

THE MOLTENO INSTITUTE FOR RESEARCH IN
PARASITOLOGY, UNIVERSITY OF CAMBRIDGE,
WITH AN ACCOUNT OF HOW IT CAME TO BE
FOUNDED.

BY GEORGE H. F. NUTTALL, F.R.S.,
Quick Professor of Biology, Director of the Institute.

(With Plates IV—VI and 6 Text-figures.)

CONTENTS.

	PAGE
Introduction	97
I. Events antecedent to the Foundation of the Institute:	
The Frederick James Quick Fund—The Quick Professorship of Biology—The Quick Endowment for Research	98
Frederick James Quick (1836–1902). A biographical note	100
The Quick Laboratory	100
The Scientific Staff of the Quick Laboratory	102
A List of those who worked in the Quick Laboratory (1907–21)	102
Work carried out in the Quick Laboratory	104
Regarding various grants and benefactions in aid of research	104
The Field Laboratory	105
II. The Foundation of the Molteno Institute	105
Mr and Mrs P. A. Molteno's benefaction	107
Benefaction from the late Lord Strathcona and Mount Royal	108
The Inauguration Ceremony	108
The Molteno Institute for Research in Parasitology	112
Preparations for building the Institute	112
The Site of the Institute	113
Description of the Institute:	
The Exterior of the Building	113
The Interior of the Building	117
Scientific Collections	123
The Library	124
Facilities for Publication	124
Plans for the future development of the Institute and their dependence on further Endowment	125
Acknowledgments	126

INTRODUCTION.

THE foundation of an Institute for Research in Parasitology in Cambridge is an achievement worthy of being recorded in some detail since it affords a recognition of the value of a branch of biological science that cannot but

gratify all who have gained an insight into the deep significance of the many problems which parasitology presents when viewed from the standpoint of pure science.

We should, moreover, signalize the generosity of the benefactors who have rendered possible the establishment of such an Institute, for the help they have given deserves the gratitude of all who are concerned directly or indirectly in securing the welfare of man, animal or plant by combating the parasites which are the cause of so much waste and death throughout the living world.

I. EVENTS ANTECEDENT TO THE FOUNDATION OF THE INSTITUTE.

Since the writer's tenure of the Quick Professorship of Biology has had an important bearing upon the developments which led to the foundation of the Institute, it seems appropriate, in the first instance, to dwell upon the history of the Professorship and the conditions that apply to its tenure. Moreover, the work done in the Quick Laboratory during the years 1907-19 led by a process of natural growth to the inevitable necessity for the more favourable accommodation that has since been found in the Molteno Institute.

The will of Frederick James Quick¹ bequeathed to the University of Cambridge a fund called the *Frederick James Quick Fund*², the income thereof to be devoted to the promotion of "study and research in the sciences of vegetable and animal biology." The administration of this fund was entrusted by the testator's trustees to a Board of Managers consisting of the Vice-Chancellor and six Members of the Senate of the University appointed by Grace. The income of the fund was to serve (a) mainly for the stipend of a Chair (£1000) to be called the *Quick Professorship of Biology*, and (b) for the expenses of research carried on in the Professor's laboratory. The Quick Professorship is tenable for three years from the date of election, the latter taking place triennially and being open to all who may apply. The writer has been elected to five successive triennial periods of tenure. At the end of the first and second triennial periods an interval of six weeks occurred during which the chair was vacant and the stipend ceased, but the regulations governing the chair were modified in 1918³ by advancing the date of re-election so that there should be no break in the tenure of the Professorship.

The original regulations governing the Quick Professorship⁴ provided *inter alia* "that it shall be the duty of the Professor to devote himself to the study of the Protozoa, especially such as cause disease, and generally to promote that branch of science by research and by the superintendence of a laboratory or otherwise." The regulations provided, moreover, that the chair might "at

¹ For biographical note relating to Mr Quick, see p. 100.

² See *Cambridge University Reporter*, 3, II. 1903; 33, III. 1906, pp. 577-581; 1, v. 1906, pp. 778-781.

³ *Ibid.* 23, IV. 1918, p. 619.

⁴ *Cambridge University Reporter*, 13, III. 1906, p. 579.

any time after twelve years from the election of the first Quick Professor be subject to alteration by Grace of the Senate on the recommendation of the Board of Managers."

It may be mentioned here that the regulations were modified in 1920¹ on the recommendation of the Managers of the Quick Fund whereby the regulation cited in the previous paragraph was altered, the words "it shall be the duty of the Professor to devote himself to the study of the Protozoa, especially such as cause disease," being changed so as to read "it shall be the duty of the Professor to devote himself to the study of Parasitology." The Managers recommended that the field of study and research should be *Parasitology* for the following reasons:

Parasitology includes, of course, the study of Protozoa causing diseases as a special section. As a pure science it is closely linked up with vegetable and animal biology generally, while as an applied science it appeals equally to the medical man, the veterinarian and the agriculturalist.

Professor Nuttall has now been elected Quick Professor for periods of three years, five times in succession, and the work continuously carried out by him, and under his direction, has insensibly drifted into the wider field of Parasitology.

Hitherto there has been no suitable laboratory available for the Quick Professor of Biology. The authorities of the Medical School placed the unfinished part of their Museum at his disposal, temporarily, but even then the Professor and his staff have been crowded into what is practically one room. It is a happy solution of this difficulty that a new Institute has been given to the University, planned expressly for the continuation and expansion of the work of the Quick Professor.

As Professor Nuttall has been so closely associated with the gift to the University of the Molteno Institute for Research in Parasitology it seems to the Managers of the Quick Fund desirable to extend the field of activity set down for the Quick Professor so that it may coincide with that for which the Research Institute is destined.

Regulation 11 for the administration of the Quick Fund provides for alteration of the other regulations except nos. 1, 2, 7, 10 and 11 at any time twelve years after the date of the first election (16th October, 1906), "provided that in all cases the main object of the Fund, namely, the promotion of study and research in the sciences of vegetable and animal biology shall be adhered to." The alteration of regulation 8 (1), now proposed, is entirely in keeping with the main object of the Fund.

The Quick Endowment for Research. As previously mentioned (see p. 98), the Quick Fund, which provides the stipend of the Professor, also makes a certain provision for the expenses of research carried on in his laboratory. This fund, during the years 1906-18, yielded an average annual income of about £200 which has since increased to £300. Until the foundation of the Molteno Institute this represented the sole permanent source of income available for the purposes of research and the maintenance of a laboratory.

¹ *Cambridge University Reporter*, Date of Report 2, XII. 1920.

FREDERICK JAMES QUICK (1836-1902).

A BIOGRAPHICAL NOTE.

(With portrait, Plate IV.)

Mr Quick was born in London on 22nd October, 1836, as the second son of James Carthew Quick, a wholesale coffee dealer of that city. He was educated at Harrow (1851-55) and Trinity Hall, Cambridge, where he came into residence in October, 1855, and took the degree of B.A. on 29th January, 1859. He studied for the Bar, but never practised. He learned farming at St Andrews, his father buying Woodmancole at Elmsworth, Sussex, for him. For a short time he became partner in a wholesale tea business, and in 1869 he entered (again as a partner) the firm of Quick, Reed and Smith, which his father had founded. He remained the head of this firm until his death on 21st December, 1902. Shortly before his death, having a horror of being buried alive, he requested one of the trustees of his will¹, Mr Williams, to see that "a surgeon probed his heart to see that death had taken place," asking, moreover, that his body might be cremated. His wishes were duly carried out, and his ashes were buried at Broadwood Cemetery. Mr Quick never married.

In business Mr Quick was a shrewd, far-seeing, and capable manager. His associates were greatly impressed with the accuracy of his judgment in affairs and in the estimation of the character of those with whom he came in contact.

He was much interested in botany and biology, and to this the founding of the Quick Professorship is mainly to be ascribed. Mr Williams has informed the writer that Mr Quick was very anxious that the Chair should be always abreast of the times, this accounting for pertinent provisions in the bequest. The full benefit of the latter will not be realized until the expiration of certain life-interests.

The writer is greatly indebted to Mr J. W. Williams for providing most of the information on which this note is based; Dr Henry Bond, Master of Trinity Hall, kindly supplied the little that is recorded in the College books.

THE QUICK LABORATORY.

After being elected to the Quick Professorship, the writer found "temporary accommodation" in the unfinished portion of the Medical School Museum, establishing the "Quick Laboratory" therein. The temporary quarters, however, became quasi-permanent for they were occupied during the years 1907-21. The laboratory consisted of one large room (Fig. 1) which was divided into cubicles by means of matchboard partitions and suitably placed cupboards or screens, the accommodation being the best that was available. A wooden floor was erected over that of the museum so as to bring the work benches near to window-level, the result being that the floor was very resonant, apart from its being creaky owing to its light sub-structure. The room grew inadequate at an early date for the increasing number of workers, collections, books and apparatus. The number of persons working in the room rendered

¹ Mr Quick's second Trustee is Mr John Eagleton of London.



FREDERICK JAMES QUICK

1836—1902

Founder of the Quick Professorship of Biology, Cambridge

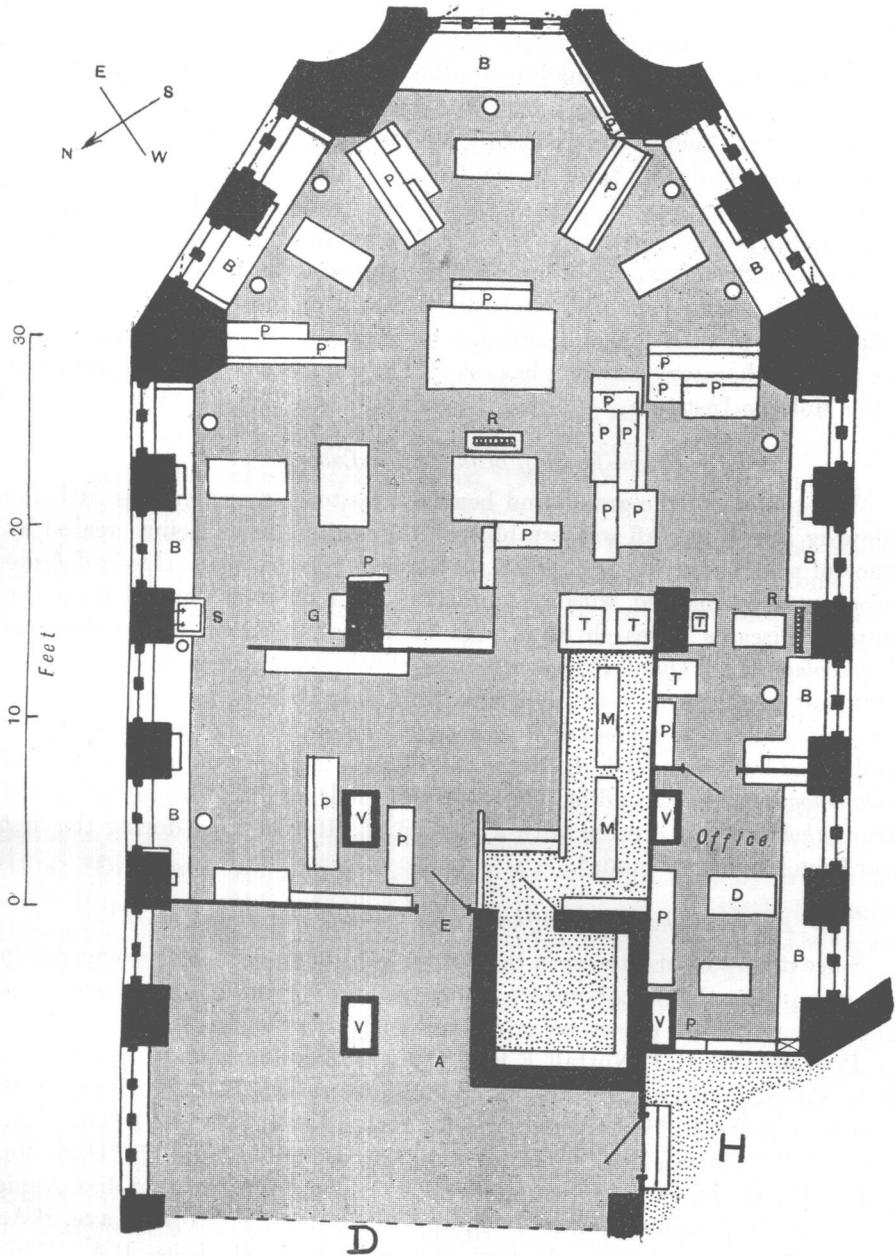


Fig. 1. Illustrating the cramped quarters of the Quick Laboratory during 1907-21. The entrance to the Laboratory (E) is reached by passing through the Hall (H) and small Demonstration Room (D) of the Medical School. The lettering indicates the internal arrangements: Alcohol specimen room (A), Benches (B), Desk (D), Glass blower (G), Microphotographic apparatus (M), Presses, Cupboards, Book-cases and Cabinets (P), Radiator (R), Sink (S), Thermostats (T), Ventilating shafts (V), Tables and shelves are left blank and 9 work-places are indicated by circles opposite benches.

102 *The Molteno Institute for Research in Parasitology*

it a very noisy place where through the shifting about and conversations going on it was difficult to collect one's thoughts and to carry on experimental work without constant interruptions, privacy being precluded. There was but one sink in the room for all the workers, there was danger of fire because of the amount of woodwork and alcohol-preserved material, and finally, especially during the war, the lack of heating and ventilation became insupportable. It was then that the writer resolved to issue an appeal for help and proceeded to write out a statement showing what a need there was in Cambridge of a suitably equipped Institute for Parasitological Research, the Quick Laboratory, in addition to all its other failings, being a place totally unfit for the prosecution of researches on organisms of an infective nature. The Quick Laboratory, as such, has ceased to exist since it is now incorporated in the Molteno Institute.

Scientific Staff of the Quick Laboratory.

With the aid of the grants and benefactions to be mentioned (p. 104) the following scientific staff was established, the various posts being created by Grace of the Senate: In June, 1907, a *Research Studentship in Medical Entomology* was established with an annual stipend of £100 derived from the Tropical Diseases Research Fund¹. In December, 1908, an *Assistantship in Protozoology to the Quick Professor* was established with an annual stipend of £100 paid during three years by the writer and subsequently by grants which have since been augmented². A second *Assistantship* was subsequently established but has lapsed. In November, 1911, a *Demonstratorship in Medical Entomology* with a stipend of £50 was established³ and in 1913-14 the post of *Helminthologist* was created with a stipend of £100, derived during the first year from laboratory funds⁴.

A List of those who worked in the Quick Laboratory 1907-21.

Since it may be of interest in the future, a list of those who were engaged in research in the Quick Laboratory is herewith appended, the names of those who have published papers being marked with an asterisk:

Professor: *G. H. F. Nuttall, F.R.S., 1906-21; *Demonstrator*: *C. Warburton, M.A., F.Z.S., joined in 1908, appointed 1911; *Assistant*: *H. B. Fantham, Sc.D. (London), 1908-10; *C. Strickland, M.A., B.C., 1910-12; *K. R. Lewin, B.A., 1912-13; *E. Hindle, M.A., Ph.D., joined 1910, appointed 1913-17; *D. Keilin, Sc.D. (Paris), joined 1915, appointed 1917; *Helminthologist*: *Miss Annie Porter, Sc.D. (London), joined 1908, appointed 1913; T. Storrar Cave, B.A., 1914; *Research Student in Medical Entomology*: A. H. Lees, B.A., 1907;

¹ *Cambridge University Reporter*, 11, vi. 1907.

² *Ibid.* 1, xii. 1908, p. 263; 24, xii following (Grace). Stipend now paid from the Tropical Diseases Research Fund, Medical Grant Committee and Medical Research Council.

³ *Ibid.* 10 and 24, x., 14 and 21, xi. 1911. Stipend paid by the Tropical Diseases Research Fund.

⁴ Stipend paid in 1914 by the Tropical Diseases Research Fund. Owing to the war, the post has since been in abeyance.

*F. P. Jepson, B.A., 1908-9; *G. Merriman, 1909-12; *N. Cunliffe, B.A., 1913-14; M. E. MacGregor, B.A., 1914-15; *D. Keilin, Sc.D. (Paris), 1915-17, when he became Assistant and the Studentship was merged with the Assistantship he now holds.

Other workers in the Laboratory were: G. Beatty, M.D., Medical Officer, South Nigeria, 1911; Dr de Blicck, Director Veterinary Department, Java, 1915; Y. Bogaerts, medical student from Louvain, 1915; Major J. E. M. Boyd, M.C., R.A.M.C., sent by the War Office, 1919-20; *P. A. Buxton, M.A., now of the Health Department, Jerusalem, 1920; *Mr G. W. Bullamore, Director of the Institute for Bee-keeping, 1920-21; Major S. R. Christophers, I.M.S., Superintendent, King Institute of Preventive Medicine, Madras, 1912; *Major J. W. Cornwall, M.D., I.M.S., Pasteur Institute, Coonoor, South India, 1912; Captain J. D. Coutts, M.R.C.V.S., D.V.S.M., South Rhodesia, 1921; *Dr Lajos Gózyony, Assistant, Bacteriological Institute, University of Budapest, 1914; Dr Graham, Medical Officer, Gold Coast, 1907; *Dr S. Hadwen, Pathologist, Biological Station, Ottawa, Canada, 1908-9, 1913; *L. Harrison, B.Sc., University of Sydney, Australia, 1914-16; Dr A. D. Hodges, Principal Medical Officer, Uganda, 1910; *F. M. Howlett, B.A., Assistant Imperial Entomologist, India, 1910; *Dr J. C. Johnson, Professor of Biology, New Zealand, 1913; Dr F. I. M. Jupe, Medical Officer, Gold Coast, 1910; R. C. Lewis, M.A., Cape Colony, 1911-12; Miss Jordan Lloyd, Newnham College, Cambridge, 1911; F. J. McCall, M.R.C.V.S., Veterinary Officer, British East Africa, 1914; N. MacDonald, Veterinary Service, Australia, 1909; *Miss D. Mackinnon, B.Sc., Carnegie Scholar, Aberdeen, 1908; J. E. M. Mellor, B.A., 1915, 1919; Dr C. de Meza, Veterinary Officer, Nyasaland, British East Africa, 1916; A. R. Momber, 1910-11; J. O. Muñoz, medical student from Liège, native of Mexico, 1914; *Captain J. W. Munro, B.Sc., R.A.M.C. (temp.), sent by War Office, 1917-19; *Dr Lucius Nicholls, Pathologist, Victoria Hospital, St Lucia, W. Indies, 1912-13; Dr Erik Nordenskiöld, Lecturer in Zoology, University of Helsingfors, 1910; *Captain W. S. Patton, M.B., I.M.S., 1908-9; I. M. Puri, M.Sc., Punjab, India, research student, 1921; L. P. W. Renouf, B.A., Trinity College, Cambridge, 1914; *L. E. Robinson, A.R.C.S. (London), research student, 1919-21; *Dr P. H. Ross, Government Bacteriologist, Nairobi, British East Africa, 1914; L. G. Saunders, M.Sc., McGill University, Montreal, research student, 1921; L. D. Sayers, B.A., Downing College, Cambridge, 1914; Dr J. O. Shircore, Medical Officer of Health, Nyasaland, 1914; *Dr G. S. Graham-Smith, Cambridge, 1908; *Dr G. U. Smith, Egypt, 1908; *Major F. H. Stewart, M.D., Sc.D., I.M.S. (retired), 1920-21; *Dr N. H. Swellengrebel, Assistant in Protozoology, Hygienic Institute, Amsterdam, 1910; J. F. Valladares, Senior Lecturer, Government Veterinary College, Bombay, 1910; Miss W. M. Vincent, Newnham College, research student, 1921; Major C. E. Williams, M.D., I.M.S., Rangoon, 1911; K. P. Williamson, M.A., Indian Education Service, 1911; Dr J. Y. Wood, Medical Officer, Kaballa, Sierra Leone, 1914; *Dr Wu Lien-Teh, Army Medical College, Tientsin, China, 1912;

104 *The Molteno Institute for Research in Parasitology*

Dr T. Yamanouchi, Tokio, Japan, 1910; Dr S. Yoshida, Department of Pathology, Osaka University, 1920.

Work carried out in the Quick Laboratory.

During the years 1906–21 the publications that emanated from the laboratory numbered 216, a large proportion appearing in this Journal. Some of the research work was done for Governments, notably that on piroplasmiasis and East Coast Fever for the Governments of Cape Colony and Transvaal; that on the bionomics of houseflies, on fleas in connection with rat-plague, and on lice (in the first instance) for the Local Government Board; that on bee disease for the Board of Agriculture; that on lice and scabies for the War Office, the latter having been aided in drawing up Army Council Instructions dealing with lousiness and itch among troops and the methods of combating these widespread evils. "Combating Lousiness among Soldiers and Civilians" to the number of 250 copies (reprinted from *Parasitology*, x. No. 4, May 1918, pp. 411–586, 4 pls., 26 text-figs.) and issued in a special cover were presented by the writer to the British and Allied Army Medical Corps during the war.

Apart from the foregoing may be mentioned researches on bugs in relation to relapsing fever, on fleas and lice as carriers of rat trypanosomes, on the bionomics and structure of anopheline mosquitoes and their relation to malaria in England, on heartwater in sheep and goats, on piroplasmiasis in the dog and horse, on the discovery of a remedy (trypanblue) for piroplasmiasis and scientific observations on the effects of the drug, on the monographic treatment of the subject of ticks and of the louse, without mentioning other parasitological papers dealing with pathogenic protozoa, etc.

The activities of the Quick Laboratory were not confined to researches, for the writer, as its representative, served on various advisory bodies, notably as (a) Member of the Advisory Committee for Plague Investigations in India appointed by the Secretary of State for India, the Royal Society and Lister Institute; (b) Member of the Epizootic Abortion Committee of the Department of Agriculture and Fisheries; (c) Member of the Honorary Committee of Management of the Imperial Bureau of Entomology, Colonial Office; (d) Member of the Government Grant Committee for Scientific Investigations, Royal Society; (e) Member of the Fish Preservation Committee of the Department of Scientific and Industrial Research; (f) Member of the Army Pathology Advisory Committee, War Office. As usual, these various services have been rendered gratuitously.

REGARDING VARIOUS GRANTS AND BENEFACTIONS IN AID OF RESEARCH.

The income of the Quick Fund proving insufficient, the writer found it necessary to obtain financial assistance from outside sources, no funds being available from the University. For several years he defrayed the extra cost including the payment of the University Assistant to the chair and a Secretary.

Since 1909, annual *Grants* have been derived continuously from the Tropical Diseases Research Fund (Colonial Office), three grants were obtained from the Local Government Board (1913-16), three from the Board of Agriculture (1915-17) and one from the Rockefeller Institute, New York (1913-14), whilst, since, 1917, grants have been received from the War Office (once), and (repeatedly) from the Medical Research Council and Medical Grant Committee (Ministry of Education).

In addition to the foregoing, various *Benefactions* were received from private and other sources as follows: In 1909-10, from The Transvaal Government, £500; The Government of Cape Colony, £500; The Duke of Bedford, £100; Lord Rothschild, £100; Sir Richard Cooper, Bart., £100; Mr and Mrs P. A. Molteno, £100; Harry Mosenthal, Esq., £26. 5s.; J. Buchanan, Esq., £25; The Tropical Diseases Research Fund, £25; E. Darwin, Sc.D., F.R.S., £5. 5s.; Julius Auerbach, Esq., £5. 5s.; Fred C. Norton, Esq., £2. 2s.; making a total of £1489¹. In 1914, from Mr and Mrs P. A. Molteno, £400 (£100 thereof toward expenses of publication); Sir Dorabji J. Tata, £250; Mr and Mrs Henry Bubb, £25; making a total of £675¹.

THE FIELD LABORATORY.

In 1909-10, largely through the above-mentioned benefactions, a field laboratory was erected by the writer upon the Milton Road at a distance of two miles from the Medical School and present site of the Molteno Institute, the laboratory serving for experimental researches that cannot be carried out in the town. The buildings are of a temporary character but ample to meet the needs of the Institute in the future; they form an essential annex to the Institute. Our laboratory can accommodate two to four research workers, being adequately and economically heated by hot water radiator pipes and a coke furnace, water and gas being laid on but not electricity. The site of our laboratory forms a part (about 5 acres) of the University Field Laboratories comprising 27 acres of land. (See Fig. 2, showing the general distribution of the buildings.)

II. THE FOUNDATION OF THE MOLTENO INSTITUTE.

The highly unsatisfactory conditions prevailing in the Quick Laboratory led the writer to issue an appeal for funds with which to erect an Institute for Parasitological Research in Cambridge. The appeal was issued in printed form in May 1919 for private circulation². From Mr and Mrs P. A. Molteno it evoked the following generous response which was subsequently published in the *Cambridge University Reporter* by the Vice-Chancellor:

¹ See *Cambridge University Reporter*, 22, II. 1910 and 9, VI. 1914.

² Nuttall, G. H. F. (1919), *The Need of an Institute for Parasitological Research in Cambridge*, 19 pp. 28 × 22 cm. (Illustrated with a general view and plans of the proposed Institute, Quick Laboratory and Field Laboratory. Privately printed at the University Press, Cambridge.)

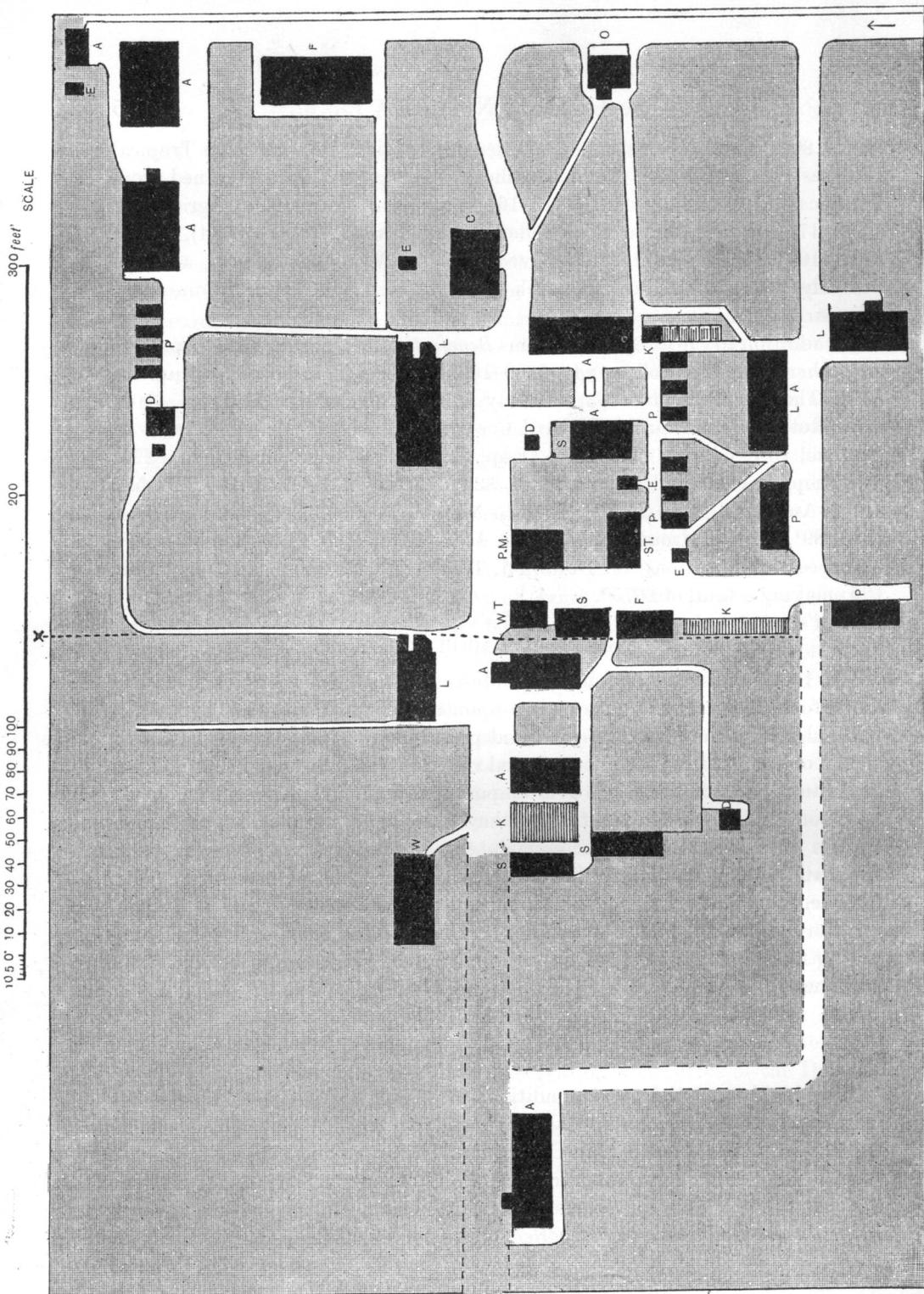
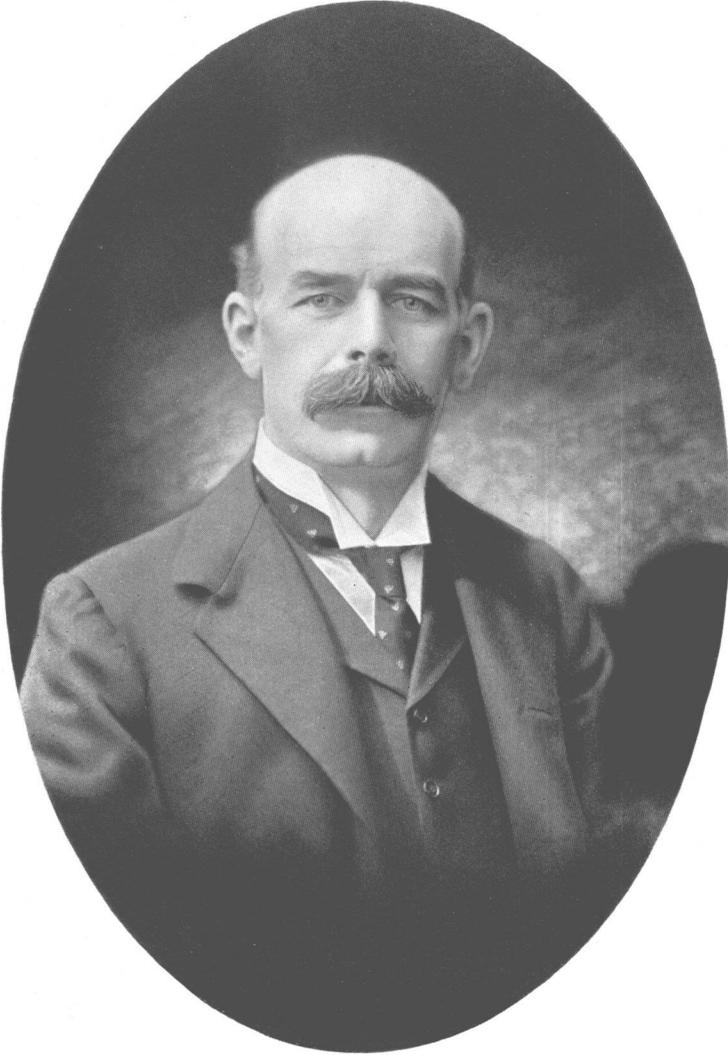


Fig. 2. Showing the grouping of the buildings on a part of the land occupied by the University Field Laboratories, Milton Road, Cambridge. The dotted line (X) indicates the eastern boundary of the land belonging to our Laboratory as distinguished from that of the Agricultural and Pathological Departments; some of the buildings being held in common. Except for one building (below, on figure) to the extreme west, belonging to the Pathological Department, all buildings to the west of the dotted line belong to our Laboratory. The different structures are indicated by letters: (A) cattle sheds and stables, (C) caretaker's cottage, (D) destructor, (E) earth closet, (F) fodder store, (K) concrete platform, (L) laboratory, (O) office, (P) piggeries, (P.M.) autopsy house, (S) shed, (ST.) stable, (WT.) weighing-house.



PERCY ALPORT MOLTENO

1922

MR AND MRS P. A. MOLTENO'S BENEFACTION.

EMMANUEL COLLEGE LODGE. 1 November, 1919.

The Vice-Chancellor has pleasure in publishing to the Senate the following letter which has been received by Professor Nuttall:

10, Palace Court,
London, W. 2.

October 23rd, 1919.

*Professor George H. F. Nuttall, F.R.S.,
Longfield,
Madingley Road,
Cambridge.*

Dear Professor Nuttall,

I have for long been interested in your work on parasitology. I regard this work as of the very greatest value to the Empire and particularly to Africa, the home of so many diseases transmitted by and through parasites.

Your researches have already produced results which are of immense benefit in the control and prevention of diseases both of men and of animals. Indeed research of this nature is indispensable if Africa is to be made habitable for white men and for animals of European stock.

Your researches are however not bounded by the African field, vast as it is, but will apply all the world over in alleviating human suffering and protecting human and animal life from disease.

I am well aware how utterly unprovided you are with the necessary accommodation to carry on research work. It is really a scandal that this should have been allowed to continue for so long, and the difficulty grows continuously with the increase in the number of your specimens and the extension of your work.

Mrs Molteno has also been greatly interested in your work and desires to join me in providing funds for the erection and maintenance of a suitable building to be used in the future as an Institute for parasitological research in the University of Cambridge.

We understand from you that you consider a sum of £20,000 would provide a suitable building with its fittings for this work, and that a further sum of £10,000 would be necessary as a fund to provide an income for the upkeep and maintenance of the Institute, and that any surplus from this income could be used with the greatest advantage in furthering the purposes of research to be carried on in the Institute.

Mrs Molteno and I will be glad to present to the University these sums of £20,000 and £10,000 making £30,000 in all for these purposes, on the understanding that the University is prepared to provide a suitable site. We desire that this sum should be a benefaction to the University for the purposes outlined above.

After provision for the upkeep of the fabric, the balance of the income available from the maintenance fund should be placed at the disposal of the Director of the Institute (in the first place yourself) to be used at his discretion in furthering the work of research.

We desire further to say that we have examined the plans drawn up by Mr Harry Redfern, F.R.I.B.A.—with the general view of the proposed Institute as it would appear on the Downing site at Cambridge. These plans appear to us to afford a suitable building, with the various halls for Library, Museum, etc. and rooms for Professor and students carrying on research work.

Accommodation appears to be provided without any unnecessary superfluities in bricks and mortar, and yet to be simple and dignified, and we hope it will be found possible for this plan to be carried out.

I will be obliged to you if you will convey the contents of this letter to the Vice-Chancellor for communication to the Senate, and to the Cambridge University Association.

108 *The Molteno Institute for Research in Parasitology*

I may conclude by saying that I am a member of Trinity College, Cambridge, and an M.A. and LL.M. of the University, and that I have always had the highest regard for the University, and for the great work which it has done and is carrying on, and I am very glad to have the opportunity, in some small way, to assist in extending that work.

Believe me,

Yours faithfully,

P. A. MOLTENO.

This great benefaction was followed by a second of £6000, likewise from Mr and Mrs Molteno, to meet the greatly increased cost of building that became apparent as soon as the estimates were worked out¹.

It may be noted here that Mr and Mrs Molteno had already helped on the work of the Quick Laboratory financially in 1909 and 1914 (see p. 105) and that throughout the intervening years they had evinced much sympathy and interest in the researches carried out in our laboratory.

The foregoing benefaction led to another which otherwise would not have been received. It was announced in the *Cambridge University Reporter* as follows:

BENEFACTION FROM THE LATE LORD STRATHCONA AND MOUNT ROYAL.

EMMANUEL COLLEGE LODGE. 20 November, 1919.

The Vice-Chancellor has pleasure in informing Members of the Senate of a further benefaction received, on November 18, by Professor Nuttall:

In the *Cambridge University Reporter* of 22 February, 1910, under the heading "Benefactions for Research Work in Parasitology," the Vice-Chancellor informed Members of the Senate that various donations had been received by Professor Nuttall for the purposes of a field laboratory on the outskirts of Cambridge, adding that "£1000 has been promised, anonymously, when the fund has reached £6000."

This promise emanated from the late Lord Strathcona and Mount Royal, who visited Cambridge in July, 1909, and evinced much interest in the parasitological work that was being carried on in the University.

When Mr and Mrs P. A. Molteno generously offered the sum of £30,000 for the purpose of building and maintaining an Institute for Parasitological Research in Cambridge (*Reporter*, 4 November, 1919, page 206), an offer since accepted by Grace of the Senate, Professor Nuttall communicated with the late Lord Strathcona's representatives, with the result that Lady Strathcona asked the Executors to pay Professor Nuttall the sum of £1000 "conditionally promised as a contribution to the Biological Research Laboratory (now the Institute for Parasitological Research) in connexion with Cambridge University."

THE INAUGURATION CEREMONY.

Before describing the new Institute in detail an account may be given of the ceremony of its inauguration.

The Institute was opened on the afternoon of 28th November, 1921², by Earl Buxton of Newtimber, G.C.M.G., late Governor-General of South

¹ See *Cambridge University Reporter*, 20, xii. 1920, p. 130.

² Before the opening ceremony, visitors from the outside were entertained at lunch parties given respectively by the Vice-Chancellor and Mrs Pearce at Corpus Christi College, Sir Arthur Shipley and the writer at Christ's College, Dr and Mrs H. K. Anderson at the Lodge of Caius College and by Mr and Mrs P. A. Molteno at the University Arms Hotel.



ELIZABETH MARTIN MOLTENO *née* CURRIE

1921

Africa, under the Chairmanship of the Vice-Chancellor of the University of Cambridge, Rev. E. C. Pearce, D.D., Master of Corpus Christi College. Academic dress and decorations were worn, Doctors appearing in scarlet robes in recognition of the importance of the occasion, a large and distinguished audience being present.

The Molteno family were represented by Mr and Mrs Percy A. Molteno (the founders), Sir James Molteno, K.C., Admiral Molteno, C.B. and Mrs Molteno, Mr and Mrs D. J. Molteno, Captain and Mrs Lenox Murray (née Molteno), Miss Audrey Molteno, Miss E. M. Molteno, Mr H. V. Molteno, accompanied by Mrs F. C. Selous, M. Emile Coué of Nancy, Miss E. Cowan and Mr H. B. Johnson.

Foreign institutions were represented by Professor M. Caullery of the Faculté des Sciences, la Sorbonne, Paris, and Dr M. Langeron of the Laboratoire de Parasitologie, École de Médecine, Paris, both of whom came to Cambridge to attend the ceremony; and Johan Hjort, Sc.D., Professor of Marine Biology in the University of Christiania.

Among the distinguished British visitors were Lord Pentland of Lyth, G.C.S.I., G.C.I.E., formerly Governor of Madras; Sir Richard Cooper, Bart., M.P.; Sir Herbert Read, K.C.M.G. (Colonial Office); Dr S. Monckton Copeman, F.R.S. (representing the Ministry of Health); Dr Andrew Balfour, C.B., C.M.G., and Dr C. M. Wenyon, C.M.G., both of the Wellcome Bureau of Scientific Research, London; Dr S. A. Neave of the Imperial Bureau of Entomology; Dr C. L. Boulenger and Dr F. J. Meggitt of the University of Birmingham; Lieut.-Colonel S. P. James, I.M.S. (retired) of the Ministry of Health; Dr G. A. Baylis and Rev. James Waterston of the British Museum (Natural History Department); D. Ward Cutler, M.A. of the Rothamsted Agricultural Station; Dr G. H. Macalister, Principal of Singapore Medical College; Dr P. Manson-Bahr, D.S.O., of the London School of Tropical Medicine and Mrs Manson-Bahr.

Cambridge was represented by the Mayor and Mayoress and numerous members of the University including Heads of Colleges, Professors, and others with their ladies. The total number of guests being about two hundred and fifty.

The writer was unfortunately unable to attend the opening ceremony through illness, having had five days previously a severe haemorrhage from a duodenal ulcer. His absence was especially regrettable because it prevented him from expressing publicly his gratitude to the founders of the Institute, welcoming the visitors, and participating in a ceremony that represented for him the consummation toward which he had striven for many years. His disappointment was, however, greatly mitigated by the kind expressions of sympathy received from those who attended the meeting and which emanated from all the speakers on that occasion.

The opening ceremony lasted one hour and it took place in the Research Museum of the Institute, the small platform being occupied by the Vice-

110 *The Molteno Institute for Research in Parasitology*

Chancellor, Mr and Mrs P. A. Molteno, Earl Buxton, Lord Pentland, Sir Arthur Shipley, Professor Caullery and the Mayor of Cambridge. The speeches were brief and may be summarized as follows:

The Vice-Chancellor¹ welcomed the founders to the Institute they had brought into being and thanked them warmly on behalf of the University for their noble benefaction, stating that he "could conceive of no more worthy object for generous-minded men to spend their money on than an Institute for Research of that kind, which necessarily must in some sense ameliorate the lot of mankind." He read a telegram from General Smuts which Mr Molteno had received through the High Commissioner of South Africa; it ran:

The Union of South Africa welcomes the opening of the Molteno Institute, which Institute is made possible by the generosity of the Molteno family. The progress of the Institute will be sympathetically watched by South African scientists.

The Vice-Chancellor had that morning received a letter of congratulation and good wishes from Dr Edmond Sergent, Director of the Institut Pasteur of Algiers, whilst Professor Nuttall had been the recipient of a telegram which ran:

Institut Pasteur et Société Pathologie Exotique Paris adressent à Institut Molteno et à son éminent Directeur cordiales félicitations et vœux de prospérité (signed) Roux, Calmette, Mesnil.

Mr Cecil Warburton, who spoke on behalf of the writer, welcomed the representatives of the Colonial Office, Ministry of Health, and War Office, and those who had come from various universities and scientific institutions. He dwelt briefly on the main features of the new Institute and the plans that were being matured for its future development as a centre for research and advanced instruction in the whole domain of parasitology.

Mr P. A. Molteno, whose rising to speak was welcomed by loud applause, after referring in the friendliest manner to the writer, expressed his and Mrs Molteno's cordial approval of the way in which their benefaction had been applied in the construction and arrangement of the building. He referred to the very inadequate facilities which had hitherto existed for parasitological research in Cambridge and to the importance of such work for the Empire, judging by his own experiences in Africa. His eloquence, that of the practised speaker, greatly appealed to the audience.

Earl Buxton spoke as an old friend of the founders who by birth were connected with South Africa, the name of Molteno having for long been well known and respected there, "especially since the time of the first Prime Minister of Cape Province, Sir John Molteno," moreover, Mrs Molteno's father, Sir Donald Currie, had done much to assist in the development of the country. His Lordship referred to the generosity of the benefaction conferred on the

¹ The following abstracts of the speeches delivered on the occasion are made from a shorthand report.

University and to his own experience of the ravages of disease in Africa, of its certainly having been high time that such an Institute, "worthy of Cambridge," should be erected and given a local habitation and a name. "Cambridge afforded ideal conditions for the establishment of a research institute of that description, because of its many-sided scientific activities and its constant stream of young and talented men who passed through the University." He emphasized the value of parasitological research and of such an institute for the Empire: "What is very greatly required is a centre where men can be trained in the scientific methods of research which bear so greatly on the health of men, animals and plants, by receiving a broad, thorough training, for at present there is very little opportunity, except for a very few men, of obtaining such training. The training is often too slight and too diffuse, the student picking up scraps here and there in professional schools, whether medical, veterinary or agricultural. The student therefore acquires no real foundation upon which to base his future research work."

"Unfortunately, in consequence of lack of training in these respects, unripe and poorly trained men went into practice who were not really fit to investigate a scientific problem. As Professor Nuttall had said: 'They travel with blinkers on their eyes along the old well-worn professional road and too often never leave it.' Thus it may come about that insufficiently trained men are frequently given posts or are sent on research expeditions, where they are expected to do scientific work, but where, not from want of zeal, but from lack of knowledge, they naturally fail.

"It would be a very great thing if the new Institute were placed in a position of being able to hold selected men to their research work until they were fit to go out as investigators and teachers. This meant, of course, considerable funds and endowments in order to keep men at work and free from financial worry for a period of years. Travelling scholarships conferred upon suitable men by their universities or Governments in different parts of the Empire would be of the utmost value to their country and mankind. If funds were available, subsidiary aid could be furnished by the Institute itself. The latter," concluded Earl Buxton, "was certain to attract men from all parts of the Empire, and scholarships or the like would be a great additional attraction. Thus a group of young and enthusiastic workers would gather round the Institute as a centre." His Lordship then declared the Institute open.

Professor Caullery, speaking in English, as the representative from France, referred to parasitology as nearly constituting a special science in the domain of biology since it bore upon an immense number of different organisms and afforded striking evidence bearing upon evolution, besides being an essential factor in the study of disease. He was glad to find one of the best of his former pupils, Dr Keilin, established at the Institute. He and his colleagues offered their congratulations and thanks to Mr and Mrs Molteno for what they had done for science and hoped that the Institute would help to bring French and British men of science into closer affiliation.

112 *The Molteno Institute for Research in Parasitology*

Sir Arthur Shipley, G.B.E., F.R.S., proposed a vote of thanks to those who had come from afar to help them on that memorable occasion. He wanted to add a word to what Earl Buxton had said about the necessity of further endowment. They had started a splendid building, but Cambridge had a habit of growing. The institution had grown from the Quick Laboratory to a Molteno Institute and would go on growing under the latter name. They would, and did, want further endowment. He was afraid that he was an inveterate beggar, for they had to keep the wheels going. As an American poet had said:

I hate to be a kicker.
I do not make for peace.
But the wheel that does the squeaking,
Is the wheel that gets the grease.

The assembled company then partook of tea as the guests of Professor and Mrs Nuttall and afterwards inspected the building under the guidance of members of the staff who could be readily singled out through their wearing Cambridge-blue rosettes.

THE MOLTENO INSTITUTE FOR RESEARCH IN PARASITOLOGY.

The following account of the Institute may prove useful to others who are contemplating the establishment of similar institutions elsewhere. Since the Institute was opened, and indeed before, it has been sought by numerous visitors interested in laboratory construction and arrangements who desired information on various matters, and this account will serve to answer some of the questions that have been asked by our visitors.

PREPARATIONS FOR BUILDING THE INSTITUTE.

A Syndicate was appointed on 6th December, 1919, by Grace of the Senate (*Camb. Univ. Reporter*, 9, XII, 1919, p. 355) to obtain plans and estimates for the erection of the Institute on the site assigned for the purpose (*vide infra*). This Syndicate consisted of the Vice-Chancellor (P. Giles, Litt.D., Chairman), Charles E. Grant-Ives, M.A., Rev. J. B. Lock, M.A., and G. F. C. Gordon, M.A., of the University Building Committee; G. S. Graham-Smith, M.D., F.R.S., Charles T. Heycock, M.A., F.R.S., Charles G. Lamb, M.A., and the writer (Secretary). This Syndicate held five meetings at three of which the plans were discussed with the architect, Mr Harry Redfern, F.R.I.B.A. The latter reported that the probable cost of construction, starting in March, 1920, would be £28,600 including architect's fees and disbursements, the calculations including a sum of £1500 for fittings and contingencies, the complete building (151,200 cubic feet) being reckoned to cost three shillings and seven pence per cubic foot. The Syndicate reported this to the Senate and their report was approved (*Camb. Univ. Reporter*, 3, II, 1920, p. 582; 2, III, 1920, p. 688; 9, III, 1920, p. 719; 16, III, 1920, p. 746 (Grace passed)).

Subsequently various changes in the choice of materials were made whereby the cost was reduced. Tenders for the erection of the building were received

from six contractors, that of Messrs William Saint Limited, Cambridge, being accepted (at £27,706).

THE SITE OF THE INSTITUTE.

Building operations were begun on 10th May, 1920, upon an attractive plot of land situated on the "Downing Site," belonging to the University and so-called because it was purchased from the immediately adjoining Downing College. The south side of the building faces the grounds of the College, there being no intervening buildings, its distance from the boundary fence being 20 feet at the S.E. corner and 38 feet at the S.W. corner of the Institute, thus reserving a small strip of land to the south of the building which has in part been fenced in, and where it is hoped, with time, one or more aquarium basins, etc., may be constructed. The removal into the new Institute took place toward the end of October, 1921, whilst workmen were still engaged in parts of the building.

The Institute is very favourably situated with regard to space and remoteness from the noise, tremor and dust of street traffic. In its immediate vicinity there is being erected a Low Temperature Station, built at Government expense and intended primarily for the scientific study of refrigeration in its bearing on food preservation and allied problems. The Schools of Forestry, Agriculture, and Botany are close by, likewise the Physiological and Biochemical Laboratories, the latter being now in course of construction. Access to the Downing Site, upon which these buildings stand, is gained from Downing Street on whose opposite side lie the Medical School, Zoological and Chemical Laboratories and other University buildings which harbour the Zoological Museum, Balfour Library (Zoological) and the Library of the Cambridge Philosophical Society which the workers at the Institute frequently seek. Apart from departmental libraries in the schools and laboratories mentioned as being near at hand, the great University Library may be finally noted as being at a distance of but 10 minutes' walk from the new Institute.

DESCRIPTION OF THE INSTITUTE.

The Exterior of the Building.

The external features of the Institute have been described at my request as follows by the architect, my friend Mr Harry Redfern, F.R.I.B.A.:

"In designing the elevations of any building it is incumbent upon the architect to express, as well as he can, the use to which that building is to be put. Such limits as may be imposed upon him by the nature of the materials employed—whilst often confining his problem within some narrow limits—not infrequently exercise a restraint which is beneficial to the result.

"If the building has been planned strictly to suit its purpose, and if the elevations truly reflect the plan (as they should do) it would seem inevitable that the external appearance is predestined, and that little remains for the designer but to model the various features with care—emphasizing here,

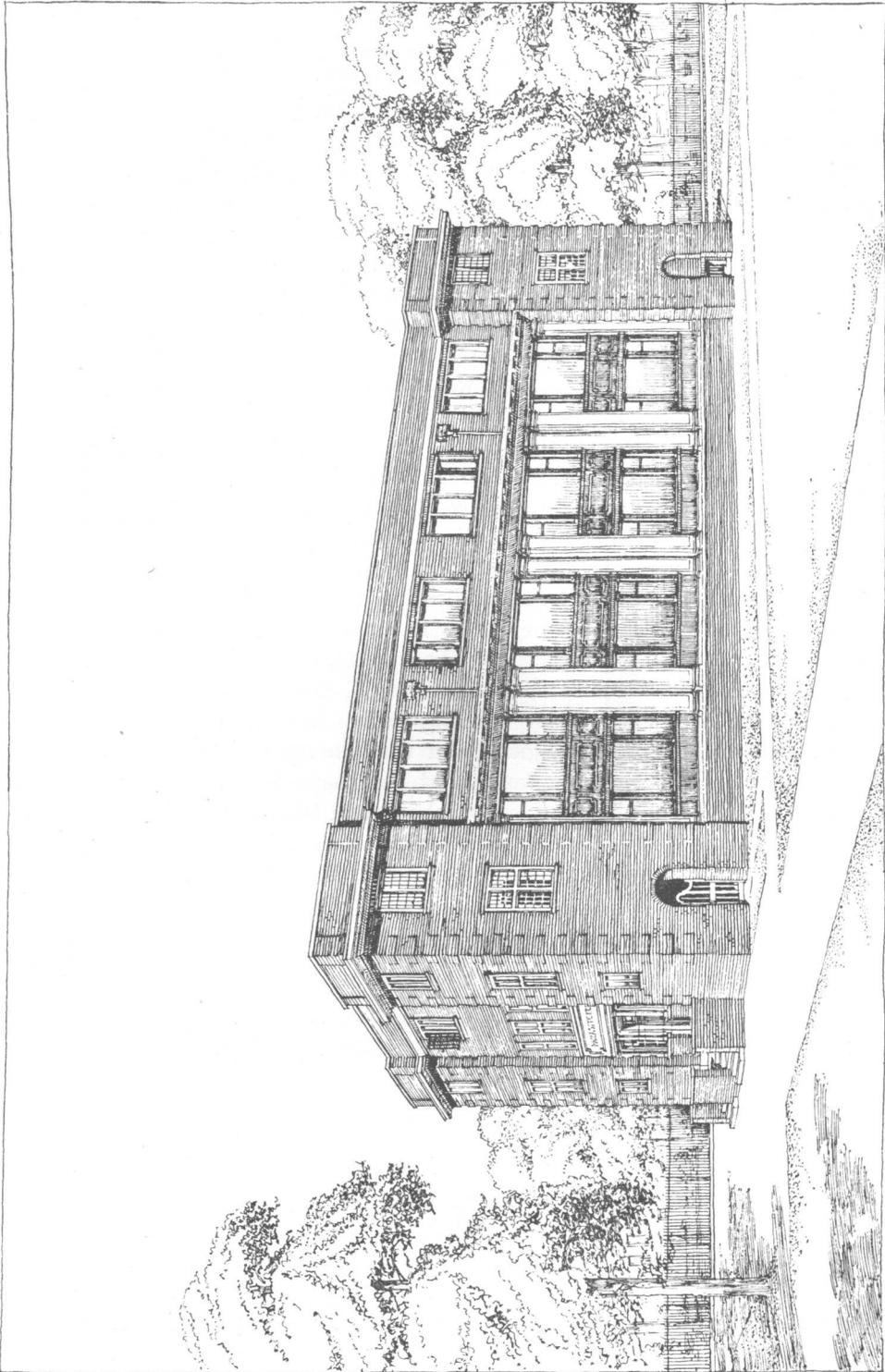


Fig. 3. General view of the Molteno Institute for Research in Parasitology, north side and east end, showing the large plate glass windows of the eight research rooms on the ground and first floors, and the four-light plate glass windows of the second floor (research museum). From a drawing executed in the architect's office since the building was erected.

toning down there—until the result satisfies his fancy. In any building the fenestration is a very powerful factor in the design.

“The buildings used by scientists for their highly technical operations present certain difficulties to their architect when designing the exterior: for example, it not infrequently happens that adjacent rooms on the same front demand entirely different conditions as to the size, number and arrangement of the windows, etc. It is such difficulties as these which make the planning of laboratories an extremely interesting problem in design. Furthermore, a building should not only be true to itself but should harmonize with its environment. It has a duty to its immediate neighbours, especially if these are buildings of a University.

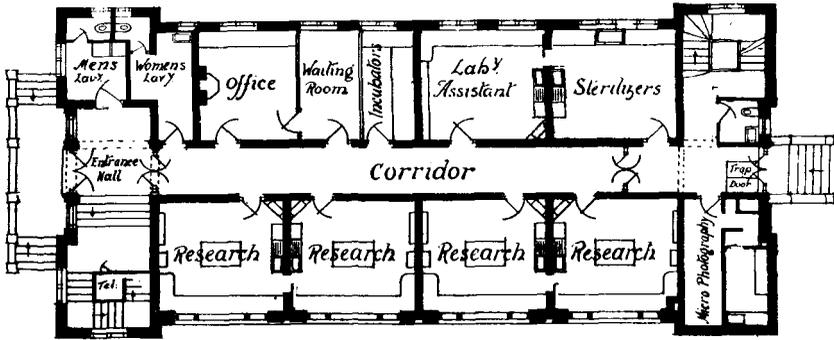
“The above considerations had weight in the designing of the Molteno Institute. The architect was influenced by the expressed desire to build in brick of a certain colour and texture and to avoid the use of an undue amount of stone dressings. Moreover, the roof had to be flat, in order to admit of its being used in connection with certain work in the laboratories.

“The accompanying plans show that, broadly speaking, there are two types of room: a series of research laboratories, with one side of each consisting almost entirely of windows glazed with large sheets of plate glass; the other type a series of rooms where large windows were unnecessary and undesirable. In the midst of this series is a large library, and the top floor is, for all practical purposes, an enormous room—the Research Museum. How to combine these elements into a composition in which the large glass area of the research room windows should not throw the remainder out of scale, nor the numerous smaller windows fritter away the wall space—how they should be arranged in some rhythmical way—that was the problem of the elevations.

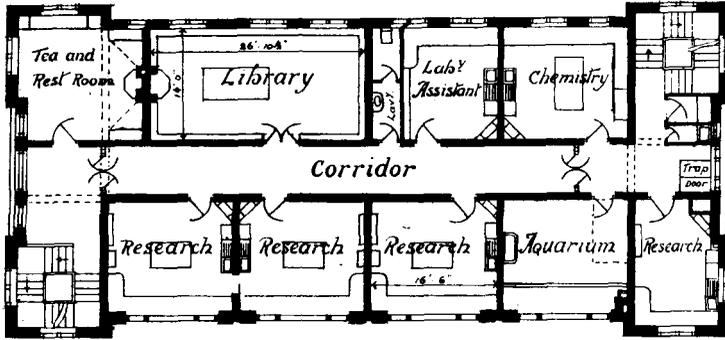
“It seemed best to group the research rooms together on the two floors and to combine the two storeys into one ‘order’ by treating the piers between the windows as pilasters, the intervening wall-surface being kept low in tone; by this means the dark masses of the large windows do not unduly assert themselves but are kept in a relatively subservient position in the strong vertical emphasis of the pilaster groups. The regular series of four-light windows on the top storey are intended to indicate the existence of one large room; whilst the treatment of the south front with its smaller windows with leaded panes and the brick piers, *quâ* pilasters, between is intended to present a kindly front to the green Court of Downing College.

“The colour scheme of the exterior has received some consideration: it is quiet and subdued and somewhat low in tone. The brick walls are in broken tints varying from purple-brown to brownish-grey; the copings, cornices and pilasters are grey-white; the woodwork (all of teak) is fast approaching a similar tone.

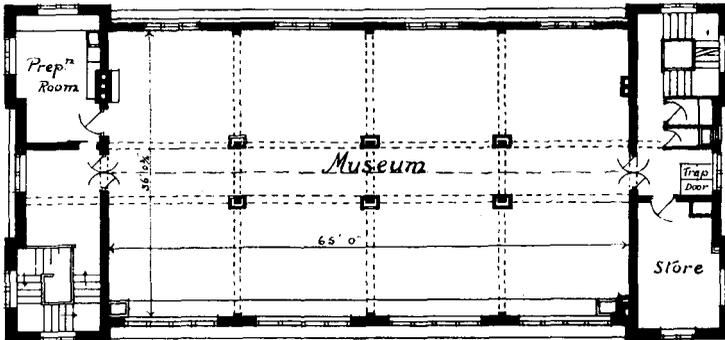
“This simple building, standing four-square against a pleasant background of old trees, is an attempt to house a modern scientific department in a manner not unsuited to its needs and the ‘atmosphere’ of its environment.”



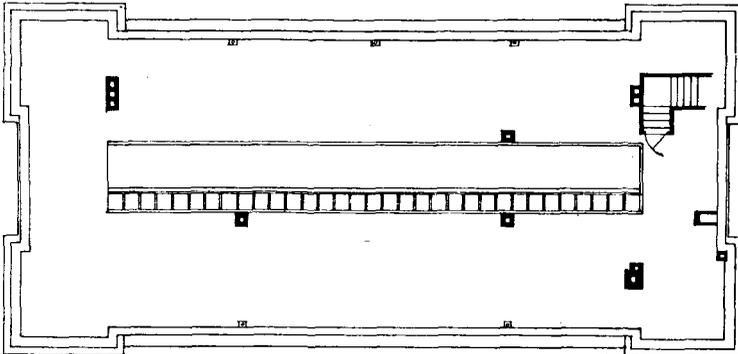
GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN



ROOF PLAN

Fig. 4. Plans of the Institute as completed.

The Interior of the Building.

The interior of the Institute was planned by Mr Redfern and the writer with a view to securing a maximum of convenience in the matter of general arrangement, light, ventilation and heating, whilst having regard to considerations of economy in view of the greatly increased cost of building operations consequent upon the great war.

Basements. These are restricted to both ends of the building, the basement on the east, serving for the accommodation of bicycles, being entered by a gate set in an arched doorway; this basement has a transversely ridged floor sloping downward to a level portion partly occupied by bicycle racks. The size of this basement corresponds to that of the combined area occupied by the staircase shaft, vestibule and lavatories above.

The basement to the west corresponds in size to the area covered on the ground floor by the photomicrographic room, research room, vestibule, part of the corridor, sterilizing room and staircase shaft. This basement contains the furnace and coal cellars on the north, the exit to the chute from the roof (see p. 120), and to the south a small animal room and storage space for a carpenter's bench, refrigerator, boxes, etc.

A space 4 feet in height, with concrete floor, lies beneath the rest of the building, whereby access can readily be gained to all drains, etc. beneath the ground floor.

General arrangement. To economize space, and to have as many research room windows as practicable fronting north whilst keeping the rooms adjacent to each other, the entrances are placed at both ends of the building. Two staircases are provided for safety in case of fire, and a straight corridor runs midway along the length of the building on two floors. There are eight research rooms occupying the ground floor and first floor, these rooms accommodating eight to sixteen workers.

The *main entrance* is to the east through double doors whose upper panels are glazed and guarded by a grill. The vestibule contains a commemorative tablet of bronze in a stone setting of appropriate design (see Fig. 5), whilst a small telephone chamber is situated at the bottom of the staircase shaft.

The *corridors* (ground floor and first floor) are cut off from the vestibules at each end by double swing-doors with glazed panels, being well lit by day through borrowed lights and transoms at their sides and from their ends by the light entering the vestibules through doors and windows.

Near the western staircase on all floors a space has been used to advantage by erecting light partition walls enclosing store-cupboards and closets for housemaids' sinks where brooms, pails, etc. can be kept. On the ground floor the sink and attendants' lavatory, etc., occupy but one space.

In the western vestibules on three floors there are *hoist holes* provided with teak trapdoors through which heavy articles can be raised from the basement to the top floor by means of a chain and pulley. This simple arrangement

118 *The Molteno Institute for Research in Parasitology*

functions in place of a lift whilst not cramping the floor space when out of use.

The *ground floor*, on the south side, contains cloak rooms and lavatories for both sexes, an office, a small waiting room for visitors, an incubator room, a laboratory assistants' room, a washing-up and sterilizing room. A photomicrographic room and four research rooms occupy the north side. The photomicrographic room and adjoining dark room are each supplied with a radiator so that they are comfortably warm in winter and always free from damp. Through vents leading respectively from the ceiling of the dark room to the roof and from the photomicrographic room to the hall these rooms are satisfactorily ventilated



Fig. 5. The commemorative tablet in the vestibule of the Institute. The tablet being of bronze and made to fit the stone setting with its incised and gilded inscription above. Designed by Mr Harry Redfern, F.R.I.B.A., the architect. The figure has been prepared from a retouched photograph.

whilst trapped against light, the air entering from the outside, as elsewhere, near the radiators.

The *first floor*, on the south side, contains a tea and rest room, a library, a lavatory, a laboratory assistants' room and chemical room. Four research rooms and an aquarium room occupy the north side.

The *tea and rest room* is regarded by the writer as a most useful feature in an institution of this kind. It serves several purposes: (a) as a gathering place for sociable intercourse among the workers at the Institute during the short interval when tea is provided, (b) as a place where those who may bring a meal with them can retire when they desire, (c) as a room where workers may rest or spend the night should this be necessary in connection with their researches. The room, in its arrangement and furniture, has nothing reminiscent of a

laboratory about it; being provided with comfortable chairs, a fire-place, a cupboard and hidden sink for storage and the washing up of eating utensils which are kept out of the laboratory entirely. A long, cushioned, bench which can be widened by a flap affords if need be a sleeping place; the writer has in the past spent many an uncomfortable night in laboratories that lacked such a resting place for workers who have to make periodic observations at night in connection with their researches.

The *aquarium room*, as shown in the plan, is on the first floor and it faces north¹. It has a slate window bench that is drained by a white glazed channel. The asphalted floor slopes to one corner where there is a large drain to prevent the danger of flooding. The sink is large and shallow to facilitate the cleansing of large glass vessels which may be used as aquaria. Three stopcocks deliver tap-water to one side of the sink, one of them being fitted with a hose coupling. The rain-water supply to the aquarium flows down vertically through a glazed pipe from the slated collecting area on the roof (see below) and is stored in a slate cistern (position indicated on the plan by a dotted line), held in a steel frame beneath the ceiling of the aquarium room. The cistern measures 8' × 4' 6'' × 2'², its capacity being about 350 gallons. The top of the cistern is covered with slate and access thereto is gained through a teak trapdoor in the floor of the room above, a movable slate slab preventing the entry of dust into the cistern. To obviate undue condensation of moisture upon the steel bearers and slate surface of the cistern in the room, the whole is enclosed in sheets of uralite with an interposed air-space. The water used for the aquaria is conducted out of the cistern in a tin pipe provided with two tinned stopcocks with tapered nozzles, one over the sink, the other over the end of the window-bench nearest the sink, a glass gauge joined to the tin delivery-pipe near the cistern serving to indicate the stored water level. A vulcanite stand-pipe conducts any overflow from the cistern into a large pipe opening near the floor drain above-mentioned.

The *second floor* is almost entirely devoted to the research museum whose north side may serve for demonstrations, practical instruction, or for research work, being, if necessary, divided up by light movable partitions to form cubicles. Museum cases, cabinets and various cupboards occupy the south side. A preparation room opens into the museum at one end, whilst the northwest corner of the building contains a store-room.

The *roof*, to which access is gained at the west end, is flat and of reinforced concrete finished with asphalt, with a closed brick parapet, 4 feet high, forming a court in which there can be accommodated terraria, aquaria, and small animals in hutches, etc. Extending along the middle of the roof is the research museum skylight, constructed on the weaver-shed principle, glazed on the north and slated on the south. A glazed earthenware gutter collects the rain-

¹ The writer is much indebted to his friend Mr Edward Bles, M.A., for advice in practical matters relating to the arrangement of the aquarium room and its rain-water supply.

² See footnote, p. 121.

120 *The Molteno Institute for Research in Parasitology*

water from the whole length of this slated portion and voids it down the vertical pipe to the slate cistern in the aquarium room. At the west end of the roof is a hatchway to a vertical *chute* leading down to a closed space opening with a door near the furnace in the basement; this chute, finished in smooth concrete internally, serves for throwing down refuse from the top to the bottom of the building where it can be incinerated or otherwise dealt with.

The *stairs* outside the building are of stone; those within are granolithic with powdered carborundum (non-slip) finish, they measure 3' 5'' in width. The bannisters are of iron painted dull black. The *internal surface of the walls* is lime-washed in the basements, plastered and white, cream, or otherwise distempered throughout, except in the photographic room and dark room which are painted black overall; in the lavatories the walls are coated with white enamel paint to a height of 5 feet above the floor. The *skirtings* are of concrete and usually 3 inches high, being mostly blackened, the concrete being preferred to wood. The *floors* are of concrete, partly reinforced, their surfaces being covered by red tiles in the vestibules, corridors and lavatories, black tiles and stone covering an area about the fireplace in the tea room; otherwise the floors are finished in Portland cement trowelled smooth, or asphalted (as on the roof) in the chemical, aquarium, sterilizing and dark rooms; a few of the rooms have the floors covered by dark green linoleum similar to that on the work benches; as linoleum is very expensive its use has necessarily been (we hope temporarily) restricted. *Woodwork.* The external doors and gate to cycle basement, window frames and ledges, and trap-doors to hoist are of teak; a few window ledges are of slate. The woodwork of the internal doors, borrowed lights, etc., is white enamelled throughout except in the basements; the *doors*, where not glazed, are smooth, unpanelled, consisting of a frame covered with boards of three-ply wood; three pairs of research rooms intercommunicate by sliding doors conveniently placed. The woodwork in the tea room and library (shelves 10'' deep) are of teak. Appropriate legends and numbers are painted in black on the doors. *Windows.* The frames and casements of the seven research rooms and aquarium (ground and first floors) are of steel; the central large fixed casement holding a single sheet of plate glass as in shop windows, the two casements flanking the central one being arranged to open so that their upper portion swings horizontally, the top edge falling inward, whilst the lower portion is hung vertically swinging one-third in and two-thirds out whereby they are readily cleaned; the lower sections of the flanking windows open in opposite ways so as to secure suitable ventilation according to the direction of the wind. The windows on the north side of the research museum, consisting of four lights each, have their lateral casements movable like those in the research rooms, the casements being of steel set in teak frames. The remaining windows of the building are leaded, the steel casements being set in teak frames. In all cases the upper line of the glazed portion of the window runs at a distance of about 6 inches from the ceiling whereby the rooms are brightened by the large amount of reflection from the ceiling.

Work benches extend across the width of the rooms and for a short distance to one side in the form of an L, being supported on steel T-bars set in the outer wall in cement. The tops are covered with green linoleum glued down to the thick deal boards beneath and all are edged with teak having rounded edges. The teak border on the free side nearest the worker is slightly broader than the thickness of the bench, the bottom margin thus affording a drip-edge in case fluids are spilled on the bench. The short arm of the L-shaped bench serves for the reception of an incubator, embedding bath, or the like. The benches are provided with electric light plugs and gas fittings conveniently placed so as to be as much as possible out of the way.

The *sinks* are white glazed earthenware throughout. Measured on the inside, those in the research rooms are 1' 9" × 1' 4" by 6" in depth¹; those in the sterilizing room (9" deep) and photographic room (6" deep) measure 2' 4" × 1' 5"; that in the aquarium room 3' 4" × 1' 9" by 5" in depth. Tap-nozzles are usually placed 14" above the bottoms of sinks. As shown in the plans, the research room sinks and similar sinks elsewhere are each provided with a teak draining board and adjacent stone shelf, each measuring 2' × 1' 6". The sinks empty into 3" glazed drains, whose large calibre precludes stoppages if larger objects escape into the drains from the sinks. A considerable economy was effected by placing sinks on opposite sides of a wall so that they empty into a common downfall drain, such paired sinks and their accompanying draining boards and stone shelves being supported by but one set of T-steel rods which transfix the wall.

Metal fittings. There is little to note regarding these, but it may be mentioned that gun-metal has been used in place of brass wherever possible so as to save unnecessary labour in cleaning. Most of the door handles are of the "push, pull and turn" pattern and therefore specially to be commended for laboratory purposes.

Some measurements relating to the building.

The following measurements are noted since some of them may be of use as a guide to others who contemplate constructing laboratories: Externally *the building* measures 92' × 44' and 35' in height to the top of the stone coping. The *corridors* are 6' wide. The four *research rooms* on the ground floor and the corresponding rooms above measure 14' in depth, the length of the middle pair being 15' 6", that of the other two being 15' 10". The *photographic room* (designed for a Zeiss optical bench) and the adjacent dark room are 16' deep and have a width of 4' 9" and 5' 6" respectively, being separated by a light partition wall of hollow bricks. The corresponding small research room at the N.W. corner of the floor above measures 10' 6" in width. On the ground and first floors, south side, the rooms are 14' deep except for the tea room which has a depth of 16'; the widths of these rooms being as follows: On the ground floor: *Sterilizing and Laboratory Assistants' room* 15' 10" and 15' 6" respectively, *Incubator room* 6' 6"; *Waiting room* 7' 7", *Office* 12' 3"; on the first floor: *Chemical room* 15' 10", *Laboratory Assistants' room* 11' 9", *Library* 26' 10", *Tea room* 15' 9". On the second floor, the *Research museum* measures 65' × 36', and both the preparation and store rooms measure 10' 6" × 16'. The size of the basements is indicated on p. 117. The

¹ The signs ' and '' denote feet and inches respectively.

122 *The Molteno Institute for Research in Parasitology*

basements are 6' 9" high, the ground and first floor rooms 10' high, the second floor rooms 9' high. Where there are no basements, the ground floor is suspended 4' above the concreted surface of the ground-level. The *roof parapet* is 4' high, the chimneys being but slightly higher. The *skylight* is 65' long and consists of 34 lights (4' × 2') framed in teak, the glazing being double with a closed air-space between the pairs of panes; the *slated surface* which serves for the collection of rain-water measures 66' 8" × 7' (area 467') and is tilted at an angle of 30°, whilst the glazed surface is 4' wide and stands at an angle of 60°. The internal measurement of the *chute* is 2' × 2', that of the *hoist-hole* 4' × 4'.

The *work benches* throughout are 27" wide, their surface being 33" above floor-level. The *slate bench* in the *aquarium* window is 30" wide and 21" above floor-level. The *chemical bench* in the centre of the room measures 7' × 4'. The *doors* measure 6' 7" × 3' as a rule. The *windows* in seven research rooms and *aquarium* occupy almost the whole north side of the room, the fixed central pane measuring 5' 11" × 5' 9". The *borrowed lights* (3' 4" × 22") are placed 6' 11" above floor-level, fifteen borrowed lights being on the ground floor and nine on the first floor, occurring either as transoms over doors or fixed in corridor walls into which they mostly open.

Heating, Ventilation and Lighting. The building is heated by hot water on the low pressure system, the boiler ("Coronation") being situated in the basement alongside the coal cellars. There are 44 radiators placed in rooms, corridors and landings, 18 being on the ground floor, 14 on the first floor, and 12 on the second floor. The radiators are mostly placed near windows beneath work benches but to one side so as not to incommode persons working at the bench; they draw fresh air through apertures from the outside and the warmed air passes up through a cast-iron grating in the bench beside the window. The radiators have been found to heat the building very efficiently. There are three open fireplaces in the building, two with modern gas hearths (in library and tea room), and one in the office where it is at times convenient to be able to burn papers. Apart from these sources of heat, arrangement was made whereby gas-stoves may be introduced into the building at some future period if required. For this purpose, small triangular gas-fume flues were built in eleven rooms by means of flat bricks, measuring 9" × 9", diagonally placed across one corner of the room, these flues leading up to the roof alongside the columns in the research museum; the small chimney-like vents to these flues are shown at five points on the plan of the roof (Fig. 4). The corner position to be occupied by gas-stoves, if required, is indicated on the plans. To instal gas-stoves it is merely necessary to cut a hole through the plaster and thin brick for the purpose of inserting the stove-pipe.

Ventilation is secured by opening windows, transoms, or borrowed lights, and by allowing the air to enter from the outside through the apertures near the radiators. Reference has already been made to the character of the windows (see p. 120).

Owing to the large windows, glazed tops of swing-doors at the ends of corridors, borrowed lights suitably placed, and to the general whiteness of the interior of the building, the latter appears singularly well illuminated during the daytime. Thoroughly efficient artificial illumination is secured by means of electric light distributed in the form of drop-lights, wall-brackets and wall-

plugs serving table lamps where they are most useful whilst having regard to economy.

It will suffice to mention that each research room is provided with (a) a central drop-light that can be moved up and down above the writing table, (b) a bracket-light above the sink, (c) a bracket-light above the short arm of the L-shaped bench used for the embedding bath, etc., (d) two plugs to table lamps on the work bench, these supplying two or four lamps as required. The bracket-lights are placed at a height of about 3 feet above the bench or sink. The drop-lights are $\frac{1}{2}$ -watt, 60-candle power, the others 30 c.p. throughout; the corridors are lit by 30 c.p. fixed drop-lights, corresponding lights in the research museum being 60 c.p. The wiring is all carried in flattened lead pipes attached to wooden strips, the pipes being protected by iron guards where liable to injury, this method of wiring having various advantages over that in which iron pipes are used for carrying the insulated wires.

Electric power plugs have been placed in five situations: the sterilizing room, chemical and photographic rooms and research museum.

Equipment. The Institute is well provided with all requisite apparatus including modern appliances for the study of the biology of parasites. Special attention is being given to securing facilities for the study of the best and most recent methods of conducting research in parasitology.

SCIENTIFIC COLLECTIONS.

The collections of the Institute comprise numerous specimens acquired by the writer during many years, others presented to the Quick Laboratory and more recently to the Molteno Institute. The collections are intended primarily to aid the workers at the Institute and are housed in the research museum, the latter affording space for the considerable expansion of the collections which is expected in the future.

The collection of Ixodoidea, which is the most valuable at present, is one of the largest existing, besides being rich in types. There are many specimens of blood-sucking and parasitic insects and acari. The helminthological collection is rapidly growing in value, and, like the preceding, comprises types. Protozoological and mycological specimens are being steadily acquired, and there is a bacteriological cabinet. We hope to augment our collections by means of exchanges and through the further generosity of donors in different parts of the world.

A considerable amount of illustrative material, largely original, including diagrams prepared for the purpose of instruction in parasitology, is already contained in our museum.

Portraits of scientific men. A collection of about 300 portraits of those who have distinguished themselves in the domain of parasitology has been gathered by the writer and presented to the Institute. The portraits are mostly framed and hung chiefly in the well-lit corridors, the grouping being by nations and as far as possible by subjects. A number of these portraits are being published

124 *The Moltano Institute for Research in Parasitology*

in the form of a series appearing in *Parasitology* with accompanying biographical notes. The collection is of considerable interest to students of parasitology and others.

THE LIBRARY.

The basis of a departmental library has been formed by the gift to the Institute of the whole of the writer's scientific books, brochures, reports, journals and some thousands of reprints which are being suitably classified, bound and catalogued, new publications being continually added. Gifts and exchanges are also helping on the library.

The nucleus of a *Library Fund* has been formed through a benefaction received from Mrs Stella Churchill in memory of her late brother Dr Walter Myers, who died in Pará, Brazil in 1901 whilst investigating yellow fever¹.

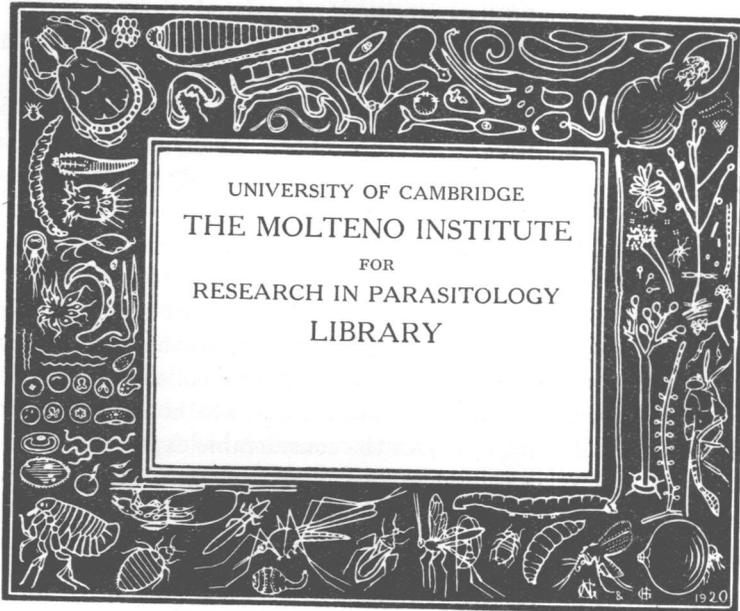


Fig. 6. The book-plate of the Institute designed by the writer.

The accompanying figure (Fig. 6) illustrates the book-plate designed by the writer for the library. The heavily parasitized border shows a reckless disregard for the relative size of the parasites depicted, most of the forms figured being readily recognizable to the initiated.

FACILITIES FOR PUBLICATION.

The publication of the scientific work carried out at the Institute is greatly facilitated by the circumstance that the writer is the founder and editor of the two journals, *Parasitology* and *The Journal of Hygiene*, the first having now attained its 14th and the second its 21st volume. Both journals are

¹ For biography and portrait, see *Journal of Hygiene*, 1901, t. pp. 285-287.

published by the University Press, Cambridge. *Parasitology* first appeared as a Supplement to *The Journal of Hygiene* in March, 1908, but, commencing with the sixth volume (1913) it became an independent journal, and to-day it represents the leading periodical publication dealing with parasitology.

PLANS FOR THE FUTURE DEVELOPMENT OF THE INSTITUTE AND THEIR
DEPENDENCE ON FURTHER ENDOWMENT.

The Institute was founded for the advancement of our knowledge of Parasitology in all its branches, being in this respect the first of its kind. Hitherto Parasitology has been taught in a limited way in professional schools, either medical or veterinary, in zoological and botanical laboratories, or in conjunction with agriculture and fisheries; consequently the student has been precluded from obtaining a general survey of the subject as a science. Similarly, in the matter of research, the work carried on in the various schools has been largely confined to problems having only a practical professional bearing. The Molteno Institute proposes to deal with Parasitology on a broad biological basis, the research and instruction offered therein being directed both to purely scientific and practical problems because pure and applied science are inseparably interwoven and many of the most important practical discoveries in the past have had their origin in purely scientific investigation.

Parasites and parasitic affections are widely distributed in Nature, the chief forms among the innumerable parasites affecting animals and plants being found among Protozoa, Vermes, Insecta, Acarina, and Fungi including Bacteria. It is evident therefore that the student desiring to obtain a broad survey of Parasitology will require to familiarize himself with a large number of widely divergent groups of organisms and that he should have corresponding facilities for their study placed at his disposal.

The well-equipped Institute herein described is an instrument of research which cannot be used to full advantage without ample funds. To render the work of the Institute efficient and to carry out the plan which governed its design and equipment it is necessary that an endowment fund or funds shall be established.

The present permanent endowments yield a total annual income of £861 derived from (a) the Quick Fund (£300 for research and laboratory), (b) the Molteno Benefaction (£546 for maintenance of Institute), and (c) the Walter Myers Fund (£5 for Library). Of this amount £500 go to meet the exorbitant rates and taxes at present demanded on the building, leaving but £351 for general purposes. Needless to say this sum represents but a fraction of the annual expenditure required to run the Institute and pay stipends, salaries, maintenance, cost of research, apparatus, chemicals, books, etc.

The main expenditure in running the Institute is met by grants for research derived from various sources as in the case of the Quick Laboratory during previous years. It will be readily understood that it is a grave drawback to any Research Institution to be dependent on grants because these are

126 *The Molteno Institute for Research in Parasitology*

necessarily obtained at irregular intervals and for specified purposes. Under the most favourable conditions, grants are but made from year to year, a circumstance that introduces a distracting element of uncertainty into the policy of the Institute. Moreover, since grants can only be obtained, as a rule, for specific researches that appeal to the judgment of the grantors, a most undesirable limitation is placed upon the Institution in its scientific work. Means should therefore be found in the near future to obtain funds wherewith scientific work may be conducted in a more unfettered manner.

In connection with the Institute, the position of *Parasitology* requires consideration. Founded in 1911 by the writer, this Journal has been carried on by him at a heavy personal loss during most of the years of its existence (1911-21). It is hardly to be expected that a publication of this kind should be self-supporting, essential though it be for the coordination and development of research, its circulation being necessarily limited, but it is clear that the cost of maintenance is small in proportion to its usefulness. It would be well if the Journal were made the official organ for the publication of the work done by investigators at the Institute whilst still serving for the presentation of papers derived from other sources. A suitable sum should therefore be made available toward the support of this Journal from endowments which may accrue to the Institute in the future, for, in view of the continued loss in publication, its continued existence is at stake.

It is hoped, therefore, that in the near future adequate funds will be found for the permanent endowment of the Institute so that it may develop as it should and perform the functions for which it is intended.

ACKNOWLEDGMENTS.

In concluding, the writer would express his deep sense of gratitude to Mr and Mrs Percy Alport Molteno for the splendid gift they have made to Science, the Empire and the University, a gift which will be appreciated to a growing degree in the future. Our great indebtedness to the late Mr Frederick James Quick, founder of the Quick Professorship of Biology, should be acknowledged anew, for, thanks to his foresight and the provisions of his legacy, wisely carried out by his Trustees and the Managers of the Quick Fund, the means provided by both the Molteno and Quick benefactions serve one and the same excellent end. We are, moreover, under great obligations to those public bodies and private persons who have helped on our work in the past (see p. 104) and, more recently, especially to the late Lord Strathcona and Mount Royal for his benefaction (see p. 108).

Our warmest thanks are due to Mr Harry Redfern, F.R.I.B.A., the architect of the Institute, for the extremely able manner in which he designed and carried out the building plans and for his ever friendly consideration of our wishes. The good work of the builders, Messrs William Saint and Son of Cambridge, speaks for itself, and we are grateful to their excellent foreman Mr Brain for the painstaking manner in which he carried out his multifarious duties.