

inverters with the possibility of transmission at high D.C. voltages, together with the realization of a virtual static D.C. 'transformer'.

A lively discussion ensued which ranged over a number of topics, and in particular many questions were asked concerning the behaviour and application of the gas-filled triodes. It was clear, as Prof. Cockcroft said in closing the discussion, that there was sufficient interest for the Conference to go on indefinitely, and the Conference passed a resolution requesting the Board of the Institute of Physics to sanction the formation of an Electronics Group.

## UTILIZATION OF INDIAN HOME-GROWN TIMBERS

A FOREST Bulletin, No. 92, Utilization (New Series), has been written by V. D. Limaya of the Forest Research Institute, Dehra Dun, on "The Testing of Packing Cases for Army Boots and suggested Improvements." (Govt. of India Press, New Delhi, 1941). Packing cases for army boots in India have usually been made of chir (*Pinus longifolia*) in the past. Owing to the large demand brought about by the War, other timbers for the purpose have come under review. The Ordnance Department suggested that semul (*Bombax malabaricum*) might answer equally well and would be more easily available as the species is not more or less confined to the outer hills of the Himalayan range. Since, however, it is a softish wood, doubts were expressed as to its suitability. Comparative tests of both timbers were therefore undertaken in the Timber Testing Section of the Institute. These tests showed that semul boxes were practically as strong as chir boxes and possessed in addition certain advantages. But the tests went further, and indicate how war-time emergencies sharpen the faculties. It was discovered that the original design could be greatly improved so as to produce a far stronger box by very small additions costing not more than two annas a box. Boxes so made were tested and found to be fifteen times stronger than those made according to the original design. The advantages to an army at war will be readily understandable. Two plates show the old box and its failure to stand certain stresses and the new one.

Bulletin No. 93, by the same author, is entitled "Indian Timbers for Tool Helves and Handles". When there has been a Forest Department in India for nearly eighty years and a Research Institute for well over thirty, it is difficult to account for the fact that up to quite recently very large quantities of hickory and ash handles were imported from America into India annually. In fact the big American manufacturers were doubtless correct in saying that "We 'handle' the World". Hickory only grows in the lower Mississippi valley and yet hickory tool handles and helves are to be found in use in practically every country in the world. Ash is also used to a very large extent for the lighter types of handles. These two species have very nearly monopolized the tool handle trade of the world. Until comparatively recently this remained true for India in spite of the large number of species growing in the great Indian forests.

The work carried out at the Forest Research Institute has, however, resulted in greater interest being taken in Indian timbers in this respect, with the result that more than three quarters of the railway

demand for tool handles (the largest demand in the country) is now met by handles made in India from Indian woods.

The author states that "wooden handles for tools are really becoming a world problem". Manufacturing processes require the use of various types of cutting tools and hammers and the demand for wooden handles for such tools has increased enormously. While admitting that hickory is rather a special type of timber and that it will probably remain in demand for special uses, it is now proved that certain Indian timbers fulfil the requirements for tool handles. The research work of the Timber Testing Department had resulted in the markets being supplied with tool handles made from Indian timbers, and the War has given a great impetus to the tool handle trade, large orders having been placed for pick-axe helves, hammer handles, axe-helves, wooden mallets, handles for entrenching tools, spades and so forth.

Some of the species of timbers used belong to about twenty genera. These, according to their qualities, are used for heavy hammer handles (hickory class), light hammer handles (ash class), axe helves (hickory class), handles for scooping tools (ash class) and handles for cutting tools (beech class). Other woods of small forest species are being tested. For example, *Anogeissus pendula*, which until recently was practically unknown as a tool handle wood, has been found to be the toughest timber ever tested.

## DOWNWARD RADIATION OF THE EARTH'S ATMOSPHERE

IN Scientific Notes of the India Meteorological Department (8, No. 93) R. Narayanaswami gives a comparison between measurements of the downward radiation of the earth's atmosphere at night made by himself at Bombay between March 1937 and October 1938 and similar observations by Ramanathan and Desai at Poona in 1930-31. The interest of the comparison lies in the fact that the climates of the two places are in strong contrast, Bombay having a coastal climate of exceptional dampness, while at Poona the climate is continental apart from the rainy season (June-September), and at times very dry, the annual rainfalls being about 70 in. and 27 in. respectively.

The instrument used both at Bombay and at Poona for measuring the atmospheric radiation was Angstrom's pyrgeometer No. 48, made by G. Rose of Upsala. With this was measured the net radiation per horizontal square centimetre, that is, the difference between the full emitted black body radiation given by  $\sigma T^4$  and the radiation received from the atmosphere, interest attaching mainly to the comparison between the ratio sky radiation to full radiation, and the vapour pressure of the air around the instrument calculated from the readings of an Assmann psychrometer. Since the radiation from the sky is practically all due to the water vapour in the atmosphere, dry air being an exceedingly bad radiator, in so far as there is considerable positive correlation between the water vapour pressure near the ground and in the overlying atmosphere as a whole, so the ratio  $S/\sigma T^4$ , where  $S$  is the sky radiation, and the vapour pressure near the ground, show high positive correlation. Comparison between these quantities and the dry-bulb reading of the Assmann psychrometer is made by tables and graphs.

Throughout the year, except possibly in October, the excess of  $S$  at Bombay compared with Poona is almost as marked as is the excess there of vapour pressure. An interesting point confirming that it is mainly the annual variation of vapour pressure that causes the annual variation of  $S$  and not the annual variation of temperature is to be noted at the onset of the monsoon in June. Temperature falls but vapour pressure and cloudiness increase in the monsoon current, with the result that  $S$  continues high. The lowest observed value of  $S$  at Bombay was 0.41 gm.cal./cm.<sup>2</sup> and the highest 0.66 gm.cal./cm.<sup>2</sup>. At both places the maximum for  $S$  is in the monsoon and the minimum in the winter.

## FORECASTING MONSOON RAINFALL

IN Scientific Notes of the India Meteorological Department (8, No. 95) V. Doraiswamy Iyer and C. Seshachar have usefully extended some work done by Sir Gilbert Walker in 1921 on the forecasting of the monsoon rainfall of Mysore State as a whole from the three factors: mean atmospheric pressure over India in the preceding May, Zanzibar rainfall in the same month, and Java rainfall for the period October-February. The multiple correlation coefficient obtained in this way was + 0.57.

It is shown by means of a map of normal monsoon rainfall (June-September) that Mysore includes two regions of widely different rainfall, the *Malnad*, which is a narrow strip of country adjoining the Western Ghats, with a monsoon fall varying from 30 in. to more than 300 in., and the *Maidan*, or plain country, which lies farther to the east and includes most of the State, with a fall of less than 30 in. Monthly normals show that in the *Malnad* July is much the wettest month, followed by June and August, whereas the rainfall of the *Maidan* is greatest from May to October with a much less pronounced maximum spread over September and October. It is known, further, that a strong monsoon circulation favours the rainfall of the *Malnad*, whereas a weak monsoon is more productive of the heavy convectional showers that give the *Maidan* a large part of its rainfall. The expectation that higher correlation coefficients might be expected for each of these regions considered by itself, when the factors used are those most suitable to each rainfall regime, than the one found by Walker for the whole State was fulfilled.

Using a number of new factors, which included sunspot numbers, multiple correlation coefficients of 0.60 and 0.70 were found for the *Malnad* and *Maidan* regions respectively. The work was extended in the case of the *Maidan* to the period September-November so as to include the two wettest months for that region, and for forecasting the rainfall of this period a multiple correlation coefficient of 0.75 was found. The factors used in this case were the *Malnad* rainfall for the previous June-August, Bangalore mean winds at 2-3 km. height in July and August and mean India pressure gradient in July and August. The effectiveness of each of the three formulæ is roughly illustrated by graphs of calculated and observed rainfall over a long period of years. These suggest that the forecasts would be of value to engineers concerned with water supply and to agriculturists, in spite of occasional failures due to the fact that the basic correlation coefficients fell very far short of unity.

## FORTHCOMING EVENTS

(Meeting marked with an asterisk is open to the public)

### Saturday, March 7

GEOLOGISTS' ASSOCIATION (at the Geological Society of London, Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Mr. W. P. D. Stebbing: "A Review of References to Geology and Allied Subjects from the 16th Century" (Presidential Address).

### Monday, March 9

ROYAL GEOGRAPHICAL SOCIETY (at Kensington Gore, London, S.W.7), at 5 p.m.—Capt. D. L. Leach: "The Survey of Sarawak".

### Tuesday, March 10

CHEMICAL ENGINEERING GROUP (SOCIETY OF CHEMICAL INDUSTRY) (joint meeting with the INSTITUTION OF CHEMICAL ENGINEERS) (at the Geological Society, Burlington House, Piccadilly, London, W.1), at 2.30 p.m.—Mr. N. Fleming: "Noise and its Suppression".

ILLUMINATING ENGINEERING SOCIETY (at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2), at 2.30 p.m.—Discussion on "Advance Planning in Lighting Reconstruction", to be opened by Mr. Howard Robertson.

ROYAL INSTITUTION (at 21 Albemarle Street, London, W.1), at 2.30 p.m.—Sir Lawrence Bragg, F.R.S.: "Metals", 2: "Metal Geography".\*

### Friday, March 13

ROYAL SOCIETY OF ARTS (INDIA AND BURMA SECTION) (at John Adam Street, Adelphi, London, W.C.2), at 1.45 p.m.—Colonel Sir Arthur Olver: "Animal Husbandry in India".

## APPOINTMENTS VACANT

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

LECTURER (WOMAN) IN MATHEMATICS—The Secretary, Somerville College, Oxford (March 10).

EDUCATIONAL PSYCHOLOGIST—The Secretary for Education, Education Offices, York (March 12).

DEPUTY BOROUGH ELECTRICAL ENGINEER—The Town Clerk, Town Hall, Sunderland (endorsed 'Appointment of Deputy Borough Electrical Engineer') (March 14).

ENGINEERING ASSISTANT—The Chairman, Mid-Kent Water Company, Snodland, Kent (March 15).

ORGANIZER OF AGRICULTURAL EDUCATION for the Administrative County of Kesteven—The Clerk to the County Council, County Offices, Sleaford, Lincs. (March 16).

LECTURER IN ANATOMY—The Secretary and Registrar, University, Bristol (March 16).

SCIENTIFIC ASSISTANT (WOMAN NOT LIABLE FOR NATIONAL SERVICE)—The Deputy Director, Imperial Bureau of Pastures and Forage Crops, Agricultural Research Building, Penglais, Aberystwyth (March 21).

TEACHER WITH HIGH QUALIFICATIONS IN BIOLOGY—The Headmaster, The School, Dartington Hall, Totnes.

BIOCHEMIST (MAN OR WOMAN) IN THE PATHOLOGICAL LABORATORY—The General Superintendent and Secretary, Salford Royal Hospital, Salford, Lincs.

## REPORTS and other PUBLICATIONS

(not included in the monthly Books Supplement)

### Great Britain and Ireland

The Advancement of Science: the Report of the British Association for the Advancement of Science. Science and World Order: Transactions of a Conference of the Division for the Social and International Relations of Science. Pp. 120 + vi. (London: British Association.) 5s. [102]

The Future of Auditing. By a Group of Accountants in Industry. (A Series of Four Articles reprinted from *The Accountant*). Pp. 28. (Potters Bar: Gee and Co. (Publishers), Ltd.; London: The City Library.) [102]

Medical Research Council: Industrial Health Research Board. Emergency Report No. 2: Hours of Work, Lost Time and Labour Wastage. Pp. iv + 26. (London: H.M. Stationery Office.) 6d. net. [112]

### Other Countries

Rubber Research Institute of Malaya. Abridged Annual Report, 1940. Pp. 19. (Kuala Lumpur: Rubber Research Institute of Malaya.) [92]

U.S. Department of Agriculture. Technical Bulletin No. 784: The Wheat Jointworm in Oregon, with Special Reference to its Dispersion, Injury and Parasitization. By T. R. Chamberlin. Pp. 48. (Washington, D.C.: Government Printing Office.) 10 cents. [92]

Records of the Geological Survey of India. Vol. 75, Professional Paper No. 11: A Study of Certain Indian Coals. By E. R. Gee. Pp. iii + 46 + v. (Calcutta: Geological Survey of India.) 2 rupees; 3s. [112]