

EAST AFRICAN AGRICULTURAL AND FISHERIES RESEARCH COUNCIL

REPORT FOR 1956

THE annual report of the East African Agricultural and Fisheries Research Council* for the year ended June 30, 1956, comprises a general review and the separate reports of the Organizations for Agricultural and Forestry Research, for Veterinary Research, for Fishery Research, for Marine Fisheries Research, and for Trypanosomiasis Research, each of which includes a list of staff and of papers published during the period. A Trypanosomiasis Research Co-ordinating Committee was established during the year and it is believed that co-ordination is now adequate. Generally, the East African Agriculture and Forestry Research Organization gives preference to problems of immediate importance to more than one territory, which require several years research, and to problems requiring both a central research team or co-ordinating research officer and territorial field officers. Forestry nursery work has been very successful in developing improved methods of managing tree seedlings. Experimental work on the conservation of water by fallows at Kangwa has been completed and the first stage of the work on assessing the fertilizer needs of a soil is nearing completion; an investigation is to be undertaken of factors which influence the rate of oxidation of organic matter in tropical soils. A revised edition of the Soil Map of East Africa is in preparation and work continued on the genetical analysis of the resistance of maize to American rust disease. The survey of insects attacking East African forest trees has been largely concerned with wood-boring species, while studies of the digestibility of protein in fodders have shown that within narrow limits there is a unique relation between the crude protein content of a feed and its apparent digestibility and that this relation is the same for all ruminants.

Substantial progress was made in the establishment of the East African Veterinary Research Organization and production of caprinized and leprinized rinderpest vaccines was not seriously interrupted. A satisfactory technique for producing high-quality pleuropneumonia antigen was devised using a new tryptose broth medium and a modified Lister separator for concentrating the organisms.

The annual report of the East African Marine Fisheries Research Organization for 1955-56 reviews briefly the work of the previous four years. A preliminary report on the distribution in place and time of the pelagic fishes will be published shortly, but this study still requires a long series of patient observations and its scope is being extended.

The East African Trypanosomiasis Research Organization was almost at full strength for the first time in 1956. It can now be affirmed that *G. morsitans* and *G. swynnertoni* normally find most feeds from wart-hog, seldom, if ever, from zebra and hartebeest, and very rarely from impala; but given the opportunity *G. morsitans* takes the greater part of its feeds from hippopotamus. In general, research on the trypanosome in East Africa is far behind that on the tsetse fly, and a chief problem is the extremely com-

plex problem of the 'trypanosome challenge'. At the Central Trypanosomiasis Research Laboratory the whole life-cycle of trypanosomes, particularly those of the polymorphic group, is under investigation, but three of the larger projects are epidemiological investigations. The pilot schemes for tsetse reclamation are being wound up and the Organization will no longer include that field among its activities.

The annual report of the East African Fisheries Research Organization* for the year ended June 30, 1956, includes a list of publications by its staff and by visiting scientists and a paper on "The Efficient Utilization of the Fisheries of Lake Victoria", setting forth the views of the Organization on retention of the existing restrictions on fishing. Appendixes include papers on the distribution of sulphur in the muds, water and vegetation of Lake Victoria and its fixation in the bottom deposits; observations on seasonal and diurnal changes of stratification in Lake Victoria; the planktonic Crustacea of Lake Victoria; effects of D.D.T. on the feeding habits of insectivorous fishes in the Victoria Nile; ring formation in the scales of *Tilapia esculenta*; and a preliminary note on investigations being undertaken on the physiology of reproduction in fishes. Studies on the water of Lake Victoria were severely handicapped by the absence of a hydrologist, but work on the food and feeding habits of piscivorous and insectivorous fishes in Lake Victoria is near completion. An investigation was started on the growth-rate and general ecology of young *Clarias messambicus* in the first two years of life, and research on the taxonomy and ecology of the seventy *Haplochromis* species in Lake Victoria is virtually complete.

* East Africa High Commission. East African Fisheries Research Organization. Annual Report 1955/1956. Pp. vii+23. (Jinja, Uganda: East African Fisheries Research Organization, 1956.)

TECHNICAL COLLEGE LIBRARIES

UNDER the title "Standards for Library Service in Colleges of Technology", a Committee of the Sub-Section for Colleges of Technology and Further Education, University and Research Section of the Library Association, under the chairmanship of L. L. Arden, has compiled a useful report* containing basic recommendations for libraries in colleges of advanced technology, regional technical colleges and those area technical colleges which have advanced full-time or sandwich courses. The report sets out to give broad guiding principles based on the experience of its members, and the minimum standards set forth should not only be of assistance to local education authorities, principals and others, including librarians engaged in the provision of libraries, but should also indicate how much remains to be done before technical college libraries can assume the regional functions that have lately been suggested for them.

The principal recommendations comprise appointment of a suitably experienced chartered librarian, with the status recommended by the Library Association Council, before the library is planned, and sufficient full-time staff to ensure that the library can

* East Africa High Commission. Annual Report of the East African Agricultural and Fisheries Research Council, 1955-1956. Pp. ii+56. (Nairobi: Government Printer, 1957.) Sh. 3.

* Standards for Library Service in Colleges of Technology: a Report compiled by a Committee of the Sub-Section for Colleges of Technology and Further Education, University and Research Section, The Library Association. Pp. 16. (Cardiff: Mr. J. Fry, Librarian, College of Technology, 1957.) 3s. 6d.

remain open during college hours. A central library rather than departmental libraries is recommended: the latter should be provided only for distantly situated departments and should even then be under the control of the librarian. Seating accommodation should be adequate for 10 per cent of the student population, each part-time student being counted as one-fifth, and as a working formula it is recommended that the number of seats should be multiplied by twenty-five, with 20 per cent added to the product, to give the floor area in square feet, allowing for a librarian's office working space. Further allowance is required for book storage and future expansion.

The initial grant should be sufficient to provide for 10,000 volumes, with a minimum requirement after five years of ten volumes per student, and there should be retrospective files of the major technical periodicals. Alternative formulae for this book fund are given, and the furnishings should include visual filing systems, internal and external telephones, noiseless typewriters, photocopying apparatus and a microfilm reader. A recognized classification scheme should be adopted and the catalogue should provide an accurate, consistent and up-to-date means of locating the book stock and its contents.

How far these standards are at present from being generally achieved is shown by an analysis subsequently issued by the Sub-Section and compiled chiefly from data for 1955-56 supplied by members of the Sub-Section. Completed returns were received from only forty-three colleges and the data are arranged in four divisions: large colleges with about one million student-hours, two-thirds being full-time; those with 500,000 student-hours, one-third full

time; small colleges, with 250,000 student-hours, most part-time and evening; and monotronics, usually smaller institutions teaching only one subject.

Of the large colleges, the six with the largest expenditure averaged only £2,740 annually on books and periodicals (compared with an average of £4,867 for six small university colleges and £2,000 recommended by the London and Home Counties Regional Advisory Council for Higher Technological Education) and the six with the smallest expenditure averaged only £706. The six with the largest expenditure averaged 27,625 books in stock, compared with 9,995 for the six with the smallest, 83,433 for the university colleges, and the 15,000 volumes recommended. The number of periodicals taken averaged 359 for the six with the highest and 125 for the six with lowest expenditure, the corresponding numbers of staff being six and two, respectively. With the latter figure, it is pointed out, a college library can only be manned, not staffed. For the medium colleges, the average figures for the four with highest and the four with the lowest expenditures are as follows: annual expenditure on books and periodicals, £1,065 and £513, respectively, compared with a recommended £1,000-£1,750; books in stock, 13,247 and 6,472, compared with 8,000-10,000 recommended; periodicals taken, 150 and 120; and staff in the four with the highest expenditure averaged only one, compared with a minimum of two recommended. While it is pointed out that expenditure on books needs improvement, the staffing problem is again the most vital. Although many technical colleges are well served by their single librarian, such provision cannot give real service to an institution.

THE SURFACE FREE ENERGY OF ICE

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THE surface free energy of ice is an important parameter in the theory of homogeneous nucleation of ice from supercooled water and in the theory of ice crystal growth from the vapour phase, but no direct experimental determination of its value is at present available. It is of interest, therefore, to estimate the work of cohesion across the basal (000 $\bar{1}$) and prism (10 $\bar{1}$ 0) faces of a single crystal of ice using the Rowlinson¹ model of the water molecule.

When an ice crystal is cleaved along a basal or prism face a molecule bonded to either surface loses one nearest molecular neighbour and three or four next nearest neighbours, respectively. A molecule which is not hydrogen-bonded across the cleavage surface loses three next nearest neighbours if it lies in the basal plane or two if it lies in a prism face. Such bonded and unbonded molecules occur in pairs in both (000 $\bar{1}$) and (10 $\bar{1}$ 0) planes; taken together they may be regarded as losing one nearest and six next nearest neighbours in either case. The energy per hydrogen-bond required for cleavage is thus $E_C = U_1 + 6U_2$, where U_1 and U_2 are the average interaction potentials between molecules in the first and second co-ordination zones, respectively, the attraction of more distant molecules being taken as negligible.

The interaction potentials U_1 and U_2 for intermolecular spacings of 2.76 Å and 4.51 Å, respectively, have been calculated using Rowlinson's force constants, in which account is taken of dispersion, induction and multiple forces, up to and including terms varying as r^{-5} (Table 1). For both basal and prism faces the calculated energy E_C is thus 6,080 calories per mole surface. Expressed per unit area this free energy represents the work of cohesion

$$W_C^0 = \frac{E_C \cdot J}{N_A s}, \text{ while the surface free energy } F = \frac{W_C}{2},$$

where J is the mechanical equivalent of heat, N_A is Avogadro's number, and s is the area of surface per hydrogen bond. From the geometry of the ice lattice the area per bond in the basal plane is given by $\frac{a^2\sqrt{3}}{2} = 1.77 \times 10^{-15} \text{ cm.}^2$ ($a = 4.51 \text{ Å.}$), whereas

the bond area in the prism face is $\frac{ac}{2} = 1.66 \times 10^{-15} \text{ cm.}^2$ ($c = 7.35 \text{ Å.}$). Thus the prism faces are the more densely populated and their surface energies are slightly higher. The works of cohesion and corresponding surface free energies are found to be:

$$\begin{array}{l} \text{Basal plane } (W_C)_B = 238 \text{ erg/cm.}^2; \quad F_B = 119 \text{ erg/cm.}^2 \\ \text{Prism face } (W_C)_P = 256 \text{ erg/cm.}^2; \quad F_P = 128 \text{ erg/cm.}^2 \end{array}$$