

developed countries in tropical regions. A review is to be made of the results of the Agency sponsored research on calcium-47, and work on the calibration and standardization of measurements of uptake of radioiodine by the thyroid gland is to continue. The distribution of calibrated radionuclide samples will be extended during 1963 and new calibration methods will be developed. Participation in the international intercomparison measurements of radionuclides organized by the International Bureau of Weights and Measures will continue. The comparative study of methods used in different laboratories for the chemical analysis of nuclear materials; the determination of trace elements in the marine environment; and in mass spectroscopy, the programme of the application of stable isotopes to analyses by the isotope dilution method, and the direct analysis by the mass spectrograph of trace elements in sea-water and nuclear materials, are some of

the investigations to continue or be commenced during the year.

There are indications that during 1963 a number of nuclear facilities will be subject to Agency safeguards, and plans are being made to buy the essential minimum of portable equipment needed for the inspections. The general problems of emergency conditions in the event of a serious accident in nuclear installations are to be reviewed and the Agency's plans for the provision of international emergency assistance to member states are to be extended. Increased attention is to be directed to the development of techniques to deal with the disposal and management of radioactive waste, atmospheric pollution, and the transport and distribution of radioactive material. In this connexion, any necessary revision to the Agency's regulations for the safe transport of radioactive materials will be considered.

S. WENTROUB

FOREST RESEARCH

THE report on forest research for the year ended March 1961* shows the wide range of work being carried out by the Forestry Commission Research Staff and for the Forestry Commission, with assistance by workers at universities and other institutions.

Much more attention is now being paid to the forest soil. Drainage is often a great problem. Wet soils may have a severe effect on tree roots by inhibiting growth and also by making the trees vulnerable to windblow. With the machines now available, the initial drainage system for a bare area may not be a very difficult task but a great deal more information is required on the depth drains should be on a given site and how far apart they should be spaced in order to provide reasonable conditions for afforestation purposes. The subsequent problems include the maintenance of the drains and, unfortunately, there is quite a lot of evidence in Britain of neglected drains. However, ways and means for ensuring the provision of good drainage in forest areas are being investigated. Nutritional work is also being undertaken. The analysis of foliar samples from fertilizer trials is providing data on nutrient deficiencies. Another series of experiments is attempting to elucidate the role of mites in the breakdown of forest litter.

For the first time a report on work study is included. The activities of the section dealing with this cover investigations on tools, equipment, machinery, piecwork and other matters affecting production operations at all levels.

A prototype direct-reading calliper has been developed and trials of this instrument have demonstrated that enumeration work can be speeded up and so costs are reduced. As the measurements are transferred directly on to a tape by a punch system, errors in recording can

be avoided. Two plates show some details of this calliper but no details are given of its weight. At least two other types of self-recording callipers are in use in Scandinavia.

In the report of the New Zealand Forest Service's Forest Research Institute for 1961 †, mention is made of the new requirement that although officers out with the Research Division are still encouraged to conduct their own research projects, these must be approved by the Director of Research. This is a wise ruling. The individual is not thwarted, co-ordination is possible and one of the great drawbacks to individual research in forestry will be avoided, namely, the discontinuance of an experiment through the transfer of an officer to another territorial charge.

It is good to read that one of the planned developments is in physiology and the reason given is "because it is basic to an understanding of many problems in the fields of silviculture, forest-tree improvement and forest pathology". Another development is the appointment of a "silvicultural economics" team with the object of constructing financial yield tables for exotic species. This shows a realistic approach to land-use evaluation and will form a proper basis for the assessment of the relative merits of agriculture and forestry whenever such is required and it is expected to be more needed in the future. In addition, it is felt in New Zealand that a new approach is required in forest economics which, for so long, has been conditioned by European practice.

There is nothing perfunctory about the forest research described in this report. Indeed, the reader is convinced that forest research in New Zealand is well planned and vigorous, and that, in addition to trying to solve present-day problems, it is also forward-looking in a very commendable way.

C. J. TAYLOR

* Forestry Commission. Report on Forest Research for the Year ended March 1961. Pp. ix + 209 + 12 plates. (London: H.M.S.O., 1962.) 14s. net.

† New Zealand Forest Service. Forest Research Institute, Rotorua. Report for the year 1961. Pp. 75. (Wellington, N.Z.: Government Printer, 1962.)

ASPERGILLUS FLAVUS AND GROUNDNUT TOXICITY

IN 1960, large numbers of young turkeys in Britain died (and, later, other domestic birds and farm animals were shown to be affected) for a reason that was at first unknown and was called 'turkey X disease'. This was later shown to be due to the presence of a toxic batch of groundnut meal in their 'feed'. As a result of this, a number of Government and other research laboratories studied this toxicity as a matter of urgency. Real progress became possible with the demonstra-

tion that the toxin was not intrinsic to the groundnuts themselves but was the product of a mould (a strain of *Aspergillus flavus*) growing on them. This toxin-producing mould is widespread, and it was not surprising, therefore, that the toxin was identifiable on some samples of groundnuts or meal from all the main producing areas.

Because the problems posed overlapped the responsibilities of a number of Government departments, an

Interdepartmental Working Party was set up to review and co-ordinate research relevant to groundnut toxicity. In August 1962 the report* of this Working Party was circulated to overseas Governments and to the Press, and was made available to those in Britain and overseas known to be concerned in the production and utilization of groundnuts.

* *Toxicity Associated With Certain Batches of Groundnuts*. Report of the Interdepartmental Working Party on Groundnut Toxicity Research (1962). Pp. 16. (Cyclostyled.) Obtainable from the Department of Scientific and Industrial Research, State House, High Holborn, London, W.C.1.

The report provides an account in general terms of the nature of the problem and means of identifying affected batches of nuts or meal. Suggestions are made as to how mould growth can be minimized and toxin-levels be kept down.

The report should prove of value to those who produce, market, process or use groundnuts, and should also stimulate necessary further research on groundnut toxicity, especially in the producing areas themselves.

P. C. SPENSLEY

POLARIZATION AND CLASSIFICATION OF RADIO SOURCES

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THE detection of polarized radio emission from the radio sources Cygnus *A* (ref. 1) and Centaurus *A* (refs. 2 and 3), and a group of weaker sources⁴, opened a new phase on the investigation of these objects. As well as the angular structure and spectrum, the percentage and position angle of polarization of radio sources are now available. This article gives the results of an examination of ten further radio sources of small angular diameter and relates the present polarization data and that obtained by Gardner and Whiteoak⁴ to other known properties of radio sources.

The receiver used was basically that utilized for the Zeeman experiment⁵, but was modified to measure the difference of intensity between two orthogonal planes of linear polarization. The frequency was 1,410 Mc/s and the band-width 5 Mc/s. Using a 20-sec time-constant, it was possible to detect differences in polarization of $2 \times 10^{-27} \text{ Wm}^{-2} (\text{c/s})^{-1}$ in the weaker radio sources studied. Measurements were taken by allowing the beam of the 250-ft. radio telescope to drift across the source at one position angle of the horn feed system and then repeating at a position angle 45° different. Sources were observed at several different hour angles. The system gave a spurious response of several per cent of the source flux which was constant and was allowed for. The measurements were made in the first week of October 1962.

This programme was confined to a group of 3C sources which had a galactic latitude (b'') greater than 12° and included representatives of the classes of radio objects identified with stars, double sources and sources with a core and halo. They also showed a wide range of spectral types, brightness temperature and redshift. The new polarization data obtained at Jodrell Bank are shown in Table 1.

The optical results quoted in Table 1 are those given by Maltby, Matthews and Moffet⁶ and by Burbidge⁷, and the radio information about the structure of the sources comes from published measurements at 160 Mc/s (refs. 8 and 9), 960 Mc/s (ref. 10) and 1,420 Mc/s (ref. 11). The results agree with the Sydney data for the sources common to both lists, namely, 3C348 and 3C353. In addition, it

was found that Cassiopeia *A* was less than 0.3 per cent polarized and Taurus *A* was 1.0 ± 0.2 per cent polarized at position angle $82^\circ \pm 8^\circ$.

This data can be combined with that obtained in Sydney, also taken at 1,400 Mc/s. However, in order to make the measurements on the extended objects Centaurus *A* and Fornax *A* uniform with the present measurements the integrated polarization of the entire object was calculated. In Centaurus *A* the central double core is 7 per cent polarized and the large double halo was estimated to be 11.5 per cent polarized at most. The integrated emission from Fornax *A* was 7.4 per cent polarized. The combined data included 11 sources which are double systems at radio frequencies, 3 which consist of a bright central core and an extended halo of lower luminosity and 3 which have been tentatively identified with stars⁷.

Cygnus *A* will be included in the following discussion although it lies only 6° above the plane and its polarization is effected by Faraday rotation in the Galaxy which amounts to about 10 rotations at 1,400 Mc/s, corresponding to an emission measure of ~ 200 in the outlying areas of Cygnus *X* which envelop Cygnus *A*. A variation of 10 per cent in the Faraday rotation across the source will be sufficient to cause complete depolarization at this frequency. At 3-cm wave-length the total rotation would amount to $\sim 100^\circ$ and the depolarization would be expected to be negligible. Thus the observed¹ polarization of 8 per cent found at 3 cm will be adopted as the polarization of the signal leaving Cygnus *A*. This step is justified by the observations of Centaurus *A* at $b'' = +20^\circ$, which show the same polarization of the bright central component from 1,400 Mc/s to 10,000 Mc/s and also by the manner Cygnus *A* fits into the picture of double radio sources in the following discussion.

The observed position angle of the received signal from the sources in Table 1 show no correlation with the axes of symmetry of the associated optical objects. This is in agreement with the Sydney⁴ and N.R.L.¹ findings and is the result of different amounts of Faraday rotation between the source and the receiver for different sources.

Table 1. PERCENTAGE POLARIZATION AND POSITION ANGLE OF THE ELECTRIC VECTOR FOR TEN SOURCES MEASURED AT 1,410 MC/S AT JODRELL BANK

Source	Polarization (per cent)	Position angle	Identification	Distance (Mpc)	Comments
3C48	1 ± 1	$70^\circ \pm 10^\circ$	Star	—	Diameter less than $1''$ at 160 Mc/s.
3C84	5 ± 1	$36^\circ \pm 10^\circ$	NGC 1275	53	Appears to be a core and halo at radio frequencies.
Perseus <i>A</i>			Two spiral galaxies	—	
3C123	4.5 ± 1.5	$8^\circ \pm 10^\circ$	—	—	Two components $12.5''$ apart E.W. Component size $5.3''$.
3C196	10.0 ± 0.5	$49^\circ \pm 2^\circ$	Star	—	Diameter $\sim 5''$.
3C274	< 0.3	—	NGC 4486	12	Core and halo at radiofrequencies associated with elliptical galaxy and jet.
Virgo <i>A</i>			Star	—	Diameter $\sim 1''$.
3C286	12 ± 1.5	$31^\circ \pm 2^\circ$	—	—	—
3C295	0.0 ± 1.0	$162^\circ \pm 4^\circ$	20.9 m galaxy	1,380	Two components $4''$ apart. Component size $\sim 1.7''$.
3C348	2 ± 0.5	$6^\circ \pm 5^\circ$	19 m galaxy	460	Two components $1.95''$ apart. Component size $\sim 0.75''$.
Hercules <i>A</i>			16.8 m galaxy	(250)	Two unequal components. $2.5''$ apart. Component size $\sim 1.4''$.
3C353	6 ± 0.5	$7^\circ \pm 10^\circ$	—	—	—
3C405	< 0.3	—	15.3 m galaxy	170	Two components $1.58''$ apart. Component size $\sim 0.7''$.
Cygnus <i>A</i>					