

faeces did not contain excess fat<sup>38</sup>. This in turn suggested a full investigation of the calorie requirements of men sledging<sup>39</sup>. There were wide variations, from 4,000 to 5,500, with a mean of 4,800 calories a day. An estimate of energy expenditure tallies very closely with this figure, confirming that the food intake was just adequate.

This research has a two-fold significance. First, it has formed the nucleus of subsequent polar physiological programmes of Antarctic expeditions now in the field. The second feature is the fact that our figures show the sledging ration of 4,200 calories to be insufficient to maintain nutritional balance in the face of extremely hard work in the cold. The Medical Research Council reviewed the whole problem and advances in food technology packaging have been incorporated in prototypes now being tested in the polar regions<sup>40</sup>.

On the biological side, the incidence of trichinosis in those dogs which were shot or died in the second year were studied. It was found that the infested dogs were among those which had been brought from west Greenland, where they have been accustomed to eating raw meat, while none of the puppies which had been born on the expedition were infested<sup>41</sup>.

The insects which were collected in the Britannia Sø area and placed in the British Museum are all well-known members of the Arctic fauna of Greenland<sup>42</sup>. A botanical collection has been examined by Dr. A. Melders at the European Herbarium of the British Museum, where the specimens are now lodged.

Small fish, an unusual variety of the Arctic char, *Salvelinus alpinus*, were taken from Britannia Sø and handed over to Mr. G. F. Friend, of the Department of Zoology, University of Edinburgh. These fish are undoubtedly descendants of migratory sea-char which once made their way up a river, into the lake, and established themselves there. Since then, they have been isolated for thousands of years perhaps, and have evolved their own peculiarities, some probably in response to their difficult life in high latitudes and sealed as they are for five-sixths of the year under thick ice. Their eyes, nostrils and lateral-line pores—all sense organs—are large for the size of such small fish. They have a starved and juvenile appearance, while their growth-rate is slower than that of any known race of char. A low, flattened cranial-roof and a 'turtle nose' are other striking features. These add much new material to the picture of the chars as a whole.

Except where stated above, the results of the research carried out in the field have now been worked up and the following list of publications may be regarded as the scientific results of the expedition.

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## COLONIAL RESEARCH, 1956-57

**F**OLLOWING the pattern of the previous report, under the title "Colonial Research, 1956-57"\* are collected the annual report of the Colonial Research Council, the twelfth annual reports of the Committee for Colonial Agricultural, Animal Health and Forestry Research and the Colonial Medical Research Com-

mittee, the tenth annual reports of the Colonial Economic Research Committee and the Colonial Pesticides Research Committee, the fourth annual report of the Colonial Products Council, the thirteenth annual report of the Colonial Social Science Research Council, the second annual report of the Colonial Road Research Committee, the annual reports of the Colonial Fisheries Advisory Committee on Fisheries Research, 1956-57, of the Tsetse Fly and Trypanosomiasis Committee, and of the director, Anti-Locust Research Centre. There is also a section on research matters not covered by the reports of the specialist advisory bodies, which deals with building and housing research, the Falkland Islands Dependencies

\* Colonial Office. Colonial Research, 1956-1957: Reports of the Colonial Research Council; Committee for Colonial Agricultural, Animal Health and Forestry Research; Colonial Economic Research Committee; Colonial Fisheries Advisory Committee; Colonial Medical Research Committee; Colonial Pesticides Research Committee; Colonial Products Council; Colonial Road Research Committee; Colonial Social Science Research Council; Tsetse Fly and Trypanosomiasis Committee; Director, Anti-Locust Research Centre; and Research Matters not covered by the above Reports of the Specialist Advisory Bodies. Pp. 322. (Cmd. 321.) (London: H.M. Stationery Office, 1957.) 11s. net.

Survey (an outstanding feature of the work of which has been the air survey of 35,000 square miles conducted during the past two years by Huntings Aerosurveys), meteorology, industrial and engineering research, water-pollution research and geodetic, topographical and geological surveys. For the first time in many years, recruitment of surveyors and cartographical draughtsmen exceeded losses and the total staff on March 31, 1957, was 390, while the number of geologists, geophysicists and geochemists overseas, where geological surveys continued in twenty territories, rose to 211, although some vacancies remained unfilled.

Other than the fact that the work is concerned with problems arising in various overseas territories there is little in common between the several reports, nor is any general conspectus attempted even in that of the Colonial Research Council itself, other than the brief reference to Colonial Development and Welfare Schemes (a list of which is appended to the report). Expenditure on these schemes for the year ended March 31, 1957, was £1,538,412, compared with £1,374,323 in the previous year. A review of the whole field of Colonial research where Colonial Development and Welfare assistance is involved is being undertaken, and the Council will then consider the possible re-allocation of funds between the various fields to ensure that full use is made of remaining funds under the current Colonial Development and Welfare Act to fulfil the various programmes envisaged. Even this, however, gives no true measure of the effort in Colonial research which Britain is making. As the various reports demonstrate, this effort is interwoven with that made by the various overseas Governments themselves, and with that of British as well as Colonial universities, so that a complete assessment is difficult or impossible. Apart from the financial aspect, it represents an appreciable tax on British scientific and technical man-power which the universities and research institutions must be prepared to meet. During the year, thirty-four new appointments brought the complement of the Research Branch of the Overseas Civil Service in March 1957 to 189. In addition, two Research Fellows continued investigations on behalf of the Colonial territories, and fourteen research studentships were awarded.

The Committee for Colonial Agricultural, Animal Health and Forestry Research, which recommended grants totalling £925,921 during the year, still finds difficulty in securing suitable officers for senior posts, although recruitment of scientific staff for overseas duties was a little easier. To ensure closer co-ordination of work on control of pests and diseases, a special sub-committee, the Crop Protection Sub-Committee, was set up jointly with the Colonial Pesticides Research Committee. Under the Technical Aid Agreement, the Food and Agriculture Organization gave expert assistance for surveys of the Rufiji Basin in Tanganyika and the Accra Plain in Ghana, assisted Cyprus in controlling an outbreak of sheep-pox, and provided an expert for a survey of swamp soils in Sarawak. Acknowledgment is again made of the help received from research organizations and universities in the United Kingdom.

Much of the work of the Commonwealth Institute of Entomology is concerned with Colonial problems and 42 per cent of the Institute's identifications during the year were concerned with Colonial inquiries, notable help being given to a survey of forest

pests in East Africa and to the investigation of premature nutfall of coconuts in the British Solomon Islands Protectorate. Very satisfactory progress has been achieved in Jamaica with soil surveys, the results of which are being utilized in land rehabilitation schemes in overcrowded areas, while studies on soil fertility are receiving very close attention in nearly all Colonial territories. There is good prospect of remedying the deficiency of major and minor plant nutrients which prevent good growth of crops over large areas of Africa south of the Sahara. The Herbarium of the Commonwealth Mycological Institute is collaborating with the West African Maize Research Unit in a statistical analysis of spore sizes in collections from different parts of the world, and a serious outbreak of leaf-curl disease in flue-cured tobacco in Nigeria led to a recommendation for an immediate preliminary survey of economic-crop diseases. An electronic computer was used in a theoretical investigation for the Tsetse Fly and Trypanosomiasis Committee into the effect of introducing sterilized males into a natural tsetse fly population.

It appears that research results are increasingly being applied in tropical agriculture. Extension of soil conservation measures with the concomitant practice of moisture conservation in areas of low or erratic rainfall has greatly improved farm conditions in Kenya, Swaziland, Uganda, Granada and Somaliland. The soil nutrient status has also become clearer with discoveries of deficiencies of major and trace elements in many parts of Africa, particularly of phosphorus, nitrogen, sulphur, boron and molybdenum. Maize breeding in Africa, particularly with strains from Mexico, has produced a series of high-yielding varieties highly resistant to tropical maize rust, while cocoa hybridization in the West Indies and West Africa has given new material of exceptional yield and early bearing. Organic weed-killers also figure prominently in research programmes: thus, in West Africa a programme to spray 700,000 acres against capsid has been approved, of which about 100,000 acres have been treated with power-sprayers, and about 20,000 hand-sprayers have already been sold to cocoa farmers. Considerable advances have been made in the control of pests and diseases of cotton, and practical and economic measures developed for controlling major insect pests of sorghum and other cereals. Much attention is being given to the prevention of damage by storage pests and valuable advances are being made in control or prevention, particularly with rice, cocoa and groundnuts.

The large regional research organizations have advanced fundamental knowledge of the role and importance of organic matter in tropical soils, the nitrogen and sulphur cycles and phosphate fixation. Advances in banana breeding are recorded in the West Indies and the examination and description of flora continued in East Africa, the Zambezi Basin, Cyprus, Malaya, Tropical West Africa, Jamaica and Trinidad. Particular attention was given to the co-ordination of research and the prompt exchange of information between workers in allied fields. In forestry the cultivation in plantations of the valuable African timber tree, mvule (*Chlorophora excelsa*), was specially examined in collaboration with the Imperial Forestry Institute. Work on hormonal arboricides has established their use in eliminating weed trees when making improvement fellings, and notable success has attended species trials on tropical pines

in Central Africa and the Caribbean, and work on ambrosia beetles in West Africa has led to the adoption of practical measures of control. While attention to animal breeding led to no spectacular results, stock of better quality is continually becoming available and progress in vaccine production and other biological products has permitted a high degree of control of rinderpest and pleuropneumonia of cattle and Newcastle disease of poultry, and much progress was made in fundamental work on protozoal diseases of animals in East Africa. The detailed accounts of the work of the regional organizations include lists of publications. The Committee's report now occupies some 111 pages out of a total of 322.

The tenth annual report of the Colonial Economic Research Committee records the completion of Prof. A. T. Peacock's inquiry on the national income of Tanganyika, and of Mr. D. T. Edwards's analysis, in association with the Jamaican Department of Agriculture, of the economics of small farms in Jamaica. A large-scale study of the economics of farming systems in Africa was commenced and also an investigation of the agricultural economy of Malta. Among new projects priority was given to a study of the economics of road development in Uganda; an economic survey of the Seychelles; a survey of farm production in British Honduras; studies of the Fijian community as an economic unit; and of the effects of diamond mining in Sierra Leone on a predominantly subsistence economy.

The annual report on Fisheries Research, 1956-57, which comprises the reports of the individual Colonial fisheries research stations, records the failure of a special mission to impress on local opinion in Ghana and Nigeria the continuing need for fishery research in West African waters and the consequent winding-up of the West African Fishery Research Institute, Sierra Leone, as an inter-territorial body, though plans have been laid to safeguard the results already obtained by establishing, in consultation with the Sierra Leone Government, a small territorial unit based on the Institute's premises. Both the Federation of Malaya and the Singapore Government have withdrawn from the work of the Regional Fisheries Research Station at Singapore, and this station is also to be wound up. Efforts are being made to place the scientific staff of both stations in other parts of the Oversea Research Service.

Results obtained at the Jinja laboratory of the East Africa Inland Fisheries Research Organization have been used in advising the East African Governments on the probable consequences of proposed changes in legislation for the protection of fish stocks in Lake Victoria. Experimental evidence has now shown that organic sulphur deposited on the lake bed as plant debris has little chance of being converted into available sulphates. Interest in snails as intermediate hosts has led to the observation that the ability of snails living in small streams and pools to survive the dry period depends on their degree of infestation by parasitic nematodes. The effects of DDT on insectivorous fishes have been studied, and work on the food and feeding habits of insect-eating and fish-eating species of fish in Lake Victoria is nearly complete. Steady progress is reported by the East African Marine Fisheries Research Organization, which has correlated the seasonal appearance of the

dolphin-fish, *Coryphaena hippuris*, with plankton and hydrographic data.

The Northern Rhodesian-Nyasaland Joint Fisheries Research Organization gave priority to basic research on fish ecology in Lake Bangweulu, the Bangweulu swamps (where the importance of *Vossia* grass is being studied) and the Zambesi and Lanyeti rivers in the area to be covered by the Kariba Dam. From the Fisheries Research Unit, University of Hong Kong, a hydrographic survey of the sea around Hong Kong has now continued for two years and the possibility of developing an edible-oyster industry in Tolo Harbour has been investigated. The West African Fisheries Research Institute had fifteen scientific papers published or in preparation, including a complete scientific survey of the Sierra Leone estuary and an extensive survey of the bottom fauna on the continental shelf off Freetown, correlating this fauna with the nature of the sea-bed and with the food of fish.

The twelfth annual report of the Colonial Medical Research Committee refers to the termination of research on the physiology of hot climates which, in Nigeria and adjacent territories over the past eight years, has been very productive. With this exception, the various fields of research have remained unchanged, although research on trachoma in Jordan had to be suspended. The Research Unit on Tuberculosis in Ghana is now well established and has maintained effective contact with workers in Nigeria and Sierra Leone, while the formation of the Leprosy Sub-Committee has greatly stimulated interest and co-ordination; pilot control measures based on data secured in filariasis research, whether loiasis or bancroftiasis, are increasingly applied or planned. On the recommendation of the Committee, modest block grants have been placed at the disposal of each of the three regional organizations for medical research, in East and West Africa, and the British Caribbean, from which each could make small immediate grants annually to provide some additional research facility required by an individual research worker.

Research on loiasis and onchocerciasis in the Cameroons and Nigeria indicated that use of DDT and dieldrin granules in high concentrations (say, 5 per cent) to spray the mud of breeding-sites of *Chrysops* and *Tabanus* killed all larvæ, a process which, while very costly, may be economical in the rain-forest where the breeding-sites, though scattered and inaccessible, are small in total area. Investigations into the effects of 'Antrypol' and dimercaptosuccinate on the concentration of microfilariae in onchocerciasis gave promising results. Encouraging results were also obtained in East Africa in the control of filariasis in rural areas by treatment with 5 mgm./kgm. 'Hetrazan' once a week for six weeks and by spraying houses with dieldrin at 100 mgm./ft.<sup>2</sup> every six months. A pilot control scheme of bilharzia among schoolchildren is to be undertaken in the Mwanza area. Investigations on guinea-worm at University College, Ibadan, point to the value of 'Hetrazan' as a prophylactic for travellers journeying through endemic areas of dracontiasis, while in Tanganyika granulated dieldrin has proved a highly effective larvicide.

No definite evidence of a relation between the frequency of the sickle-cell trait and the parasite-rate or parasite-density was obtained in investigations in Nigeria and Southern Cameroons on malaria and the

sickle-cell trait. At the West African Council for Medical Research Laboratories, Lagos, studies in hepatic pathology showed that monkeys hyper-immunized against Zika virus were more tolerant to the yellow fever virus than the normal controls, while at the Trinidad Regional Virus Laboratory, Port of Spain, research has centred around epidemiological investigations of Ilheus virus infections. Investigations on the yellow fever hazard at the Institute for Medical Research, Kuala Lumpur, have been mainly concerned with whether local mosquitoes and animals can transmit and maintain the disease, whether the presence of other viruses in Malaya would affect its establishment, and methods of vaccination and mosquito-control. The United States Army Medical Research Unit (Malaya), in collaboration with the Institute, the nearby British Military Hospital and the Walter Reed Army Institute of Research, Washington, has made clinical and laboratory studies of children with pyrexias of unknown origin in the General Hospital, Kuala Lumpur, of encephalitis in Singapore and the Federation, and of the ecology of potential vectors of viral diseases in Malaya.

Much progress has been made in building up facilities for nutrition research at the East African Medical Survey and Research Institute, Mwanza, and at Kampala the Infantile Malnutrition Research Unit continued to explore the use of various diets in treating kwashiorkor. The Tropical Metabolism Research Unit, Jamaica, continued work on the composition of tissues in malnutrition, especially of muscle, and some progress was made in the measurement of Krebs cycle oxidations. In a controlled pilot trial in Nigeria, which has now lasted twenty-five months, diphenylthiourea has proved an effective treatment for all types of leprosy in a dosage of 1.0-3.0 gm. daily. It is at least as active as diamino-diphenylsulphone. With an isoniazid it combines effectively, is remarkably free from toxic action, and no evidence of drug resistance has appeared. Diamino-diphenyl sulphoxide also continues to show considerable promise. In studies at Makerere College on the enzymes of *Mycobacteria*, particularly the use of tetrazolium salts to detect dehydrogenases, satisfactory micro-methods have been developed which give consistent results with cultural organisms. At the National Institute of Medical Research studies have been made on the evolution of infection with *Mycobacterium leprae* in experimental animals, while at the Medical Research Council Laboratories in The Gambia, observations on the long-term therapeutic effects of 'Hetrazan' in *Wuchereria bancrofti* infections indicate that the maximal effect of non-toxic dosage-levels is not discernible until two years after treatment. In research on the biology of sandflies in East Africa, work with *Phlebotomus guggisbergi* may provide clues as to the real vector of kala-azar.

The tenth annual report of the Colonial Pesticides Research Committee refers to further studies of the Colonial Insecticides Research Unit, Porton, on the sorption of insecticides by soils, which have shown that repeated sprayings do not affect the sorption-rate, whereas increase of temperature increases the sorption of DDT and dieldrin, and that loss of insecticide by chemical decomposition is not a significant factor. A preliminary investigation has been made of the properties of residual DDT and dieldrin on some surfaces used in house construction, and the relative toxicities of the organic phosphorus

insecticides, diazinon, chlorthion and malathion, to houseflies and some species of mosquitoes have been determined. Promising new variations in olfactometric technique have been developed at the Imperial College Field Station, Silwood Park, while at Long Ashton Research Station a technique has been evolved for controlling leaf-spot disease of Lacertan bananas. At Urambo, Tanganyika, the Colonial Pesticides Research Unit successfully controlled heavy infestations of bollworm (*Heliothis armigera*) and stainers (*Calidea*) on cotton by weekly sprayings of DDT at 1 lb./acre, with BHC for aphid control when required. Control of bean fly, *Agromyza (Melanagromyza) phaseoli*, has been obtained with seed dressings of emulsifiable concentrates of aldrin, endrin and dieldrin. The Biting Fly Research Unit, Uganda, extended its facilities for entomological research and has established a laboratory colony of *Stomoxys calcitrans*. In filariasis research in Fiji residual sprays of DDT and dieldrin gave satisfactory control of mosquitoes resting in houses, and in transmission experiments high infection-rates were obtained with *A. polynesiensis* Marks in feeding experiments. In the Western Sokoto Malaria Control Pilot Project an improved technique for sampling insecticide deposits on mud surfaces was evolved, and on the 100-acre experimental plot at Kidichi Mdo, Zanzibar, effective economical control of *Pseudotheraptus wayi* on coconuts was obtained using 10 per cent DDT with 1 per cent coumarone indene resin dissolved in a mixed aromatic petroleum solvent.

Stress is also laid on research being done in the Colonies without the assistance of the Committee: for example, the preliminary survey at Aden of the relative importance of various pests of cotton; the promising results obtained in control of various weeds in Bermuda; the control of olive leaf spot (*Cycloconium oleaginum*) in Cyprus with 10:1:100 Bordeaux mixture; of scale insects on *Hibiscus* sp. in Malaya with dieldrin and 'Nicotox'; and of white copper borer, *Anthonus leuconotus* Pasc., with 0.5 per cent dieldrin in Tanganyika.

Almost half the fourth annual report of the Colonial Products Council and Laboratory is concerned with work conducted outside the Laboratory but under the direction or with the assistance of the Council. The 745 inquiries handled by the Laboratory during the year, of which sixty-two were still in hand, included such varied subjects as cedarwood oil, coconut products, the development of *Crambe abyssinica* as an oilseed crop, the relative nutritional value of *Oryza glaberrima* and *O. sativa*, the packing and transport of fresh mangoes, nutritional biscuits from local ingredients for school-children in Uganda, and the extraction of vitamin C from the West Indian cherry. Among the ninety-five investigations completed by the Laboratory during the period were those relating to oil of *Leptospermum citratum*, oil from the bark of *C. pedatinervium* as a source of safrole, Illipe butter, sugar cane wax, sisal wax, starches from arrowroot and sago, and animal feeding stuffs from waste materials. Other work included the separation, by chromatographic and counter-current techniques, of the constituents of pyrethrum, work on the seaweed *Corallopsis opuntia*, which has good jellying properties, the comparative properties of abaca fibre from Borneo, Sumatra and the Philippines, and pulping trials of *Ricinodendron rautanenii* timber from Northern Rhodesia and of British Honduras slash pine, *P. caribaea*.

Further work on the curing of the cacao bean and on the structure of the cacao leucocyanidin compounds was carried out at the Colonial Microbiological Research Institute, Trinidad, where a 3:4-diol structure has been indicated for peltogynol in place of the accepted structure, and the isolation of the intermediate oxidation products of substituted catechols is in progress. The Sugar Technological Laboratory, Trinidad, carried out much work on the fundamental physico-chemical aspects of clarification and also further work on the removal of evaporator scale and the chemistry of constituents of ammoniated molasses, but pilot-plant work indicates that the production of levulinic acid from molasses is unlikely to be economical. At Makerere College, besides investigations on the natural products of East African plants, the methane fermentation of vegetable wastes has been studied up to pilot-plant scale; and studies at the Forest Products Research Laboratory, Princes Risborough, on the production of fibreboard from secondary Colonial timbers indicated that after treatment with steam alone in the 'defibrator', pulp from all the species tested required further refining to give boards of adequate strength. Work on sugar derivatives continued at the University of Birmingham, where the series of oligosaccharides produced by acid reversion of N-acetyl-D-glucosamine has been fractionated and two disaccharides isolated, and a unit has been established for studying the pharmacological activity of extractives from plants and other materials of interest to Colonial territories. The study of medicinal plants which might contain hepatotoxic agents by the Medical Research Council's Toxicology Research Unit continued and also work on the constitution of the alkaloid dioscorine at University College, Cardiff, chemical investigations on the leaves of *Anona senegalensis* and the structure of the pectic compounds of *Agave sisalana* flesh at the University of Edinburgh. Further investigation at the Institute of Animal Physiology, Cambridge, of extracts of the seeds of *Dichapetalum toxicarium* indicates that a major part of the active fraction behaves mainly as a C<sub>18</sub>-fatty acid with one double bond and one fluorine atom.

In its second annual report the Committee on Colonial Road Research notes a slow but steady build-up of the Colonial Section of the Road Research Laboratory, which, at the end of March 1957, was short of its complement by two scientific officers, five experimental officers and five assistants (scientific) and emphasizes the adverse effect of the restrictions and delays in new buildings. Federal Nigeria proposes to establish its own central Road Research Laboratory, and Western Nigeria and Northern Nigeria are building up their Materials Testing Laboratories. Research teams have been recruited to study road-making materials available in Colonial territories and pavement design, and a survey has been made of published information on corrugations, theories advanced to explain their formation, and on methods of alleviating or preventing them by selection and treatment of road-making materials.

The bearing capacity of representative soils from Uganda, Northern Rhodesia and The Gambia over a range of densities and moisture contents has been determined using the California bearing ratio test. Road construction problems with fine-grained cohesionless sands occurring in coastal and desert areas have been investigated in connexion with the proposed Ado-Badagry road in Western Nigeria and the George-

town-Rosignol road in British Guiana. A range of full-scale experiments on the use of rubber in surface dressing, bitumen macadam and rolled asphalt is in progress, and examination of the economics of roads and road transport in under-developed territories has begun. This work has included a review of methods of road accidents with the view of helping territories to adopt methods within their capacities and suited to their needs, and ensuring that the data are so presented that they provide a reliable measure of the pattern of road accidents and their economic importance.

To the thirteenth annual report of the Colonial Social Science Research Council are appended the customary reports for 1956-57 of the East African Institute of Social Research, the West African Institute of Social and Economic Research, the Institute of Social and Economic Research, University College of the West Indies and the Rhodes-Livingstone Institute. Work was commenced on the project initiated at University College, Ibadan, for a history of Benin, to be financed jointly by the Carnegie Corporation and the Governments of Nigeria, and a study of family attitudes in Jamaica. The fourth volume, "Bantu Languages of Africa", of the Handbook of African Languages is in the press, and forty volumes of the Ethnographic Survey of Africa have now been published, while further sections on peoples of East Africa and of Nigeria are in preparation. A new relation between the East African Institute of Social Research and the Social Studies Department of Makerere College is being inaugurated which will establish a closer link between teaching and research, while maintaining the Institute as an autonomous organization within the College. The Institute of Social and Economic Research, University College of the West Indies, is studying West Indian agriculture and agricultural development, the labour market, the analysis and supplementation of West Indian national accounts and the role of investment in economic development. At the Rhodes-Livingstone Institute for Social Research, studies are in progress of European communities in the Copperbelt and in Southern Rhodesia; of the economics of peasant farms and of African education; and of urban sociology and the sociology of industry as well as two tribal studies.

The major field of activity of the Tsetse Fly and Trypanosomiasis Committee was in chemotherapy, and at a conference at the Colonial Office agreement was reached on procedures for the fullest co-ordination of full trials of promising new trypanocidal drugs and the prompt dissemination of such results. The new procedures have already been implemented, and the suramin complexes developed at the West African Institute for Trypanosomiasis Research appear to offer a considerable increase in the period of protection obtainable. In human trypanosomiasis the Institute has closely studied changes occurring in the saliva of tsetse infected with the *brucei* group of trypanosomes, and its clinical trials indicate that 'Malarsen' is a valuable alternative for treating *T. gambiense* infection under field conditions, especially in late or relapsed cases. Research on the forest species of tsetse continued at the Field Station and a comparative experiment on 'man-fly contact' was started near Kaduna during the rains. The study, by the East African Trypanosomiasis Research Organization, of the resting-places of the tsetse flies *Glossina swynnertoni*, *pallidipes* and *morsitans* is

likely to lead to new ideas on the use of insecticides. An investigation of the mechanism of water control in the pupa of *Glossina* is contributing to an understanding of the success and failure of some current methods of reclamation.

At the Sukulu Laboratory a small hospital was opened for the reception of patients from the lake-shore fly-belts, and a joint investigation with the Kenya Medical Department has shown that in that area *G. pallidipes* is a carrier of *T. rhodesiense*. The epidemiology of *palpalis*-borne sleeping sickness in Uganda is also being investigated. In Northern Rhodesia trypanosomiasis research has been limited to drug trials and prophylaxis. The Veterinary Department of the Northern Region of Nigeria is pursuing a vigorous programme of research into cattle trypanosomiasis, while the Department of Veterinary Services, Tanganyika, has compared the protection given by prothidium, ethidium-suramin complex and RD290 suramin complex with that given by 'Antrycide' prosalt. Prothidium was also the outstanding new prophylactic tested by the Department of Veterinary Services, Kenya.

The report of the director of the Anti-Locust Research Centre for 1956-57—in which the Centre received 984 reports of the desert locust situation from thirty-two territories, including reports on low-density locust populations from survey officers in the

Somali Peninsula, Ethiopia and parts of Arabia—notes that the desert locust situation improved somewhat in Eastern Africa, Iran, Pakistan and India, although heavy breeding occurred in the Sudan, the French Chad territory and the Niger Colony. A panel of international experts which met at the Anti-Locust Research Centre in April 1956 recommended that permanent surveys of the whole of the distribution area should be established by all governments concerned, and that all information on the state of desert locust populations and relevant weather phenomena should be centralized.

The International Red Locust Control Service continued studies on red locust populations in relation to vegetation dynamics and on control methods, and the International African Migratory Locust Organization became a permanent international body in 1956, when a research service was established. The Anti-Locust Research Centre continued to work on phase variation and its inheritance; maturation and fecundity in the red locust; weight and water-content of the desert locust in relation to flight and the life-cycle of *Eyprepocnensis plorans*, *Acrida bicolor* and *Gastrinargus africanus*. Annual and seasonal frequency maps of the incidence of desert locust swarms and hoppers were completed and maps of the major seasonal swarm movements were prepared.

## OBITUARIES

### Dr Willis R. Whitney

WITH the death on January 9 of Dr. Willis Rodney Whitney, at the age of eighty-nine, there ended a very remarkable career.

Although Dr. Whitney was a first-class scientist in his own right, his great contribution was the organization and successful direction, for thirty-two years, of the Research Laboratory of the General Electric Co., Schenectady, New York. It is hard to understand now what a truly pioneer task this was, for in 1900 there were no organized industrial research laboratories in the United States. He had to prove that industrial research could be made to pay. When he did this, other industries quickly followed General Electric's example. To-day, a research laboratory is considered essential for industrial success.

Born in Jamestown, New York, on August 22, 1868, Dr. Whitney's interest in science began with the acquisition of a microscope when he was in high school. After graduating from the Massachusetts Institute of Technology in 1890, he first spent four years as instructor in chemistry there, then went to the University of Leipzig, where he received his Ph.D. degree in 1896. After six months at the Sorbonne, he returned to the Massachusetts Institute of Technology as assistant professor and later full professor.

It was at this point that E. W. Rice, vice-president of the General Electric Co., visited him and proposed that he should start a research laboratory—a thing new to industry. The fact that it was an experiment appealed to Whitney—he loved an experiment. But he also believed in proceeding cautiously and slowly, feeling one's way. So he agreed to try it on a part-time basis, spending three days a week in Schenectady and the other three at the Massachusetts Institute.

His first laboratory was a barn in the rear of Dr. Steinmetz's house, and the laboratory staff consisted of Whitney and half the time of an assistant shared with Dr. Steinmetz. When the barn burned down in the following year, he moved to a building in the Schenectady works, and gradually began to add more employees, being very careful to preserve the atmosphere of friendly co-operation.

This atmosphere he himself generated by personal example. As long as the size of the laboratory permitted, he made a practice of visiting every member of the staff every day. His usual greeting on these visits was, "Are you having any fun?" To him, research was fun, "the finest of sports", as he once expressed it. Frequently, on his visits, he brought some new project or experiment, suggested by company activities or scientific progress, which he literally peddled from room to room, but seldom assigned.

It was one of his key principles that members of his staff were given freedom, in proportion to their proved ability, to choose their own research problems, and to publish important results promptly in their own names. He was a pioneer in the championing of such publication.

Optimism, enthusiasm and sound judgment were conspicuous qualities of Dr. Whitney, but above all was his devotion to science. It was literally true of him that science was his religion. He often talked about religion, but always concluded that the "search for truth" was the best kind of religion.

Scientific curiosity, which he once defined as the greatest asset of a research man, was his most conspicuous quality. If you visited him on a Saturday afternoon, you were likely to find him in a field near his home, putting a small piece of iron wire in the stem of a golden-rod and surrounding it by a high-frequency coil, to find out whether it was the heat of