in Chemical Engineering. Pp. 28. (London: Institution of Chemical Engineers.) [101]  
Ministry of Labour and National Service. Higher Appointments: Report of the Committee appointed by the Minister of Labour and National Service in July 1943. (Cmd. 6576.) Pp. 62. (London: H.M. Stationery Office.) 1s. net. [101]

### Other Countries

Bulletin of the Bingham Oceanographic Collection. Vol. 9, Art. 2: Studies on the Marine Resources of Southern New England, 1: An Analysis of the Fish Population of the Shore Zone. By Herbert E. Warfel and Daniel Merriman. Pp. 92. (New Haven, Conn.: Peabody Museum of Natural History, Yale University.) 1.50 dollars. [2812]  
Annual Report of the Imperial Council of Agricultural Research for 1943-44. Pp. ii+44. (Delhi: Manager of Publications.) 2 rupees; 3s. [2812]

Republica Argentina: Ministerio de Agricultura, Direccion de Meteorologia, Geofisica e Hidrologia. Serie E, No. 1: El Tercer Centenario del Barometro. Pp. 12. (Buenos Aires: Ministerio de Agricultura.) [2812]

Indian Forest Leaflet No. 65: Conditioning Chamber for Plywood. By M. A. Rehman. Pp. ii+3. (Dehra Dun: Forest Research Institute.) 6 annas; 7d. [2812]

Food is Where you Find It: a Guide to Emergency Foods of the Western Pacific. By Lucy M. Cranwell, Josiah E. Green and A. W. B. Powell. Pp. 72+4. (Auckland: Auckland Institute and Museum.) [41]

Seventeenth Annual Report of the Council for Scientific and Industrial Research, for the Year ended 30th June 1943. Pp. 76. (Cantabria: Commonwealth Government Printer.) 3s. 4d. [41]

Papers of the Michigan Academy of Science, Arts and Letters. Vol. 29 (1943). Pp. xiii+606. (Ann Arbor, Mich.: University of Michigan Press; London: Oxford University Press.) 5 dollars; 28s. net. [51]

New Zealand: State Forest Service. Annual Report of the Director of Forestry for the Year ended 31st March 1944. Pp. 38. (Wellington: Government Printer.) 1s. [51]