

projects are directed to increased economical production per acre by new varieties or increased use of fertilizers, and reduced costs of weed and frog hopper control, all compared on a cost/performance basis like a series of *Which?* surveys. This work was planned when sugar production appeared surplus to world demand and a different yardstick may be required to deal with the situation where increased production at a higher cost per ton may be more profitable. The facts are there for such deliberation. In addition, a number of basic, long-term research projects are in hand.

The introduction of benzene hexachloride in 1951 to control the frog hopper brought great economic benefit to the industry. This pest is frequently so severe in Trinidad that inability to control it could mean the end of profitable production of sugar, at 1962 sugar prices, hence the consternation when resistance to chlorinated hydrocarbons appeared in 1955. Long-term control must depend on a better knowledge of the insect, about which little has been published since 1921.

The fecundity of the female frog hopper examined in captivity at the Central Agricultural Research Station is much greater than estimated. In the 3-4 weeks of her life she may be expected to lay from 239 to 318 eggs with an incubation period of 14 to more than 210 days. Only a negligible percentage of the eggs were infertile or parasitized. Frog hopper eggs laid in the dry season and kept under moist conditions, even when laid by the same female on the same day, exhibit wide variation in their degree of diapause, with no apparent relationship to adverse conditions. Investigations are in progress with juvenile hormones, chilling, and dry conditions in relation to hatching. With the higher field cost for chemical control of frog hoppers resistant to chlorinated hydrocarbon insecticides, and the constant threat of resistance to other groups of insecticides developing, 21 insecticides were screened against the frog hopper. Ten per cent 'Thimet' granules remains the outstanding product for effective and economic control, with 'Thiodan' and methylparathion the most promising of the newer insecticides tested. All, however, are highly toxic. The data illustrate the complexity of field evaluation of insecticides on this pest, which may produce up to four generations in the season.

The assessment of new cane varieties on a formula which converts yield and sugar content to pre-processing

cost, shows wide differences between varieties and that one variety may be the most economic producer as a plant crop but not as a ratoon. Some of the 54 and 55 series of Barbados varieties look promising on 1962 performance. The standard fertilizer treatment is 4 cwt. of sulphate of ammonia and 2-cwt. muriate of potash. Not all soil types responded to potash and few to phosphate, and on these 2 cwt. of superphosphate were as effective as 4 cwt. At St. Madeleine an initial phosphate application to plants is adequate for subsequent ratoons. Additional nitrogen frequently increased cane yield but reduced juice quality. The large series of trials confirm estate practice but show that small adjustments could be made profitable on certain specific soil types. A number of proprietary compounds tested with varying ratios showed no improvement over straights and were more expensive.

Over the past two or three years, the estates have adopted the persistent pre-emergence herbicides, diuron or atrazine, with 2:4 dichlorophenoxyacetic acid, as the most effective and economical treatments. About 15 new compounds were field tested, four of which are recommended for more extensive testing. 'Pesco 18-15' was outstanding on a cost/performance basis, 5 months control for 50s. per acre. A new approach to reducing harvesting costs, which on an acre basis may exceed cultivation costs, is the use of a plant auxin such as 'Pesco 18-15' or a 'Suerol' oil formulation, both of which were shown to give a significant reduction in the tons cane/tons sugar ratio when applied four weeks prior to harvest, by helicopter.

Continuing basic investigations include quantitative evaluation of the fluctuation in soil micro-organisms, with the ultimate intention of determining their role in cane growth and the development of the root system; the physiology of frog hopper blight, naturally occurring plant growth substances, and standards for foliar analysis.

Half the cane acreage of Trinidad is cultivated by small-cane farmers who produce one-third of the sugar. This report explains in detail how high yields can be obtained economically. The extension of these methods to the cane farmers offers a potential increase of 15 million dollars in exports, greater than the total exports of all other agricultural produce. This would be a tremendous boost to the Island's economy and particularly the 12,600 small growers; can the authorities accept the challenge?

G. WRIGLEY

## THE CARNEGIE TRUST FOR THE UNIVERSITIES OF SCOTLAND

THE sixty-first annual report of the Executive Committee of the Carnegie Trust for the Universities of Scotland for the year 1961-62\* records the decision of the Trust to add a special allocation of £250,000 to its normal allocation of £300,000 to the universities by way of capital grants for the new quinquennium. This is accompanied by a request that the universities should concentrate it on projects unlikely to be supported by the University Grants Committee or on projects for improving student amenities or recreation and facilities, towards the cost of which the University Grants Committee would contribute only a relatively small proportion. The allocations of £53,500 each to the University of St. Andrews and the University of Aberdeen and of £85,500 each to the University of Glasgow and the University of Edinburgh have been allocated in accordance with this wish.

Expenditure under the research scheme rose by almost 25 per cent to more than £74,000; £34,131 of this was

on fellowships and scholarships, £10,000 in block grants to universities for travelling expenses, £2,945 to the Trust's own scheme for travel and maintenance abroad, and £16,195 to general grants in aid of research: the corresponding figures for the previous year are £27,871; £7,000; £1,335; and £12,834. A further marked increase in expenditure on scholarships and fellowships is anticipated in 1962-63, partly because of the steep, all-round increases in 'approved fees' chargeable over and above the titular value of the award, and partly because the titular values of Carnegie awards have been increased to £400 and £500 for scholarships, £650 for senior scholars and £1,000 for Fellows. The new regulations for scholarships and fellowships are appended to the report.

Expenditure on assistance to students under Clause B of the Trust Deed decreased by more than half from the comparable figure of £15,575, reflecting the extended assistance to students made available by the State as a result of the Anderson Report. Moreover, although vacation awards increased slightly, it is not expected that the expenditure on assistance with fees will appreciably exceed the present figure of about £7,500. Vacation

\* The Carnegie Trust for the Universities of Scotland. Sixty-first Annual Report for the Year 1961-62. Pp. vii+68. (Edinburgh: The Carnegie Trust for the Universities of Scotland, 1963).



awards to 71 meritorious students totalled £2,965, mostly in science and medicine; and the second year's working confirmed the promise of this new development. It is clear that while under the Welfare State the scope of Class B, so far as it is concerned with the payment of fees, is greatly diminished, there is still a restricted field

within which the intentions of the Trust can be properly and effectively implemented. Besides lists of research grants, fellowships and scholarships awarded and of publications since September 30, 1961, by Fellows, scholars and recipients of grants, the report includes a brief report on the work of Fellows and scholars during the year.

## ASSESSMENT OF SITE FACTORS IN FORESTRY

THIS subject is dealt with in an able manner in Bulletin 16 of Duke University School of Forestry, under the title *Parameters of Site for Certain Growth Components of Slash Pine—Pinus elliottii* Engelm, by Dr. D. S. Jackson\*. It is a subject which is extremely important in forestry because a great amount of planting of exotic trees is taking place in many parts of the world. If bad mistakes are to be avoided, and mistakes in the choice of tree species are not always readily apparent, some practical means of assessing site factors within the natural distribution of the species and outside it are almost essential. Compared with the agriculturist, the forester has to contend with many more factors, especially the whole seasonal cycle, wind, insect persistence and so on.

Numerous attempts have been made to produce climatic classifications and most of these have been concerned essentially with maximum and minimum temperatures, duration of drought, number of rainy days, the effective amount and time distribution of rainfall, and so on. Dr Jackson gives a very good review of some of these classifications and he points out their failings from the practical point of view. Many of the factors on which the classifications were based were often too arbitrarily selected and they gave too much consideration to those factors limiting natural distribution and not to those controlling growth. This is a very important point because it is now well known that an exotic tree may give a better productivity in an alien climate where it may have a longer growing season and may be more tolerant of its new site. An outstanding example is *Pinus radiata* in New Zealand.

Dr. Jackson set himself the task to determine the inter-relationship of climatic and edaphic factors affecting

\* Duke University: School of Forestry. Bulletin No. 16: *Parameters of Site for Certain Growth Components of Slash Pine—Pinus elliottii* Engelm. By Dr. D. S. Jackson. Pp. vii+118. (Durham, N. Carolina: Duke University, 1962.) 2 dollars.

productivity. Such a task is now possible because long-term data are available on growth and statistical methods enable site factors to be quantitatively defined. He used slash pine inside and outside its natural distribution and his investigations were directed to ascertain whether soil variables known to affect production in one climatic region were significant elsewhere, to determine the correlation between climatic factors and productivity, and to develop an empirical equation relating productivity to the most important factors of the physical environment. As a result of statistical analysis, a high correlation was found to exist between mean annual height increment and mean annual precipitation, average diurnal range of temperature through March to the end of June as well as the mean temperature of the coldest month, and also certain soil conditions. In addition, other significant correlations were established. Therefore, Dr. Jackson has concluded that "homoclimal comparisons should be based on: (a) the continuous quantitative relationships between physical factors and specific productivity; as well as (b) the discrete factors which limit survival, and of their relative incidence and control in both native habitat and the area of introduction".

Dr. Jackson has carried out a very important piece of work. His critical survey of the various methods of attempting to correlate site characteristics with growth requirements of plants make one realize all the more how systematic he has been in trying to establish the relationship of the physical factors of the environment which affect the productivity of a species. The lay-out of the publication is excellent but the literary style does not always make for easy reading. This Bulletin will be welcomed by the many who are concerned with exotic trees and with further introductions.

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## X-RAY DIFFRACTION AND MOLECULAR MODEL BUILDING STUDIES OF THE INTERACTION OF ACTINOMYCIN WITH NUCLEIC ACIDS

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ACTINOMYCIN  $C_1$  (AMC) inhibits nucleic acid syntheses dependent on deoxyribonucleic acid (DNA)<sup>1,2</sup>; ribonucleic acid (RNA) synthesis is especially sensitive. RNA-dependent RNA synthesis is unaffected<sup>2</sup>. Elucidation of this inhibition may lead to a better understanding of how genetic information is replicated and how it is transmitted from DNA to RNA. Biological activity of AMC is correlated with its ability to bind to DNA<sup>3-5</sup>, probably by complexing specifically to guanine<sup>6-8</sup>; no description of the stereochemistry of the interaction has

been published. The amount of AMC bound to DNA increases with the guanine content of the DNA and is greatest when the DNA is in the native helical conformation. Single-strand DNA from the bacteriophage  $\phi X$  174 binds less AMC than 2-stranded DNA having a similar guanine content<sup>8</sup>.

The formula of AMC is shown in Fig. 1. There is a whole family of actinomycins differing in the amino-acid composition of the cyclic peptides<sup>9</sup>. Derivatives of the various actinomycins have been prepared in which the