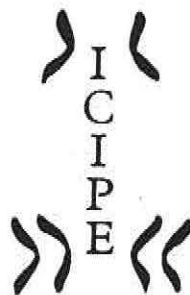


D. W. BARASA  
DOCUMENTALIST



THE INTERNATIONAL CENTRE OF  
INSECT PHYSIOLOGY AND ECOLOGY

FIRST ANNUAL REPORT  
**1973**

Nairobi, July 1973



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## THE INTERNATIONAL CENTRE OF INSECT PHYSIOLOGY AND ECOLOGY

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Professor Thomas R. Odhiambo (ex-officio)  
Mr. Joel M. Ojal (ex-officio)  
Prof. T. A. Taylor (1973)  
Professor D. P. S. Wasawo (1970)





## GRANTORS FOR THE FINANCIAL YEAR

1ST JULY 1972 TO 30TH JUNE 1973

United Nations Development Programme/Pre-Project Activity Grant  
United Nations Development Programme 1st and 2nd Quarterly Grants  
United States Agency for International Development Grant to Mosquito Biology Unit  
Swedish International Development Agency  
Netherlands Government  
Volkswagen Foundation  
Swiss National Science Foundation  
Nuffield Foundation  
British Overseas Development Administration  
Rockefeller Foundation  
Israel Academy of Sciences and Humanities  
Sloan Foundation  
Danish International Development Agency

## FINANCIAL SUMMARY FOR THE FINANCIAL YEAR 1972/73\*

<i>Income</i>	<i>K Shs.</i>
Grants	<u>5,577,705.15</u>
<i>Expenditures</i>	
Research and Support Services	430,633.45
Central Administration	1,913,505.00
Capital Investments	<u>548,811.50</u>
	<u>2,892,949.95</u>

\*A Balance Sheet may be supplied on request.



## TABLE OF CONTENTS

	<i>Page</i>
1. Perspectives in Insect Science	1
2. Central Administration and Research Support Services	3
3. Technical Training Programme	7
4. The Reproductive Physiology of Tsetse Flies and Ticks	9
5. Aestivation Diapause in Some Equatorial Insect Pests	17
6. Studies on the Acoustic Component of Communication in the Tsetse Fly	23
7. Tsetse Salivary Physiology: Its Relation to Trypanosome Development	25
8. Armyworm Research	29
9. Termite Research	31
10. Tick Research	35
11. Chemical Studies of Natural Regulators	39
12. The Electrophysiology Research Unit	53
13. The Fine Structure Research Unit	59
14. Ecological Studies on <i>Aedes aegypti</i> in East Africa Preliminary to Genetic Control	61





Professor Thomas R. Odhiambo, founder and Director of the International Centre of Insect Physiology and Ecology (ICIPE).

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## PERSPECTIVES IN INSECT SCIENCE

The International Centre of Insect Physiology and Ecology (ICIPE) was established as a unique institution linking a number of the world's leading scientists into a multi-disciplinary institute in Nairobi where the research focus of the scientific staff is to discover new knowledge that may permit the design and development of species-specific, non-toxic, non-persistent means for insect pest control. The ICIPE is not an applied research institute, yet its broad objectives relate to a concerted effort to fill the serious gaps that now exist in our understanding of the characteristics of insect species of great economic importance as pests of human life, of livestock, and of agricultural crops.

Tropical Africa — and, indeed, the whole tropical world — is endowed with a great diversity of insect life, much more complex than in any other zoogeographical region. Many of these species (e.g. the tsetse fly and the locust) have played a major role in shaping the economic and social history of tropical Africa; many more have been serious stumbling blocks in the intensification of agricultural development of this region. The task that the ICIPE has set itself is therefore an awesome challenge.

### INITIAL CHOICE

The Governing Board of the ICIPE, on the advice of its Directors of Research, has chosen to tackle this enormous problem by selecting a few kinds of tropical insect pests as the first targets of the concentrated effort of its research staff. These target insects — the tsetse fly, the tick, the African armyworm, the termite, and the yellow fever mosquito (*Aedes aegypti*) — all illustrate different aspects of the concerns of the ICIPE.

The tsetse fly and the tick, which transmit probably the most devastating diseases of tropical livestock, have been the subject of intensive investigations in Africa over the last 70 years or so. Most research effort has been directed toward elucidating the clinical symptomatology, disease pathology, and epidemiology of these vector-borne diseases. Further effort has been devoted to the ecology of the vectors. However, we know little of the physiology of these arthropods — their feeding biology, reproductive physiology, developmental biology, and sensory physiology — and we need to relate this knowledge more organically to an understanding of the ectoparasitic relationships of these vectors. The ICIPE will be devoting considerable expertise to this area during this initial phase of its work. The information we have already obtained on the salivary gland, the mother-larval relationships, spermatophore formation, and sperm activation in the tsetse fly, and what we are beginning to understand of the aggregation pheromone in the ticks, seem to signpost to important advances in the near future.

Now that the various locust species are under much improved surveillance and suppression control in Africa, the most serious hazard, actually or potentially, among the migratory insect pests in Africa is the African armyworm. We now have a system of forecasting outbreaks of armyworm moths that works with reasonable accuracy in East Africa. We know that the caterpillars restrict their choice of hosts to graminaceous plants. We do not know the regulatory mechanisms for this restricted host selection. Nor do we know much about the behaviour of migratory and non-migratory moths, their flight behaviour, their energy resources and flight metabolism, and the way in which they congregate and set their migratory direction. The ICIPE will be studying these problems, which are basic to a rational design for the long-term control of this important pest species.

The termites, which reach a complexity of social organization in tropical Africa rarely attained elsewhere, offer a different kind of challenge. The extent of their overt economic importance, as a result of their feeding on crops and forest products, is not accurately computed — but it is certainly great. Their significance also lies in the crucial role they are suspected to play in the soil-forming and landscape-architectural activities in the tropics. Finally, they are a major experimental target for the elucidation of the chemical communication system of insects. We have come to appreciate the important function small molecules play in the language of recognition, intra-specific behaviour, aggregation, and aggression among insects. Undoubtedly termites, with their intricate social system and their dependence on the maintenance of a stable domestic environment, offer excellent experimental materials for investigating these problems. The ICIPE has launched its programme in this area by a thorough study of the trail-laying behaviour of certain species of termites, and the chemical analysis of the pheromone involved. On another plane, some initial steps are being taken to experimentally study the factors that regulate the differentiation of the many castes of the higher termites.

Yellow fever is still regarded as an important disease in Africa. The second factor that has induced the ICIPE to select the *Aedes aegypti* mosquito as a target insect species at this time is that it is probably the best insect for use in studying the practical possibilities of genetic engineering as a technique for species-specific pest control. A great deal of information is available on the genetics of this species.

tsetse fly,  
tick

armyworm

termites

yellow  
fever  
*Aedes  
aegypti*





Its general ecology has been intensively studied over the last 30 years or so. The ICIPE has initiated an in-depth study of the population genetics, population dynamics, and behaviour of the various strains of the *A. aegypti* mosquito along the Kenya coast. This effort should shortly lead to a pilot project on actual control of this mosquito in ecologically isolated areas using genetic manipulative techniques.

### CRITICAL MASS

The ICIPE has now made a start on its scientific programme. The significant start is barely a year old. The critical mass of the scientific personnel of the Centre will probably be reached only at the end of the current year. Then we expect to have reached a diversity of disciplinary expertise in organic chemistry, biochemistry, physiology, experimental biology, electrophysiology, fine structure, and ecology, and a wealth of technical support in electronics, insectary services, photographic services, field travel facilities, and laboratory services, that will assure an interacting scientific community focussed on oriented entomological research.

This First Annual Report is largely devoted to a descriptive outline of the research activities of this young international research institute. It should be regarded as an earnest of what is yet to come.

*Thomas R. Odhiambo*

ICIPE Research Centre,  
Nairobi,  
9th July, 1973.



## CENTRAL ADMINISTRATION AND RESEARCH SUPPORT SERVICES

### A. CENTRAL ADMINISTRATION

Since December 1972, most of the Central Administration staff have been accommodated in a rented house on Surrey Road, two miles away from the main locale of the ICIPE Research Centre at the Chiromo Campus of the University of Nairobi. The house in Surrey Road has provided office room for the Director for Administration and Finance, the Accountant, and their supporting staff, as well as space for the storage of stationery and equipment that cannot be installed at Chiromo before the completion of the third building early in 1974.

The Centre has a Coastal Research Station at Mombasa, along the Nyali Beach. The station is accommodated in a two-storey house, which is presently occupied by the Mosquito Biology Project.

### SERVICES

The Central Administration has endeavoured to provide various key services aimed at facilitating the work of the Centre. For example:

- (a) *Work permits:* For a person who is not an East African to carry out any kind of work in Kenya, it is essential to have a work (or entry) permit. The Administration negotiates with the Kenya ministry concerned to have the work permit issued (or extended if it is due to expire). Usually, due to the co-operation of the Government, there is no undue delay.
- (b) *Permit to do research in Kenya:* The Government requires that those engaged in research in Kenya obtain permission from the Office of the President for their activities. The issue of such a permit is conditional, in that the findings of the research must be deposited with the appropriate bodies in Kenya. The Administration has not had any difficulties so far with this requirement.
- (c) *Duty clearance:* Certain types of goods imported by the ICIPE are allowed in duty-free, but from time to time difficulties arise and a member of the Administration is called upon to negotiate with the authority concerned to gain duty clearance.
- (d) *Tax clearance:* The Income Tax Department has instructed all airlines that no air ticket may be issued to a person working in East Africa for travel outside the East African Community area without personal tax clearance. This legal requirement has caused difficulties in cases where staff working with the ICIPE are being paid their salaries outside East Africa. The Administration has endeavoured to get clearance so that no person would suffer from double taxation or from travel restriction.

### GENERAL

Since the beginning of 1973, there have been a number of important administrative activities at the ICIPE. These include:

- (a) *Governing Board meetings:* The Governing Board held its 16th meeting in Nairobi on 19th to 21st January 1973. This was followed by the 17th meeting, held in London, at the Centre for Overseas Pest Research, on 14th and 15th May 1973.
- (b) *African Committee meeting:* The 3rd annual meeting of the ICIPE African Committee convened in Lusaka, Zambia on 6th, 7th and 8th February 1973. The National Council for Scientific Research of Zambia provided the necessary facilities such as transport, secretarial services and a committee room for the meeting.
- (c) *Resident Science Council:* This body, composed of representatives of the ICIPE research staff, the Laboratory Manager, and the two Directors, meets regularly every month. During the year it considered a number of important issues affecting the working environment of the research staff; training programmes; and the like.
- (d) *Liaison:* The ICIPE/University of Nairobi Liaison Committee did not meet during 1973, but informal meetings were held between Professor J. W. S. Pringle (Chairman, ICIPE Building Committee) and the Resident Architect of the University to sort out the question of readjusting the boundary of the land subleased by the University to the ICIPE at Chiromo. Professor Pringle also had talks with Mr. B. M. Gecaga, a Governor of the ICIPE and Chairman of the University of Nairobi Council, on the same and related questions.



(e) *Management Committee*: This Committee, an administrative arm composed of all Heads of Departments at the ICIPE, meets every Wednesday to discuss management matters.

## CONCLUSION

In retrospect, the year just past has been packed with activity. The number of scientists has gone up and the space available has remained inadequate, but spirit has been high in spite of the discomforts arising from time to time. Nearly everyone has contributed to the maximum, and a few officers have been very heavily overtaxed. The understanding of the Governing Board has given the staff encouragement; and personal comfort has been sacrificed to keep the ICIPE going.

## B. LABORATORY MANAGEMENT

As the ICIPE has grown in size, number of personnel, and programme scope, the need for a Laboratory Management service unit has become ever more pressing. The Centre was fortunate in obtaining in March 1973 the services of Mr. Atashili Mando as Laboratory Manager. His unit is now organised to handle the many functions necessary to the maintenance, safety, and ease of operation of the entire ICIPE complex, e.g. building maintenance, management of stores, organisation of safety precautions, and technical advisory services with regard to equipment acquisition, maintenance, and repair. Further laboratory management objectives include the organisation of educational demonstrations and training courses for the laboratory staff.

## C. THE WORKSHOPS

The major overall objective of this key ICIPE unit is equipment maintenance. However, the construction of special experimental adjuncts and the creation of substitutes for unavailable items are equally important functions. Under the guidance of the Workshop Manager, Mr. Peter Orawo, the Workshop is taking form as a quadruple service: mechanical, woodworking, electrical, and glass-blowing facilities are being developed so that the ICIPE Research Centre can become steadily more self-sufficient with regard to research needs and maintenance. Present facilities and equipment have been provided through the generosity of the UNDP and the Volkswagen Foundation.

## D. PHOTOGRAPHIC SERVICES

At present, photographic services at the ICIPE Research Centre are in a developmental state. A darkroom has been set up at the Surrey Road Campus to cater for electron and light-microscopy requirements, while another darkroom (largely for electrophysiology) is situated in the Mwangaza Building. Neither of the two existing darkrooms is properly equipped to meet all the demands of the research staff; hopefully, the construction of Building III and future availability of funds will enable the Administration to rectify this situation. Meanwhile, the Department of Entomology of the University of Nairobi is kindly allowing the ICIPE photographer the use of certain necessary equipment.

## E. LIBRARY AND DOCUMENTATION

Thanks to the generosity of the Netherlands Government and the Swiss Academy of Natural Sciences, the ICIPE has received more than a hundred basic biological and chemical texts, and subscriptions to several important journals. The Library is at present housed in a small room in the Harambee Building; but with the completion of the permanent building, it will be moved to a large and comfortable Library-Seminar room capable of holding a much expanded stock.

Although funds for Library and Documentation services have thus far been limited, it is hoped that beginning in 1974 it will become possible to provide more facilities for the use of the scientific staff, for example, projection and microfilm equipment, "tear-sheet" services for hard-to-get reprints, and many more professional journals and texts. These necessities can only be added as new funds become available.

Regular publications of the ICIPE include the Annual Report, and a bi-monthly Newsletter, both of which are distributed on request to academic institutions, research centres, academies of science, and other interested recipients throughout the world. The scientific staff working at the ICIPE publish occasionally in the journals of their disciplines; and it is planned to gather these "ICIPE Papers" once yearly for issuance under the Centre's aegis, with an Introduction by the Director.

## F. VEHICLE POOL

The central Vehicle Pool presently consists of only three vehicles — a long-wheel-base Landrover, a short-wheel-base Toyota Land Cruiser, and a Peugeot 204. The first is used mainly by the research staff



for scientific work; the Toyota is on call for general purposes (mainly purchasing services); and the Peugeot is used for postal and general messenger work. To the pool may be added the Citroën car assigned to the Director for Scientific Affairs.

The Centre is rather lacking in field vehicles. However, a number of research programmes have their own vehicles; and the Centre will shortly be purchasing three mobile laboratories and two two-ton Land Rovers to tow them.

## G. THE INSECTARY

The Insectary was almost the first scientific support service to be initiated in 1970 when the ICIPE was established. It was developed to provide more or less standardised insect material in quantity, firstly, for experimental purposes and secondly, for bioassay of chemicals under investigation (e.g. insect hormone analogues being extracted from plants.) In pursuit of these objectives, the ICIPE Research Centre has made substantial progress in the mass-breeding of two species of tsetse flies (*Glossina morsitans* and *G. austeni*), the soft tick (*Ornithodoros moubata*), the African armyworm (*Spodoptera exempta*), two species of locusts (*Schistocerca gregaria* and *Locusta migratoria migratorioides*), and the stem-borer (*Chilo zonellus*). Mosquitoes (*Aedes aegypti*) of various genetic origin and constitution are being bred at the ICIPE Coastal Research Station in Mombasa.

## ANIMAL BREEDING

A number of laboratory animals are bred and maintained at the Centre for regular use as animal hosts for the blood-sucking arthropods (tsetse flies and soft ticks) that are maintained by the Centre — e.g. rabbits, rats, and mice — or are maintained for experimental use as host animals or for other experimental purposes — e.g. guinea pigs and chickens. Earlier on (in 1970–72), goats were maintained for tsetse-feeding; but they proved so refractory, developing anaemia and other ailments so easily, that their use was stopped.

## BLOOD-SUCKING ARTHROPODS

A nucleus colony of *G. austeni* was taken over from that existing in the Department of Entomology of the University of Nairobi in 1970. To this have been added batches of pupae from the Tsetse Research Laboratory in Bristol. This colony supplied most of the insect material for research until early 1972. A second tsetse colony, of *G. morsitans*, was started at the beginning of 1972, largely with pupal material from the Seibersdorf Laboratory of the International Atomic Energy Agency (IAEA) in Vienna. This colony is now self-sustaining, and is capable of supplying all the needs of the present research programmes at the ICIPE Research Centre. Both colonies are fed on rabbit ears, although experiments are shortly to be initiated on artificial membrane feeding as a long-term measure.

Attempts to colonise a third species of tsetse flies, *G. pallidipes*, which is crucially important for "nagana" in cattle, have so far not fared well. Flies, from pupae sent to the Centre by the East African Trypanosomiasis Research Organization at Tororo, have been kept going for two or three generations at a time; but this has not led to a self-perpetuating colony as yet.

Since mid-1972, a colony of *O. moubata* has been maintained on rabbits at the Centre. It is adequate to provide experimental material, but not large enough for chemical extraction procedures. Furthermore, the individual specimens are relatively smaller than wild-caught individuals, and seem to feed less well. Consequently, investigations have been going on since last year to discover a more adequate host animal. Experiments up to now seem to indicate that nestling rats might prove to be superior to rabbits.

## PLANT-FEEDING INSECTS

The African armyworm is an important target insect for ICIPE research programmes, especially in relation to behavioural and electrophysiological studies on host selection, and in regard to studies on migratory flight and the chemistry of its pheromones. Thus, the mass-rearing of larvae and adult moths is important. This was initiated late last year; and, in spite of restricted accommodation, *S. exempta* being fed on an artificial diet originally developed at the East African Agriculture and Forestry Research Organization at Muguga is doing well. Armyworm breeding requires sterile conditions; this has not been possible so far because of restricted accommodation and the need to have other insects share the armyworm room. The situation will change later on this year when a greenhouse becomes available.

The two locust species are routinely kept in wheat seedlings or grass, and are flourishing. So are *Galleria mellonella* moths, which are maintained for bioassay purposes. An artificial medium, based on the well-known medium for the rice-borer but with the substitution of maize-leaf powder for rice-plant powder, has been successfully developed for *C. zonellus*. This moth is now routinely bred in the ICIPE Insectary.

A start has been made this year of breeding termites, by starting each individual colony by a pair of termites alates. It will be many months before we can gauge the rate of success with this technique.





## CONCLUSION

Two matters featured largely during this period. Firstly, it is quite evident that training in insectary matters is a basic pre-requisite for this central support service. So far, only two staff members of the Insectary can be said to have had a thorough grounding in insect breeding. Special effort needs to be directed to finding relevant mechanisms for the efficient training of the rest of the staff.

Secondly, the problem of Insectary accommodation is an acute one. Since each insect species being bred at the Centre at the moment requires its own unique environmental conditions, adequate space is needed — which presently is conspicuously lacking.

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## TECHNICAL TRAINING PROGRAMME

One of the most important aspects of the ICIPE's activities is its technical training programme, which has been receiving support from various funding sources including SIDA, USAID, the Swiss Government, the International Atomic Energy Agency, NUFFIC, the Rotary Club International, and the Israel Academy of Humanities and Sciences. Since the beginning of 1971, several young African scientists and technicians have been enabled by this programme to expand their range of skills and thus increase their usefulness to scientific research in general and to the ICIPE in particular. The technicians will form the backbone of the service units that will assist the ICIPE's operations during the next few years; while the scientists will add to the growing pool of research staff at the Centre.

*Arora, Gurdeep K.* Academic Record: M.Sc. in Entomology, University of Nairobi, 1971; Assistant Lecturer in Entomology, University of Nairobi, 1971. Miss Arora (a Kenya citizen) trained at the University of Wageningen, The Netherlands, under ICIPE Director of Research Professor Jan de Wilde during 1972 in histological, experimental, and biochemical techniques, then returned to the ICIPE to act as Experimental Officer in Endocrinology in the insect reproductive physiology group. Miss Arora has recently married and moved to England.

*Mango, Christine.* Academic Record: B.Sc., Interamerican University, Puerto Rico 1964; M.Sc., Columbia University, U.S.A. 1966. From July to September 1971, Mrs. Mango (a Kenya citizen) was trained under the supervision of Professor R. Galun at the Israel Institute for Biological Research, Ness-Ziona, Israel, in tick breeding and the maintenance of tick colonies, as well as in the general histology of the tick, and the cytology of the tick brain (especially its neurosecretory cells). Some of the results of her research have recently been published in a scientific paper: Galun, R., Sternberg, S., and Mango, C. (1972). The use of sterile females for the control of the tick *Argas persicus* (Oken). *Israel Journal of Entomology*, VII, 109-115.

*Orawo, Peter.* Academic Record: Diploma in Engineering Electronics, 1964-67; Maintenance Supervisor's Certificate, 1969; Diploma in Semi-conductor Maintenance, Turin, 1970; Senior Technician, Science Faculty Workshop, University of Nairobi, 1965-71. During 1972, Mr. Orawo (a Kenya citizen), underwent training in the United States at Hewlett-Packard, Syntex, Zoëcon, and the Stanford Linear Accelerator Electronics Laboratory, in the selection and maintenance of equipment necessary to the ICIPE's electrophysiology and fine structure analysis units. He returned to the ICIPE in December 1972; and is now the Workshop Manager for the Electronics and Mechanical Workshops.

*Owiny, A. Michael.* Academic Record: B.Sc. in Zoology, Botany, and Chemistry, at Makerere University, 1965; Ph.D., University of London, 1972. Dr. Owiny, a citizen of Uganda, is presently being trained in acoustic physiology under Professor Aage R. Møller at the Karolinska Institute, Stockholm, Sweden. His fellowship funds are being supplied by SIDA. Upon completion of his training in January 1974, Dr. Owiny will take up an appointment as a Research Scientist at the ICIPE Research Centre in Nairobi, to work on the acoustic physiology of tsetse, armyworm, and other target insects.

*Sequeira, Maria Lina.* Academic Record: M.Sc. in Entomology, University of Nairobi, 1971; Graduate Research Assistant, Tsetse Physiology Project, University of Nairobi, 1968-71. In March 1973, Miss Sequeira (a Kenya citizen) completed a course of training under Dr. John Treherne and ICIPE Director of Research Professor Torkel Weis-Fogh at the University of Cambridge in the use of radioisotopes in insect physiological research, as well as special training in high-resolution electron microscopy. On her return to the ICIPE, she became Experimental Officer in the Fine Structure Research Unit.

*Wanyonje, John.* Academic Record: Diplomate, Ralph Bunche Academy; Technical Assistant, East African Trypanosomiasis Research Organization (EATRO), Tororo, 1967-69. An employee of the ICIPE since 1970. During 1971, Mr. Wanyonje held an International Atomic Energy Agency Fellowship that enabled him to train at the Agency's laboratory at Seibersdorf in the establishment and maintenance of large colonies of insects, especially tsetse flies, for entomological research. On his return in December 1971, Mr. Wanyonje (a Kenya citizen) took temporary charge of the Insectary at the ICIPE, until the arrival of the present Insectary Manager in April 1973.

*Wanyonyi, Kizito.* Academic Record: B.Sc., Zoology and Chemistry, Makerere University, 1971. At present, Mr. Wanyonyi (a Kenya citizen) is completing a two-year research and training programme at the University of Bern, Switzerland, under the direction of ICIPE Director of Research Martin Lüscher,



with emphasis on termite research techniques vital to the ICIPE's project on the higher termites (caste differentiation, pheromonal biology, and ecology). Mr. Wanyonyi completed his Master's thesis in July, and is expected to return to the ICIPE Research Centre in September 1973 as Experimental Officer in the termite research group.

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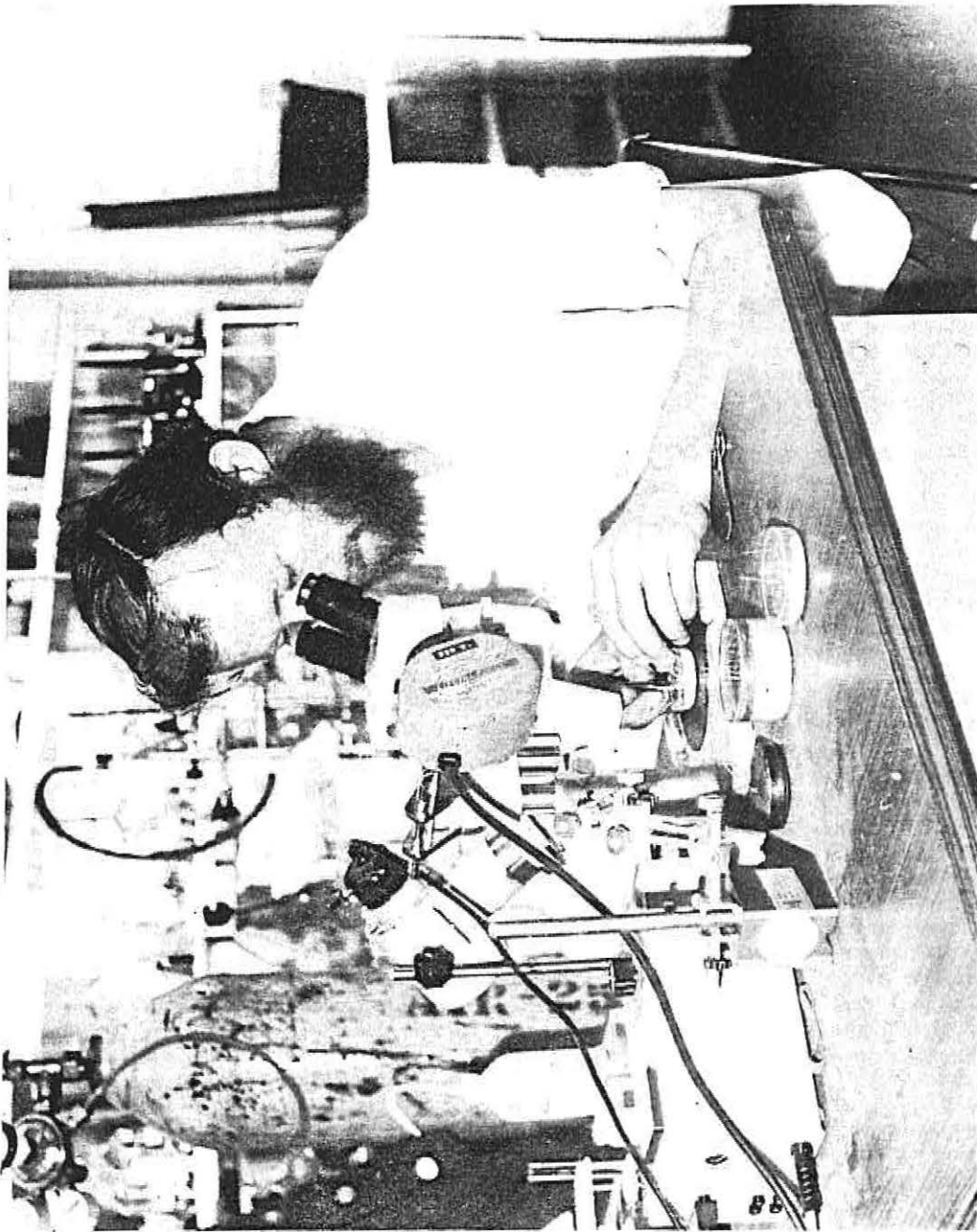
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Work on the reproductive physiology of tsetse flies is carried out by an ICIPE Research Scientist.

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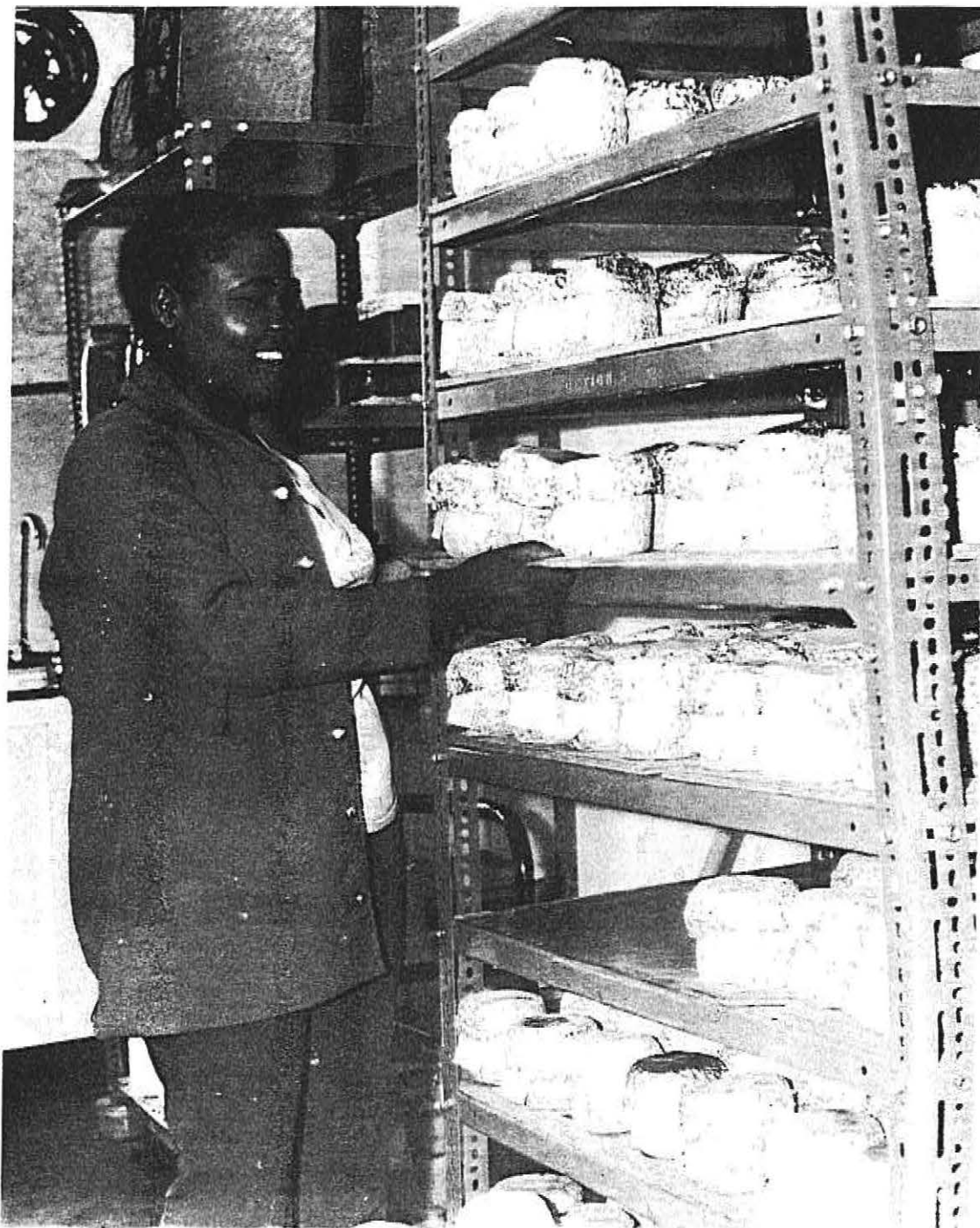
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Termite colonies being reared in the ICIPE Nairobi laboratories.

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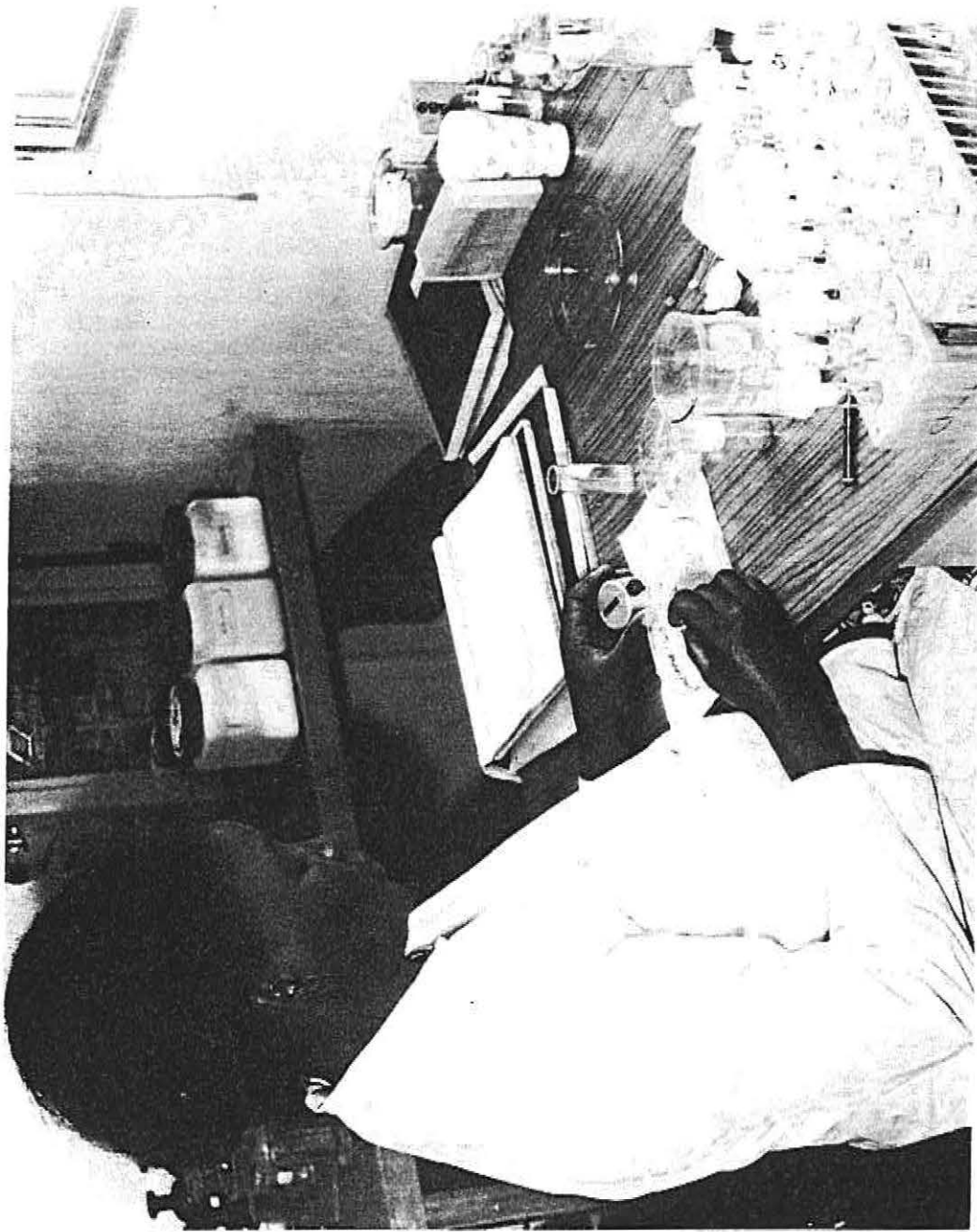
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An ICIP Experimental Officer at work on the Tick Project.

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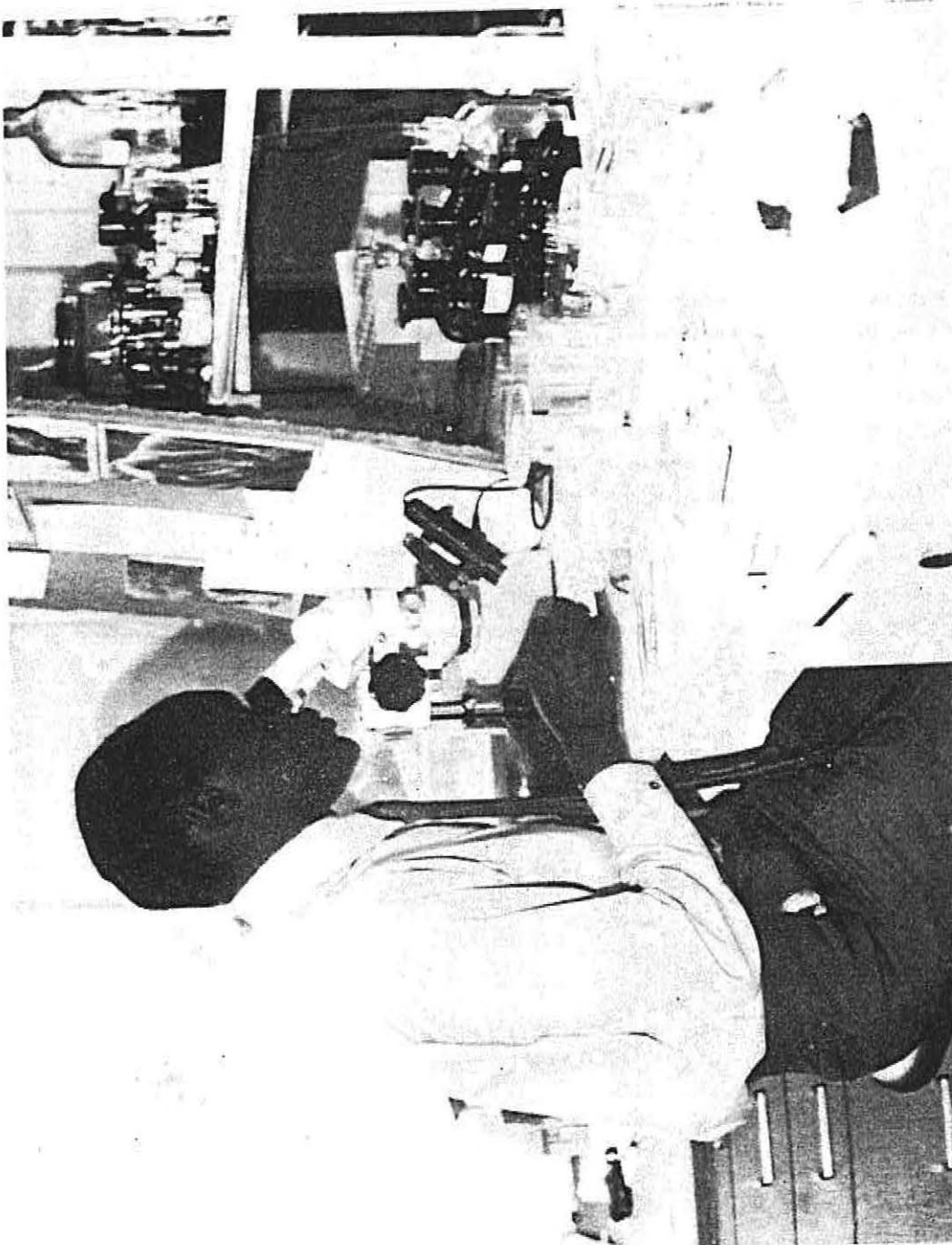
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An ICIPE Research Scientist whose fields of interest include the host-seeking and mating behaviour of various insect pests.

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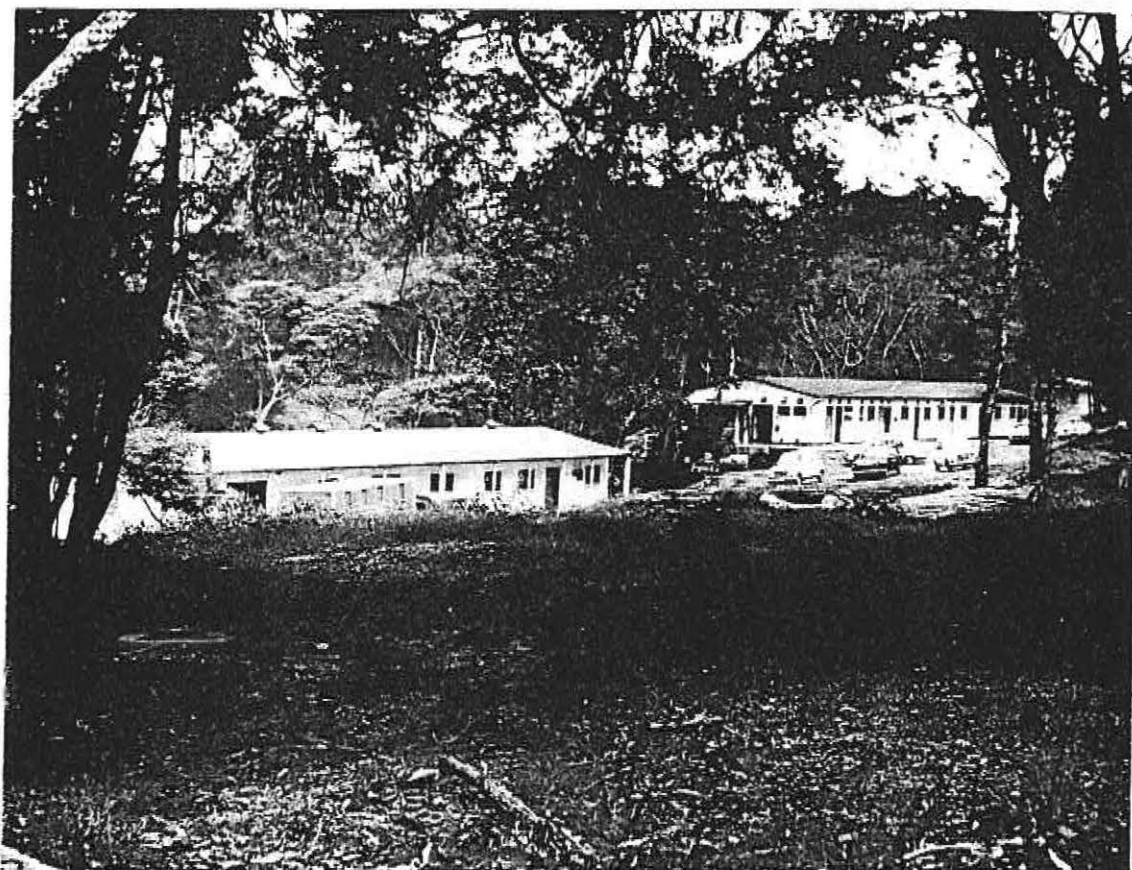




Mosquito breeding habits are studied in the sylvan area outside Mombasa.





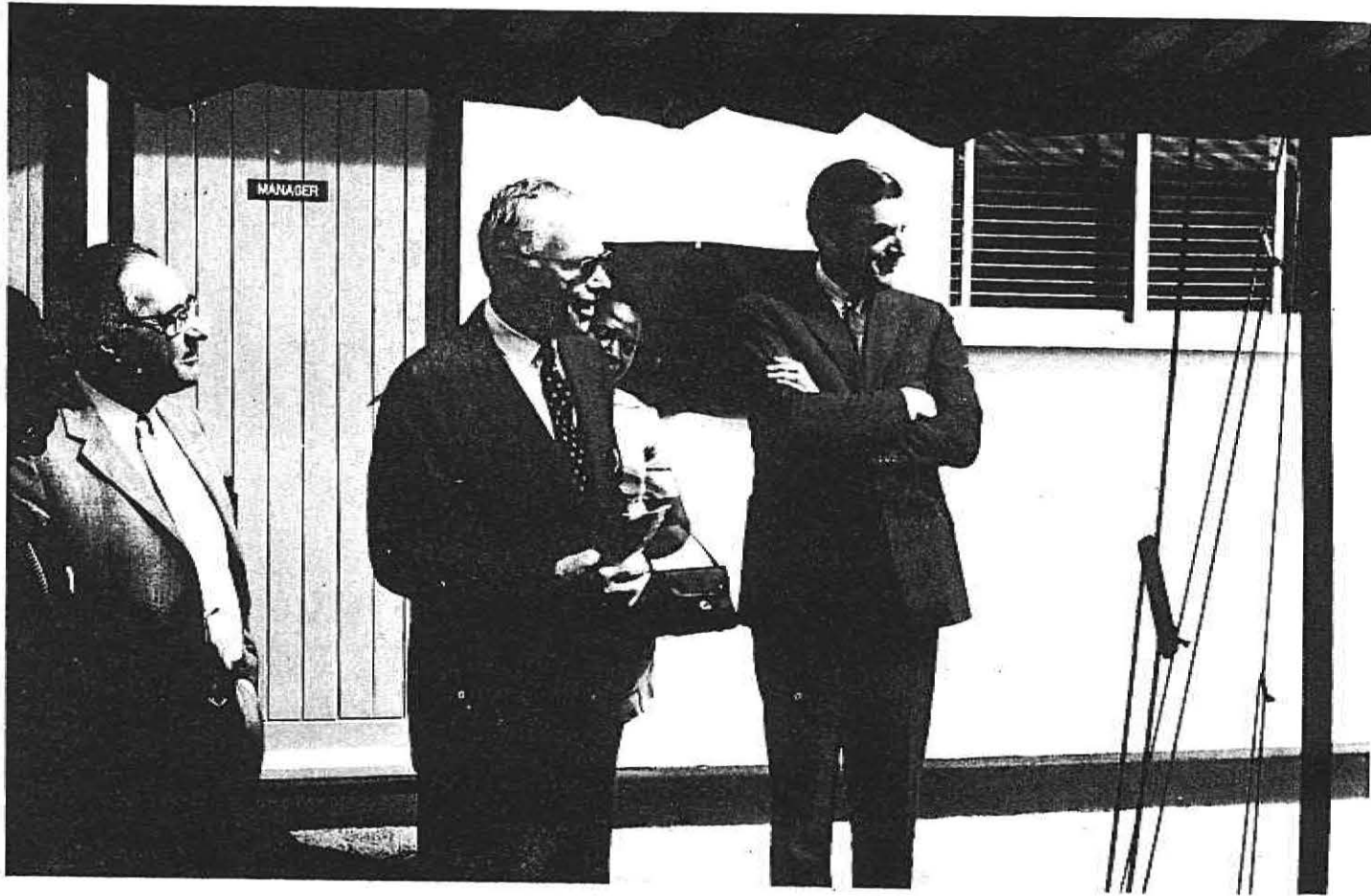


The temporary buildings of the ICIPE Research Centre, Nairobi (Chiromo).  
The first permanent building will be occupied in 1974.



The ICIPE Coastal Research Station at Mombasa, where studies on *Aedes* mosquitoes are under way.





At the 1971 dedication of the "Harambee" Building, ICIPE, gift of the Universities of Amsterdam and Wageningen. At left, Prof. Jan de Wilde, a Governor of the ICIPE and dedicator of the building; centre, the first Chairman of the ICIPE Governing Board, Prof. Carroll L. Wilson; right, the Ambassador of the Netherlands. In the background, Mrs. Odhiambo, wife of the Director.



By developing facilities for glassblowing and other laboratory maintenance techniques, the ICPE is improving its self-sufficiency.

