THE LISTER INSTITUTE
OF
PREVENTIVE MEDICINE.

Report of the Governing Body, 1912.

CHELSEA GARDENS,
LONDON, S.W.

May 8th, 1912.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, CHELSEA BRIDGE ROAD, LONDON, S.W., and ELSTREE, HERTS.

THE GOVERNING BODY.

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Director:

*C. J. Martin, M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, M.A., M.B., D.Sc., *Bacteriologist-in-Chief at Chelsea.*
*G. F. Petrie, M.D., *Assistant Bacteriologist.*
*J. Henderson Smith, M.B., Ch.B., ,, ,,
J. A. Arkwright, M.A., M.D., B.Sc. ,, ,,
H. R. Dean, M.A., M.D., Ch.B., M.R.C.P., ,, ,,
G. H. K. Macalister, M.A., M.D., D.P.H. ,, ,,
E. E. Atkin, M.B., B.A. ,, ,,
W. Ray, M.B., B.Sc. ,, ,,

Department of Bio-Chemistry:

*A. Harden, D.Sc., Ph.D., F.R.S., *Chemist-in-Chief.*
*H. Maclean, M.D., Ch.B., *Assistant.*
W. J. Young, D.Sc., ,,

Department of Protozoology:

*E. A. Minchin, M.A., F.R.S., *Professor of Protozoology in the University of London.*
H. M. Woodcock, D.Sc., *Assistant.*
Muriel Robertson, M.A., ,,

Department of Statistics:

G. Udny Yule, *Honorary Consulting Statistician to the Institute.*
*M. Greenwood, Junr., M.R.C.S., L.R.C.P., *Statistician to the Institute.*
J. W. Brown, *Assistant.*

Antitoxin Department:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*

Vaccine Department:

Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of Calf Vaccine Laboratories.*

Director's Laboratory:

The Director.
Harriette Chick, D.Sc., *Assistant.*
Sydney Rowland, M.A., M.R.C.S., ,,

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*

Librarian:

Florence Wilson.

Chief Clerk:
A. L. White.

Artist:
Mabel Rhodes.

Assistant Secretary and Accountant:

George Cooper.

** A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

. OF .

The Lister Institute of Preventive Medicine,

May 8th, 1912.

REPORT OF THE GOVERNING BODY.

In presenting the 18th Annual Report, the first duty of the Governing Body is to refer to the great loss the Institute has to deplore in the death of Lord Lister.

They need not enlarge on the far-reaching effect of his work and discoveries, as these have met with a world-wide acknowledgment culminating in the impressive funeral service at Westminster Abbey, when representatives not only of Science and Medicine, but of all that stands for the progress of civilisation met from many countries to present their last homage to his memory. They desire rather to record their appreciation of the debt which the Institute owes to him in its foundation, its aims, its guidance and, not least, in the example of his unselfishness and of the imagination, patience and accuracy which characterised his researches.

Joining with others quick to appreciate the importance of the work of Pasteur and Koch, Lister helped to establish this Institute in the firm confidence that it would aid in the great work of carrying those discoveries still further. He undertook the duties of the first Chairman of its Governing Body, holding that post from 1891 to 1903, when advancing age led him to accept the Honorary position of President of the Institute. He spared no efforts to secure adequate financial support for the establishment of the Institute on a firm foundation, and great was his satisfaction when the munificent donation of a friend to Science made that support assured.

His interest in the Institute continued to the last, and his approval of its work, founded on long experience, has been shown by the generous bequest of £20,000 to its general funds.

The Royal Society have nominated Sir William Leishmann, F.R.S., to a seat upon the Governing Body during the absence of Colonel Sir David Bruce, who has been appointed to command an expedition to Nyassaland for the further study of Sleeping Sickness in that colony. It is anticipated that Sir David Bruce will be absent from this country for two or three years. At the same time the Royal Society nominated Sir William Watson Cheyne, Bart., C.B., F.R.S., to be the representative of the Society on the General Council of the Institute.

Mr. G. Udny Yule, the distinguished Statistician, has consented to accept an honorary post on the staff of the Statistical Department, whereby his great experience will be at the service of the department.

Several changes in the Scientific Staff have also occurred. Dr. F. A. Bainbridge having been appointed Professor of Physiology in the University of Durham, has resigned his position in the Bacteriological Department of the Institute. The services of Dr. G. F. Petrie have been temporarily lent to the Government of Egypt to undertake an investigation into the epidemiology of Plague in Upper Egypt.

Dr. E. E. Atkin, formerly a Beit Scholar, and Dr. W. Ray, formerly a Rhodes Scholar, have been elected to fill the vacancies in the Bacteriological Staff caused by these appointments.

The services of Mr. Sydney Rowland are still placed at the disposal of the Advisory Committee for the Investigation of Plague in India.

The importance of Entomological Science in relation to Public Health and Preventive Medicine has led the Governing Body to appoint Mr. A. W. Bacot, a distinguished student of Insect Bionomics, as entomologist on their staff. Mr. Bacot will devote himself principally to research in connection with the medical aspect of his subject, but it is also proposed that he should give at the Institute from time to time a short course of lectures in Medical Entomology.

Mr. R. V. Norris, Mr. E. A. Cooper and Dr. Casimir Funk have during the year held the Grocers', Jenner Memorial and the Institute Scholarships respectively.

Turning to the current work of the past year, the Governing Body are glad to be able to report continued development and progress in all the activities of the Institute. Individual researches as well as special or organised investigations have both increased in number and importance. In addition to the researches which have been conducted in the various laboratories, the general scope of which may be gathered from the list of scientific papers published during the year which is appended to this report, certain organised inquiries with which the Institute has been concerned deserve mention.

By arrangement with the Local Government Board, the Institute continues to co-operate with the Medical Inspectors of the Board in the investigation of suspected typhoid carriers in this country.

The Bacteriological Department has also undertaken an investigation into the Anaerobic Flora of the Child's Intestine. The work is being carried out by Dr. H. R. Dean, and the expenses of the research are defrayed by a special grant from the Local Government Board.

During the year the Commission for the Investigation of Plague in India has continued its inquiries both in India and at the special plague laboratories of the Institute at Elstree, which were placed at the disposal of the Advisory Committee. In December this Committee issued a further volume of reports including (*a*) a detailed account of experimental inquiries conducted in the Institute's laboratories as to the toxic and immunising properties of the various constituents of the plague bacillus and the application of the result to the immunisation of horses with a view to the production of curative sera and to the preparation of prophylactic vaccines capable of standardisation, and (*b*) a minute analysis of the factors influencing the prevalence of Plague in the Punjab, carried out in the Institute's Statistical Laboratory.

In 1911, 3,246 samples of milk were examined for the presence of Tubercle Bacilli for the London County Council, an increase of 296 over the number tested in 1910.

In addition to the General Scientific Staff and the holders of the Institute's research Scholarships, the following ladies and gentlemen have carried out researches at the Institute during the year: Mesdames Norris, Parsons and Wood ; Misses Hole, Lane-Claypon, Pixell, and Smedley (Beit Scholar) ; Drs. Bayon (Beit Scholar), Bosanquet, Brooks (British Medical Association Scholar), Cunningham, Funk, Martinez, Nicoll (Ernest Hart Scholar, B.M.A.), Penfold, Priestley (Beit Scholar), Tarapurvalla, Tebbutt, Thomson, Valladares, Visentini ; Messrs. Cooper (Beit Scholar), Cropper, Davies, Dunkerley, Harding, Hort, Kirkpatrick, Lanchester, Martin, Morgan, Norris (Beit Scholar), E. H. Ross, H. C. Ross, Wingate.

The growing demand from holders of research scholarships and other private workers for opportunities to work in the Institute's laboratories is gratifying. The Governing Body recognise that, although such hospitality, including in many instances the provision by the Institute free of cost of all facilities necessary for the investigations, involves enhanced expenditure and greater demands upon the time of the staff, it is a direction in which the general usefulness of the Institute has been increased.

The Governing Body have long felt that the expansion of the Institute's activities rendered it desirable to relieve the Director of some of the supervision of administrative and financial details, and they decided to appoint another member of the Scientific Staff to assist him in this work. Mr. M. Greenwood, Junr., has been selected to perform these duties and will, in addition to his scientific work as head of the Statistical Laboratory, act as Secretary to the Governing Body. The new arrangement is working successfully.

The progress of the Institute has also induced the Governing Body to take advantage of an offer to acquire by purchase from the Executors of the late Sir Charles Lawes-Wittewronge, Bart., the freehold and leasehold premises known as the "Studios," adjoining the Institute's building at Chelsea. Though there is no immediate necessity for adding to their laboratories, the Governing Body feel that in all probability it will not be long before they may be glad of the power of expansion which the control of these premises will afford.

At Elstree, the new Stables referred to in the last annual report are in use, giving loose box accommodation for 20 additional horses. New laboratories for the preparation of calf-lymph were commenced in 1911, and are now occupied. The buildings are of one story with lofts above affording accommodation for general storage. They include a large general laboratory, an operating room with top light, a private laboratory for the bacteriologist in charge, a small room containing a gas engine to supply power, a service room and a small photographic laboratory. Separated from the laboratory building by a few yards is a calf stable capable of accommodating 12 animals. This is warmed from the main building. The old calf stable and operating room has been converted into a quarantine stable for the calves prior to their employment for the preparation of vaccine.

Owing to the increased output of the Elstree departments the Governing Body will shortly proceed to the appointment of an Assistant Bacteriologist on the staff there.

The Governing Body also desire to mention that the Rev. C. N. R. Burrows having generously offered to the Institute his collection of acari and insect parasites, they have gratefully accepted the gift, and the specimens are now available for study in the Entomological Department.

The Balance Sheet of the Institute for the year ending December 31st, 1911, is attached and shows a satisfactory position, the excess of income over expenditure being at Elstree £4,671 5s. 4d., at Chelsea £1,861 18s. 9d. During the year £2,475 6s. 6d. has been expended on the additions to the Stabling and the new Laboratories at Elstree. The total sum of £393 13s. 5d. has been placed to the credit of the Sinking Fund in the Chelsea and Elstree accounts.

The Governing Body desire, in conclusion, to acknowledge the effective and cordial co-operation of the Director and all members of the Staff in the research work of the Institute.

HENRY E. ROSCOE.

Chairman.

The Lister Institute

Dr. BALANCE SHEET,

	£ s. d.	£ s. d.
To Creditors		814 5 7
To Loan from Bankers against Securities per Contra		9,500 0 0
To Sinking Fund		3,366 3 2
To Capital Fund—		
Including Donations, &c. received from the following—		
Dr. Ludwig Mond	£2,000 0 0	
The Berridge Trustees	46,379 10 1	
The Grocers' Company	10,000 0 0	
Lord Iveagh	250,000 0 0	
Other Donations	20,120 8 3	
Jenner Memorial Fund	5,768 0 11	
	370,890 2 1	
Add		
Balance of Chelsea Gardens Department Income and Expenditure Account, being excess of Income over Expenditure, for the year ending 31st December, 1911	1,861 18 9	
Balance of Elstree Department Income and Expenditure Account, being excess of Income over Expenditure for the year ending 31st December, 1911	4,671 5 4	
	6,533 4 1	
		377,423 6 2
		£391 103 14 11

HENRY E. ROSCOE,
Chairman.

J. L. PATTISSON,
Hon. Treasurer.

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the Institute's affairs, according to the best of our information and the explanations given to us and as shown by the books of

London, 12th April, 1912.

# of Preventive Medicine.

31st DECEMBER, 1911.

Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	319 1 10	
In hand	26 13 5	
		345 15 3
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4,570 11 0	
£5,000 Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London and North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 3½ per cent. Stock, 1918	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,500 City of Sydney 4 per cent. Bonds	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
		26,052 5 9
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945 ...	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935 ...	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 ...	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock ...	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1895	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investment, Sinking Fund (at cost)—		
£3,421 3s. 11d. 2½ per cent. Consols		2,972 9 9
(The above Investments, at the market value, 31st December, 1911, show a depreciation.)		
By Debtors...		4,427 13 5
By Stock of Tuberculin, Mallein, Anti-Bacterial Vaccines, &c.		426 6 0
By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1908		2,746 17 2
By Expenditure on Institute Building at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1910	17,053 1 10	
Add additions during the year	2,475 6 6	
		19,528 8 4
Stock of Animals and Forage	603 17 9	
Stock of Anti-Toxins, Bottles, &c.	6,496 6 11	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		7,919 15 3
		£391,103 14 11

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view of the state the Institute.

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

The Lister Institute of

Dr. Chelsea Gardens Department.—INCOME AND EXPENDITU

INCOME.

			£ s. d.
To Interest and Dividends on Investments			8,713 13 0
To Investigation, Diagnosis and Analysis Fees, &c.			4,808 17 0
To Sales of Tuberculin, Mallein, Anti-Bacterial Vaccines, &c.	£1,462 1 2		
Add Stock of Tuberculin, Mallein, Anti-Bacterial Vaccines, &c., 31st December, 1911...	426 6 0		
	1,888 7 2		
Deduct Stock of Tuberculin, Mallein, &c., 31st December, 1910	369 19 0		
			1,518 8 2
			£15,040 18 2

Dr. Elstree Department.—INCOME AND EXPENDITURE

INCOME.

	£ s. d.	£ s. d.
To Sale of Antitoxins, &c.	8,733 5 2	
Add Stock, 31st December, 1911	6,257 3 1	
	14,990 8 3	
Deduct Stock, 31st December, 1910	5,459 7 0	
		9,531 1 3
		£9,531 1 3

f Preventive Medicine.

TURE ACCOUNT for the Year ending 31st December, 1911. Cr.

EXPENDITURE.	£	s.	d.
By Rates, Taxes and Insurance	686	12	10
By Salaries and Wages of Staff	7,924	5	5
By Stationery, Printing, Postage and Advertising	296	18	5
By Office Expenses and Sundries	211	15	6
By Travelling Expenses	10	16	0
By Law Charges	5	5	0
By Auditors' Fee	21	0	0
By Gas and Water	273	19	7
By Electric Light and Power	173	1	3
By Fuel	139	10	3
By Director's Laboratory Expenses, including General Apparatus	290	11	4
By Bacteriological Laboratory Expenses, including Apparatus	404	13	2
By Water and Bio-chemical Laboratory Expenses, including Apparatus	301	15	6
By Furniture	29	19	3
By Culture Media	114	11	9
By Animals	560	18	6
By Animal House Expenses	372	10	7
By Repairs and Alterations to Buildings and Apparatus	232	13	10
By Library Expenses	150	9	4
By General Stores	125	6	11
By Protozoological Expenses, including Apparatus	100	17	3
By Bad Debts	4	5	6
By Interest on Loan from Bankers	422	10	8
By Sinking Fund (½% per annum on £64,916 3s. 1d., Cost of Buildings)	324	11	7
	13,178	19	5
By Balance, being Excess of Income over Expenditure Transferred to Capital Fund (see Balance Sheet)	1,861	18	9
	£15,040	18	2

ACCOUNT for the Year ending 31st December, 1911. Cr.

EXPENDITURE.				£	s.	d.
By Rent, Taxes and Insurance				124	4	9
By Salaries and Wages				2,078	16	7
By Animals—Stock 31st December, 1910		£536 19 9				
Purchased during the year ending 31st December, 1911		431 11 7				
		968 11 4				
Deduct—Sales during the year ending 31st December, 1911	£70 15 2					
Stock, 31st December, 1911	548 7 3					
		619 2 5				
				349	8	11
By Forage				1,127	9	9
By Stables and other Expenses				13	12	10
By Farm Expenses, including Furniture and Implements				27	14	5
By Gas, Water and Fuel				180	5	9
By Postages and Telegrams				36	16	1
By Laboratory Expenses, including Cost of Bottles, Chemicals and Apparatus				677	7	6
By Travelling Expenses				22	2	11
By Farm General Stores				47	1	7
By Farm Office Expenses and Printing				29	12	3
By Repairs and Alterations				76	0	9
By Sinking Fund (½% per annum on Estimated Cost of Buildings)				69	1	10
				4,859	15	11
By Balance, being excess of Income over Expenditure transferred to Capital Fund (see Balance Sheet)				4,671	5	4
				£9,531	1	3

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR

ARKWRIGHT, J. A. ... ... VARIATIONS IN THE VIRULENCE OF DIFFERENT STRAINS OF *Bacillus Diphtheriæ*. *Journal of Hygiene*, Vol. XI., 1911.

ARKWRIGHT, J. A. ... ... THE SERUM REACTIONS (COMPLEMENT FIXATION) OF THE MENINGOCOCCUS AND THE GONOCOCCUS. *Journal of Hygiene*, Vol. XI., 1912.

ARKWRIGHT, J. A. ... ... REPORT ON THE BACTERIOLOGICAL EXAMINATION OF FISH DURING THE EPIDEMIC AMONGST SALMON AND TROUT IN THE SUMMER OF 1911. *Board of Agriculture and Fisheries Report.*

BAINBRIDGE, F. A. ... ... THE ACTION OF CERTAIN BACTERIA ON PROTEINS. *Journal of Hygiene*, Vol. XI., 1911.

BAINBRIDGE, F. A., AND DUDFIELD, R. AN OUTBREAK OF DYSENTERY. *Journal of Hygiene*, Vol. XI., 1911.

BAYON, H. ... ... DEMONSTRATION OF SPECIMENS RELATING TO THE CULTURE OF THE LEPROSY BACILLUS. *British Medical Journal*, II., 1911.

BAYON, H. ... ... ON THE TRANSMISSION OF LEPROSY TO ANIMALS BY DIRECT INOCULATION. *British Medical Journal*, I., 1912.

BAYON, H. ... ... DEMONSTRATION OF ACID FAST GERMS CULTIVATED FROM CASES OF LEPROSY. *Trans. Soc. Trop. Med. and Hygiene*, 1912.

BAYON, H. ... ... THE CULTURE AND IDENTIFICATION OF THE GERM OF LEPROSY AND THE RELATIONSHIP OF THE HUMAN DISEASE TO RAT LEPROSY. *Trans. Soc. Trop. Med. and Hygiene*, 1912.

BROOKS, R. T. ST. JOHN ... ... (*See* HENDERSON-SMITH, J., and BROOKS, R. T. ST. JOHN.)

BROWN, J. W., AND GREENWOOD, M. AN EXAMINATION OF SOME FACTORS INFLUENCING THE RATE OF INFANT MORTALITY. *Journal of Hygiene* (in the Press).

CHICK, HARRIETTE AND MARTIN, C. J. ON THE "HEAT COAGULATION" OF PROTEINS, Part II. THE ACTION OF HOT WATER UPON EGG-ALBUMEN AND THE INFLUENCE OF ACID AND SALTS UPON REACTION VELOCITY. *Journal of Physiology*, Vol. XLIII., 1911.

COOPER, E. A. ... ... The Bactericidal Action of Cresols and Allied Bodies, and the best means of employing them. (An Investigation undertaken for the Therapeutic Committee, British Medical Association.) *British Medical Journal* (in the Press).

COOPER, E. A., and FUNK, CASIMIR... Experiments on the Causation of Beri-beri. *The Lancet*, Vol. II., 1911.

DEAN, H. R. ... ... On the Factors concerned in Agglutination. *Proceedings of the Royal Society*, B. Vol. 84, 1911.

DEAN, H. R. ... ... The Relation between the Fixation of Complement and the Formation of a Precipitate. *Proceedings of the Royal Society of Medicine*, Vol. V., 1911.

(*See also* Ledingham, J. C. G., and Dean, H. R.)

DUDFIELD, R. ... ... (*See* Bainbridge, F. A., and Dudfield, R.)

DUNKERLY, J. S. ... ... On some Stages in the Life-History of Leptomonas muscæ domesticæ, with some remarks on the Relationships of the Flagellate Parasites of Insects. *Quarterly Journal of Microscopical Science*, Vol. 56, 1911.

DUNKERLY, J. S. ... ... On the Occurrence of Thelohania and Prowazekia in Anthomyid Flies. *Centralbl. f. Bakt.*, I., Orig. Bd., 62, 1912.

FUNK, CASIMIR ... ... Note on the probable formation of Adrenaline in the Animal Body. *Journal of Physiology*, Vol. XLIII., 1911.

FUNK, CASIMIR ... ... On the Chemical Nature of the substance which cures Polyneuritis in Birds induced by a Diet of Polished Rice. *Journal of Physiology*, Vol. XLIII., 1911.

FUNK, CASIMIR ... ... The Effect of a Diet of Polished Rice on the Nitrogen and Phosphorus of the Brain. *Journal of Physiology*, Vol. XLIV., 1912.

FUNK, CASIMIR ... ... Studies on the Cause of Beri-beri (in the Press).

(*See also* Cooper, E. A., and Funk, Casimir.)

GREENWOOD, M., Junr. ... ... Statistical Investigation of Plague in the Punjab. Third Report: On some of the Factors which Influence the Prevalence of Plague. *Journal of Hygiene* (Supplement), Vol. XI., 1911.

(*See also* Brown, J. W., and Greenwood, M.)

HARDEN, A., and MACLEAN, H. ... The Oxidation of Isolated Animal Tissues, *Journal of Physiology*, Vol. XLIII., 1911.

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The Lister Institute of Preventive Medicine.

Report of the Governing Body, 1913.

Chelsea Gardens,
London, S.W.

May 21st, 1913.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, CHELSEA BRIDGE ROAD, LONDON, S.W., and ELSTREE, HERTS.

THE GOVERNING BODY.

SIR JOHN ROSE BRADFORD, K.C.M.G., M.D., F.R.S., *Chairman.*
THE RIGHT HON. SIR HENRY E. ROSCOE, P.C., D.C.L., F.R.S.
THE VISCOUNT IVEAGH, K.P., G.C.V.O., F.R.S.
J. LUARD PATTISSON, C.B., *Hon. Treasurer.*
SIR WILLIAM OSLER, BART., M.D., F.R.S.
PROFESSOR ERNEST H. STARLING, M.D., F.R.S.
LIEUT. COLONEL SIR WILLIAM B. LEISHMAN, M.B., F.R.S.

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F. W. ANDREWES, M.A., M.D.	Royal College of Physicians, London.
PROFESSOR A. E. METTAM, B.Sc. (PRESIDENT) ...	Royal College of Veterinary Surgeons.
THE EARL OF FEVERSHAM	Royal Agricultural Society.
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FRANK POWNALL, Esq.	Worshipful Company of Grocers.
BAINBRIDGE BROWNING, Esq.	Worshipful Company of Grocers.
DAWSON WILLIAMS, M.D.	British Medical Association.
COLONEL G. W. ADDISON, R.E.	Members of the Institute.
SIR JOHN ROSE BRADFORD, K.C.M.G., M.D., F.R.S.	,, ,,
SIR ARTHUR BRANFOOT, K.C.I.E.	,, ,,
HORACE T. BROWN, F.R.S.	,, ,,
PROFESSOR GEORGE DEAN, M.B.	,, ,,
PROFESSOR ARTHUR HARDEN, PH.D., F.R.S.	,, ,,
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WILLIAM HUNTING, F.R.C.V.S.	,, ,,
SIR EDWIN RAY LANKESTER, K.C.B., F.R.S. ...	,, ,,
J. C. G. LEDINGHAM, M.B., D.Sc.	,, ,,
PROFESSOR CHARLES J. MARTIN, M.B., D.Sc., F.R.S.	,, ,,
H. DE REIMER MORGAN, M.R.C.S.	,, ,,
J. LUARD PATTISSON, C.B.	,, ,,
SAMUEL G. SHATTOCK, F.R.C.S.	,, ,,
PROFESSOR W. J. SIMPSON, C.M.G., M.D.	,, ,,
J. SIDNEY TURNER, M.R.C.S.	,, ,,

THE STAFF.

Director:

*C. J. Martin, M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, M.A., M.B., D.Sc., *Bacteriologist-in-Chief at Chelsea.*
*G. F. Petrie, M.D., *Assistant Bacteriologist.*
*J. Henderson Smith, M.B., Ch.B. ,, ,,
J. A. Arkwright, M.A., M.D., B.Sc. ,, ,,
E. E. Atkin, M.B., B.A. ,, ,,
W. Ray, M.B., B.Sc. ,, ,,
W. J. Penfold, M.B., D.P.H. ,, ,,
H. L. Schütze, M.D., B.Sc. ,, ,,

Department of Bio-Chemistry:

*A. Harden, D.Sc , Ph.D., F.R.S., *Chemist-in-Chief.*
Percival J. Hartley, D.Sc., *Assistant.*
Robert Robison, Ph.D., F.I.C., ,,

Department of Protozoology.

*E. A. Minchin, M.A., F.R.S., *Professor of Protozoology in the University of London.*
H. M. Woodcock, D.Sc., *Assistant.*
Muriel Robertson, M.A., ,,

Department of Statistics:

G. Udny Yule, M.A., *Honorary Consulting Statistician to the Institute.*
*M. Greenwood, Junr., M.R.C.S., L.R.C.P., *Statistician to the Institute.*
J. W. Brown, *Assistant.*

Antitoxin Department:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*

Vaccine Department:

Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of Calf Vaccine Laboratories.*

Director's Laboratory:

The Director.
Harriette Chick, D.Sc., *Assistant.*
Sydney Rowland, M.A., M.R.C.S., ,,

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*

Librarian:

Fernie Fletcher.

Chief Clerk:
A. L. White.

Artist:
Mabel Rhodes.

Assistant Secretary and Accountant:

George Cooper.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 21st, 1913.

REPORT OF THE GOVERNING BODY.

The Governing Body have the honour to present their 19th Annual Report.

During the period under review, Sir Henry E. Roscoe expressed his wish to be relieved of the duties of Chairman of the Governing Body; the distance of his residence from London and considerations of health rendering it difficult for him to be as much at the Institute as formerly.

Sir Henry, one of the Founders of the Institute, had been Chairman since 1903, when he succeeded Lord Lister. He had previously been the Treasurer of the Institute from its commencement.

His colleagues, in acceding with regret to his wish, expressed their high appreciation of the services he had rendered, and their satisfaction that he would still remain a Member of the Governing Body.

At the unanimous request of the Board, Sir John Rose Bradford accepted the Chairmanship in succession to Sir Henry.

A number of members of the Institute having expressed the wish to present to the Governing Body a portrait of Lord Lister, the Council of the Royal College of Surgeons were approached to allow for this purpose a copy to be made of Mr. W. W. Ouless' fine picture in their possession. The permission was cordially granted.

Mr. Dorofield Hardy was entrusted with the commission, and his faithful copy has now been formally presented to the Institute by the subscribers, and hung in the Board Room.

During the year the following changes in the Staff have occurred:—

Dr. H. R. Dean, Assistant Bacteriologist, has been appointed Professor of Pathology in the University of Sheffield.

Dr. H. Maclean, First Assistant in the Bio-Chemical Department, has been appointed Chemical Pathologist at St. Thomas's Hospital.

Dr. W. J. Young, of the same Department, has been appointed Bio-Chemist to the Australian Institute of Tropical Medicine.

Dr. G. H. K. Macalister has been appointed to a research post in the Wellcome Laboratories.

Dr. H. R. Dean has been succeeded in the Institute by Dr. W. J. Penfold, and Dr. Maclean by Dr. P. J. Hartley, Physiological Chemist to the Indian Imperial Institute of Bacteriology.

Dr. Young has been succeeded by Dr. Robert Robison, Lecturer in Chemistry, University College, Nottingham, and Dr. Macalister by Dr. H. Schütze, Beit Fellow.

The term during which Dr. G. F. Petrie's services are at the disposal of the Egyptian Government has been extended until December 31st, 1913.

Mr. Sydney Rowland is still, with the sanction of the Governing Body, seconded for special service under the Advisory Committee for the investigation of Plague in India.

Mrs. Wood has been appointed to the Grocers' Company Research Scholarship at the Institute.

The Senate of the University of London has conferred the title of Professor of Experimental Pathology upon Dr. C. J. Martin; that of Professor of Biochemistry upon Dr. A. Harden; and that of Reader in Bacteriology upon Dr. J. C. G. Ledingham.

Turning to the current work of the past year, the Governing Body are glad to be able to report continued development and progress in all the activities of the Institute. Individual researches as well as special or organised investigations have both increased in number and importance. In addition to the researches which have been conducted in the various laboratories, the general scope of which may be gathered from the scientific papers published during the year, a list of which is appended to this report, certain organised enquiries with which the Institute has been concerned, deserve mention.

By arrangement with the Local Government Board, the Institute continues to co-operate with the Medical Inspectors of the Board in the investigation of material from suspected typhoid carriers in this country.

In 1912, 3,232 samples of milk were examined for the presence of Tubercle bacilli on behalf of the London County Council.

The special plague laboratories at Elstree are still placed at the disposal of the Advisory Committee, and the last report issued by the Committee includes a paper by Dr. A. T. MacConkey on the preparation of antitoxic plague sera, five papers by Mr. S. Rowland, dealing with various aspects of plague immunity and experiments relating thereto, and a study of the opsonic index in plague vaccination by Dr. St. John Brooks.

In addition to the general scientific staff and the holders of the Institute's Research Scholarships, the following ladies and gentlemen have carried out researches at the Institute during the year:—

Mesdames Norris and Werner, Misses Hole, Homer (Beit Fellow), Lubrzynska, Michaelis, Pixell (Beit Fellow), Smedley (Beit Fellow).

Messrs. Armit, Cooper (Beit Fellow), Cropper, Cunningham (Agric. Research Scholar), Ewart, Grey, Hort, Lapage, Morgan, Norris (Beit Fellow), E. H. Ross, H. C. Ross.

Drs. Bayon (Beit Fellow), Bosanquet, Braddon, Brooks, Castellani, Funk (Beit Fellow), Gray, Jona (Beit Fellow), Macallum (Beit Fellow), Priestley (Beit Fellow), Penfold, Schmidt, Schütze (Beit Fellow), Sherwin, Tebbutt, Thomson, Tidswell, Weber.

Colonel Jennings, I.M.S. Major Christophers, I.M.S.

The new laboratories at Elstree are now completely equipped, and the increased outputs of sera and calf-lymph can be conveniently dealt with.

The Balance Sheet of the Institute for the year ending 31st December, 1912, is attached and shows a satisfactory position; the excess of income over expenditure being:—

At Chelsea	£784 : 2 : 8
At Elstree	£5,478 : 12 : 10

During the year £2,669 2s. 9d. has been expended on the purchase of the lease of "The Studios" adjoining the Institute's premises at Chelsea, and £927 1s. 5d. on additions to the Elstree property. The total sum of £410 13s. 7d. has been placed to the credit of the Sinking Fund in the Chelsea and Elstree accounts, and £39 10s. 0d. has been written off the value of "The Studios" lease.

The Governing Body desire, in conclusion, to acknowledge the effective and cordial co-operation of the Director and all members of the Staff in the research work of the Institute.

JOHN ROSE BRADFORD,

Chairman.

The Lister Institute

Dr. BALANCE SHEET,

	£ s. d.	£ s. d.	£ s. d.
To Creditors			1,375 19 7
To Loan from Bankers against Securities per Contra			7,750 0 0
To Sinking Fund			3,870 18 9
To Capital Fund—			
Balance of Income and Expenditure to 31st Dec., 1911 ...	43,155 6 11		
Donations, &c., received from the following—			
Dr. Ludwig Mond	2,000 0 0		
The Berridge Trustees	46,379 10 1		
The Grocers' Company	10,000 0 0		
Lord Iveagh	250,000 0 0		
Other Donations	20,120 8 3		
Jenner Memorial Fund	5,768 0 11		
		377,423 6 2	
Add			
Balance of Chelsea Gardens Department Income and Expenditure Account, being excess of Income over Expenditure, for the year ending 31st December, 1912	784 2 8		
Balance of Elstree Department Income and Expenditure Account, being excess of Income over Expenditure for the year ending 31st December, 1912	5,478 12 10		
		6,262 15 6	
			383,686 1 8

JOHN ROSE BRADFORD,
Chairman.

J. L. PATTISSON,
Hon. Treasurer.

£396,683 0 0

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required, of the Institute's affairs, according to the best of our information and the explanations given to us and as shown by the books of

London, 10th April, 1913.

# of Preventive Medicine.

31st DECEMBER, 1912

Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	662 15 9	
In hand...	36 15 0	
		699 10 9
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4,570 11 0	
£5,000 Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London and North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 3½ per cent. Stock, 1918	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,500 City of Sydney 4 per cent. Bonds	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
		26,052 5 9
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945 ...	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949...	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935 ...	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 ...	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25 000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock ...	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investment, Sinking Fund (at cost)—		
£4,047 0s 10d. 2½ per cent. Consols		3,460 5 2
(The above Investments, at the market value, 31st December, 1912, show a depreciation.)		
By Debtors		4,416 2 4
By Stock of Tuberculin, Mallein, Bacterial Vaccines, &c.		211 1 5
By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1908		2,746 17 2
By Expenditure on Institute Building at Chelsea —		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea ...		169 6 8
By Purchase of Lease of "The Studios," Chelsea	2,669 2 9	
Less amount written off	39 10 0	
		2,629 12 9
By Queensberry Lodge Farm, Elstree —		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1911	19,528 8 4	
Add additions during the year	927 1 8	
		20,455 10 0
Stock of Animals and Forage	556 15 11	
Stock of Anti-Toxins, Bottles, &c.	7,781 17 6	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		9,158 4 0
		£396,683 0 0

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view of the state the Institute.

COOPER BROTHERS & CO.,
Chartered Accountants. } *Auditors.*

The Lister Institute o

Dr. Chelsea Gardens Department.—INCOME AND EXPEN

INCOME.

			£ s. d.
To Interest and Dividends on Investments			8,580 19 10
To Investigation, Diagnosis and Analysis Fees, &c.			4,623 4 11
To Sales of Tuberculin, Mallein, Bacterial Vaccines, &c.	£1,636 7 5		
Add Stock of Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1912	211 1 5		
	1,847 8 10		
Deduct Stock of Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1911	426 6 0		
		1,421 2 10	
		£14,625 7 7	

Dr. Elstree Department.—INCOME AND EXPENDITURE

INCOME.

	£ s. d.	£ s. d.
To Sale of Antitoxins, &c.	9,517 9 7	
Add Stock, 31st December, 1912	7,634 14 0	
	17,152 3 7	
Deduct Stock, 31st December, 1911	6,257 3 1	
		10,895 0 6
		£10,895 0 6

Preventive Medicine.

DITURE ACCOUNT for the Year ending 31st December, 1912. Cr.

EXPENDITURE.

	£	s.	d.
By Rent, Rates, Taxes and Insurance	768	5	0
By Salaries and Wages of Staff	8,381	16	8
By Stationery, Printing, Postage and Advertising	189	11	11
By Printing of Collected Papers	211	19	8
By Office Expenses and Sundries	190	15	11
By Travelling Expenses	101	19	11
By Law Charges	10	0	0
By Auditors' Fee	21	0	0
By Gas and Water	312	9	6
By Electric Light and Power	188	3	4
By Fuel	138	11	0
By Director's Laboratory Expenses, including General Apparatus	229	13	1
By Bacteriological Laboratory Expenses, including Apparatus	355	15	10
By Water and Bio-chemical Laboratory Expenses, including Apparatus	286	10	3
By Furniture	1	4	0
By Culture Media	158	12	1
By Animals	589	14	4
By Animal House Expenses	344	7	3
By Repairs and Alterations to Buildings, including Workshop Expenses	234	9	7
By Library Expenses	144	16	9
By General Stores	168	1	4
By Protozoological Expenses, including Apparatus	92	13	9
By Bad Debts	5	16	2
By Interest on Loan from Bankers	380	16	0
By Depreciation of the Lease of "The Studios," Chelsea	39	10	0
By Sinking Fund (½% per annum on £64,916 8s. 1d., Cost of Buildings)	324	11	7
	13,841	4	11
By Balance, being Excess of Income over Expenditure Transferred to Capital Fund (see Balance Sheet)	784	2	8
	£14,625	7	7

ACCOUNT for the Year ending 31st December, 1912. Cr.

EXPENDITURE.

			£	s.	d.
By Rent, Taxes and Insurance			176	9	0
By Salaries and Wages			2,082	2	1
By Animals—Stock 31st December, 1911	£548 7 8				
Purchased during the year ending 31st December, 1912	241 4 5				
	789 11 8				
Deduct—Sales during the year ending 31st December, 1912	15 0 0				
Stock, 31st December, 1912	533 19 4				
	548 19 4				
			240	12	4
By Forage			1,092	0	11
By Stables and other Expenses			19	14	8
By Farm Expenses, including Furniture and Implements			64	18	11
By Gas, Water and Fuel			196	9	4
By Postages and Telegrams			23	9	7
By Laboratory Expenses, including Cost of Bottles, Chemicals and Apparatus			757	17	9
By Travelling Expenses			17	1	5
By Farm General Stores			25	7	10
By Farm Office Expenses and Printing			31	12	9
By Repairs and Alterations			602	9	1
By Sinking Fund (½% per annum on Estimated Cost of Buildings)			86	2	0
			5,416	7	8
By Balance, being excess of Income over Expenditure transferred to Capital Fund (see Balance Sheet)			5,478	12	10
			£10,895	0	6

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR.

ARKWRIGHT, J. A. ... ... An Epidemic Disease affecting Salmon and Trout in England During the Summer of 1911. *Journal of Hygiene*, Vol. XII., 1912.

ARKWRIGHT, J. A. ... ... Natural Variation of *B. acidi lactici* with respect to the Production of Gas from Carbohydrates. *Journal of Hygiene*, Vol. XII., 1913.

BACOT, A. W. ... ... On the Bionomics of Fleas. *Journal of Hygiene* (Plague Supplement), 1913 (in the Press).

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The Lister Institute
of
Preventive Medicine.

Report of the Governing Body, 1914.

Chelsea Gardens,
London, S.W.

May 13th, 1914.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, CHELSEA BRIDGE ROAD, LONDON, S.W., and ELSTREE, HERTS.

THE GOVERNING BODY.

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SAMUEL G. SHATTOCK, F.R.C.S....	,, ,,
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*J. C. G. Ledingham, M.A., M.B., D.Sc., *Reader in Bacteriology, University of London.*
*G. F. Petrie, M.D., *Assistant Bacteriologist.*
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J. A. Arkwright, M.A., M.D., B.Sc. ,, ,,
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H. L. Schütze, M.D., B.Sc. ,, ,,

Department of Bio-Chemistry:

*A. Harden, D.Sc., Ph.D., F.R.S., *Professor of Bio-Chemistry in the University of London.*
Percival J. Hartley, D.Sc., *Assistant.*
Robert Robison, Ph.D., F.I.C., ,,

Department of Experimental Pathology:

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Harriette Chick, D.Sc., *Assistant.*
Sydney Rowland, M.A., M.R.C.S., *Assistant.*

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*

Department of Protozoology:

*E. A. Minchin, M.A., F.R.S., *Professor of Protozoology in the University of London.*
H. M. Woodcock, D.Sc., *Assistant.*
Muriel Robertson, M.A., ,,

Department of Statistics:

G. Udny Yule, M.A., *Honorary Consulting Statistician to the Institute.*
*M. Greenwood, Junr., M.R.C.S., L.R.C.P., *Statistician to the Institute.*
J. W. Brown, *Assistant.*

Antitoxin Department [Elstree]:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*

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Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of Calf Vaccine Laboratories.*

Librarian:
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Artist:
Mabel Rhodes.

Chief Clerk:
A. L. White.

Assistant Secretary and Accountant:
George Cooper.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

. OF .

The Lister Institute of Preventive Medicine,

May 13th, 1914.

REPORT OF THE GOVERNING BODY.

The Governing Body have the honour to present their 20th Annual Report.

They have regretfully to record the loss through death of two distinguished members of Council — Surgeon-General Sir Arthur Branfoot and Mr. William Hunting.

Dr. Ray has resigned his post on the Staff of the Bacteriological Department, and Dr. Schütze, a former Beit Fellow, has been appointed an assistant bacteriologist. Dr. G. F. Petrie, whose services have for two years been placed at the disposal of the Egyptian Government for special investigations in connection with the spread of plague in Egypt, and Miss Muriel Robertson, who has been working during the past two-and-a-half years in Uganda as a member of the Sleeping Sickness Commission of the Royal Society, have returned to duty at Chelsea. Mr. Rowland is still seconded by the Governing Body for special service at Elstree under the Advisory Committee for Plague Investigations. Mrs. Frances Wood was reappointed Grocers' Research Scholar during the past year.

During the year under review the munificent legacy, amounting with interest to £17,303 15s. 2d., bequeathed by the late Lord Lister to the general funds of the Institute, has been received from his

executors. This bequest has enabled the Governing Body to give practical effect to a scheme they had for some time been desirous to set up, of making provision for the superannuation of members, both of the higher and the subordinate staffs of the Institute on attaining the age of 65 years, or in special cases that of 60 years.

Acting under Actuarial advice, they have invested this sum as the basis of a special Pension Fund, to accumulate at compound interest until such time—some years hence—as the pension claims shall begin to mature. To the same fund they propose to add annually from the general income of the Institute the sum of £700 - each appropriation being invested at the time in similar manner. The fund is calculated to produce by the necessary dates an income sufficient to enable the Governing Body to provide for every one in their regular employment on reaching the age of 65, a superannuation allowance equal to 50 per cent. of the average salary received during the last three years of service; and in some special cases a proportionally reduced allowance at the age of 60. But as the whole expense of the scheme will be borne by the funds of the Institute, without contributory payments by any potential beneficiary, it is provided therein that no legal liability to confer such pensions shall rest on the Governing Body. They hope, however, that no untoward circumstance will arise, rendering it necessary for them to fall back on this reservation. The scheme further provides that no claim to pension shall arise in regard to services terminated for any reason before the ages above mentioned.

In view of the new Department of Medical Research now being established by H.M. Government in accordance with the provision in the National Insurance Act of 1911, the Governing Body have been considering whether it would not be in the interest of Medical Science in this country that they should recommend to the members of the Institute to offer, under conditions, to the nation, the organization and resources of the Lister Institute, as the nucleus of the Government scheme. At present, however, the Governing Body are not in a position to make any more definite statement or recommendation on the subject.

Turning to the scientific activities of the Institute, the appended list of papers issued from the various laboratories indicates the scope and amount of research accomplished.

The Institute has also borne a share in several collective enquiries of importance. Dr. Ledingham has continued to supervise the bacteriological examination of material from cases diagnosed as typhoid fever, or suspected typhoid, in connection with outbreaks in this country. He has also drawn up a report on the work as carried out by Dr. Theodore Thomson, of the Local Government Board and himself, giving the results of a bacteriological examination at intervals of typhoid convalescents for several months after their discharge from the hospitals of the Metropolitan Asylums Board. This report, which contains much information, showing the length of time typhoid

convalescents remain infective, is published in the Annual Report of the Medical Officer to the Local Government Board.

An extensive enquiry into the bacteriological and chemical purity of dried milks, creams and foreign pasteurized milks has also been undertaken for the Local Government Board by the Bacteriological and Bio-chemical Departments. During the year 3,020 samples of milk have been examined for the presence of tubercle bacilli for the London County Council, and a large number for the Health Departments of various boroughs.

The investigations into plague, for the Administration of which the Institute, in conjunction with the India Office and the Royal Society, is responsible, have been proceeding during the year both in India and in this country, and the Institute's special isolated laboratories at Elstree continue at the disposal of the Advisory Committee appointed by the above-mentioned bodies. During the year, the Committee has issued an Eighth Report of the Investigations carried out under their auspices, as a special supplement to the JOURNAL OF HYGIENE. The Report contains papers by Mr. S. Rowland on the influence of cultivation of the plague bacillus in various media upon its virulence and antigenic properties, in which the great importance of the medium in which the bacillus is propagated upon the production of an efficient vaccine, is brought out. The effect of similar variations on the conditions under which this organism is cultivated upon the facility with which it is ingested by leucocytes, is the subject of a report by Dr. St. John Brooks. The volume also contains a valuable monograph on the bionomics of fleas by Mr. A. W. Bacot, Entomologist to the Institute, and some interesting observations on the mechanism by which fleas transmit plague, by Messrs. Bacot and Martin.

By arrangement with the Metropolitan Asylums Board, the research pathologist of that Authority, Dr. Mair, is accommodated in the Institute.

Research workers in the laboratories, other than members of the staff, have included:

Mesdames Barratt, MacLean and Norris.

Misses Dalyell (Beit Fellow), Homer, Hole, and Lubrzynska.

Messrs. Cropper, Grey (Beit Fellow), Hirst, Hort, Lanchester, Lapage, Morgan, E. H. Ross, H. C. Ross, and Sherwin.

Drs. Barratt (Beit Fellow), Bedson (B.M.A. Scholar), Bosanquet, Braddon, Brooks, Cooper (Beit Fellow), Coplans (Beit Fellow), Ewart, Funk (Beit Fellow), Ingram, Jona (Beit Fellow), Macallum (Beit Fellow), Mair, Martinez, Schmidt, Theisen, Thomson, Violle, de Wesselow, and Zilva.

Major Cummins, R.A.M.C., and Majors Rost and Harvey, I.M.S.

Captains Morrison and Rutherfoord, I.M.S.

The Accounts and Balance Sheet of the Institute for the year ending 31st December 1913, are attached and show a satisfactory position—the excess of income over expenditure being:

At Chelsea	...	...	£750 1 7.
At Elstree	...	...	£4,938 3 0.

The total sum of £410 13s. 7d. has been placed to the credit of the sinking fund in the Chelsea and Elstree Accounts, and £65 2s. has been written off the value of "The Studios" lease.

The Governing Body desire, in conclusion, to acknowledge the effective and cordial co-operation of the Director and all members of the Staff in the research work of the Institute.

JOHN ROSE BRADFORD,

Chairman.

1913.
1913-6.

The Lister Institute

Dr. BALANCE SHEET,

	£ s. d.	£ s. d.	£ s. d.
To Creditors			1,110 8 7
To Loan from Bankers against Securities per Contra			3,000 0 0
To Pension Fund—			
Appropriation from Capital Fund (Lord Lister's Legacy) ...	16,943 18 11		
Interest and Dividends on the Investments of the Fund ...	359 16 3		
Annual Contribution from the Institute	700 0 0		
			18,003 15 2
To Sinking Fund			4,391 17 4
To Capital Fund—			
Balance of Income and Expenditure to 31st Dec., 1912 ...	49,418 2 5		
Donations, &c., received from the following—			
Dr. Ludwig Mond	2,000 0 0		
The Berridge Trustees	46,379 10 1		
The Grocer's Company	10,000 0 0		
Lord Iveagh	250,000 0 0		
Other Donations	20,120 8 3		
Jenner Memorial Fund	5,768 0 11		
Lord Lister's Bequest to date	16,943 18 11		
		400,630 0 7	
Add			
Balance of Chelsea Gardens Department Income and Expenditure Account, being excess of Income over Expenditure, for the year ending 31st December, 1913	750 1 7		
Balance of Elstree Department Income and Expenditure Account, being excess of Income over Expenditure for the year ending 31st December, 1913	4,938 3 0		
		5,688 4 7	
		406,318 5 2	
Deduct			
Appropriation of Lord Lister's Bequest to the Pension Fund		16,943 18 11	
			389,374 6 3
			£415,880 7 4

JOHN ROSE BRADFORD, *Chairman.*

J. L. PATTISSON, *Hon. Treasurer.*

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the Institute's affairs, according to the best of our information and the explanations given to us and as shown by the books

London, 27th March, 1914.

# of Preventive Medicine.

31st DECEMBER, 1913. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	465 17 6	
In hand...	25 8 8	
		491 6 2
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4,570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,620 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 3½ per cent. Stock, 1918	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942/62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
		26,052 5 9
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945...	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949 ...	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935 ...	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 ...	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943... ...	23,850 0 0	
£25,000 London and South Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898 ...	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock ...	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investments, Pension Fund (at cost)—		
100 Shares ($50) Morris and Essex Railway	1,760 0 0	
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock ...	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital, 5 per cent. Preference Debentures	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£500 Royal Medical, &c., Society of London Debentures	350 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 New York Central and Hudson River Bonds	640 0 0	
£3,000 Crompton & Co. First Mortgage, 5 per cent. Debentures	1,680 0 0	
£2,000 China Navigation Company Stock	2,000 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debentures	984 0 0	
Vincent House Mortgage...	425 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debentures... ...	656 19 7	
£500 Canada 4 per cent. Stock	492 11 0	
By Cash Balance	142 7 11	
		18,003 15 2
By Investment, Sinking Fund (at cost)—		
£4,745 3s. 8d. 2½ per cent. Consols		3,931 3 9
(The above Investments, at the market value, 31st December, 1913, show a depreciation.)		
By Debtors...		4,137 15 4
By Stock of Tuberculin, Mallein, Bacterial Vaccines, &c.		209 1 0
By Furniture, Fittings, Scientific Apparatus and Books—		
As per account 31st December, 1908		2,746 17 2
By Expenditure on Institute Building at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea ...		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,629 12 9	
Less amount written off...	65 2 0	
		2,564 10 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	477 5 7	
Stock of Anti-Toxins, Bottles, &c.	9,087 15 5	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		10,384 11 7
		£415,880 7 4

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view of the state of the Institute.

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Dr. Chelsea Gardens Department.—INCOME AND EXPE

		£ s. d.
INCOME.		
To Interest and Dividends on Investments including £359 16s. 3d. on Pension Fund Investments		9,192 0 11
To Investigation, Diagnosis and Analysis Fees, &c.		1,586 11 6
To Sales of Tuberculin, Mallein, Bacterial Vaccines, &c.	£1,450 12 2	
Add Stock of Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1913	209 1 0	
	1,659 13 2	
Deduct Stock of Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1912	211 1 5	
		1,448 11 9
To Rent of Rooms to the Metropolitan Asylums Board		33 6 8
		£15,260 10 10

Dr. Elstree Department.—INCOME AND EXPENDITURE

	£ s. d.	£ s. d.
INCOME.		
To Sale of Antitoxins, &c.	8,531 3 1	
Add Stock, 31st December, 1913	8,920 1 8	
	17,454 4 9	
Deduct Stock, 31st December, 1912	7,634 14 0	
		9,819 10 9
		£9,819 10 9

f Preventive Medicine.

DITURE ACCOUNT for the Year ending 31st December, 1913. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	814	11	7
By Salaries and Wages of Staff	8,109	3	2
By Stationery, Printing, Postage and Advertising	201	11	0
By Printing of Collected Papers	191	8	4
By Office Expenses and Sundries	113	1	6
By Travelling Expenses	10	6	5
By Law Charges	16	18	6
By Auditors' Fee	21	0	0
By Gas and Water	325	5	11
By Electric Light and Power	171	13	9
By Fuel	111	13	6
By Director's Laboratory Expenses, including General Apparatus	206	1	3
By Bacteriological Laboratory Expenses, including Apparatus	257	11	6
By Water and Bio-chemical Laboratory Expenses, including Apparatus	211	16	3
By Furniture	4	4	5
By Culture Media	89	3	2
By Animals	589	6	7
By Animal House Expenses	322	5	2
By Repairs and Alterations to Buildings, including Workshop Expenses and Tools	577	10	11
By Library Expenses	149	17	11
By General Stores	158	15	0
By Protozoological Expenses, including Apparatus	100	6	2
By Bad Debts	6	2	2
By Interest on Loan from Bankers	234	12	4
By Annual Contribution to the Pension Fund £700 and Interest on Pension Fund Investments	1,059	16	3
By Loss on Sale of Pension Fund Investments	4	12	11
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on £61,916 3s. 1d., Cost of Buildings)	324	11	7
	14,510	9	3
By Balance, being Excess of Income over Expenditure Transferred to Capital Fund (see Balance Sheet)	750	1	7
	£15,260	10	10

ACCOUNT for the Year ending 31st December, 1913. Cr.

EXPENDITURE.			£	s.	d.
By Rent, Taxes and Insurance			212	11	3
By Salaries and Wages			2,161	5	5
By Animals—Stock 31st December, 1912	£533	19 4			
Purchased during the year ending 31st December, 1913	91	15 0			
	625	14 4			
Deduct—Sales during the year ending 31st December, 1913	12	0 0			
Stock, 31st December, 1913	466	18 1			
	478	18 4			
			146	16	0
By Forage			1,129	14	1
By Stables and other Expenses			6	2	1
By Farm Expenses, including Furniture and Implements			57	4	7
By Gas, Water and Fuel			183	18	8
By Postages and Telegrams			27	19	2
By Laboratory Expenses, including Cost of Bottles, Chemicals and Apparatus			659	6	3
By Travelling Expenses			18	5	3
By Farm General Stores			43	6	1
By Farm Office Expenses and Printing			26	1	4
By Repairs and Alterations			128	15	7
By Sinking Fund (½% per annum on £17,221 0s. 0d., Estimated Cost of Buildings)			86	2	0
			4,891	7	9
By Balance, being excess of Income over Expenditure transferred to Capital Fund (see Balance Sheet)			4,938	3	0
			£9,819	10	9

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR.

ARKWRIGHT, J. A. ... ... On the Agglutination of Watery Extracts of Bacteria. *Journal of Hygiene*, Vol. XIV., 1914.

ATKIN, E. E. ... ... On the Constitution of a Bacterial Haemolysin. *Biochemical Journal*, Vol. VIII., 1914.

BACOT, A. W. ... ... A Study of the bionomics of the common rat fleas and other species associated with human habitations, with special reference to the influence of temperature and humidity at various periods of the life history of the insect. *Journal of Hygiene* (Plague Supplement III.) 1914.

BACOT, A. W. ... ... On the Survival of Bacteria in the Alimentary Canal of Fleas during Metamorphosis from Larva to Adult. *Journal of Hygiene* (Plague Supplement III.) 1914.

BACOT, A. W. ... ... The Effect of the Vapours of Various Insecticides upon Fleas (*Ceratophyllus fasciatus* and *Xenopsylla cheopis*) at each stage in their life history and upon the bed bug (*Cimex lectularius*) in its larval stage. *Journal of Hygiene* (Plague Supplement III.) 1914.

BACOT, A. W., and MARTIN, C. J. ... Observations on the Mechanism of the Transmission of Plague by Fleas. *Journal of Hygiene* (Plague Supplement III.) 1914.

BEDSON, S. P. ... ... The Effect of Nuclein on the Normal Antibody. *Journal of Pathology and Bacteriology*, 1914.

BROOKS, R. ST. JOHN ... ... The Influence of the Medium in which the Plague Bacillus is Propagated upon the facility with which it is ingested by Human Leucocytes. *Journal of Hygiene* (Plague Supplement III.) 1914.

BROWN, J. W., GREENWOOD, M., and WOOD, F. ... A Study of Index Correlations. *Journal Royal Statistical Soc.*, Vol. LXXVII., 1914.

BROWN, J. W., and LAL, MOHAN ... An inquiry into the relation between Social Status and Cancer Mortality. *Journal of Hygiene*, Vol. XIV., 1914.
(*See also* Greenwood, M., Junr., and Brown, J. W.)

CHICK, HARRIETTE ... ... The Factors concerned in the Solution and Precipitation of Euglobulin. *Biochemical Journal*, Vol. VII., 1913.

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CHICK, HARRIETTE, AND MARTIN, C. J. THE PRECIPITATION OF EGG-ALBUMIN BY AMMONIUM SULPHATE. A CONTRIBUTION TO THE THEORY OF THE "SALTING-OUT" OF PROTEINS. *Biochemical Journal*, Vol. VII., 1913.

COOPER, E. A. ... ... THE PREPARATION FROM ANIMAL TISSUES OF A SUBSTANCE WHICH CURES POLYNEURITIS IN BIRDS INDUCED BY DIETS OF POLISHED RICE. *Biochemical Journal*, Vol. VII., 1913.

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DALYELL, E. ... ... THE ISOLATION IN PURE CULTURE OF CERTAIN INTESTINAL ANAEROBES. *Journal of Pathology and Bacteriology*, 1914.

FUNK, CASIMIR ... ... STUDIES ON BERI-BERI. VII.: CHEMISTRY OF THE VITAMINE-FRACTION FROM YEAST AND RICE-POLISHINGS. *Journal of Physiology*, Vol. XLVI., 1913.

FUNK, CASIMIR ... ... ÜBER DIE PHYSIOLOGISCHE BEDEUTUNG GEWISSER BISHER UNBEKANNTER NAHRUNGSBESTANDTEILE, DER VITAMINE. *Ergebnisse der Physiologie*, Vol. XIII. 1913.

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FUNK, CASIMIR AND MACULLUM, A. B. ON THE CHEMICAL NATURE OF SUBSTANCES FROM ALCOHOLIC EXTRACTS OF VARIOUS FOODSTUFFS WHICH GIVE A COLOUR REACTION WITH PHOSPHOTUNGSTIC AND PHOSPHOMOLYBDIC ACIDS. *Biochemical Journal*, Vol. VII., 1913.

GREENWOOD, M., JUN. ... ... THE FACTORS WHICH DETERMINE THE RISE, SPREAD, AND DEGREE OF SEVERITY OF EPIDEMIC DISEASES. *Proceedings International Congress of Medicine*, Section XVIII., 1913.

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GREENWOOD, M., JUN., & YULE, G. UDNY ON THE DETERMINATION OF SIZE OF FAMILY AND OF THE CHARACTERS IN ORDER OF BIRTH FROM SAMPLES TAKEN THROUGH MEMBERS OF THE SIBSHIPS. *Journal of the Royal Statistical Society*, Vol. LXXVII., 1914.

(*See also* BROWN, J. W., GREENWOOD, M., and WOOD, F.)

SCHUTZE, H. L. ... ... Spontaneous Phagocytosis and the influence thereon of acids and alkalies with experiments on cataphoresis. *Journal of Hygiene*, Vol. XIV., 1914.

SHERWIN, J. A. H. ... ... Complement fixation reactions in Eclampsia. *Journal of Hygiene*, Vol. XIV., 1914.

SMEDLEY, IDA, & LUBRZYNSKA, EVA The Biochemical Synthesis of the Fatty Acids. *Biochemical Journal*, Vol. VII., 1913.

(*See* Maclean, Ida Smedley also Lubrzynska, Eva, and Smedley, Ida.)

VIOLLE, H. ... ... *See* Penfold, W. J., and Violle, H.

WOOD, FRANCES ... ... The Course of Real Wages in London, 1900-12. *Journal of the Royal Statistical Society*, Vol. LXXVII., 1913.

(*See* Brown, W. J., Greenwood, M. and Wood, F.; *also* Greenwood, M. and Wood, F.)

WOODCOCK, H. M. ... ... On "Crithidia" fasciculata in hibernating mosquitoes (*Culex pipiens*) and the question of the connection of this parasite with a Trypanosome. *Zoologischen Anzeiger*, Bd. XLIII., 1914.

WOODCOCK, H. M. ... ... Further remarks on the flagellate parasites of Culex. Is there a generic type, Crithidia? *Zoologischen Anzeiger*, Bd. XLIV., 1914.

WOODCOCK, H. M., and LAPAGE, G. ... On a Remarkable New Type of Protistan Parasite. *Journal of the Microscopical Society*, Vol. 59, 1914.

YOUNG, W. J. ... ... (*See* Harden, A., and Young, W. J.)

YULE, G. UDNY ... ... (*See* Greenwood, M., and Yule, G. Udny.)

The Lister Institute
of
Preventive Medicine.

Report of the Governing Body, 1915.

Chelsea Gardens,
London, S.W.

May 12th, 1915.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, CHELSEA BRIDGE ROAD, LONDON, S.W., and ELSTREE, HERTS.

THE GOVERNING BODY.

THE RIGHT HON. SIR HENRY E. ROSCOE, P.C., D.C.L., F.R.S., *Chairman.*

SIR JOHN ROSE BRADFORD, K.C.M.G., C.B., M.D., F.R.S.

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PROFESSOR R. T. HEWLETT, M.D.	" "
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J. C. G. LEDINGHAM, M.B., D.Sc.	"
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J. LUARD PATTISSON, C.B.	" "
PROFESSOR SAMUEL G. SHATTOCK, F.R.C.S.	" "
PROFESSOR W. J. SIMPSON, C.M.G., M.D.	" "
J. SIDNEY TURNER, M.R.C.S....	" "

THE STAFF.

Director:

*C. J. Martin, M.D., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, M.A., M.B., D.Sc.,	*Bacteriologist in chief; Reader in Bacteriology, University of London.*
*G. F. Petrie, M.D.,	*Assistant Bacteriologist.*
*J. Henderson Smith, M.B., Ch.B.	*Assistant Bacteriologist; Reader in Bacteriology, University of London.*
J. A. Arkwright, M.A., M.D., B.Sc.	*Assistant Bacteriologist.*
E. E. Atkin, M.B., B.A.	,, ,,
W. J. Penfold, M.B., D.P.H.	,, ,,
H. L. Schütze, M.D., B.Sc.	,, ,,

Department of Bio-Chemistry:

*A. Harden, D.Sc., Ph.D., F.R.S., *Professor of Bio-Chemistry in the University of London.*
Percival Hartley, D.Sc., *Assistant.*
Robert Robison, Ph.D., F.I.C., ,,

Department of Experimental Pathology:

C. J. Martin, M.B., D.Sc., F.R.S., *Professor of Experimental Pathology in the University of London.*
Harriette Chick, D.Sc., *Assistant.*
Sydney Rowland, M.A., M.R.C.S., *Assistant.*

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*

Department of Protozoology:

*E. A. Minchin, M.A., F.R.S., *Professor of Protozoology in the University of London.*
H. M. Woodcock, D.Sc., *Assistant.*
Muriel Robertson, M.A., ,,

Department of Statistics:

G. Udny Yule, M.A., *Honorary Consulting Statistician to the Institute.*
*M. Greenwood, Junr., M.R.C.S., L.R.C.P., *Reader in Statistics, University of London; Statistician to the Institute.*
J. W. Brown, *Assistant.*

Antitoxin Department [Elstree]:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*
S. S. Zilva, Ph.D., *Assistant.*

Vaccine Department:

Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of Calf Vaccine Laboratories.*

Librarian:
Fernie A. M. Fletcher.

Artist:
Mabel Rhodes.

Chief Clerk:
A. L. White.

Assistant Secretary and Accountant:
George Cooper.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING
OF
The Lister Institute of Preventive Medicine,
May 12th, 1915.

REPORT OF THE GOVERNING BODY.

The Governing Body have the honour to present their 21st Annual Report.

The "coming of age" of the Institute would, in any case, have made 1914 a memorable year in its history, and would have suggested in this Report a review of its growth and progress. The outbreak of the great European War, with its resulting demands upon the Institute, as upon every other section of the British community, so overshadows all other interests that it is felt that those to whom this Report is addressed will prefer to hear more of the immediate part the Institute has taken, both collectively and individually, in the service of the country at this crisis. The Report will, therefore, go more into detail than has hitherto been usual.

Immediately after the declaration of war, in August last, the Staff of the Institute requested the permission of the Governing Body to place their services at the disposal of the Army Medical Department in whatever capacity might be deemed suitable by the Governing Body and the Director General of the Army Medical Service. This feeling was enthusiastically seconded by the whole of the research workers in the Institute's laboratories. The Governing Body thereupon caused a communication to be addressed to the War Office to the following effect:—

> "That the Lister Institute offers to the Army Medical Department at the cost price of labour and materials its available stock of anti-tetanus and anti-dysentery sera, and anti-typhoid vaccine, and to continue so long as may be necessary to manufacture the same medicines to the utmost of its capacity."
>
> "That the Director of the Institute has been authorised by the Governing Body to grant leave of absence to any member of the higher or lower staffs of the Institute and scholars volunteering for military service during the war—the Governing Body undertaking to make good to any accepted volunteer the loss to him should military pay be less than he was receiving from the Institute."

At the same time, a list of volunteers, containing particulars as to their age, training and capabilities, and whether available for foreign service, was transmitted to the Director General, Army Medical Service. The offer to supply sera, etc., at cost price, was gratefully accepted by the War Office, and the Director General informed the Director of the Institute that he would gladly avail himself of the patriotic offers of the staff as occasion arose.

A large supply of sera and vaccines was at once requisitioned by the Army Medical Department. In consequence, the pressure on the Elstree laboratories was severe. It was cheerfully met by Dr. MacConkey and his staff, supplemented by several willing volunteers from the Chelsea headquarters. In the same spirit, Dr. Alan Green, in charge of the calf lymph branch at Elstree, placed his laboratory and stables at the disposal of the serum department, and arranged, with the approval of the Governing Body, to carry on his own work in temporary premises at Bushey. Later on, the Board found it necessary to increase the Elstree staff by the temporary appointment of Dr. Zilva (who had been for some time working as a research student with Professor Harden) as scientific assistant to Dr. MacConkey. It was also necessary to add considerably to the number of horses used in the preparation of the sera—so many as 60 being required in the production of the tetanus anti-toxin alone.

At Chelsea, the demand for anti-typhoid vaccine also entailed much extra labour, especially on the bacteriological staff, but it was met with equal goodwill and energy, and fully satisfied.

In the eight months ending on the 31st March last, the following deliveries were made to the Army and Navy Medical Departments, viz.:—

Army.		
Tetanus anti-toxin	102,340	doses.
Diphtheria anti-toxin	18,500	,,
Anti-typhoid vaccine	770,000	,,
Navy.		
Tetanus anti-toxin	18,300	,,

besides considerable quantities of other prophylactic preparations to both Forces.

The Institute was also able to afford assistance to the Army Medical Department in connection with the manufacture and distribution of anti-typhoid vaccine at the R.A.M.C. College at Millbank. On the outbreak of war, a considerable portion of the military staff usually engaged in this duty were

mobilised, and the department left short-handed, at a time when enormous demands were being made upon it, if the expeditionary force was to be inoculated prior to embarkation. The Governing Body, therefore, at the request of Colonel Sir William Leishman, deputed a bacteriologist and two laboratory attendants to work at Millbank for the time being.

Turning now to the military service rendered by the personnel of the staff and workers at the Institute, the following list will show to what extent the "Lister" has been privileged to respond to the national call:—

Scientific Staff.

Dr. J. C. G. Ledingham Dr. W. J. Penfold Dr. P. Hartley		In charge of the Pathological and Bacteriological Service of the King George Military Hospital, Waterloo.
Mr. S. Rowland Dr. G. F. Petrie	...	Lieutenants, R.A.M.C., France.
Dr. R. Robison	...	Lieutenant, R.A.M.C., Dardanelles.

Scholars and Voluntary Workers.

Dr. M. Coplans	...	Captain, R.A.M.C., France.
Dr. P. Bedson ...	...	Lieutenant, Northumberland Fusiliers.
Dr. E. A. Cooper	...	Lieutenant, R.A.M.C., France.
Dr. E. Grey ...	...	Lieutenant, Royal Fusiliers, Salisbury Plain.
Dr. E. C. Hort ...	...	Physician to the Military Fever Hospital, Addington, Surrey.
Dr. C. de Wesselow	...	Lieutenant, R.A.M.C., France.
Dr. W. W. Ingram	...	Lieutenant, R.A.M.C., France.
Dr. Elsie Dalyell	...	Physican and Bacteriologist to the 2nd Serbian Relief Fund Unit.

Subordinate Staff.

T. Ayling ...	...	Private, 10th Middlesex, India.
J. Ayling ...	...	Private, 10th Middlesex, London.
D. Bevis ...	...	Private, Yeomanry, England.
H. Blunden ...	...	Coast Defence.
R. Bird ...	...	Private, 13th City of London, London.
S. Cummins ...	...	Apprentice, Royal Navy.
H. Drew ...	...	Stoker, H.M.S. "Crescent."
H. M. Green ...	...	Sergeant, 10th Middlesex, India.
H. Green ...	...	Private, Motor Transport, London.
T. Horwood ...	...	Private, Motor Transport, London.
V. L. Pickering...	...	Private, Army Service Corps, London.
A. Morgan ...	...	Coast Defence.
D. Quaife ...	...	Private, R.A.M.C., France.
W. Ward ...	...	Private, Bedfordshire Regiment.
F. Williamson ...	...	Private, R.A.M.C., 1st General Hospital.

To all on the list, the Governing Body desire to express their appreciation, and they congratulate Dr. Ingram on gaining the Military Cross for distinguished service as a Medical Officer in the field.

They also wish to congratulate Mr. Sydney Rowland on the success of the first Mobile Field Laboratory fitted out by him and his colleagues. The laboratory left for the Headquarters of the Expeditionary Force in October, under the charge of Mr. Rowland, and proved of so great an advantage to the Medical Corps at the Front that three other Mobile Laboratories were requisitioned. The valuable services rendered by these mobile laboratories in the early diagnosis of infectious diseases, and the detection of bacterial carriers was cordially acknowledged by Field Marshal Sir John French in a recent despatch.

In connection with the war services rendered by the Institute and its staff, the Governing Body feel that it is appropriate to record the pleasure with which they learnt that their late Chairman, Sir John Rose Bradford, was selected by the War Office as one of the consulting Physicians with the Army in France. Sir John has been absent from this country since September last, and it is an added pleasure to his colleagues that his services have been recognised by the bestowal upon him by the King of the honour of a C.B.

The Institute has also been of service in connection with the outbreaks of cerebro-spinal meningitis, which have given rise to some anxiety during recent months. The first investigation in which the Institute took part was that occurring among the Canadian contingent encamped upon Salisbury Plain. In response to a request from the Medical Officer in charge, the Governing Body lent the services of Dr. Arkwright and Dr. Schütze to assist the Sanitary Officers of the contingent in a bacteriological investigation of the epidemic. Dr. Arkwright proceeded to Bulford, and superintended the fitting up of a laboratory there in connection with No. 1 General Hospital, in which bacteriological examination of patients could be adequately carried out. Dr. Arkwright, was shortly afterwards joined by

Dr. Schütze, and with the assistance of four Canadian Medical Officers—Captain Rankin, Captain Ellis, Captain Shanks and Captain Lomer, undertook a bacteriological examination of the throats of over 1,400 troops. Thirty "carriers" were discovered and isolated.

Subsequently, the services of Dr. Penfold were requisitioned in connection with an outbreak of the same disease in Salisbury itself, where he worked in conjunction with Dr. Johnstone, of the Local Government Board, and Dr. Fison, Medical Officer of Health to the town.

It became apparent early in the present epidemic that anti-meningococcic sera available in this country were of little if any value in the treatment of the cases. The Institute, therefore, made special efforts to immunise horses as rapidly as possible with strains of the organism isolated from the present epidemic. The results with the new serum are promising, but time has not yet permitted of an analysis of sufficient cases to speak quantitatively.

In response to an appeal from the British Red Cross Society, the Governing Body were glad to be able to help the Committee of the King George Hospital in approving the acceptance by Drs. Ledingham, Penfold and Hartley of the control of the Pathological and Bacteriological work of this new large Military Hospital in South London. Pathological and bacteriological laboratories have been provided at the Hospital under the direction of Dr. Ledingham and towards their equipment apparatus has been lent by the Institute. The Chelsea laboratories will also be used as a base for the preparation of culture media and the carrying out of investigations requiring further facilities.

Another important subject, connected with the food supply of the country which has for some time been under the consideration of the Board of Agriculture, the Treasury and the Royal Society, namely a scientific and experimental enquiry into swine fever, and the means by which this disease may be controlled, has also given the Institute an opportunity of being of service at this juncture. The Governing Body have, in response to a special request from the Royal Society, seconded for this investigation Mr. Greenwood, the Institute's Statistician, and Dr. Atkin, an assistant Bacteriologist.

In the early summer the services of the Institute's Entomologist were placed for a period of one year at the disposal of the Colonial Office, and in July last, Mr. Bacot proceeded to Sierra Leone to take part in an investigation into yellow fever.

The Scholarship held by Mrs. Wood in the Statistical Department has been temporarily suspended, as her services were requisioned by the Board of Trade to superintend the compilation of Statistics of unemployment due to the outbreak of the War.

It will be seen, therefore, that the exigencies of the War have greatly depleted the Staff of the Institute. Nevertheless, through the energy of the Director and of his colleagues remaining at Chelsea, who have with the same public spirit, subordinated their special investigations to the more pressing national needs, adequate arrangements have been maintained for dealing with the various requisitions of the Army Medical Department and carrying on the ordinary routine investigations of disease in connection with civil practice, the volume of which shows no signs of diminution.

The list of scientific papers by members of the Staff, published during the year, is appended. This is shorter than usual, and comprises, for the most part, work accomplished prior to the outbreak of war.

The Governing Body feel assured that the members of the Institute will fully appreciate both the patriotism of the Staff, and also the policy of the Board in seconding those whose services could be temporarily employed more usefully elsewhere.

Another matter of great interest to the Institute during the year under review was the recommendation by the majority of the Governing Body to the members of the Institute to consider favourably the suggestion of an amalgamation of Funds, Forces and Management with the new National Department of Medical Research established in accordance with the provisions of the Insurance Act of 1911.

In their last Annual Report, the Governing Body mentioned that this proposal was under their consideration. During the early part of 1914 it was the subject of several conferences between the Board and the representatives of the National Committee, and of the Treasury. The Governing Body, however, were divided in their views of the advantages of such an alliance. On the final division, at a full meeting of the Governing Body, five of the Board were in favour of submitting the proposal as a definite recommendation to the members of the Institute, and two were against this. Among the latter was Sir John Rose Bradford, the Chairman of the Governing Body. In consequence of the vote, but to the regret of his colleagues, Sir John felt obliged to resign both the Chairmanship and his seat on the Board. Sir Henry Roscoe was accordingly invited to accept the Chairmanship, and this he kindly agreed to do.

Eventually, on the 18th November last, the proposal was submitted to the members of the Institute at a specially summoned General Meeting. After a discussion lasting some time, a division was taken, and, although a majority of the votes of those present were in favour of the suggestion, it was rejected on a poll, 39 voting against the Resolution to 32 in favour.

The majority of the Governing Body, though regretting the rejection and still firm in their belief that the amalgamation would be to the best interests both of the Institute and of the country, felt that it was inadvisable in face of the adverse vote and under the circumstances of the War, to ask the members for a reconsideration of the proposal, and a notice to that effect was issued to all members of the Institute. They, the majority of the Governing Body, hope, however, that at some future time, when more attention can be given to the case for the proposal, the vote of last year may not be considered as barring a further friendly discussion of the suggestion.

At a subsequent meeting of the Council of the Institute to fill the vacant seat on the Governing Body, Sir John Rose Bradford in consideration of the decision of the Members upon the proposal for amalgamation accepted re-nomination, and was unanimously re-elected.

The vacancies created in the Council by the lamented deaths of Mr. William Hunting and Surgeon-General Sir Arthur Branfoot and the resignation of Mr Horace Brown, have been filled by the election of Colonel Sir William B. Leishman, C.B., Professor R. T. Hewlett and Dr. L. C. Parkes.

No changes during the year have taken place in the personnel of the scientific staff.

The seconding of so many of the headquarters staff for War duties has enabled the Governing Body to accommodate temporarily in their Chelsea laboratories on terms acceptable to both sides, the Bio-chemical Staff of the National Committee for Medical Research.

THE BALANCE SHEET.

The Accounts and Balance Sheet for the year ending 31st December are attached. The form of accounts has been somewhat varied from that of previous years, in order to show more clearly the new Pension and Contingency Accounts. It will be seen that during the year the balance of the Loan from the Institute's Bankers originally advanced to meet the expenses incurred in building the new wing, has been repaid, and that the cash in hand has enabled the Governing Body to further strengthen the Pension account by placing to its credit (in addition to the usual annual subscription of £700) £1,000 of the War Loan Stock, and, at the same time, to start a Contingency Reserve account with a similar grant.

The balance of the excess of income over expenditure at Elstree transferred to the Capital Fund on December 31st, 1914, is less than usual. The volume of the ordinary commercial business during 1914 was, however, but slightly less than in previous years, and the smaller balance is accounted for partly by the higher cost of production during the latter half of 1914, but principally because the Governing Body have written down more severely than usual the value of the stock in hand. They were advised to do this, as the price charged to the War Office on the basis of "cost of labour and materials" is less than cost price, and, therefore, lower than that at which the stock has been previously valued, while at the termination of the War the Serum Department will, owing to the nature of serum production, inevitably be left with supplies of particular sera in excess of the normal demand.

The War has necessarily increased both the cost of wages and of material, especially in glassware and fodder. These facts may require some adjustment in the selling price of the Institute's manufactures, but the Governing Body have cause to be well satisfied at the present crisis with the financial position of the Institute.

In conclusion, the Governing Body wish cordially to thank the Director and all grades of the Staff of the Institute for the willing and energetic manner in which everyone has met the altered conditions and the extra work imposed by the great emergency. They realise especially how great must have been the strain on the Director to carry on the ordinary routine work of the Institute with his depleted staff, and at the same time to conduct negotiations in regard to the new activities referred to in this Report. They wish to acknowledge also how much both the Governing Body and his colleagues in the laboratories owe to his wise and sympathetic advice.

The Governing Body recognise also the disregard of self which has been shown by several of the Staff in consenting to remain at their home posts and deal with the difficulties here, while their desire was to take service if possible at the Front.

Research Workers in the Laboratories, other than members of the Staff, have included:

Mesdames Barratt, MacLean, Norris and Wood.
Misses Dalyell (Beit Fellow), Lodge, Schwab and Turner.
Messrs. Cropper, Grey (Beit Fellow), Henley, Hort, Morgan, E. H. Ross and H. C. Ross.
Drs. Barratt (Beit Fellow), Bedson (B.M.A. Scholar), Brooks, Cooper (Beit Fellow), Coplans (Beit Fellow), Cordova, Ewart, Ingram, Onodera, Kakehi, Macallum (Beit Fellow), Mair, Matsui, Schmidt, Thaysen, Thomson, de Wesselow, Zilva.
Major Harvey, I.M.S., Captain Rutherford, I.M.S.

HENRY E. ROSCOE,
Chairman.

The Lister Institute

Dr. BALANCE SHEET,

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				972 7 11
To Pension Fund—				
Lord Lister's Bequest as per Account, 31st December, 1913, appropriated to this Fund from the Capital Fund	16,043 18 11			
Interest, Dividends and Annual Contribution from the Institute to 31st December, 1913	1,059 16 3			
		18,003 15 2		
Balance of Lord Lister's Bequest in 1914 ...	256 16 1			
Interest and Dividends on the Investments of the Fund during 1914	1,269 13 11			
Annual Contribution to the Fund from the Institute for the year ending 31st Dec. 1914	700 0 0			
Special Contribution to the Fund from the Institute's Surplus, 1914, viz., £1,000 War Loan Stock, costing	945 6 8			
		3,171 16 8		
				21,175 11 10
To Contingency Fund (1914)				945 6 8
To Sinking Fund to December 31st, 1914 ...				4,928 1 10
To Capital Fund to December 31st, 1914—				
Balance of Income and Expenditure to 31st December, 1913		55,106 7 0		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)...		2,000 0 0		
The Berridge Trustees (1893/98)		46,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Lord Iveagh (1900)		250,000 0 0		
Other Donations (1891-1907)		20,120 8 3		
Jenner Memorial Fund (1899)		5,768 0 11		
Balance of Lord Lister's Bequest (1914) ...		256 16 1		
Add			389,631 2 4	
Balance of Chelsea Gardens Department Income and Expenditure Account, being excess of Income over Expenditure, for the year ending 31st December, 1914 ...		2,251 19 6		
Less				
Appropriated as under:—				
Special Contribution to the Pension Fund as above	945 6 8			
Contingency Fund, as above	945 6 8			
		1,890 13 4		
Balance of Elstree Department Income and Expenditure Account, being excess of Income over Expenditure for the year ending 31st December, 1914		361 6 2		
		2,003 7 5		
			2,364 13 7	
			391,995 15 11	
Deduct				
Appropriation of Balance of Lord Lister's Bequest to the Pension Fund			256 16 1	
				391,738 19 10
				£419,760 8 1

HENRY E. ROSCOE, *Chairman.*

J. L. PATTISSON, *Hon. Treasurer.*

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the state of the Institute's affairs, according to the best of our information and the explanations given to us and as shown

London, March 29th, 1915.

# of Preventive Medicine.

31st DECEMBER, 1914. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	2,506 2 6	
In hand	39 6 1	
		2,545 8 7
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4,270 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 3½ per cent. Stock, 1918	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942/62	1,500 0 0	
£333 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
		26,052 5 9
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945 ...	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949 ...	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935 ...	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 ...	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898 ...	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock ...	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investment Contingency Fund (at cost)—		
£1,000 War Loan, 3½ per cent. Stock, 1925-1928		945 6 8
By Investments, Pension Fund (at cost)—		
100 Shares ($50) Morris and Essex Railway	1,760 0 0	
£2,383 Grand Trunk Railway Company of Canada Consolidated Stock ...	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital, 5 per cent. Preference Debentures	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£500 Royal Medical, &c., Society of London Debentures	350 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 New York Central and Hudson River Bonds	640 0 0	
£3,000 Crompton & Co. First Mortgage, 5½ per cent. Debentures	1,680 0 0	
£2,000 China Navigation Company Stock	2,000 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debentures	984 0 0	
Vincent House Mortgage	425 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debentures ...	656 19 7	
£500 Canada 4 per cent. Stock	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debentures	891 2 9	
£1,000 War Loan, 3½ per cent. Stock, 1925-1928	945 6 8	
Cash Balance	185 6 2	
		21,175 11 10
By Investment, Sinking Fund (at cost)—		
£5,451 19s. 7d. 2½ per cent. Consols		4,517 8 3
(The above Investments, at the market value, 31st December, 1914, show a depreciation of approximately £60,000.)		
By Debtors		4,493 16 1
By Stock of Tuberculin, Mallein, Bacterial Vaccines, &c.		298 2 11
***By Furniture, Fittings, Scientific Apparatus and Books—**		
As per account 31st December, 1908		2,746 17 2
By Expenditure on Institute Building at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea ...		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,564 10 9	
Less amount written off	65 2 0	
		2,499 8 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	882 18 6	
Stock of Anti-Toxins, Bottles, &c.	5,474 12 4	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec. 1908	139 1 4	
Laboratory Apparatus, as per account, 31st December, 1903 ...	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		7,177 1 5
		£419,760 8 1

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view by the books of the Institute.

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Dr. Chelsea Gardens Department.—INCOME AND EXPENDITURE

			£ s. d.
INCOME.			
To Interest and Dividends on General Investments			8,730 17 0
To Interest and Dividends on Pension Fund Investments			1,269 13 11
To Interest and Dividends on Sinking Fund Investments			125 10 11
To Investigation, Diagnosis and Analysis Fees, &c.			4,506 17 10
To Sales of Tuberculin, Mallein, Bacterial Vaccines, &c., ...	£3,301 11 3		
Add Stock of Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1914	298 2 11		
	3,599 14 2		
Deduct Stock of Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1913	209 1 0		
			3,390 13 2
To Rent of Rooms to the Metropolitan Asylums Board			200 0 0
			£18,223 12 10

Dr. Elstree Department.—INCOME AND EXPENDITURE

		£ s. d.	£ s. d.
INCOME.			
To Sale of Antitoxins, &c.		11,282 17 0	
Add Stock, 31st December, 1914		5,306 12 4	
		16,589 9 4	
Deduct Stock, 31st December, 1913		8,920 1 8	
			7,669 7 8
			£7,669 7 8

f Preventive Medicine.

JRE ACCOUNT for the Year ending 31st December, 1914. Cr.

EXPENDITURE.

	£	s.	d.
By Rent, Rates, Taxes and Insurance	869	11	0
By Salaries and Wages of Staff	8,568	0	0
By Stationery, Printing, Postage and Advertising	309	11	2
By Printing of Collected Papers	190	3	3
By Office Expenses and Sundries	110	11	7
By Travelling Expenses	36	12	4
By Law Charges	30	17	0
By Auditors' Fee	21	0	0
By Gas and Water	342	10	5
By Electric Light and Power	161	18	4
By Fuel	135	15	8
By Director's Laboratory Expenses, including General Apparatus	144	2	6
By Bacteriological Laboratory Expenses, including Apparatus	569	18	7
By Water and Bio-chemical Laboratory Expenses, including Apparatus	149	2	0
By Furniture	17	7	9
By Culture Media	162	0	2
By Animals	579	6	2
By Animal House Expenses	400	9	4
By Repairs and Alterations to Buildings, including Workshop Expenses and Tools	277	1	1
By Library Expenses	99	15	9
By General Stores	140	1	6
By Protozoological Expenses, including Apparatus	107	14	9
By Bad Debts	8	18	6
By Interest on Loans from Bankers	54	6	1
By Annual Contribution to the Pension Fund £700 and Interest on Pension Fund Investments	1,969	13	11
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on £64,916 3s. 1d., Cost of Buildings and Interest on Sinking Fund Investments)	450	2	6
By Balance, being Excess of Income over Expenditure Transferred to Capital Fund, as under—	15,971	13	4
By Special Contribution to the Pension Fund being £1,000 War Loan Stock at a cost of £945 6 8			
By Contingency Fund do. do. do. 945 6 8			
By Balance, transferred to Balance Sheet 361 6 2			
	2,251	19	6
	£18,223	12	10

ACCOUNT for the Year ending 31st December, 1914. Cr.

EXPENDITURE.

			£	s.	d.
By Rent, Rates, Taxes and Insurance			210	14	9
By Salaries and Wages			2,240	4	8
By Animals—Stock 31st December, 1913	£466	18 4			
Purchased during the year ending 31st December, 1914	559	13 5			
	1,026	11 9			
Deduct—Sales during the year ending 31st December, 1914 ... 17 18 9					
Stock, 31st December, 1914 ... ... 872 6 4					
	890	5 1			
			136	6	8
By Forage			1,015	13	3
By Stables and other Expenses			16	0	2
By Farm Expenses, including Furniture and Implements			46	18	1
By Gas, Water and Fuel			204	11	6
By Postages and Telegrams			28	16	8
By Laboratory Expenses, including Cost of Bottles, Chemicals and Apparatus			1,445	8	0
By Travelling Expenses			25	5	4
By Farm General Stores			42	17	5
By Farm Office Expenses and Printing			24	18	9
By Repairs and Alterations			142	3	0
By Sinking Fund (½% per annum on £17,221 0s. 0d., Estimated Cost of Buildings)			86	2	0
			5,666	0	3
By Balance, being excess of Income over Expenditure transferred to Capital Fund (see Balance Sheet)			2,003	7	5
			£7,669	7	8

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR.

ARKWRIGHT, J. A. ... ... THE INTERPRETATION OF EPIDEMIOLOGICAL OBSERVATIONS BY THE LIGHT OF BACTERIOLOGICAL KNOWLEDGE. (*Contribution to a discussion on Cerebro-spinal Meningitis held at the Royal Society of Medicine, 1915.*)

BACOT, A. W. ... ... THE INFLUENCE OF TEMPERATURE, SUBMERSION AND BURIAL ON THE SURVIVAL OF EGGS AND LARVAE OF *Cimex lectularius*. *The Bulletin of Entomological Research*, Vol. V., 1914.

BACOT, A. W. ... ... OBSERVATIONS ON THE LENGTH OF TIME THAT FLEAS (*Ceratophyllus fasciatus*) CARRYING *Bacillus pestis* IN THEIR ALIMENTARY CANALS ARE ABLE TO SURVIVE IN THE ABSENCE OF A HOST AND RETAIN THE POWER TO RE-INFECT WITH PLAGUE. *Journal of Hygiene* (*Plague Supplement* IV.), 1915.

BACOT, A. W. ... ... FURTHER NOTES ON THE MECHANISM OF THE TRANSMISSION OF PLAGUE BY FLEAS. *Journal of Hygiene* (*Plague Supplement* IV.), 1915.

BACOT, A. W. ... ... NOTES ON THE DEVELOPMENT OF *Bacillus pestis* IN BUGS (*Cimex lectularius*) AND THEIR POWER TO CONVEY INFECTION. *Journal of Hygiene* (*Plague Supplement* IV.), 1915.

BACOT, A. W., PETRIE, G. F., AND TODD, R. E. THE FLEAS FOUND ON RATS AND OTHER RODENTS, LIVING IN ASSOCIATION WITH MAN, AND TRAPPED IN THE TOWNS, VILLAGES AND NILE BOATS OF UPPER EGYPT. *Journal of Hygiene*, Vol. XIV., 1914.

BACOT, A. W., AND RIDEWOOD, W. G. ... OBSERVATIONS ON THE LARVAE OF FLEAS. *Parasitology*, Vol. VII., 1914.

BEDSON, S. P. ... ... *See* LEDINGHAM, J. C. G., and BEDSON, S. P.

BRADDON, W. L., AND COOPER, E. A. ... THE INFLUENCE OF THE TOTAL FUEL VALUE OF A DIETARY UPON THE QUANTITY OF VITAMINE REQUIRED TO PREVENT BERI-BERI. *British Medical Journal*, Vol. I., 1914.

BRADDON, W L., AND COOPER, E. A. ... THE INFLUENCE OF METABOLIC FACTORS IN BERI-BERI. Part I. THE EFFECT OF INCREASING THE CARBOHYDRATE RATION ON THE DEVELOPMENT OF POLYNEURITIS IN BIRDS FED ON POLISHED RICE. *Journal of Hygiene*, Vol. XIV., 1914.

BROOKS, R. ST. JOHN ... ... *See* MACALISTER, G. H., and BROOKS, R. ST. JOHN.

COOPER, E. A. ... ... THE CURATIVE ACTION OF AUTOLYSED YEAST AGAINST AVIAN POLYNEURITIS. *Biochemical Journal*, Vol. VIII., 1914.

COOPER, E. A. ... ... THE RELATIONS OF VITAMINE TO LIPOIDS. *Biochemical Journal*, Vol. VIII., 1914.
See also BRADDON, W. L., and COOPER, E. A.

DALYELL, E. JEAN ... ... OBLIGATE ANAEROBES IN THE ALIMENTARY TRACT OF INFANTS. *Journal of Pathology and Bacteriology*, Vol. XIX., 1914.

EWART, R. J. ... ... THE INFLUENCE OF THE AGE OF THE PARENT ON THE VITALITY OF THE CHILD. A First Study. *Journal of Hygiene*, Vol. XIV., 1914.

GREEN, A. B. ... ... THE RESISTANCE OF THE VACCINE VIRUS TO FILTRATION. *Journal of Hygiene*, Vol. XIV., 1914.

GREY, E. C. .. .. THE VOLUMETRIC ESTIMATION OF CARBON IN ALIPHATIC SUBSTANCES IN THE WET WAY. *Trans. Chemical Society*, 1914.

HARDEN, A., AND ZILVA, S. S. ... THE ENZYMES OF WASHED ZYMIN AND DRIED YEAST (LEBEDEFF). III. PEROXYDASE, CATALASE, INVERTASE AND MALTASE. *The Biochemical Journal*, Vol. VIII., 1914.

HARTLEY, P. ... ... THE DETERMINATION OF THE COMPOSITION OF THE DIFFERENT PROTEINS OF OX AND HORSE SERUM BY THE METHOD OF VAN SLYKE. *The Biochemical Journal*, Vol. VIII., 1914.

HORT, E. C. ... ... THE STERILITY OF NORMAL URINE IN MAN. *The Journal of Hygiene*, Vol. XIV., 1914.

LAPAGE, G. ... ... *See* WOODCOCK, H. M., and LAPAGE, G.

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The Lister Institute
of
Preventive Medicine.

Report of the Governing Body, 1916.

Chelsea Gardens,
London, S.W.

May 17th, 1916.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W.,
ELSTREE, HERTS, and HAYLE, CORNWALL.

THE GOVERNING BODY.

SURG.-GENL. SIR DAVID BRUCE, A.M.S., C.B., F.R.S., *Chairman.*
SIR JOHN ROSE BRADFORD, K.C.M.G., C.B., M.D., F.R.S.
THE VISCOUNT IVEAGH, K.P., G.C.V.O., F.R.S.
SIR WILLIAM OSLER, BART., M.D., F.R.S.
PROFESSOR ERNEST H. STARLING, M.D., F.R.S.
LT.-COL. G. W. ADDISON, R.E., *Hon. Treasurer.*

THE COUNCIL.

MEMBERS	REPRESENTING THE
SURG.-GENL. SIR DAVID BRUCE, A.M.S., C.B., F.R.S.	Royal Society.
PROFESSOR A. C. O'SULLIVAN, M.B.	Royal Irish Academy.
THE PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS... ...	Royal College of Surgeons, England.
THE PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS ...	Royal College of Physicians, London.
PROFESSOR F. W. ANDREWES, M.A., M.D., F.R.S.	Royal College of Physicians, London.
THE PRESIDENT OF THE ROYAL COLLEGE OF VETERINARY SURGEONS	Royal College of Veterinary Surgeons.
THE EARL OF NORTHBROOK	Royal Agricultural Society.
SIR WILLIAM OSLER, BART., M.D., F.R.S.	University of Oxford.
PROFESSOR G. SIMS WOODHEAD, M.D.	University of Cambridge.
PROFESSOR W. S. GREENFIELD, M.D.	University of Edinburgh.
PROFESSOR JAMES LITTLE, M.D.	University of Dublin.
LORD FLETCHER MOULTON OF BANK, P.C., F.R.S.	University of London.
PROFESSOR ARTHUR SCHUSTER, PH.D., D.Sc., LL.D., F.R.S. ...	Victoria University.
S. CONWAY, Esq.	Worshipful Company of Grocers.
J. R. DRAKE, Esq.	Worshipful Company of Grocers.
DAWSON WILLIAMS, M.D.	British Medical Association.
LT.-COL. G. W. ADDISON, R.E.	Members of the Institute.
SIR JOHN ROSE BRADFORD, K.C.M.G., C.B., M.D., F.R.S. ...	,, ,,
SIR WILLIAM WATSON CHEYNE, BART., C.B., F.R.S.	,, ,,
PROFESSOR ARTHUR HARDEN, D.Sc., F.R.S.	,, ,,
PROFESSOR R. T. HEWLETT, M.D.	,, ,,
SIR VICTOR HORSLEY, C.B., F.R.C.S., F.R.S.	,, ,,
SIR EDWIN RAY LANKESTER, K.C.B., F.R.S.	,, ,,
J. C. G. LEDINGHAM, M.B., D.Sc.	,, ,,
COLONEL SIR WILLIAM LEISHMAN, R.A.M.C., C.B., F.R.S. ...	,, ,,
PROFESSOR CHARLES J. MARTIN, M.B., D.Sc., F.R.S.	,, ,,
H. DE REIMER MORGAN, M.R.C.S.	,, ,,
LOUIS C. PARKES, M.D.	,, ,,
PROFESSOR SAMUEL G. SHATTOCK, F.R.C.S.	,, ,,
PROFESSOR W. J. SIMPSON, C.M.G., M.D....	,, ,,
J. SIDNEY TURNER, M.R.C.S.	,, ,,

THE STAFF.

Director:

*C. J. Martin, M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, M.A., M.B., D.Sc., *Bacteriologist in chief; Reader in Bacteriology, University of London.*
*G. F. Petrie, M.D., *Assistant Bacteriologist.*
J. A. Arkwright, M.A., M.D., B.Sc., „ „
E. E. Atkin, M.B., B.A., „ „
H. L. Schütze, M.D., B.Sc., „ „

Department of Bio-Chemistry:

*A. Harden, D.Sc., F.R.S., *Professor of Bio-Chemistry in the University of London.*
Percival Hartley, D.Sc., *Assistant.*
Robert Robison, Ph.D., F.I.C. „

Department of Experimental Pathology:

*C. J. Martin, M.B., D.Sc., F.R.S., *Professor of Experimental Pathology in the University of London.*
Harriette Chick, D.Sc., *Assistant.*
Sydney Rowland, M.A., M.R.C.S. „
Eleanor M. M. Hume, „
Mabel Rhodes, „

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*

Department of Protozoology:

H. M. Woodcock, D.Sc., *Acting Head of the Department.*
Muriel Robertson, M.A., *Assistant.*

Department of Statistics:

G. Udny Yule, M.A., *Honorary Consulting Statistician to the Institute.*
*M. Greenwood, Junr., M.R.C.S., L.R.C.P., *Reader in Statistics, University of London; Statistician to the Institute.*
J. W. Brown, *Assistant.*

Antitoxin Department [Elstree]:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*
Annie Homer, D.Sc., *Assistant.*
S. S. Zilva, Ph.D., „

Vaccine Department [Hayle]:

Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of Calf Vaccine Laboratories.*

Librarian:
Fernie A. M. Fletcher.

Chief Clerk.
A. L. White.

Assistant Secretary and Accountant:
George Cooper.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 17th, 1916.

REPORT OF THE GOVERNING BODY.

The Governing Body have the honour to present their 22nd Annual Report.

During the year 1915, the Institute suffered very heavy losses by the death of Sir Henry E. Roscoe, the Chairman of the Governing Body, and of Mr. J. Luard Pattisson, the Honorary Treasurer.

Sir Henry Roscoe took an active part in the foundation of the Institute, first as Treasurer and then as Chairman of the Governing Body, and had been intimately concerned with its welfare throughout the whole of its history. Mr. Pattisson had been Treasurer since 1899, and had, especially of late years, devoted much of his time to the interests of the Institute. They had worked steadily together for the advancement of the Institute, with the satisfaction of seeing the completed building entirely freed from debt in 1914.

Surgeon-General Sir David Bruce was elected Chairman of the Governing Body, *vice* Sir Henry E. Roscoe, and Lt.-Colonel G. W. Addison was appointed by Lord Iveagh as his representative on the Governing Body *vice* Mr. J. Luard Pattisson, and was elected Hon. Treasurer.

Sir John Rose Bradford is still acting as Consulting Physician with the Army in France.

The vacancy on the Council caused by the lamented death of Sir Henry Roscoe, has been filled by the appointment of Professor Arthur Schuster, F.R.S., as the representative of the Victoria University of Manchester.

In pursuance of the policy adopted by the Governing Body in 1914, the Institute has continued to devote its energies almost entirely to War work of various kinds. In view of the importance of retaining the services of the subsidiary staff, application was made to the Ministry of Munitions, as a result of which badges for War work were issued to the majority of the workers, both at Chelsea and at Elstree.

At Chelsea, in the Director's Department, Miss Chick with the assistance of Miss Rhodes has been largely occupied in the manufacture of agglutinating sera, for the use of the Army and Navy Medical Services. The following sera have been issued to a total amount of over 10,000 phials, and have been largely used for diagnostic purposes with satisfactory results:—

B. typhosus,
B. paratyphosus A.,
B. paratyphosus B.,
B. dysenteriæ, Flexner,
B. dysenteriæ, Y.,
B. dysenteriæ, Shiga,
M. melitensis,
M. paramelitensis,
B. enterit., Gärtner,
B. suipestifer,
V. choleræ,
Hæmolytic sera.

In addition to this a large number of cultures of meningococci received from various epidemics in England and France, have been tested and despatched to Elstree for the manufacture of anti-meningococcic serum.

Another series of researches undertaken by this Department has been directed to the examination of various foodstuffs for the presence of vitamines in view of the occurrence of deficiency diseases (beri-beri and scurvy) in some areas of the War. Up to the present time various dry, portable foodstuffs have been examined with the view of ascertaining those most suited to the cure and prevention of these diseases among the troops.

The research on anærobic organisms isolated from cases of gas and other gangrene occurring among wounded soldiers, undertaken by the Director in co-operation with Miss Robertson, has been completed by the latter, and a paper embodying the results has been published.

Miss Robertson has now undertaken an investigation with the object of ascertaining whether an organism isolated by Dr. Penfold from cases of typhus confers immunity against that disease.

The Bacteriological Department has again prepared a considerable quantity of typhoid, paratyphoid and cholera vaccines for military purposes, and researches are now being carried out on the disinfecting action of hypochlorites, by Dr. Schütze, and on the prophylactic use of Dysentery Vaccines, by Dr. J. D. Thomson. Under the arrangement reported last year, two of the bacteriological staff, Dr. Penfold and Dr. Atkin, and Dr. J. D. Thomson, a voluntary worker in the Institute, have been seconded to the King George Hospital to undertake the pathological and bacteriological work. Dr. H. M. Woodcock, Assistant in the Protozoological Department, has been appointed Honorary Protozoologist to the King George Hospital and is engaged in a research on the prophylaxis of Amœbic Dysentery.

In the Entomological Department, Mr. Bacot, having returned from West Africa in October, 1915, has been engaged in investigations on the bionomics of lice, with the special object of devising simple means of sterilising clothing and preventing infection.

At Elstree, the energies of Dr. MacConkey and Dr. Zilva, and since January, of Miss Homer, have been largely taken up in providing antitoxins for the use of the Army and Navy.

As mentioned in last year's report, cultures were obtained of strains of meningococcus isolated during the epidemic of cerebral meningitis which occurred early in 1915, and also of strains isolated from cases which have occurred still more recently. These cultures have been used for the immunisation of horses and the serum so obtained has been tested in recent cases with satisfactory results. A large amount of this serum has been supplied to the War Office. Large use is also being made of the Institute's anti-dysentery serum.

A new bottling room has been added to the Institute at Elstree and is now ready for use. New stables for 11 horses have also been built, and the total number of horses has been increased to 76.

The Governing Body are greatly indebted to the Hygienic Laboratory of the United States of America, Public Health Department and to its Director, Dr. J. F. Anderson, for the generous manner in which, after the outbreak of war, they placed at the disposal of the Institute supplies of standard diphtheria antitoxin and standard tetanus toxin.

During the year ending March 31st, 1916, the following quantities of sera and vaccines have been delivered to the Army, the Navy and the Australian Forces:—

	War Office.	Admiralty.	Australian Government.
Diphtheria antitoxin (Doses of 2,000 U.)	38,828	800	—
Tetanus antitoxin (Doses of 500 U.)	176,300	8,836	400
Anti-dysentery serum (Doses of 20 c.c.)	35,200	2,040	36
Anti-streptococcic serum (Doses of 10 c.c.)	2,000	450	—
Anti-meningococcic serum (Doses of 30 c.c.)	4,750	90	1,140
Anti-plague serum (Doses of 20 c.c.)	2,650	—	—
Agglutinating sera (Phials of 1 c.c.)	10,206	210	—
Bacterial vaccines (c.c.), (Typhoid, Mixed Typhoid and Paratyphoid, Cholera, &c.)	51,500	8,000	98,000

Large quantities of culture media have also been supplied to various Military and Red Cross Hospitals.

The proposed investigation into Swine Fever referred to in last year's report was ultimately abandoned at the request of the Board of Agriculture.

As in the preceding year, the lecture room of the Institute has been placed at the disposal of the R.A.M.C., who have regularly employed it for the instruction of their units, and laboratory accommodation has also been provided for their practical classes.

During the year the Calf Lymph Laboratory has been removed from the temporary premises at Busbey to Hayle, Cornwall, and Dr. Green has taken up his duties there. The removal of this laboratory arose from the fact that the laboratories at Elstree were required for other work. Suitable premises have been acquired in Hayle for a period of five years and, so far, the arrangement is working extremely well.

Throughout the year the Bio-chemical Staff of the National Committee for Medical Research has occupied several laboratories in the Institute. Laboratory accommodation has also been placed at the disposal of the Ministry of Munitions for the carrying out of work connected with the supply of Munitions of War.

A list of the scientific papers by members of the staff, published during the year, is appended. It is necessarily much shorter than usual.

As in the previous year, many members of the staff have been engaged in special War work either at the front or in military hospitals at home, and a list of these is given below.

Early in July, 1915, the Director was gazetted to the Australian Medical Service, and in August proceeded to the East, where he has since been actively engaged as Pathologist to the Third Australian General Hospital, first at Lemnos and then in Cairo. In December last Dr. Ledingham was appointed a member of the Mediterranean Advisory Committee on Tropical Diseases with the rank of Lieut.-Colonel, and left King George Hospital to take up this post.

The following list gives the names of members of the staff and workers at the Institute who have been employed elsewhere on military service:—

SCIENTIFIC STAFF.

Prof. C. J. Martin, Lt.-Colonel, Australian Medical Service, Egypt.
Dr. J. C. G. Ledingham, Lt.-Colonel, R.A.M.C., Advisory Committee on Tropical Diseases, Egypt.
Mr. S. Rowland, Major, R.A.M.C., France, at first in charge of Mobile Laboratory and now investigating wound infection.
Dr. G. F. Petrie, Captain, R.A.M.C., Bacteriologist to No. 7 Stationary Hospital, Boulogne.
Dr. R. Robison, Captain, R.A.M.C., Sanitary Work, Egypt.
Dr. J. A. Arkwright, Captain, R.A.M.C., Pathologist to St. George's Hospital, Malta.
Mr. M. Greenwood, Captain, R.A.M.C., Sanitary Work.
Dr. P. Hartley, Lieutenant, R.A.M.C., Sanitary Work, France.
Dr. W. J. Penfold,
Dr. E. E. Atkin,
Dr. J. D. Thomson,
} In charge of the Pathological and Bacteriological service of the King George Military Hospital, Waterloo.
Mr. J. W. Brown, Statistical Department, Munitions' Ministry.

SCHOLARS AND VOLUNTARY WORKERS.

Dr. M. Coplans, Captain, R.A.M.C., in charge Mobile Hygiene Laboratory, France.
Dr. P. Bedson, Lieutenant, Northumberland Fusiliers, wounded at Suvla and invalided home, since transferred to R.A.M.C.
Dr. E. A. Cooper, Captain, R.A.M.C., Sanitary Work, France, invalided home.
Mr. E. Grey, Lieutenant, Royal Fusiliers, wounded at Suvla and invalided home.
Mr. E. C. Hort, Physician, Military Fever Hospital, Addington, Surrey.
Dr. C. de Wesselow, Captain, R.A.M.C., France.
Dr. W. W. Ingram, Captain, R.A.M.C., wounded and invalided home, now Pathologist, Hampstead District Military Hospitals.
Dr. J. O. W. Barratt, Captain, R.A.M.C., Sanitary Work, at first in Egypt and now in France.
Dr. Elsie J. Dalyell, Bacteriologist to the Typhus Colony in Serbia, then to the Addington Park War Hospital, Surrey.
Dr. R. St. John Brooks, Pathologist, County of London War Hospital, Epsom.
Mrs. Frances Wood, Board of Trade.

SUBORDINATE STAFF.

T. Ayling ...	Private, 10th Middlesex, India.
J. Ayling ...	Private, 10th Middlesex, Gallipoli and Egypt.
D. Bevis ...	Private, Yeomanry, France.
H. Blunden ...	Coast Defence.
R. Bird ...	Private, 13th City of London, France.
S. Cummins ...	Apprentice, Royal Navy.
H. Drew ...	Stoker, *H.M.S. Crescent.*
H. M. Green ...	Sergeant, 10th Middlesex, India.
H. Green ...	Private, Motor Transport, London.
T. Horwood ...	Private, Motor Transport, London.
V. L. Pickering	Private, Army Service Corps, London.
A. Morgan ...	Coast Defence.
D. Quaife ...	L.-Cpl., R.A.M.C., France.
W. Ward ...	Private, Bedfordshire Regiment.
F. Williamson	Sergeant, R.A.M.C., 1st General Hospital.

The Governing Body are highly gratified that so many of the staff have been utilised in this way. They consider that those who are temporarily employed elsewhere are doing good and patriotic service, while they are also gaining experience which cannot fail to be of value, hereafter, in dealing with the problems of Preventive Medicine.

CHANGES IN STAFF.

In May, during the temporary absence of the Director, Dr. Harden was appointed as Deputy Director, and was confirmed in this position when Dr. Martin was gazetted to the Australian Army Medical Corps, in July.

Miss Fletcher was appointed in June to act as Secretary to the Governing Body until further notice, *vice* Mr. Greenwood.

Dr. J. Henderson Smith, who returned to the Institute in May, 1915, after an absence of some months on sick leave, has unfortunately again been compelled to give up his work owing to illness. Under these circumstances the Governing Body decided with regret to accept his offer of resignation as from March 31st, 1916.

In April, 1916, Dr. W. J. Penfold resigned his position on his appointment as Officer in control of the Federal Serum Institute, Melbourne, Australia.

In June, 1915, Miss Rhodes was appointed a whole time Assistant in the Director's Department, and in April, 1916, Miss Hume was appointed a temporary Assistant in the same Department.

Miss Homer was appointed temporary Assistant at Elstree, and took up her duties on January 1st, 1916; in January, 1916, also Dr. Elsie Dalyell was appointed temporary Assistant in the Bacteriological Department, a position which she resigned in April on her appointment as Bacteriologist to the Women's Hospital in France.

In October, 1915, Mr. Bacot returned to the Institute, having successfully accomplished his work in Sierra Leone for the Yellow Fever Commission.

Dr. Emma Buckley was appointed to the Jenner Scholarship in August, with a special proviso that she should be liable to help in the routine and special service obligations of the Institute.

The Governing Body regret to have to record the death of Professor E. A. Minchin, F.R.S., who occupied the Chair of Protozoology in the University of London, and was an honorary member of the Staff. His valuable collection of pamphlets and books was purchased by the Institute and has been added to the Library, and in addition to this a collection of apparatus was also taken over. Dr. H. M. Woodcock has been temporarily appointed by the University as Acting Head of the Department.

Research workers in the laboratories other than members of the Staff have included:—

Mrs. MacLean, Miss Hume, Miss Buckley.

Messrs. Cropper, Hort, Ross and Drs. Barratt *(Beit Fellow)*, Brooks, Cordova, Kakehi, Tsurumi, Mair, Thaysen, Seligmann, Watabiki, Matsui, Thomson, St. John Brooks.

Captain Corfield.

ACCOUNTS AND BALANCE SHEET.

The Accounts and Balance Sheet for the year ending 31st December, 1915, are attached, and it will be seen that the financial position of the Institute continues to be thoroughly satisfactory. The selling prices of many of the Institute's preparations were increased on January 1st, 1915, to meet the higher cost of production due to War conditions, but the stocks of sera, vaccines, &c. have again been valued on a low basis, with a liberal allowance for supplies in hand which may not be required after the War.

The Reserve for Contingencies has been substantially increased, out of the surplus income of the year, and the Governing Body have, as in 1914, made a special contribution from the surplus to the Pension Fund.

The Governing Body desire, in conclusion, to thank the Deputy Director and every member of the Staff remaining at home for the way in which they have successfully met the various difficulties arising out of the War. This has involved a considerable degree of self-sacrifice on the part of the workers at the Institute and the Governing Body heartily appreciate the devotion which they have shown.

DAVID BRUCE,

Chairman.

The Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				2,112 5 9
To Pension Fund—				
Lord Lister's Bequest	17,200 15 0			
Interest, Dividends and Annual Contributions from Income Accounts to 31st Dec., 1914	3,974 16 10			
		21,175 11 10		
Interest and Dividends on the Investments, and Annual Contribution from Income Account, 1915	1,762 5 3			
Special Contribution to the Fund from the Institute's Surplus, 1915, viz., £1000 War Loan 4½% Stock, costing... ...	964 13 11			
		2,726 19 2		
				23,902 11 0
To Contingency Fund to December 31st, 1915 ...				8,201 16 11
To Sinking Fund to December 31st, 1915 ...				5,569 17 5
To Capital Fund to December 31st, 1915—				
Balance of Income and Expenditure to 31st December, 1914...		57,471 0 7		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)		2,000 0 0		
The Berridge Trustees (1893/96)		46,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Lord Iveagh (1900)		250,000 0 0		
Other Donations (1891-1907)		20,120 8 3		
Jenner Memorial Fund (1899)		5,768 0 11		
Add			391,738 19 10	
Balances of Income and Expenditure Accounts, 1915, Chelsea Gardens ...	3,456 11 9			
Elstree	7,130 14 8			
		10,587 6 5		
Less				
Appropriated as under:—				
Special Contribution to the Pension Fund as above	964 13 11			
Contingency Fund	7,256 10 3			
		8,221 4 2		
			2,966 2 3	
				394,105 2 1

DAVID BRUCE, *Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

£493,891 13 2

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the state of the Institute's affairs, according to the best of our information and the explanations given to us and as shown

London, 29th March, 1916.

# of Preventive Medicine.

31st DECEMBER, 1915. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	2,363 8 1	
In hand	52 0 10	
		2,415 8 11
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4,570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 3½ per cent. Stock, 1918	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
		26,052 5 9
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investment Contingency Fund (at cost)—		
£8,200 War Loan, 4½ per cent. Stock, 1925-1945		8,163 13 3
By Investments, Pension Fund (at cost)—		
100 Shares ($50) Morris and Essex Railway	1,760 0 0	
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 6 per cent. Preference Debentures	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£500 Royal Medical, &c., Society of London Debentures	350 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 New York Central and Hudson River Bonds	640 0 0	
£3,000 Crompton & Co. First Mortgage, 5½ per cent. Debentures	1,680 0 0	
£2,000 China Navigation Company Stock	2,000 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debentures	984 0 0	
Vincent House Mortgage	425 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debentures	656 19 7	
£500 Canada 4 per cent. Stock	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debentures	891 2 9	
£3,700 War Loan, 4½ per cent. Stock, 1925-1945	3,639 11 0	
Cash Balance	218 1 0	
		23,902 11 0
By Investment, Sinking Fund (at cost)—		
£4,200 4½ per cent. War Loan, 1925-1945		4,199 2 5
(The above Investments, at the market value, 31st December, 1915, show a depreciation of approximately £75,000.)		
By Debtors		11,583 11 7
By Stock of Tuberculin, Mallein, Bacterial Vaccines, &c.		320 7 6
*By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1908		2,746 17 2
By Expenditure on Institute Buildings at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,499 8 9	
Less amount written off	65 2 0	
		2,434 6 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	1,025 17 1	
Stock of Anti-Toxins, Bottles, &c.	2,919 0 6	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		4,764 8 2
		£133,891 13 3

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view by the books of the Institute.

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Dr. Chelsea Gardens Department.—INCOME AND EXPENDI

				£ s. d.
INCOME.				
To Interest and Dividends on General Investments				8,998 17 0
To Interest and Dividends on Pension Fund Investments				1,062 5 3
To Interest and Dividends on Sinking Fund Investments				231 2 0
To Investigation, Diagnosis and Analysis Fees, &c.				3,050 0 2
To Sales of Tuberculin, Mallein, Bacterial Vaccines, &c.		£4,516 5 5		
Add Stock of Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1915		320 7 6		
		4,836 12 11		
Deduct Stock Tuberculin, Mallein, Bacterial Vaccines, &c., 31st December, 1914		298 2 11		
				4,538 10 0
To Rent of Rooms				742 4 3
				£19,231 18 8

Dr. Elstree Department.—INCOME AND EXPENDITURE

	£ s. d.	£ s. d.
INCOME.		
To Sale of Antitoxins, &c.	19,290 8 11	
Add Stock, 31st December, 1915	2,478 10 0	
	21,768 18 11	
Deduct Stock, 31st December, 1914	5,306 12 4	
		16,462 6 7
		£16,462 6 7

f Preventive Medicine.

URE ACCOUNT for the Year ending 31st December, 1915. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	999	3	7
By Salaries and Wages of Staff	7,410	3	9
By Stationery, Printing, Postage and Advertising	295	11	5
By Printing of Collected Papers	140	4	10
By Office Expenses and Sundries	103	7	6
By Travelling Expenses	22	11	4
By Law Charges	5	15	0
By Auditors' Fee	21	0	0
By Gas and Water	391	14	4
By Electric Light and Power	151	5	4
By Fuel	196	8	6
By Director's Laboratory Expenses, including General Apparatus	301	7	4
By Bacteriological Laboratory Expenses, including Apparatus	360	0	6
By Water and Bio-chemical Laboratory Expenses, including Apparatus	30	12	2
By Furniture	48	5	6
By Culture Media	208	12	8
By Animals	539	9	10
By Animal House Expenses	377	18	3
By Repairs and Alterations to Buildings, including Workshop Expenses and Tools	557	8	6
By Library Expenses	93	15	0
By General Stores	111	5	10
By Protozoological Expenses, including Apparatus	42	2	1
By Bad Debts	9	6	6
By Annual Contribution to the Pension Fund £700 and Interest on Pension Fund Investments	1,762	5	3
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on £64,916 3s. 1d., Cost of Buildings and Interest on Sinking Fund Investments)	555	13	7
By Loss on Sale and Conversion of Investments representing various Funds	974	16	4
	15,775	6	11
By Balance, being Excess of Income over Expenditure, Transferred to Balance Sheet—	3,456	11	9
	£19,231	18	8

ACCOUNT for the Year ending 31st December, 1915. Cr.

EXPENDITURE.				£	s.	d.
By Rent, Rates, Taxes and Insurance				264	13	8
By Salaries and Wages				2,912	8	10
By Animals—Stock 31st December, 1914	872	6	4			
Purchased during the year ending 31st December, 1915	262	1	2			
	1,134	7	6			
Deduct—Sales during the year ending 31st December, 1915	15	2	6			
Stock, 31st December, 1915	986	6	4			
	1,001	8	10			
				132	18	8
By Forage				1,998	13	10
By Stable and other Expenses				14	17	9
By Farm Expenses, including Furniture and Implements				24	14	7
By Gas, Water and Fuel				239	9	2
By Postages and Telegrams				28	14	6
By Laboratory Expenses, including Cost of Bottles, Chemicals and Apparatus				2,725	11	2
By Travelling Expenses				20	2	8
By Farm General Stores				41	7	0
By Farm Office Expenses and Printing				43	7	1
By Repairs and Alterations				798	11	0
By Sinking Fund (½% per annum on £17,221 0s. 0d., Estimated Cost of Buildings)				86	2	0
				9,331	11	11
By Balance, being Excess of Income over Expenditure, Transferred to Balance Sheet—				7,130	14	8
				£16,462	6	7

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BACOT, A. W. ... ... THE TEMPERATURE NECESSARY FOR THE DESTRUCTION OF LICE AND THEIR EGGS. *British Medical Journal*, Vol. I., 1916.

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MARTIN, C. J. ... ... Memorandum on the prevalence of different forms of Dysentery at Mudros West, with suggestions for their therapeutic treatment. (*Privately printed.*)

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MINCHIN, E. A. ... ... Address to the Zoological Section: The Evolution of the Cell. *Proceedings of the British Association for the Advancement of Science*, 1915.

NORRIS, R. V. ... ... *See* Harden, A., and Norris, R. V.

PENFOLD. W. J. ... ... Two Cases of Dysentery in Children due to *B. dysenteriæ* of Flexner Type. *British Medical Journal*, Vol. II., 1915.

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THOMSON, J. D. ... ... Attempts to produce a Safe and Effective *Bacillus dysenteriae* (Shiga) Vaccine for Prophylactic Purposes. *British Medical Journal*, Vol. I., 1916.

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YULE, G. UDNY ... ... *See* Greenwood, M. (junr.), and Yule, G. Udny.

ZILVA, S. S. ... ... *See* Harden, A., and Zilva, S. S.; and MacConkey, A. T., and Zilva, S. S.

The Lister Institute
of
Preventive Medicine.

Report of the Governing Body,
1917.

Chelsea Gardens,
London, S.W. 1.

May 16th, 1917.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W. 1;
ELSTREE, HERTS; HAYLE, CORNWALL.

THE GOVERNING BODY.

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Director:

*Lt.-Col. C. J. Martin, A.A.M.C., M.B., D.Sc., F.R.S.

Department of Bacteriology.

*Lt.-Col. J. C. G. Ledingham, R.A.M.C., M.A., M.B., D.Sc., *Bacteriologist in chief; Reader in Bacteriology, University of London.*

*Capt. G. F. Petrie, R.A.M.C., M.D., *Assistant Bacteriologist.*

Major J. A. Arkwright, R.A.M.C., M.A., M.D., B.Sc., „ „

E. E. Atkin, M.B., B.A., „ „

H. L. Schütze, M.D., B.Sc., „ „

Mary M. Barratt, M.B., Ch.B., „ „

Department of Bio-Chemistry:

*A. Harden, D.Sc., F.R.S., *Professor of Bio-Chemistry in the University of London.*

Capt. Percival Hartley, R.A.M.C. (T.), D.Sc., *Assistant.*

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S. S. Zilva, Ph.D., A.I.C. „

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*Lt.-Col. C. J. Martin, A.A.M.C., M.B., D.Sc., F.R.S., *Professor of Experimental Pathology in the University of London.*

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Eleanor M. M. Hume, „

Olive C. Lodge, „

Mabel Rhodes, „

Ruth Skelton, B.Sc., „

Frances M. Tozer, „

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*
Honorary Adviser on Entomological Questions to the War Office.

Department of Protozoology:

H. M. Woodcock, D.Sc., *Acting Head of the Department.*

Muriel Robertson, M.A., *Assistant.*

Department of Statistics:

G. Udny Yule, M.A., *Honorary Consulting Statistician to the Institute.*

*Capt. M. Greenwood, Junr., R.A.M.C. (T.), M.R.C.S., L.R.C.P., *Reader in Statistics, University of London; Statistician to the Institute.*

J. W. Brown, *Assistant.*

Antitoxin Department [Elstree]:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*

Annie Homer, D.Sc., *Assistant.*

Vaccine Department [Hayle]:

Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of Calf Vaccine Laboratories.*

Librarian:
Fernie A. M. Fletcher.

Chief Clerk:
A. L. White.

Assistant Secretary and Accountant:
George Cooper.

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*A recognised Teacher of the University of London.

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 16th, 1917.

REPORT OF THE GOVERNING BODY.

The Governing Body have the honour to present their 23rd Annual Report.

During the year 1916, Surgeon-General Sir David Bruce has acted as Chairman of the Governing Body. At their Annual Meeting the Members of the Institute elected as their representatives on the Governing Body Major F. W. Andrewes *vice* the late Sir Henry E. Roscoe, and Sir E. Ray Lankester *vice* Sir W. Osler.

Colonel Sir John Rose Bradford throughout the year has been absent, acting as Consulting Physician with the Army in France, and since November, 1916, Major E. H. Starling has also been absent in Salonika.

In pursuance of the policy adopted by the Governing Body in 1914, the energies of the Institute have been almost entirely devoted to routine War work and to investigations bearing on problems arising out of the War.

Preparation of Vaccines and Sera.

The preparation and distribution of sera and vaccines has been continued on the lines pursued during the previous year. At Chelsea, in the Director's Department, Miss Chick, assisted by Miss Rhodes, and for a short period by Miss Dalyell, has continued the preparation of agglutinating, haemolytic and anti-human precipitin sera, and the examination of cultures derived from cerebrospinal meningitis and various intestinal infections in different parts of the War area.

In the Bacteriological Department Dr. Schütze and Mrs. Barratt have been engaged on the preparation of typhoid, paratyphoid, cholera, melitensis and plague vaccines for military purposes. At Elstree, the production of sera has continued throughout the year under the direction of Dr. MacConkey, assisted by Miss Homer and, until November, by Dr. Zilva, and the quantities of various sera shown below have been supplied to the Military and Naval Authorities during the year ending March 31st, 1917. All the diphtheria and tetanus antitoxins issued during this year have been refined.

	War Office.	Admiralty.	Australian Imp. Force.
Diphtheria antitoxin (Doses of 2,000 U.)	20,900	1,524	—
Tetanus antitoxin (Doses of 1,500 U.)	83,400	252	30
Anti-dysentery serum (Doses of 20 c.c.)	74,200	192	—
Anti-streptococcic serum (Doses of 10 c.c.) ...	—	608	—
Anti-meningococcic serum (Doses of 30 c.c.) ...	5,350	60	200
Normal horse serum (Doses of 10 c.c.)	388	70	—
Agglutinating sera (Phials of 1 c.c.)	4,663	82	70
Bacterial vaccines (c c.), (Mixed Typhoid and Paratyphoid, Cholera, etc.)	2,000	4,270	35,360

Large quantities of culture media have also been supplied to various Military and Red Cross Hospitals.

At the request of the War Office two kinds of univalent anti-meningococcus serum were prepared from strains supplied for that purpose, and these have been found to be efficacious for curative purposes.

A feature of this year has been the regular monthly supply of anti-dysentery serum to the War Office. Satisfactory accounts of the usefulness of this serum have been received from Col. Sir John Rose Bradford from France.

Research.

In addition to the production of sera and vaccines, a considerable amount of scientific research has been carried on in the various departments on subjects directly arising from the War. In the Director's Department Miss Chick, assisted by Misses Delf, Hume, Lodge, Skelton and Tozer, has carried on an elaborate series of investigations into the distribution in a large number of food materials of the accessory substances which prevent beri-beri and scurvy, with special reference to the suitability of these foodstuffs for incorporation in the rations of the troops. Many reports on these subjects have been issued to the War Office, two papers have been communicated to the Royal Society on the subject by Miss Chick and Miss Hume, and it has been found possible to give advice to many enquirers on these important subjects.

The Biochemical Department has also taken a share in similar experiments dealing with the best way of drying foodstuffs, the presence of accessory factors in beer, and the chemical nature of these elusive substances.

Miss Robertson completed her experiments on the relation of the coccus isolated by Dr. Penfold to Typhus fever, and came to the conclusion that this organism was unable to confer immunity against Typhus. An investigation was also made on the influence upon the resistance of guinea-pigs to infection by *B. perfringens* of previous vaccination with heated or attenuated cultures of this organism. Miss Robertson's main energies have, however, been devoted to an investigation carried out in connection with the Tetanus Committee of the War Office, which is referred to below.

In the Bacteriological Department, Dr. Schütze has collaborated with Dr. Thomson in the continuation of the experiments undertaken by the latter on the prophylactic use of dysentery vaccines, and has also worked on the reliability of the agglutinin absorption test in the diagnosis of *B. typhosus*. Mrs. Barratt has also commenced some work on the members of the Suipestifer group.

In the Entomological Department, Mr. Bacot has been largely employed in testing insecticides for use at the Front, and has published several Notes on this subject as well as providing the War Office with a series of Reports. In recognition of the service which he has rendered in this way he has been requested by the War Office to accept the position of Honorary Adviser on Entomological questions. Another enquiry of great economic importance at the moment has been commenced into the possibility of utilising the larvae and puparia of house flies instead of grain as food for poultry, and encouraging preliminary results have been obtained.

At Elstree, Dr. MacConkey has carried out a number of researches on behalf of the Tetanus Committee of the War Office, and Miss Homer has continued her work on the concentration of anti-toxic sera, and has published several valuable papers on the subject.

Committee on Tetanus.

During the year a Committee for the study of Tetanus was formed by the War Office under the Chairmanship of Sir David Bruce. The Institute has made a grant of £500 to this Committee, and has also placed at its disposal a research room. The main object of the Committee is to study the occurrence and treatment of Tetanus arising from wounds, and experimental work is being carried on with this object on behalf of the Committee in various laboratories. At the University of London Dr. Golla, with the aid of several collaborators, has made experiments on the best mode of administration of Tetanus antitoxin, the chemical nature of the toxin and the effect on it of various reagents, the mode of distribution of the toxin in the nervous system, the electrical response of the nerves of infected animals, the treatment of infected wounds with antiseptics and various other aspects of the subject.

Professor Sherrington at Oxford is making a very detailed investigation into the relative value of different modes of injection of the antitetanic serum in arresting Tetanus, the experimental animals employed being monkeys.

A considerable amount of experimental work has also been done for the Committee at the Institute. At Elstree, Dr. MacConkey and Miss Homer have worked on the duration of the passive immunity conferred by a prophylactic dose of antitetanic serum. At Chelsea, Miss Robertson has made an extended and laborious investigation into the presence of *B. tetani* in wounds, both of cases showing and not showing clinical symptoms of Tetanus. A large number of these cases have shown the presence of an organism of the morphological characteristics of *B. tetani*. Many of these organisms, however, did not produce the specific toxin, and Miss Robertson is now engaged in collaboration with Lieutenant Tulloch in a detailed investigation of the nature of these organisms and their relation to *B. tetani*.

Throughout the year the Biochemical Staff of the National Committee for Medical Research has occupied several laboratories in the Institute. Laboratory accommodation has also been placed at the disposal of the Ministry of Munitions for a portion of the year, the Canadian Army Medical Corps, the Australian Army Medical Corps and the Tetanus Committee.

A list of the scientific papers by members of the staff and by members of the Tetanus Committee of the War Office published during the year, is appended.

As in the previous year, many members of the staff have been engaged in special War Work either at the Front or in Military Hospitals at home, and a list of these and of workers at the Institute who have been employed elsewhere on Military service is given below.

SCIENTIFIC STAFF.

Prof. C. J. Martin, Lt.-Colonel, Australian Army Medical Corps, France.
Dr. J. C. G. Ledingham, Lt.-Colonel, R.A.M.C., Advisory Committee on Tropical Diseases, Mesopotamia.
Dr. G. F. Petrie, Captain, R.A.M.C., Bacteriologist to No. 7 Stationary Hospital, Boulogne.
Dr. R. Robison, Captain, R.A.M.C. (T.), Sanitary Work, Egypt, now invalided home.
Dr. J. A. Arkwright, Major, R.A.M.C., Pathologist to St. George's Hospital, Malta.
Mr. M. Greenwood, Capt., R.A.M.C. (T), Sanitary Work, and Health of Munition Workers' Committee.
Dr. P. Hartley, Captain, R.A.M.C. (T.), Sanitary Work, France.
Dr. E. E. Atkin, } In charge of the Pathological and Bacteriological service to the King
Dr. J. D. Thomson, } George Military Hospital, Waterloo.
Mr. J. W. Brown, Statistical Department, Munitions' Ministry.
Dr. H. M. Woodcock, Protozoologist to Advisory Committee on Tropical Diseases, Egypt.

SCHOLARS AND VOLUNTARY WORKERS.

Dr. M. Coplans, D.S.O., Captain, R.A.M.C., A.D.M.S. Sanitary, France.
Dr. P. Bedson, Lieutenant, Northumberland Fusiliers, wounded at Suvla and invalided home, since transferred to R.A.M.C.
Dr. E. A. Cooper, Captain, R.A.M C. (T.), Sanitary work, France, invalided home.
Mr. E. Grey, Lieutenant, Royal Fusiliers, wounded at Suvla, and invalided out.
Mr. E. C. Hort, Physician, Addington Park War Hospital, Surrey.
Mr. A. L. de Wesselow, Captain, R.A.M.C., France.
Mr. W. W. Ingram, M.C., Captain, R.A.M.C., wounded and invalided home, now Pathologist, Hampstead District Military Hospitals.
Dr. J. O. W. Barratt, Captain, R.A.M.C. (T.), Sanitary Work, at first in Egypt and now in France.
Dr. Elsie J. Dalyell, Bacteriologist to the Women's Hospital, France, and now in Malta.
Dr. R. St. John Brooks, Pathologist, County of London War Hospital, Epsom.
Mrs. Frances Wood, Ministry of Munitions.

SUBORDINATE STAFF.

T. Ayling	...	Private, 10th Middlesex, India.
J. Ayling	...	Private, 10th Middlesex, Gallipoli and Egypt.
D. Bevis	...	Private, Yeomanry, France.
R. Bird	...	Private, 13th City of London, France.
S. Cummins	...	Apprentice, Royal Navy.
H. Drew	...	Stoker, *H.M.S. Crescent.*
H. M. Green	...	Sergeant, 10th Middlesex, India.
E. Green,	...	Private, A.S.C., France.
T. Horwood	...	Private, Motor Transport, London.
V. L. Pickering		Private, Army Service Corps, France.
D. Quaife	...	L.-Cpl., R.A.M.C., Salonika.
W. Ward	...	Private, Bedfordshire Regiment.
F. Williamson		Sergeant, R.A.M.C., 1st General Hospital.

It is gratifying to know that during the year Captain Coplans has received the D.S.O., and Lt.-Colonel Martin, Captain Robison and Captain de Wesselow have been mentioned in despatches.

CHANGES IN STAFF.

The Governing Body regret to have to record the death, while on Service in France, of Major Sydney D. Rowland, R.A.M.C., who had been a member of the Staff since 1898.

During the year, the Misses Delf, Lodge, Skelton and Tozer have been appointed temporary assistants in the Director's Department to assist in the researches on scurvy and beri-beri.

Dr. Emma Buckley resigned her Jenner Scholarship in August on her return to Australia.

Research workers in the laboratories other than members of the Staff have included: Mrs. Barratt, Dr. Emma Buckley, Dr. Elsie J. Dalyell, Miss Field, Miss Hempl, Captain Bell, Mr. Hort, and Drs. Cordova, Goadby, Thaysen and Tsurumi.

ACCOUNTS AND BALANCE SHEET.

The Accounts and Balance Sheet for the year ending 31st December, 1916, are attached, and show a considerable excess of income over expenditure due to the fact that the War Office requirements for the supply of sera, etc., have been on a greatly increased scale, while the ordinary activities of the Institute are necessarily, to a large extent, suspended. The stocks in hand at the end of the year, many of which will become almost useless when the War is at an end, are valued on the same low basis as in the previous year.

The Governing Body have again made a special contribution of £1,000 to the Pension Fund, out of the surplus income of the year.

In accordance with the Government request, the following securities have been deposited with the Treasury:

£800 5% Perpetual Debentures, Grand Trunk Railway.
£800 5% Debentures, Ontario and Quebec Railway.
£500 4% Canada Stock.

The following securities were sold, and the proceeds re-invested in 5% Exchequer Bonds:

100 Shares ($50) Morris & Essex Railway.
£800 New York Central & Hudson River Bonds.

In conclusion, the Governing Body have pleasure in recording their appreciation of the manner in which the whole of the Staff have exerted themselves to meet the large demands for sera, etc., made by the Military Authorities, and to carry on the research and experimental work necessary for any development of preventive medicine, whether for War or Peace time use.

DAVID BRUCE,

Chairman.

Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				3,205 1 7
To Pension Fund—				
Lord Lister's Bequest	17,200 15 0			
Interest, Dividends and Contributions from Income Accounts to 31st Dec., 1915 ...	6,701 16 0			
Special Contribution to the Fund from the Institute's Surplus, 1916, viz., £1,000 6% Exchequer Bond, costing ...	1,000 0 0			
		24,902 11 0		
Interest and Dividends on the Investments, and Annual Contribution from Income Account, 1916		2,082 11 8		
				26,985 2 8
To Contingency Fund to December 31st, 1916 ...				8,201 16 11
To Sinking Fund to December 31st, 1916 ...				6,144 12 11
To Capital Fund to December 31st, 1916—				
Balance of Income and Expenditure to 31st December, 1915...		59,837 2 10		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)		2,000 0 0		
The Berridge Trustees (1893/98)... ...		46,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Lord Iveagh (1900)		250,000 0 0		
Other Donations (1891-1907)		20,120 8 3		
Jenner Memorial Fund (1899)		5,768 0 11		
Add			394,105 2 1	
Balance of Income and Expenditure Account, 1916		18,365 12 5		
Less				
Special Contribution to the Pension Fund, as above		1,000 0 0		
			17,365 12 5	
				411,470 14 6

DAVID BRUCE, *Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

£456,007 8 7

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the state of the Institute's affairs, according to the best of our information and the explanations given to us and as shown

London, 1st May, 1917.

31st DECEMBER, 1916. Cr.

	£ s. d.	£ s. d.
BY CASH—		
At Bankers	2,874 11 11	
In hand	18 0 4	
		2,892 12 3
BY INVESTMENTS (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4 570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 3½ per cent. Stock, 1918	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,503 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
£3,000 6 per cent. Exchequer Bonds	3,000 0 0	
£14,000 Treasury Bills	13,248 15 0	
		42,301 0 9
BY INVESTMENTS, LORD IVEAGH'S DONATION (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1948	23,850 0 0	
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
BY INVESTMENTS, JENNER MEMORIAL FUND (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
BY INVESTMENT CONTINGENCY FUND (at cost)—		
£8,200 4½ per cent. War Stock, 1925-1945		8,163 13 3
BY INVESTMENTS, PENSION FUND (at cost)—		
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debentures (deposited with Treasury)	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£500 Royal Medical, &c., Society of London Debentures	350 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£3,000 Crompton & Co. First Mortgage, 5½ per cent. Debentures	1,680 0 0	
£2,000 China Navigation Company Stock	2,000 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debentures (deposited with Treasury)	984 0 0	
Vincent House Mortgage	425 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debentures	656 19 7	
£500 Canada 4 per cent. Stock (deposited with Treasury)	492 11 0	
£700 Western Australia 4 per cent. Stock. 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debentures	891 2 9	
£3,700 4½ per cent. War Stock, 1925-1945	3 639 11 0	
£3,200 5 per cent. Exchequer Bonds	3,200 0 0	
£2,100 6 per cent. Do.	2,100 0 0	
Cash Balance	400 12 8	
		26,985 2 8
BY INVESTMENTS, SINKING FUND (at cost)—		
£2,000 Treasury Bills	1,901 5 0	
£4,200 4½ per cent. War Stock, 1925-1945	4,199 2 5	
		6,100 7 5
(The above Investments, at the market value, 31st December, 1916, show a depreciation of approximately £113,000.)		
BY DEBTORS		12,074 2 7
BY STOCK OF TUBERCULIN, MALLEIN, BACTERIAL VACCINES, &c.		218 5 5
*BY FURNITURE, FITTINGS, SCIENTIFIC APPARATUS AND BOOKS—		
As per account, 31st December, 1908		2,746 17 2
BY EXPENDITURE ON INSTITUTE BUILDINGS AT CHELSEA—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
BY PURCHASE OF FREEHOLD LAND ADJOINING "THE STUDIOS," CHELSEA		169 6 8
BY LEASE OF "THE STUDIOS," CHELSEA, as per last account	2,434 6 9	
Less amount written off	65 2 0	
		2,369 4 9
BY QUEENSBERRY LODGE FARM, ELSTREE—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	1,488 2 1	
Stock of Anti-Toxins, Bottles, &c.	2,539 9 0	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		4,847 1 8
		£456,007 8 7

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view by the books of the Institute.

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Lister Institute of

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.
To Interest and Dividends on General Investments	9,250	7	5
To Interest and Dividends on Pension Fund Investments	1,382	11	8
To Interest and Dividends on Sinking Fund Investments	164	1	11
To Investigation, Diagnosis and Analysis Fees, &c.	2,462	16	1
To Sales of Tuberculin, Mallein, Sera, &c., and Stock at 31st December, 1916, less Stock at 31st December, 1915	31,605	8	7
To Rent of Rooms in the Institute	1,121	14	6
	£45,987	0	2

Preventive Medicine.

for the year ending 31st December, 1916. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	1,451	8	2
By Salaries and Wages of Staff	11,083	1	9
By Stationery, Printing, and Postage	357	1	2
By Printing of Collected Papers	103	5	2
By Office Expenses and Sundries	182	14	7
By Travelling Expenses	109	14	4
By Auditors' Fee	26	5	0
By Gas, Water and Fuel...	912	13	10
By Electric Light and Power	199	15	4
By Director's Laboratory Expenses, including General Apparatus	253	14	5
By Bacteriological Laboratory Expenses, including Apparatus	257	2	2
By Water and Bio-chemical Laboratory Expenses	34	9	5
By Serum and Calf Lymph Laboratories Expenses, including Apparatus and Cost of Bottles	4,336	7	0
By Culture Media	433	19	9
By Animals	442	9	6
By Animal House Expenses	3,256	12	2
By Repairs and Alterations to Buildings, including Workshop Expenses	1,150	19	10
By Library Expenses	58	10	1
By General Stores	183	14	11
By Bad Debts	3	14	0
By Annual Contribution to the Pension Fund £700 and Interest on Pension Fund Investments	2,082	11	8
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments) ...	574	15	6
By Loss on Sale of Pension Fund Investments	61	6	0
By Balance, being Excess of Income over Expenditure, Transferred to Balance Sheet	18,365	12	5
	£45,987.	0	2

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR.

ANDREWES, F. W. ... ... The Intrathecal Route for the Administration of Tetanus Antitoxin. (In the Press.)

ATKIN, E. E. & BACOT, A. W. ... The Relation between the Hatching of the Eggs and the Development of the larvæ of *Stegomyia fasciata* (*Aëdes calopus*) and the presence of Bacteria and Yeasts. *Parasitology*, Vol. IX., 1917.

BACOT, A. W. ... ... The Use of Insecticides against Lice. *British Medical Journal*, Vol. I, 1916.

" The improvement of Fly-spraying Fluids and the Control of Experimental Trials. *British Medical Journal*, Vol. II., 1916.

" The Report of the Epidemiological Investigation undertaken for the Yellow Fever (West Africa) Commission for the year August, 1914, to July, 1915. *Yellow Fever Commission, Investigators' Report*, Vol. III., 1916.

" A Contribution to the Bionomics of *Pediculus humanus* (*vestimenti*) and *Pediculus capitis*. *Parasitology*, Vol. IX., 1917.

" The Louse Problem. *Proceedings of the Royal Society of Medicine*, 1917.

See also Atkin, E. E. and Bacot, A. W.

BRUCE, SIR DAVID ... ... Notes on the Incidence of Tetanus Among Wounded Soldiers. *British Medical Journal*, 27th January, 1917.

" " The Intramuscular versus the Intrathecal Route in the Treatment of Tetanus by the Injection of Antitoxin. (In the Press.)

CHICK, HARRIETTE, & HUME, E. M. M. The Effect of the Exposure to Temperatures at or above 100°C. upon the substance (Vitamine) whose deficiency in a diet causes Polyneuritis in birds and Beri-beri in man. (In the Press.)

" " " The Distribution in Wheat, Rice and Maize Grains of the substance the Deficiency of which in a diet causes Polyneuritis in birds and Beri-beri in man. (In the Press.)

CORDOVA, R. F. ... ... The Therapeutic Value of Hypochlorous Acid. *British Medical Journal*, Vol. I., 1916.

DALE, H. H. & HARTLEY, P. ... Anaphylaxis to the separated Proteins of Horse-serum. *Bio-Chemical Journal*, Vol. X., 1916.

DALYELL, E. J. ... ... Note on the Preparation of Agglutinating Serum for *B. dysenteriæ* (Shiga). *Lancet*, Vol. I., 1916.

DREW, A. H. .. .. See Penfold, W. J., Woodcock, H. M., and Drew, A. H.

GOLLA, F. L. ... ... A comparison of Subcutaneous with Intravenous and Intrathecal Administration of Tetanus Antitoxin in Experimental Tetanus. (In the Press.)

GREEN, ALAN B. ... ... The Australian Epidemic, 1914. *Journal of Hygiene*, Vol. XV., 1916.

GREENWOOD, M. ... ... The Outbreak of Cerebro-Spinal Meningitis at Salisbury in 1914-15. *Proceedings of the Royal Soc. of Medicine*, Vol. X., 1917.

" A Statistical Note on Col. Sir W. Leishman and Major Smallman's Analysis of Recent Cases of Tetanus in the British Expeditionary Force. (In the Press.)

GREENWOOD. M. & YULE, G. UDNY A Quantitative Study of Bacteriological Water Analysis. *Journal of Hygiene*, 1917.

HARDEN, A. ... ... Conditions of Activation of washed Zymin and the Specific Effect of certain actions in Alcoholic Fermentation. *Bio-Chemical Journal*, Vol. XI., 1917.

HARTLEY, P.... ... ... See Dale, H. H. and Hartley, P.

HUME, E. M. M. ... ... See Chick, Harriette and Hume, E. M. M.

HOMER, ANNIE ... ... On the Concentration of Antitoxic Sera. *Biochemical Journal*, Vol. X., 1917.

" An Improved Method for the Concentration of Antitoxic Sera. *Journal of Hygiene*, Vol. XV., 1917.

" On Factors limiting the Extent of the Concentration of Antitoxic Sera by the fractional precipitation Methods at present employed. *Journal of Hygiene*, Vol. XV., 1917.

" The Reaction of Sera as a Factor in the successful concentration of antitoxic sera by the methods at present in use. *Biochemical Journal*, Vol. XI., 1917.

" See also MacConkey, A. T. and Homer, A.

KELLAWAY, C. H. ... ... See Martin, C. J., Kellaway, C. H. and Williams, Eleanor.

KAKEHI, S. ... ... The Effects of Vaccine Sensitised with Homologous Immune Serum, as compared with those of Non-sensitised Vaccine. *Journal of Pathology and Bacteriology*, Vol. XX., 1916.

MacCONKEY, A. T. ... ... Note on the Keeping Qualities of Therapeutic Serums. *British Medical Journal*, Vol. I., 1917.

MacCONKEY, A. T. & HOMER, A. ... On the Passive Immunity Conferred by a Prophylactic Dose of Antitetanic Serum. *Lancet*, Vol. I., 1917.

MARTIN, C. J. ... ... Observations on the Pathology of Barcoo Rot (Veld Sore?), with suggestions as to treatment. *Journal of the Royal Army Medical Corps* (In the Press.)

" Concerning the Pathology and Etiology of the Infectious Jaundice common at the Dardanelles, 1915. *British Medical Journal*, Vol. I., 1917.

MARTIN, C. J. & UPJOHN, W. G. D. ... The Distribution of Typhoid and Paratyphoid infection amongst Enteric Fevers at Mudros, October — December, 1915. *British Medical Journal*, Vol. II., 1916.

MARTIN, C. J. & WILLIAMS, F. ELEANOR Types of Dysentery bacilli isolated at No. 3 Australian General Hospital, Cairo, March—August, 1916, with observations on the variability of the mannite fermenting group. *Journal of the Royal Army Medical Corps.* (In the Press.)

MARTIN, C. J., KELLAWAY, C. H. and WILLIAMS, F. ELEANOR ... Epitome of the results of the examination of the stools of 422 cases admitted to No. 3 Australian General Hospital, Cairo, for Dysentery and Diarrhœa, March to August, 1916. *Journal of the Royal Army Medical Corps.* (In the Press.)

PENFOLD, W. J. ... ... Etiology of Typhus (Preliminary Communication). *Trans. of the Society of Tropical Medicine & Hygiene*, Vol. IX., 1916.

PENFOLD, W. J., WOODCOCK, H. M. and DREW, A. H. ... ... The Excystation of *Entamoeba histolytica* (tetragena) as an indication of the vitality of the Cysts. *British Medical Journal*, I., 1916.

ROBERTSON, MURIEL ... ... Notes on the Vaccination of Guinea-pigs with *B. perfringens*. *Lancet*, Vol. XXI., 1917.

" " Notes on Typhus. *Journal of Pathology and Bacteriology*, Vol. II., 1916.

TSURUMI, M. ... ... A Contribution to the Study of Amboceptors and Receptors. Second communication on Heterologous Immunity to Malignant Mouse Tumours. *Journal of Hygiene*, Vol. XV., 1917.

" Third Communication on Heterologous Immunity to Malignant Mouse Tumours. *Journal of Hygiene*, Vol. XV., 1917.

UPJOHN, W. G. D. ... ... See Martin, C. J. and Upjohn, W. G. D.

WOOD, FRANCES ... ... The Increase in the cost of food for different Classes of Society since the Outbreak of War. *Journal of the Royal Statistical Society*, Vol. 79, 1916.

WILLIAMS, F. ELEANOR ... ... See Martin, C. J. Kellaway, C. H., and Williams, F. Eleanor, and Martin, C. J. and Williams, F. Eleanor.

WOODCOCK, H. M. ... ... See Penfold, W. J., Woodcock, H. M. and Drew, A. H.

YULE, G. UDNY ... ... See Greenwood M. and Yule, G. Udny.

THE LISTER INSTITUTE
OF
PREVENTIVE MEDICINE.

Report of the Governing Body, 1918.

CHELSEA GARDENS,
LONDON, S.W. 1.

May 15th, 1918.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W. 1;
ELSTREE, HERTS; HAYLE, CORNWALL.

THE GOVERNING BODY.

MAJ.-GENL. SIR DAVID BRUCE, K.C.B., D.Sc., LL.D., F.R.S., A.M.S., *Chairman.*

LT.-COL. G. W. ADDISON, R.E., *Hon. Treasurer.*

MAJOR F. W. ANDREWES, M.A., M.D., F.R.S., R.A.M.C. (T.)

MAJ.-GENL. SIR JOHN ROSE BRADFORD, K.C.M.G., C.B., M.D., D.Sc., F.R.S., A.M.S.

THE VISCOUNT IVEAGH, K.P., G.C.V.O., F.R.S.

SIR E. RAY LANKESTER, K.C.B., M.A., D.Sc., LL.D., F.R.S.

PROF. ERNEST H. STARLING, C.M.G., M.D., F.R.S.

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THE PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS	Royal College of Physicians, London.
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J. R DRAKE, Esq.	Worshipful Company of Grocers.
DAWSON WILLIAMS, M.D.	British Medical Association.
LT.-COL. G. W. ADDISON, R.E.	Members of the Institute.
MAJ.-GENL. SIR JOHN ROSE BRADFORD, K.C.M.G., C.B., M.D., D.Sc., F.R.S., A.M.S.	" "
SURG.-GENL. SIR WILLIAM WATSON CHEYNE, BART., K.C.M.G., C.B., LL.D., F.R.S., R.N.	" "
SIR RICKMAN J. GODLEE, BART., K.C.V.O., F.R.C.S., LL.D.	" "
PROFESSOR ARTHUR HARDEN, D.Sc., F.R.S.	" "
PROFESSOR R. T. HEWLETT, M.D.	" "
SIR E. RAY LANKESTER, K.C.B., M.A., D.Sc., LL.D., F.R.S.	" "
LT.-COL. J. C. G. LEDINGHAM, C.M.G., M.B., D.Sc., R.A.M.C.	" "
COLONEL SIR WILLIAM LEISHMAN, C.B., F.R.S., A.M.S.	" "
LT.-COLONEL CHARLES J. MARTIN, M.B., D.Sc., F.R.S., A.A.M.C.	" "
H. DE REIMER MORGAN, M.R.C.S.	" "
LOUIS C. PARKES, M.D.	" "
PROFESSOR SAMUEL G. SHATTOCK, F.R.C.S., F.R.S.	" "
PROFESSOR W. J. SIMPSON, C.M.G., M.D.	" "
J. SIDNEY TURNER, M.R.C.S	" "

THE STAFF.

Director:

*Lt.-Col. C. J. Martin, M.B., D.Sc, F.R.S., A.A.M.C.

Department of Bacteriology:

*Lt.-Col. J. C. G. Ledingham, C.M.G., M.A., M.B., D.Sc, R.A.M.C., *Bacteriologist in chief; Reader in Bacteriology, University of London.*

*Capt. G. F. Petrie, M.D., R.A.M.C., *Assistant Bacteriologist.*
J. A. Arkwright, M.A., M.D., B.Sc., " "
Lieut. E. E. Atkin, M.B., B.A., R.A.M.C., " "
H. L. Schütze, M.D., B.Sc. " "
Mary M. Barratt, M.B., Ch.B. " "
Dorothy Cayley. " "

Department of Bio-Chemistry:

*A. Harden, D.Sc., F.R.S., *Professor of Bio-Chemistry in the University of London.*
Capt. P. Hartley, M.C., D.Sc., R.A.M.C. (T.) *Assistant.*
Capt. R. Robison, Ph.D., F.I.C., R.A.M.C. (T.) "
S. S. Zilva, Ph.D., M.Sc., A.I.C. "

Department of Experimental Pathology:

*Lt.-Col. C. J. Martin, M.B., D.Sc., F.R.S., A.A.M.C., *Professor of Experimental Pathology in the University of London.*
Harriette Chick, D.Sc., *Assistant.*
Alice Davey, "
E. Marion Delf, B.A., D.Sc., "
Doris Gardiner, "
Eleanor M. M. Hume, "
Rosamund Pilgrim, "
Mabel Rhodes, "
Frances M. Tozer, "

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*
Honorary Adviser on Entomological Questions to the War Office.

Department of Protozoology:

H. M. Woodcock, D.Sc., *Acting Head of the Department.*
Muriel Robertson, M.A., *Assistant.*

Department of Statistics:

G. Udny Yule, M.A., *Honorary Consulting Statistician to the Institute.*
*Capt. M. Greenwood, Junr. M.R.C.S., L.R.C.P., R.A.M.C. (T.), *Reader in Statistics, University of London; Statistician to the Institute.*
J. W. Brown, *Assistant.*

Antitoxin Department [Elstree]:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*
Annie Homer, D.Sc., *Assistant.*
R. Roger, "

Vaccine Department [Hayle]:

Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of Calf Vaccine Laboratories.*

Librarian:
Fernie A. M. Fletcher.

Chief Clerk:
A. L. White.

Assistant Secretary and Accountant:
George Cooper.

**A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 15th, 1918.

REPORT OF THE GOVERNING BODY.

The Governing Body have the honour to present their 24th Annual Report.

During the year 1917, Major-General Sir David Bruce has acted as Chairman to the Governing Body. Maj.-Genl. Sir John Rose Bradford has again been absent and Major Starling was also absent during a large portion of the time.

As in previous years of the War, the energies of the Institute have been almost entirely devoted to routine War work and to investigations bearing on problems arising out of the War.

Preparation of Vaccines and Sera.

The preparation and distribution of sera and vaccines has been continued on the lines pursued during former years.

At Chelsea, Miss Chick and Miss Rhodes have continued the preparation of agglutinating sera and the examination of cultures derived from various infections in different parts of the War area.

In the Bacteriological Department, Dr. Schütze and Mrs. Barratt have been further engaged on the preparation of cholera and plague vaccines for war purposes.

At Elstree, the production of sera has continued throughout the year under the direction of Dr. MacConkey, assisted by Miss Homer and since August by Mr. Roger, and the quantities of various sera shown below have been supplied to the Military and Naval Authorities during the year ending March 31st, 1918.

	War Office.	Admiralty.	Oversea Forces.
Diphtheria antitoxin (Doses of 2,000 U.) ...	69,800	2,076	2,548
Tetanus antitoxin (Doses of 1,500 U.)	84,200	265	2,182
Anti-dysentery serum (Doses of 20 c.c.)	57,750	130	122
Anti-streptococcic serum (Doses of 10 c c.) ...	—	509	586
Anti-meningococcic serum (Doses of 30 c.c.) ...	28,774	132	140
Normal horse serum (Doses of 10 c.c.)	1,704	100	90
Agglutinating sera (Phials of 1 c.c.)	3,293	—	—
Bacterial vaccines (c.c.), (Cholera, Plague, &c.) ...	119,750	3,486	34,355

At the request of the War Office, Antimeningococcic serum has been put up in separate phials containing sera prepared from Types I., II., III. and IV. of the Meningococcus and a large quantity of these type sera, and also of the four types mixed for use where diagnosis is not clear, has been supplied.

In order to meet the requirements of the War Office additional accommodation for forty-two horses has been added during the year.

Owing to the great shortage of male labour, an application was made to the Women's National Land Service Corps, as the result of which seven women workers were engaged at Elstree and have been housed in cottages belonging to the Institute.

In the Calf Lymph Department there has been a continuous and increasing demand for Calf Vaccine, in many cases for the use of the troops, and it is satisfactory to know that the returns show that its use has been attended with very good results.

The amount of Calf Lymph supplied to the Overseas Forces during the year was 12,500 tubes.

A considerable quantity of culture media has again been supplied to the Addington Park and King George War Hospitals, and also to various workers engaged in research on War problems in the Institute.

Research.

Research in the various laboratories of the Institute has been continued on the main lines indicated in last year's report, and a number of papers, a list of which is appended, have been published by members of the Staff.

The investigation on scurvy and beri-beri has been continued in the Director's Department, under the direction of Miss Chick, and a considerable amount of additional information has been acquired and reported on. The experiments on the same subject in the Biochemical Department have also been considerably extended, and several papers, embodying the results obtained, have been published.

An investigation was also carried out in the Biochemical Department on behalf of the Food Production Committee on the use of yeast foods in baking.

Miss Robertson, in addition to a considerable amount of work carried out in connection with the Tetanus Committee of the War Office, which is referred to below, has continued her investigations on the anaerobes of wounds, dealing especially with the *Vibrion septique* in respect to its power of producing toxin and its serological relations.

The two lines of work in progress last year in the Bacteriological Department, namely, the prophylactic uses of dysentery vaccines and the serological classification of the Suipestifer group, have been continued by Dr. Schütze and Mrs. Barratt respectively.

In the Entomological Department Mr. Bacot has again been largely employed in testing insecticides for use at the Front, and has now commenced important work on the transmission of Trench Fever by the louse. The Entomological Laboratory has also been utilised for the instruction of Officers of the R.A.M.C. in insect work in relation to hygiene, and a large amount of advice on this subject has been given.

At Elstree, owing to the shortage of experimental animals, it has not been possible to carry out much research work, but Miss Homer has continued her work on the methods of concentration of antitoxin, and has again published several papers on this subject. Mr. Roger has also been engaged in the investigation of the methods of testing antimeningococcic serum.

In the Calf Lymph Department at Hayle problems of storage of lymph and methods of maintaining and raising the virulence of seed lymph are under investigation.

Committee on Tetanus.

During the past year the War Office Committee for the study of Tetanus, under the chairmanship of Sir David Bruce, has continued its work and has received a grant of £750 from the Institute.

At the University of London Dr. Golla has continued his investigations in various directions.

Professor Sherrington, at Oxford, has continued his work on the action of anti-tetanic serum in arresting tetanus in experimental monkeys, and has published a paper on the subject.

Miss Robertson has worked during the year at the Institute on the occurrence of *B. tetani* in wounds. The results of the examination of 252 septic wounds were embodied in a paper published in October, 1917. It was found that many of the cases showed a non-pathogenic organism, which is morphologically indistinguishable from *B. tetani*, but can be distinguished from it by cultural and serological reactions.

Captain Tulloch, working at the Institute on behalf of the Tetanus Committee, has continued the investigation of *B. tetani* isolated from men suffering from Tetanus, and has succeeded by serological methods in differentiating that organism from others which, though similar to it in morphological characters, are non-pathogenic. A cultural method has been devised which assists in the investigation of wound exudates with a view to demonstrating the presence of *B. tetani*.

This work shows that the designation *B. tetani* really comprises at least three groups of organisms which differ *inter se* in their serological reactions. The bearing which this may have upon the prophylaxis and therapeutics of Tetanus is at present the subject of enquiry.

Work is also being conducted with the object of determining the rôle which organisms, other than *B. tetani*, frequently present in wound exudates, play, possibly as adjuvants or as deterrents, in the pathogenesis of Tetanus.

Trench Fever Committee.

A Committee for the study of Trench Fever was formed in December last by the Director-General, Army Medical Service, and consists of the following:—

Major-General Sir David Bruce, *Chairman.*
Dr. J. A. Arkwright.
A. W. Bacot, Esq.
Major W. Byam, R.A.M.C.
Sir W. M. Fletcher, K.B.E., F.R.S.
Lt.-Colonel H. French, R.A.M.C.
Lt.-Colonel D. Harvey, C.M.G., R.A.M.C.

The Committee at once set to work to solve the problems of the causation and spread of the disease, and in view of the already widespread belief that the body louse was the guilty agent, steps were taken to put this theory to the test. The experiments so far carried out seem to show that infection is not directly conveyed by the bite of the louse, whereas when the excreta of the louse are brought into the blood the typical disease develops. Moreover, the louse only becomes capable of conveying infection about twelve days after being itself infected.

Trench Fever is an exceedingly important disease from the man power point of view, and the discovery that the louse is one, if not the main, means of its spread may lead to its eradication. Enquiries are now proceeding as to the best method of disinfesting soldiers of lice in the field.

The expenses of the enquiry have been borne by the Lister Institute.

During the year the Biochemical and Applied Physiology Staffs of the National Committee for Medical Research have occupied several laboratories in the Institute, and laboratory accommodation has also been placed at the disposal of the Canadian Army Medical Corps, the War Office (Cerebro-spinal meningitis laboratory), The Australian Army Medical Corps, Captain Henry and the Tetanus Committee.

As in the previous year, many members of the staff have been engaged in special War Work either at the Front or in Military Hospitals at home, and a list of these and of workers at the Institute who have been employed elsewhere on Military service is given below.

SCIENTIFIC STAFF.

Lt.-Colonel C. J. Martin, Australian Army Medical Corps, No. 25 Stationary Hospital and member of New Advisory Council on medical matters in France.
Lt.-Colonel J. C. G. Ledingham, R.A.M.C., Consulting Bacteriologist, Bagdad.
Captain G. F. Petrie, R.A.M.C., Bacteriologist to No. 11 General Hospital, Italian Expeditionary Force.
Captain R. Robison, R.A.M.C. (T.), Hygienic Laboratory, Genoa.
Major J. A. Arkwright, R.A.M.C. Pathologist to St. George's Hospital, Malta; now returned to the Institute.
Captain M. Greenwood, R.A.M.C. (T.), Welfare Department, Ministry of Munitions.
Captain P. Hartley, R.A.M.C. (T.), No. 25 Stationary Hospital, France.
Lieutenant E. E. Atkin, R.A.M.C., B.E.F., India.
Dr. J. D. Thomson, in charge of the Pathological and Bacteriological service to the King George Military Hospital, Waterloo.
Mr. J. W. Brown, Statistical Department, Ministry of Munitions.
Dr. H. M. Woodcock, Protozoologist to Advisory Committee on Tropical Diseases, Egypt.

SCHOLARS AND VOLUNTARY WORKERS.

Captain M. Coplans, R.A.M.C., A.D.M.S. Sanitary, France.
Captain P. Bedson, Northumberland Fusiliers, wounded at Suvla and invalided home; since transferred to R.A.M.C.
Captain E. A. Cooper, R.A.M.C. (T.), Sanitary work, France, invalided home, now at Hygiene department, Aldershot.
Mr. E. Grey, Lieutenant, Royal Fusiliers, wounded at Suvla, and invalided out.
Mr. E. C. Hort, Physician, Addington Park War Hospital, Surrey.
Captain A. L. de Wesselow, R.A.M.C., France.
Captain W. W. Ingram, R.A.M.C., wounded and invalided home, now Pathologist, Hampstead District Military Hospitals.
Captain J. O. W. Barratt, R.A.M.C. (T.). Sanitary Work, in Egypt, France, and now in Italy.
Dr. Elsie J. Dalyell, attached R.A.M.C., 63rd Gen. Hospital, Salonika.
Lieutenant R. St. John Brooks, R.A.M.C., Pathologist, County of London War Hospital, Epsom.
Mrs. Frances Wood, Ministry of Munitions.

SUBORDINATE STAFF.

T. Ayling	...	Private, 10th Middlesex, India.
J. Ayling	...	Private, 10th Middlesex, Gallipoli and Egypt.
D. Bevis	...	Private, Yeomanry, France.
R. Bird	...	Private, 13th City of London, France.
S. Cummins	...	Seaman, Royal Navy.
H. Drew	...	Stoker, *H.M.S. Crescent.*
H, M. Green	...	Sergeant, 10th Middlesex, India.
E. Green	...	Private, A.S.C., France.
T. Horwood	...	Private, Motor Transport, London.
V. L. Pickering		Private, Army Service Corps, France.
D. Quaife	...	L.-Cpl., R.A.M.C., Salonika.
W. Ward	...	Private, Bedfordshire Regiment.
F. Williamson		Sergeant, R.A.M.C., 1st General Hospital.

It is gratifying to know that during the year Lt.-Colonel Ledingham has been made C.M.G., and Captain Hartley has received the Military Cross.

CHANGES IN STAFF.

During the year, the Misses Gardiner, Pilgrim and Davey and Mrs. Plimmer were appointed temporary assistants in the Director's Department to assist in the researches on scurvy and beri-beri. Miss Skelton and Mrs. Plimmer have resigned their appointments.

Miss Cayley was appointed as temporary assistant and seconded to the Tetanus Committee.

ACCOUNTS AND BALANCE SHEET.

The Accounts and Balance Sheet for the year ended 31st December, 1917, are attached. The excess of income over expenditure was less than in the preceding year, although larger supplies of sera and vaccines were produced and sold, which is accounted for by the increased cost of labour, forage, bottles and materials generally. It was also found necessary to increase, at Elstree, as a temporary measure, stabling and store accommodation.

The financial position of the Institute continues to be quite satisfactory, and the Governing Body have been able further to strengthen the Staff Pension Fund by a special grant of £1,000 out of the surplus income of the year.

The following investments were paid off during the year and have been replaced by War Loans, viz.:

£500 Royal Medical, etc., Society of London Debentures.
£425 Vincent House Mortgage.

In conclusion, the Governing Body have again pleasure in recording their appreciation of the manner in which the whole of the Staff have exerted themselves to meet the large demands for Sera, etc., made by the Military Authorities, and to carry on the research and experimental work necessary in any development of preventive medicine.

DAVID BRUCE,

Chairman.

The Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.
To Creditors			3,768 0 10
To Pension Fund—			
Lord Lister's Bequest	17,200 15 0		
Interest, Dividends and Contributions from Income Accounts to 31st Dec., 1917 ...	9,784 7 8		
Special Contribution to the Fund from the Institute's Surplus, viz.:—			
£1000 5% National War Bond, 1922, costing	1,000 0 0		
		27,985 2 8	
Interest and Dividends on the Investments, and Annual Contribution from Income Account, 1917		2,250 18 10	
			30,236 1 6
To Contingency Fund to December 31st, 1917 ...			8,228 18 1
To Sinking Fund to December 31st, 1917 ...			6,898 5 11
To Capital Fund to December 31st, 1917—			
Balance of Income and Expenditure to 31st December, 1916	77,202 15 7		
Donations, &c., received to date from the following—			
Dr. Ludwig Mond (1893)	2,000 0 0		
The Berridge Trustees (1893/98)	46,379 10 1		
The Grocers' Company (1894)	10,000 0 0		
Lord Iveagh (1900)	250,000 0 0		
Other Donations (1891-1907)	20,120 8 3		
Jenner Memorial Fund (1899)	5,768 0 11		
			411,470 14 6
Add			
Balance of Income and Expenditure Account, 1917	14,114 19 8		
Less			
Special Contribution to the Pension Fund, as above	1,000 0 0		
		13,114 19 8	
			£473,717 0 6

DAVID BRUCE, *Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the state of the Institute's affairs, according to the best of our information and the explanations given to us and as shown

London, April 19th, 1918.

# of Preventive Medicine.

31st DECEMBER, 1917. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	1,210 18 1	
In hand	43 3 3	
		1,254 1 4
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4 570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 3½ per cent. Stock, 1918	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
£3,000 6 per cent. Exchequer Bonds, 1920	3,000 0 0	
~~£4,300~~ 5 per cent. National War Bonds, 1922	~~4,300 0 0~~	
£25,600 6 per cent. War Stock, 1929-1947	24,324 16 2	
		57,677 1 11
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investment Contingency Fund (at cost)—		
£8,700 5 per cent. War Stock, 1929-1947		8,228 18 1
By Investments, Pension Fund (at cost)—		
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debenture Stock (deposited with Treasury)	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
~~£3,000 Crompton & Co. First Mortgage 5½ per cent. Debentures~~	~~1,680 0 0~~	
~~£2,000 China Navigation Company Stock~~	~~2,000 0 0~~	
£800 Ontario and Quebec Railway 5 per cent. Debenture Stock (deposited with Treasury)	984 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debentures	656 19 7	
£500 Canada 4 per cent. Stock (deposited with Treasury)	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1948-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debenture Stock	891 2 9	
£9,200 5 per cent. War Stock, 1929-1947	8,672 15 3	
£2,100 6 per cent. Exchequer Bonds, 1920	2,100 0 0	
~~£2,500~~ 5 per cent. National War Bonds, 1922	~~2,500 0 0~~	
~~Cash Balance~~	~~98 7 3~~	
		~~30,236 1 6~~
By Investments, Sinking Fund (at cost)—		
£700 5 per cent. National War Bonds, 1922	700 0 0	
£6,500 5 per cent. War Stock, 1929-1947	6,106 7 6	
		6,806 7 6
(The above Investments, at the market value, 31st December, 1917, show a depreciation of approximately £116,245.)		
By Debtors		12,541 2 7
By Stock of Tuberculin, Mallein, Bacterial Vaccines, &c.		201 6 2
*By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1908		2,746 17 2
By Expenditure on Institute Buildings at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,016 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,360 4 9	
Less amount written off	65 2 0	
		2,304 2 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	1,576 19 3	
Stock of Anti-Toxins, Bottles, &c.	2,015 11 0	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		~~1,112 0 10~~
		£473,717 0 6

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view by the books of the Institute.

COOPER BROTHERS & CO.,
Chartered Accountants.

Auditors.

Lister Institute of

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.	
To Interest and Dividends on General Investments	10,654	18	0	10804 14 9
To Interest and Dividends on Pension Fund Investments	1,550	18	10	1570 19 5
To Interest and Dividends on Sinking Fund Investments	342	19	5	387. 50
To Investigation, Diagnosis and Analysis Fees, &c.	2,006	9	4	42288 1710
To Sales of Tuberculin, Mallein, Sera, &c., and Stock at 31st December, 1917, less Stock at 31st December, 1916	37,210	14	0	1726 1.1
To Rent of Rooms in the Institute	805	14	8	936. 128

£57668.109

£52,571 14 8

Preventive Medicine.

for the year ending 31st December, 1918. Cr.

EXPENDITURE.	£	s.	d.	
By Rent, Rates, Taxes and Insurance	1,910	7	2	— 2075
By Salaries and Wages of Staff	13,022	17	8	- 16956
By Stationery, Printing, and Postage	436	10	7	- 303
By Printing of Collected Papers	62	11	0	- 153
By Office Expenses and Sundries	116	19	8	— 147
By Interest on Loans	49	4	11	— 25
By Travelling Expenses	51	10	9	— 31
By Auditors' Fee	26	5	0	— 26
By Gas, Water and Fuel	1,104	10	0	— 1363.
By Electric Light and Power	279	19	11	— 234
By Director's Laboratory Expenses, including General Apparatus	284	3	11	— 426
By Bacteriological Laboratory Expenses, including Apparatus	251	1	10	— 861
By Water and Bio-chemical Laboratory Expenses	101	3	6	— 467.
By Tetanus Research Expenses	695	9	7	— 583
By Serum and Calf Lymph Laboratory Expenses, including Apparatus and Cost of Bottles	7,106	11	9	— 1606
By Culture Media	404	16	3	— 6455
By Animals	480	13	0	— 389
By Animal House Expenses and Forage	5,126	14	7	— 863.
By Repairs and Alterations to Buildings, including Workshop Expenses	687	10	5	— 7481.
By Temporary Stables and Sheds for War Work	2,778	3	4	— 623.
By Library Expenses	94	5	6	57
By General Stores	281	3	3	472.
By Bad Debts	7	6	0	25
By Annual Contribution to the Pension Fund £700 and Interest on Pension Fund Investments	2,250	18	10	1220
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0	65
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments)	758	13	0	758.
By Contingency Fund	27	1	2	44668
By Balance, being Excess of Income over Expenditure, Transferred to Balance Sheet ...	14,114	19	8	13000.
	£52,571	14	3	57668

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR

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THE LISTER INSTITUTE
OF
PREVENTIVE MEDICINE.

Report of the Governing Body, 1919.

CHELSEA GARDENS,
LONDON, S.W. 1.

June 11th, 1919.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W. 1;
ELSTREE, HERTS; HAYLE, CORNWALL.

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Honorary Adviser on Entomological Questions to the War Office.

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Muriel Robertson, M.A., *Assistant.*

Department of Statistics:

G. Udny Yule, M.A., *Honorary Consulting Statistician to the Institute.*

*M. Greenwood, M.R.C.S., L.R.C.P., *Reader in Statistics, University of London; Statistician to the Institute.*

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Antitoxin Department [Elstree]:

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*G. F. Petrie, M.D., *Assistant.*

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Librarian:
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*A recognised Teacher of the University of London.

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

June 11th, 1919.

REPORT OF THE GOVERNING BODY.

The Governing Body has the honour to present the 25th Annual Report.

CHANGES IN THE GOVERNING BODY.

In July, 1918, a Special Meeting of the Council was called to elect two members of the Governing Body, in place of Major-General Sir John Rose Bradford, and Sir E. Ray Lankester, who, owing to absence from London, were unable to attend meetings of the Board. Sir James Kingston Fowler, K.C.V.O., and Professor W. Bulloch, F.R.S., were elected to fill the places of Sir John Rose Bradford and Sir E. Ray Lankester for the remainder of the year.

In February of this year the Governing Body learned with great regret that, owing to the pressure of other business, Viscount Iveagh found it necessary to resign his seat upon the Board. Lord Iveagh has appointed Lt.-Col. Hon. Walter E. Guinness, M.P., to be a member of the Governing Body in his place.

STAFF.

Professor Martin, on being released from military service on January 1st, 1919, resumed the Directorship of the Institute, and Professor Harden was relieved of the office of Deputy Director.

Dr. Ledingham, who has been Consulting Bacteriologist to the Mesopotamian Force, returned from Baghdad in May and took over charge of the Bacteriological Department.

Since the beginning of 1919 other members of the Staff have been gradually demobilised, and with the exception of Captain M. Greenwood and Captain P. Hartley have taken up their duties at the Institute.

As in the previous years during the War, the Governing Body has made a number of temporary appointments to enable the depleted Staff to carry on the work of the various departments. Some of these workers have resigned their appointments to continue their pre-war academic duties, but Mrs. Barnes, Miss Davey, Dr. Delf, Miss Homer, Miss Hume, Mr. Roger, Miss Runge, Miss Tozer, and Dr. Zilva, are remaining as temporary members of the Staff during the whole or part of 1919.

RESEARCH WORK.

As in recent years the energies of the Institute, apart from manufacture or routine work, have been devoted to investigations bearing upon problems arising out of the War. A short summary of the scientific activities of the Institute will now be given and further details of those completed will be found in the various publications included in the appended list of the scientific papers published during the year.

Bacteriological Department.

The energies of the small remaining staff of the Bacteriological Department have been largely devoted to carrying out the routine bacteriological examinations, which the Institute undertakes for the London County Council and other public bodies and the production of very considerable supplies of plague and cholera vaccine, etc., for the War Office, and the Government of Egypt.

During the whole of the year Dr. Arkwright has been working as a member of the War Office Committee on Trench Fever and has been investigating with Mr. Bacot the virus of Trench Fever and the transmission of the disease by lice. In December, Dr. Arkwright went to Londonderry to obtain material from cases of Typhus Fever for examination and experimental inoculation into animals. Subsequently he and Mr. Bacot made observations on the nature of the virus and the transmission of the disease to monkeys and guinea-pigs by means of lice.

Dr. Schütze has continued his researches into the differences, relationships and variability of the members of the group of bacteria comprising *B. paratyphosus* B. and *B. suipestifer*, a research stimulated by problems arising from observations made upon outbreaks of food-poisoning in the Army in France. Dr. Schütze rendered valuable assistance in connection with these outbreaks by supplying the bacteriologists engaged in investigating them with special agglutinating sera against strains of bacilli of the food-poisoning group.

Miss Muriel Robertson, of the Protozoological department, who during the War has turned her attention to bacteriological problems, has continued her researches upon anaerobic bacteria which infect wounds. Particular attention has been paid to the reactions of *Vibrion septique*, and to the production of toxin by this anaerobe. Miss Robertson has made standard samples of this toxin, which have been of assistance in preparing and standardising the sera issued to the Army from the Serum laboratories of Messrs. Burroughs Wellcome & Co.

Miss Robertson was invited in March, 1918, to become a member of the Anaerobic Committee, originated by the Medical Research Committee to collect the results of work on gas gangrene already obtained and to co-ordinate future investigations. She is Secretary of this Committee, which is at present preparing an extensive publication upon "The anaerobic infections of wounds and the bacteriological and serological problems arising therefrom." Much of the work of collecting and arranging the material and editing the publication has fallen upon the Secretary.

In September, the Governing Body gave Miss Robertson six weeks leave of absence to go to Paris on behalf of the Anaerobic Committee. The object of the journey was to acquire information upon the advances in the study of the anaerobes and upon the use and preparation of curative sera made by Dr. Weinberg and his colleagues at the Pasteur Institute.

Much of our present knowledge of the pathogenic anaerobes has been acquired since the beginning of the War. In the acquisition of this information Miss Robertson has taken a prominent part. During the last four years she has isolated, scrutinised, and maintained for distribution, type strains of anaerobic bacteria from wounds. These have been in constant demand by workers in other laboratories both in England and abroad and she is at present making type collections for distribution to various Universities and Pathological Schools.

Biochemical Department.

The research carried on in this Department has been exclusively concerned with the accessory food factors, their properties, and the effects on various animals when deprived of them. The experiments in progress last year have been continued jointly by Dr. Harden and Dr. Zilva, and seven papers dealing with the results have been published during the year. In addition to this a paper was published in conjunction with Dr. Still on the preparation from lemon juice of a highly potent extract for use in cases of Infantile Scurvy. Dr. Zilva has also carried out independent research on the action of ultra-violet light on the accessory factors, and on the effects of various dietetic deficiencies on animals' immunity to disease. He has also co-operated with Dr. Still in therapeutic experiments with accessory factors, and has studied in conjunction with Major Wells, C.A.M.C., the dental changes occurring in animals when nourished on deficient diets.

In addition an investigation of the effect of cold storage on the fat soluble accessory factor of Butter, the expenses of which are defrayed by the Cold Storage Committee of the Department for Scientific and Industrial Research, was commenced in October. It involved the examination of the samples at considerable intervals, and will be concluded during 1919.

Miss Homer has continued her researches into the principles underlying the practice of the concentration of anti-toxic sera, dealing in particular with the effect of hydrogen ion concentration and temperature on the precipitation of protein and of antitoxin from heated sera by ammonium sulphate and by sodium sulphate, and the way in which the antitoxin is distributed among the precipitated proteins of the sera under various conditions. These experiments are of fundamental importance in the

economical production of a concentrated anti-toxin preparation as free as possible from non-anti-toxin-bearing proteins. Experiments have also been made as to the toxicity of cresylic acid in sera, and the interesting observation has been made that this antiseptic is less toxic in the presence of refined sera than in that of crude sera. The results of her investigations have been embodied in a number of papers published in the *Biochemical Journal*, etc.

DEPARTMENT OF EXPERIMENTAL PATHOLOGY.

An experimental investigation of Scurvy was begun in the Autumn of 1916, by Dr. H. Chick, in response to an appeal for help from the Military Authorities. Since then it has been expanded so as to include other deficiency diseases, and at present the vexed problem of the cause of Pellagra is being attacked along the same lines. The essential technique is to rear animals (guinea-pigs and monkeys) on a diet deficient in one respect, but adequate in all others. The greatest care is taken of the animals and the adjustment of their diet. The ingestion of a full and balanced diet deficient only in the particular constituent concerned, is controlled by daily weighings and ensured, if necessary, by hand feeding. Monkeys "take the bottle" readily enough with a little training and guinea-pigs when necessary are fed from a pipette. This type of work is extremely exacting and a large number of experiments, each one often extending over three to six months, has to be undertaken to obtain a satisfactory answer to each question.

A considerable temporary staff of workers was, therefore, secured to collaborate with Miss Chick in these researches, and the following lines of enquiry have been undertaken.

1. A Study of natural foodstuffs, in order to determine quantitatively their relative antiscorbutic efficiency.

2. Attempts to devise the best method of preserving lemon juice in order to retain its original antiscorbutic potency. (Miss Davey).

   Lemon and Lime Juice.—From the experiments with guinea-pigs and monkeys, the fact unexpectedly emerged that the juice of the West Indian lime both when fresh and preserved, is greatly inferior to that of the lemon. Mrs. Henderson Smith has undertaken a historical enquiry—searching past records for evidence of the relative merits of the juices of these two fruits in the prevention of human scurvy, particularly in the case of Arctic exploration. Her researches have brought to light the fact that at the time Scurvy was successfully combated in the British Navy and Mercantile Marine, the "lime juice" distributed to the sailors was made from lemons.

   Experiments are being undertaken to ascertain the best methods of preserving lemon juice in order to retain its antiscorbutic virtue as much as possible, and considerable progress has been made towards a solution of this problem.

   Root Vegetables.—The necessity arose in 1917 and 1918, owing to restriction to importation of oranges and lemons of finding a cheap substitute for the orange juice used largely as anti-scorbutic for infants nourished on artificial food, and a survey was made of the juices of the commoner root vegetables. Swede juice was found to be the most effective, and not much inferior to orange juice; the other vegetables investigated in order of merit are the potato, carrot, and beetroot; these are greatly inferior to swedes, and the juice of the last-named was found powerless to prevent scurvy in the largest doses that could be administered.

3. *A study of the antiscorbutic and growth-promoting properties of cow's milk with special reference to infant feeding, and a comparison of the value of raw, heated and dried milk in this respect.* (Mrs. Barnes and Miss Hume.)

   This research is now almost complete, and the experimental work with guinea-pigs has been confirmed with monkeys in this case also. The results show conclusively the marked inferiority of dried milk, even when of recent date, to raw milk or "scalded" milk, as regards antiscorbutic value. The difference as regards growth-promoting properties is much less marked.

4. *An investigation of the laws governing loss of antiscorbutic properties during heating of fruits and vegetables, and the application of the results to methods of cooking.*
   (Miss Runge, Miss Gardiner and Dr. E. M. Delf.)

   In connection with the work on the effect upon fruit and vegetables of exposure to heat upon the anti-scurvy accessory factor during the ordinary processes of canning, Miss Campbell has been attached to the laboratory at the request of the Food Production Department of the Board of Agriculture. A report on the subject has been furnished to the Director of Food Production, and a paper dealing with those results of permanent scientific value is in course of preparation.

The results show that canned vegetables (cabbages and French beans) have lost all but a negligible proportion of their original value. Seeing that the food value of these products is also small, the practice of canning vegetables must be regarded as opposed to principles of national economy. Canning fruits, however, would appear to be a useful practice; the investigation is here incomplete, but evidence is accumulating that tinned oranges and tomatoes are a valuable source of the antiscorbutic factor.

5. *Loss of antiscorbutic value during drying of vegetables.* (Miss Skelton and Dr. E. M. Delf.)

Dried vegetables were found to be deficient in antiscorbutic properties, the degree of loss depending chiefly upon the disorganisation of the tissues during drying, but to a small extent also upon the time of storage. The result is in accord with the experience of the British Navy in the XVIIIth century and in several military campaigns dating from the same period.

The work described under 1 and 5 is now practically complete, and several papers have been published; that under 2, 3 and 4 is still incomplete. From time to time, as information was obtained, memoranda have been forwarded to various Government Departments concerned to aid administrative action.

In addition to the work detailed above, the Department has undertaken, at the request of the Food Investigation Board of the Department of Scientific and Industrial Research, to investigate the effect of cold storage for long periods of time upon the anti-scurvy and other Vitamines contained in some natural products. The cost of this work, which is already begun, will be met by a grant from the Department of Scientific and Industrial Research.

An important feature in this nutritional research has been the introduction of the quantitative factor, which, while enhancing enormously the value of the results obtained, increases correspondingly the difficulty of the work. Neglect of this method in the past has led to conclusions which may be quite erroneous. For example: in studying the changes in antiscorbutic content during cooking, it is evident that if the foodstuff in the amount given contains, when raw, a large excess over the minimum required, any loss sustained will not be assessed or even detected if the residual amount in the cooked ration is still in excess of that minimum. In estimating the relative antiscorbutic value of any given series of foodstuffs, the first step necessary is to determine experimentally for each substance the minimum daily ration which will protect the experimental animal from scurvy under the conditions of the experiment. An accurate estimate of the loss sustained by heating, drying, or other methods of preservation can then be obtained by a comparison between the minimum rations required before, and after, the operation in question. The determination of these minima involves a large number of experiments, but these are necessary if the results obtained are to be other than misleading.

Dr. John Haldane, F.R.S. and Professor Kellas have been studying the adaptive physiological mechanism whereby "acclimatisation" to low barometric pressure is brought about, as observed in ascents of high mountains. The enquiry was carried on by means of the Institute's large pressure chamber, the gift of the late Dr. Ludwig Mond.

Entomological Department.

During the year the major portion of the time of Mr. Bacot was occupied in work connected with the War Office Trench Fever Committee and problems concerning the destruction of lice in the Army. In his capacity as Honorary Advisory Entomologist to the War Office, Mr. Bacot carried out numerous experimental tests of processes and methods aiming at ridding the troops of lice.

During the summer months, with the aid of Corporal George Talbot, R.A.M.C., an investigation concerning the efficiency of various preparations for repelling the attacks of mosquitoes was carried out in this laboratory. The mosquitoes utilized for the trials were *Stegomyia fasciata*, of the stocks brought by Mr. Bacot from Sierra Leone. The report was submitted to the War Office, and a paper, based on the observations made has been published.

Very large numbers of lice have been reared throughout the year in order to supply the extensive needs of the Trench Fever Committee's work proceeding at Hampstead and at the Institute, as well as to provide for the experimental tests connected with louse destruction referred to above.

Normal lice, with unblemished past, were also supplied to the American Red Cross Trench Fever Research Commission, to Captain Nankivell and, more recently, to Sir John Rose Bradford's research party at Etaples.

Committee on Tetanus.

The War Office Committee for the Study of Tetanus, under the Chairmanship of Sir David Bruce, has continued its work and has received during the year a grant of £583 12s. 3d. from the Institute.

The investigations of the Committee during this period have been mainly directed to the study of the inter-relation of the various anaerobic bacteria and tetanus.

The Chairman continued his analyses of cases of tetanus occurring in Home Military Hospitals. During 1918, 292 cases occurred. During the same year there were some 380,000 wounded men sent to England from France. This gives an incidence of 8 per 10,000 wounded. When this is compared with the first three months of the War, 20,761 wounded, and 153 cases of tetanus, an incidence of 74 per 10,000, it will be seen that the incidence of cases of tetanus to wounded has dropped to a tenth of the former rate. This drop has been chiefly due to the prophylactic use of anti-tetanic serum. There have been some 1,450 cases of tetanus among the wounded sent to England during the War, but for the serum there would presumably have been some 14,000.

The rate of mortality among these cases of tetanus has also fallen in a similar manner. The ratio of deaths to cases during the first year was 58%, whereas during 1918 it fell to 25%.

Trench Fever Committee.

During the year the Institute has contributed the sum of £1,606 14s. towards the expenses of this investigation into Trench Fever.

This extraordinary disease, which suddenly appeared among our soldiers in the trenches, seemed to be a special creation of the War. It was, so far as could be ascertained, a new and unknown disease. It had not previously been recognized and described. In all probability it existed to a small extent in Flanders before the War, but had not been recognized as a distinct disease, being lost in the confusion of rheumatism, neuralgia, and such terms. Under war conditions the small number of cases occurring quickly changed into large numbers, so that it is no exaggeration to say that Trench Fever was one of the most important causes of sickness and invaliding in the British Army during the Great War. Trench Fever, as this Committee was the first to prove, by direct experiment on man, is carried from man to man by the louse, and the sickness caused by the fever and by the general effects of lousiness were estimated at one time at from 70% to 90% of the whole sickness in the Army. From this it will be seen how important a factor in War is the louse. The louse may be said at times to have removed almost as many men from the firing line as the poison gases, high explosives, projectiles, and bullets of the enemy. In the next war under similar conditions it will be as necessary to supply apparatus and means to keep our men free from lice, as to provide shells or observation balloons.

The Committee, since the last Annual Report, has confirmed and added much to the knowledge previously reached, of the way in which the disease is spread by lice. So far, there is no evidence that the disease is spread in any other way.

The work of Mr. Bacot and others on the destruction of lice by a moderate degree of dry heat has been confirmed by practical experience on a large scale with hot air chambers for disinfesting soldiers' clothing and blankets. This method devised on the basis of knowledge acquired in the laboratory, has been used very successfully by the Armies in France, and appears to have largely abolished Trench Fever.

Much doubt and great difference of opinion have existed as to the nature of the virus of Trench Fever, but researches during the past year have gone far to establish the view that the causal micro-organism belongs to the class of very small bodies called *Rickettsia*, which has till recently been little studied and still needs much investigation.

Some work has also been done on Typhus Fever on account of the great similarity between Typhus and Trench Fever, as to the properties of the virus and the mode of spread.

Indeed it seems probable that the work on Trench Fever will throw much light on Typhus Fever—a disease of great importance and extreme severity in many parts of the world.

Committee on Accessory Food Factors.

[Appointed jointly by the Lister Institute and Medical Research Committee.]

This Committee was constituted early in 1918 with the objects of gathering together from all countries and rendering rapidly available, experimental knowledge on this subject; of providing machinery whereby valuable observations upon outbreaks of Scurvy, Beri-beri and other deficiency diseases, heretofore mostly buried in official reports, might be brought to light for future guidance; and of co-ordinating further investigations upon the subject.

The Members are:— Professor F. G. Hopkins, F.R.S., *Chairman.*
Dr. H. Chick, *Secretary.*
Dr. J. C. Drummond.
Professor A. Harden, F.R.S.
Dr. E. Mellanby.

The following corresponding Members have been appointed:—

Colonel W. W. O. Beveridge
Dr. A. J. Chalmers, Khartoum.
Colonel S. L. Cummins.
Dr. H. D. Dakin, New York.
Dr. J. C. G. Ledingham.
Dr. Charles Todd, Cairo.
Major Norman White, I.M.S., Simla.

A survey of the present state of our knowledge upon accessory food factors and deficiency diseases has been made by the Committee and is now in the press. This Monograph has been written to suit the needs of the general scientific and medical reader.

A scheme of co-operation with the Army Medical Department has been arranged by means of which Officers in contact with outbreaks of deficiency disease on active service abroad may forward accounts of these occurrences directly to the Committee.

A similar connection has been established with the responsible medical authorities in our tropical Colonies with the help of the Colonial Office.

The Committee has worked in conjunction with the Oils and Fats Committee of the Food Investigation Board, Department of Scientific and Industrial Research, and is represented on that Committee by Dr. J. C. Drummond.

A memorandum on the food value of margarine was drawn up jointly with the Oil and Fats Committee and forwarded to the Ministry of Food, in March, 1919. In this document was set forth the urgent reasons why the control of the Ministry as regards the proportion of animal fat to be included in margarine should not be relaxed.

Other documents issued by the Accessory Food Factors' Committee are the following:—

(a) A memorandum containing results of work from the Lister Institute, on the relative anti-scorbutic value of Lemon Juice and Lime Juice (since published, *Lancet*, December, 1918) was forwarded to the Army and Navy Medical Services early in October, 1918.

(b) At the same period a memorandum setting forth the reasons why increased imports of fresh fruit were desirable during the coming winter, was forwarded to the Food Controller.

Serum Department.

During the first half of 1918, the researches of Miss Homer on the concentration of anti-toxic sera, referred to in connection with the work of the Biochemical Department, were carried on at Elstree. Dr. MacConkey has also been experimenting upon the more practical sides of the concentration of anti-toxin, and particularly upon the substitution of sodium sulphate for ammonium sulphate in the process, a problem with which he became suddenly confronted owing to the failure of supplies of the latter salt in 1918.

By means of sodium sulphate, antitoxin was concentrated six times; the final product contained 14% of protein, was clear and almost colourless. The antitoxin content does not decrease any faster than in other antitoxin preparations.

A large amount of work has been done by Dr. MacConkey and Mr. Roger to test various methods which have been suggested for the standardisation of anti-meningococcic sera. This is a most important requirement for the proper serum therapy of meningitis. No parallelism was discovered between the agglutinating titre of the serum, and the apparent success of its administration to patients. In Dr. MacConkey's hands, the method of titrating the sera against definite weighed quantities of dried meningococci of various types suggested by Lt.-Col. Gordon, C.M.G., of the Central C.S.F. Laboratories of the War Office, was disappointing, owing to the irregularity of the results. A modification of the method in which filtered extracts of meningococci were employed as "toxin" was also unsatisfactory.

PRODUCTION OF SERA AND VACCINES.

Up to the time when hostilities ceased, the Serum Department was working to the limit of its capacity to supply the requirements of the Army. Since the Armistice the demands of the War Office have diminished and in the case of Tetanus Antitoxin ceased, but that for other sera is still considerable. The quantities of sera, etc., supplied to the Military and Naval authorities, Local Government Board, etc., during the year ending March 31st, 1919, were as follow:—

	War Office.	Admiralty.	Overseas Forces.	Local Govt. Board.
Diphtheria Antitoxin (Doses of 2,000 U.) ...	44,856	2,247	3,900	—
Tetanus Antitoxin (Doses of 1,500 U.) ...	60,312	710	100	—
Antidysentery Serum (Doses of 20 c.c.) ...	93,720	400	—	—
Antistreptococcic Serum (Doses of 10 c.c.) ...	2,850	2,594	4,200	—
Antimeningococcic Serum (Doses of 30 c.c.) ...	11,491	24	1,160	—
Agglutinating Sera (Phials of 1 c.c.)	576	51	220	—
Bacterial Vaccines (c.c.), (Cholera, Plague, Influenza, etc.)	91,225	3,851	603,000	53,000
Calf Vaccine (Vaccinations)	—	—	21,000	—

GENERAL AND FINANCIAL POLICY.

During the winter the Governing Body has been considering the future policy of the Institute, and a committee of the scientific members of the Board was appointed for this purpose.

The Governing Body has decided to restrict the work undertaken by the Diagnosis Department to examinations and analyses desired by Public Bodies and proposes in future to limit the latter as far as possible, in order that the Institute may be able to devote its whole energies to medical research.

The Governing Body has long felt that the Institute suffers from its want of contact with the practical problems of disease and has decided that a research hospital in connection with the Institute would add greatly to its usefulness. By Section 3 (d) of the existing Memorandum of Association, however, the Institute is specifically debarred from having a residential hospital, although it may treat as out-patients persons suffering from disease. The Governing Body therefore proposes to ask the members to amend this section of the Articles of Association so as to remove the disability.

The Governing Body has also been considering for some time whether the designation "Lister Institute of Preventive Medicine" adequately indicates to the mind of the public the nature of its activities. The Governing Body has arrived at the conclusion that it does not do so, and that the words "Medical Research" would convey to all persons more clearly the nature of the work carried on in the Institute than the words "Preventive Medicine."

Owing to the greatly increased cost of maintaining laboratories at the present time, and the difficulty of profitably carrying on the business side of the Institute on account of the enhanced price of labour and materials, the Governing Body will be obliged in future to curtail its activities, and unless it finds itself in possession of further funds, will not be in a position to continue to afford the same advantages to research workers as it has done in the past.

The endowment of the Lister Institute is small compared with that of the Pasteur Institute and Rockefeller Institute, and income derived from endowments is, for many reasons, preferable in the case of an institute such as the Lister to one derived in large part from the results of trading. The Institute has not received any substantial sum by way of endowment since Lord Iveagh's munificent gift in 1899, and the Governing Body believes that the more clearly the public understands the scope of its work, the more likely it is to receive support.

The Governing Body therefore proposes, for the consideration of Members, a modification in the final portion of the name of the Institute, and that in future it shall be called "The Lister Institute for Medical Research," and is summoning a Special General Meeting of the members, at which the Chairman will propose Resolutions amending Section I. of the Memorandum of Association, stating what the name of the Institute shall be, and Section 3 (d) which specifically excludes the establishment of a residential hospital from the category of the objects of the Institute.

Inasmuch as the provisions contained in the Memorandum of Association constituted the conditions on which Viscount Iveagh made his gift of £250,000 to the Institute in 1899, no alteration can be made in the Memorandum of Association without his consent, or that of the person in whom the right of appointment of his representative on the Governing Body is vested. Lord Iveagh raises no objection to the change in the title, and has signified his agreement with the proposal to have a hospital, provided special funds are found and the ordinary funds of the Institute are not made use of for this purpose.

The Accounts and Balance Sheet for the year ended 31st December, 1918, are attached and although they show a satisfactory position, the change from war to peace conditions must be expected to materially affect the results in future. The large Army contracts will disappear and all work, whether of research or in the production of sera, etc., will involve greatly increased cost, as compared with pre-war times. The Governing Body has decided to raise the prices of the Institute's products, but it does not see any reason to suppose that the increased cost of production will, in the near future, be compensated either by increased sales or enhanced selling prices.

Dilapidations to the Institute's property at Chelsea and Elstree have not been made good since 1914, and a considerable sum will be required to be spent this and next year upon reparations unavoidably postponed during the War.

The Governing Body has been informed that the Institute is liable for payment of Income Tax under Schedule D. on profits resulting from the sale of sera to the Government, and they have, therefore, placed a sum of £6,000 to a special reserve fund, to meet the probable claims for Income Tax to the 31st December, 1918. Further payments to a considerable amount have still to be provided for, the tax being based on three-year averages.

When the Pension Scheme was formed it was decided the fund should be re-valued five years later by a Fellow of the Institute of Actuaries, who should report to the Governing Body upon the adequacy of the fund to meet the expected claims upon it. This has been recently done, and in accordance with the recommendation of Mr. W. Palin Elderton, F.I.A., an additional sum of £1,000, making £1,700 in all, has been added to the fund for the year 1918.

The following investments of the Pension Fund have been paid off or sold during the year, and replaced by War Bonds, viz. :—

£3,000 Crompton & Co., 5½% debentures.
£2,000 China Navigation Co. Stock

resulting in a profit of £2,463 15s., and bringing the value of Lord Lister's gift to the Institute up to £19,669 10s.

In closing its report for the last of the years during which our country has been at war, the Governing Body records its appreciation of the work performed, often under considerable strain, by the members of the staffs who have remained at their posts. By so doing it has been possible for the Institute to enormously increase the production of sera, vaccines, etc., to meet the requirements of our soldiers and sailors, and to carry out important investigations demanded by the state of war and by the limitation of our food supplies. The Governing Body is aware that such work has often been performed under great difficulties due to want of trained assistance and limitation of the supply of necessary materials.

It also desires to express its recognition of the valuable help rendered by those who have temporarily filled gaps occasioned by the absence of the regular staff on military service. In most cases such positions have, of necessity, been filled by women, and the Governing Body realises that the Institute could not have met the demands upon it and taken its share in the divers scientific investigations, upon the successful prosecution of which our national existence has depended, had it not been for the help afforded by women who have successfully undertaken duties ranging from the conduction of an original research to the grooming of a restive horse.

DAVID BRUCE,

Chairman.

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.
To Creditors			3,155 5 11
To Pension Fund—			
Lord Lister's Bequest	17,200 15 0		
Profit on Sale of Investments	2,468 15 0		
	19,669 10 0		
Interest, Dividends and Contributions from Income Accounts to 31st Dec., 1917 ...	13,035 6 6		
Interest and Dividends on the Investments, and Contribution from Income Account, 1918	3,220 19 5		
			35,925 15 11
To Contingency Fund to December 31st, 1918 ...			8,228 18 1
To Sinking Fund to December 31st, 1918 ...			7,660 4 6
To Income Tax Schedule D. Reserve Account...			6,000 0 0
To Capital Fund to December 31st, 1918—			
Balance of Income and Expenditure to 31st December, 1917...	90,317 14 11		
Donations, &c., received to date from the following—			
Dr. Ludwig Mond (1893)	2,000 0 0		
The Berridge Trustees (1893/96)	46,379 10 1		
The Grocers' Company (1894)	10,000 0 0		
Lord Iveagh (1900)	250,000 0 0		
Other Donations (1891-1907)	20,120 8 3		
Jenner Memorial Fund (1899)	5,768 0 11		
Add		424,585 14 2	
Balance of Income and Expenditure Account, 1918	11,701 2 1		
Less			
Income Tax Schedule D. Reserve Account...	6,000 0 0		
		5,701 2 1	
			430,286 16 3

DAVID BRUCE, *Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

£491,257 0 8

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the state of the Institute's affairs, according to the best of our information and the explanations given to us and as shown

London, 22nd May, 1919.

31st DECEMBER, 1918. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	2,144 8 7	
In hand	35 14 5	
		2,180 3 0
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4 570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 5½ per cent. Stock, 1922-32	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
£3,000 6 per cent. Exchequer Bonds, 1920	3,000 0 0	
£7,300 5 per cent. National War Bonds, 1922	7,300 0 0	
£25,600 5 per cent. War Stock, 1929-1947	24,324 16 2	
		60,677 1 11
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investment Contingency Fund (at cost)—		
£8,700 5 per cent. War Stock, 1929-1947		8,228 18 1
By Investments, Pension Fund (at cost)—		
£2,383 Grand Trunk Railway Company of Canada Consolidated Stock	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debenture Stock (deposited with Treasury)	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debenture Stock (deposited with Treasury)	984 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debentures	656 19 7	
£500 Canada 4 per cent. Stock (deposited with Treasury)	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debenture Stock	891 2 9	
£9,200 5 per cent. War Stock, 1929-1947	8,672 15 3	
£2,100 6 per cent. Exchequer Bonds, 1920	2,100 0 0	
£5,500 5 per cent. National War Bonds, 1922	5,500 0 0	
£4,700 5 per cent. National War Bonds, 1923	4,700 0 0	
Balance Uninvested	1,763 1 8	
		35,925 15 11
By Investments, Sinking Fund (at cost)—		
£700 5 per cent. National War Bonds, 1922	700 0 0	
£6,500 5 per cent. War Stock, 1929-1947	6,106 7 6	
		6,806 7 6
(The above Investments, at the market value, 31st December, 1918, show a depreciation of approximately £105,157.)		
By Debtors		20,717 19 4
By Stock of Tuberculin, Mallein, Bacterial Vaccines, &c.		54 2 9
*By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1908		2,746 17 2
By Expenditure on Institute Buildings at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,304 2 9	
Less amount written off	65 2 0	
		2,239 0 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		30,455 10 0
Stock of Animals and Forage	1,764 10 11	
Stock of Anti-Toxins, Bottles, &c.	1,787 12 1	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1908	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		4,371 13 7
		£491,257 0 8

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view by the books of the Institute.

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Lister Institute of

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.
To Interest and Dividends on General Investments	10,844	14	9
To Interest and Dividends on Pension Fund Investments	1,520	19	5
To Interest and Dividends on Sinking Fund Investments	351	5	0
To Investigation, Diagnosis and Analysis Fees, &c.	2,288	17	10
To Sales of Tuberculin, Mallein, Sera, &c., and Stock at 31st December, 1918, less Stock at 31st December, 1917	41,696	11	1
To Rent of Rooms in the Institute	936	12	8
	£57,639	0	9

Preventive Medicine.

for the year ending 31st December, 1918. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	2,075	18	2
By Salaries and Wages of Staff	16,956	0	1
By Stationery, Printing and Postage	303	2	11
By Printing of Collected Papers	153	3	2
By Office Expenses and Sundries	147	9	10
By Interest on Loans	25	3	3
By Travelling Expenses	31	16	0
By Auditors' Fee	26	5	0
By Gas, Water and Fuel	1,363	9	4
By Electric Light and Power	234	17	6
By Director's Laboratory Expenses, including General Apparatus	432	7	8
By Bacteriological Laboratory Expenses, including Apparatus	861	18	0
By Water and Bio-chemical Laboratory Expenses	467	8	2
By Tetanus Research Expenses	583	12	3
By Trench Fever Research Expenses	1,606	14	0
By Serum and Calf Lymph Laboratory Expenses, including Apparatus and Cost of Bottles	6,455	13	9
By Culture Media	389	15	7
By Animals	890	10	9
By Animal House Expenses and Forage	7,704	6	6
By Repairs and Alterations to Buildings, including Workshop Expenses	631	4	7
By Library Expenses	51	4	11
By General Stores	472	4	7
By Bad Debts	25	12	8
By Contribution to the Pension Fund £1700 and Interest on Pension Fund Investments	3,220	19	5
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments) ...	761	18	7
By Balance, being Excess of Income over Expenditure, Transferred to Balance Sheet ...	11,701	2	1
	£57,639	0	9

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR

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" " — THE ASSOCIATION OF RICKETTSIA WITH TRENCH FEVER. *Journal of Hygiene*, Vol. XVIII., 1919.

" " — THE MINUTE BODIES (RICKETTSIA) FOUND IN ASSOCIATION WITH TRENCH FEVER, TYPHUS FEVER AND ROCKY MOUNTAIN SPOTTED FEVER. *Transactions of Society of Tropical Medicine and Hygiene*, Vol. XII., 1919.

ARKWRIGHT, J. A. AND LEPPER, Elizabeth A. — A SERIES OF SIXTEEN CASES OF BLACKWATER FEVER OCCURRING IN THE EASTERN MEDITERRANEAN. *Trans. of Society of Tropical Medicine and Hygiene.* Vol. XI., 1918.

BACOT, A. - - - - - MOSQUITOES AND THE DANGER OF MALARIA IN ENGLAND. *The Essex Naturalist*, Vol. XVIII., 1918.

" - - - - - THE UNRELIABILITY OF SULPHUR FOR THE DESTRUCTION OF LICE IN CLOTHING. *British Medical Journal*, Vol. II., 1918.

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BACOT, A. AND LINZELL, L. - - THE INCUBATION PERIOD OF THE EGGS OF *Haematopinus asini*. *Parasitology*, Vol. XI., 1919.

BACOT, A., AND LLOYD, L. - - DESTRUCTION OF NITS OF THE CLOTHES LOUSE BY SOLUTIONS OF CRESOL-SOAP EMULSION AND LYSOL. *British Medical Journal*, Vol. I., 1918.

BACOT, A. AND TALBOT, G. - - THE COMPARATIVE EFFECTIVENESS OF CERTAIN CULICIFUGES UNDER LABORATORY CONDITIONS, *Parasitology*, Vol. XI., 1919.

" " - - THE SURVIVAL PERIOD OF LICE AND NITS (*Pediculus humanus*) WHEN SUBMERGED IN TAP WATER AND WATER CONTAINING 1% OF SALT, AT VARIOUS TEMPERATURES. *British Medical Journal*, Vol. I., 1919.

CHICK, Harriette and DELF, E. Marion — The Antiscorbutic Value of Dry and Germinated Seeds. *Biochemical Journal*, Vol., XIII., 1919.

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CHICK, Harriette and RHODES, Mabel — An investigation of the Antiscorbutic Value of the Raw Juices of Root Vegetables, with a view to their adoption as an adjunct to the dietary of Infants. *Lancet*, Vol. II., 1918.

DELF, Marion and SKELTON, Ruth F. — The Anti-scorbutic Value of Cabbage. II. The Effect of Drying on the Anti-scorbutic and Growth promoting properties of Cabbage. *Biochemical Journal*, Vol. XII., 1918.

DELF, E. Marion and TOZER, Frances M. — The Anti-scorbutic Value of Cabbage. I. The Anti-scorbutic and Growth promoting properties of Raw and Heated Cabbage. *Biochemical Journal*, Vol. XII., 1919.

(*See* also Chick, Harriette and Delf, E. Marion.)

DUNCAN, F. Martin . . . (*See* Arkwright, J. A., Bacot, A. and Duncan, F. M.)

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GREENWOOD, M. . . . . — On the Efficiency of Muscular Work. *Proceedings of the Royal Society B.* Vol. 90, 1918.

" . . . . . — The Epidemiology of Influenza. *British Medical Journal*, Vol. II., 1918.

" . . . . . — A Report on the Causes of Wastage of Labour in Munitions Factories employing Women. *Medical Research Committee, Special Report Series.* No. 16. 1916.

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GREENWOOD, M. and TEBB, A. E. . — An Inquiry into the Prevalence and Aetiology of Tuberculosis among Industrial Workers, with special reference to Female Munition Workers. *Medical Research Committ e, Special Report Series.* No. 22. 1919.

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HARDEN, A. and ROBISON, R. . . — The Antiscorbutic Properties of Concentrated Fruit Juices. *Journal of the Royal Army Medical Corps*, Vol., XXXII., 1919.

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" " . . Experimental Scurvy in the Monkey. *Journal of Pathology and Bacteriology*, 1919. (In the Press.)

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" . . . . A Note on the Nature of the Proteins associated with Antitoxin in Antitoxic Sera. *Journal of Physiology*, LII., 1918.

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BACOT, A., and LLOYD, L. . .	„ „ „
BYAM, W. and others . .	Trench Fever – a louse borne disease. *Transactions of Society of Tropical Medicine and Hygiene*. Vol. XI., 1918.
„	Trench Fever. *Oxford Medical Publications, 1919*. (In the Press.)

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1. Memorandum upon the Use of Germinated Pulses (Dhall) in the Prevention of Scurvy on Active Service.
   Forwarded to the Director General, Army Medical Service, January 4th, 1918.
2. Report on Sample of Lime Juice (Official issue) prepared in Bombay, received from the India Office, October 17th, 1917.
   Forwarded to the India Office, February 20th, 1918.
3. Report on Anti-scorbutic Value of Dried Cabbage, prepared at the Dunnington Farm Produce Factory.
   Forwarded to the Food Production Committee of the Board of Agriculture, May 27th, 1918.
4. Memorandum upon the Anti-scorbutic Value of the Juice of Lemons and Limes, and the superiority of the former.
   Forwarded to the Director General, Army Medical Service and Naval Medical Service, The India Office, Ministry of Food, etc. October 5th, 1918.
5. Memorandum containing results of Experimental work carried out by Dr. E. Marion Delf, to ascertain the influence of a small concentration of Citric acid (0·5%) upon the deterioration in anti-scorbutic value taking place during the cooking of germinated pulses and other vegetables. (Suggested by Major Greig, I.M.S.)
   Forwarded to the India Office and War Office, December 7th, 1918.

THE LISTER INSTITUTE
OF
PREVENTIVE MEDICINE.

Report of the Governing Body, 1920.

CHELSEA GARDENS,
LONDON, S.W. 1.

May 12th, 1920.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W. 1;
ELSTREE, HERTS; HAYLE, CORNWALL.

THE GOVERNING BODY.

MAJ.-GENL. SIR DAVID BRUCE, K.C.B., D.Sc., LL.D., F.R.S., A.M.S. *Chairman.*

LT.-COL. G. W. ADDISON, R.E., *Hon. Treasurer.*

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PROFESSOR W. BULLOCH, M.D., F.R.S.

SIR JAMES KINGSTON FOWLER, K.C.V.O., C.M.G., M.D.

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PROFESSOR ERNEST H. STARLING, C.M.G., M.D., F.R.S.

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SIR E. RAY LANKESTER, K.C.B., M.A., D.Sc., LL.D., F.R.S. ...	,, ,,
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THE STAFF.

Director:

*Professor C. J. Martin, C.M.G., M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, C.M.G., D.Sc., M.B., *Bacteriologist in chief; Reader in Bacteriology, University of London.*
J. A. Arkwright, M.A., M.D., B.Sc., *Assistant Bacteriologist.*
E. E. Atkin, M.B., B.A., „ „
H. L. Schütze, M.D., B.Sc. „ „
Mary M. Barratt, M.B., Ch.B. „ „ *(Temporary).*

Department of Bio-Chemistry:

*A. Harden, D.Sc., F.R.S., *Professor of Bio-Chemistry in the University of London.*
R. Robison, Ph.D., F.I.C., *Assistant.*
S. S. Zilva, Ph.D., M.Sc., A.I.C. „ *(Honorary).*

Department of Experimental Pathology:

*C. J. Martin, C.M.G., M.B., D.Sc., F.R.S., *Professor of Experimental Pathology in the University of London.*
Harriette Chick, D.Sc., *Assistant.*
Eleanor M. M. Hume, „ *(Temporary).*
Frances M. Tozer, „ „
Hannah Henderson Smith, „ „
Sheila Rutherford, „ „

Entomological Department:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*
Honorary Adviser on Entomological Questions to the War Office.

Department of Protozoology:

Muriel Robertson, M.A., *Assistant.*

Antitoxin Department [Elstree]:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist in charge of Serum Laboratories.*
*G. F. Petrie, M.D., *Assistant.*
J. W. Brown, *Clerk.*

Vaccine Department [Hayle]:

Alan B. Green, M.A., M.D., B.C., *Bacteriologist in charge of the Anti-variolous Vaccine Laboratories.*

Assistant Secretary and Accountant:
George Cooper.

Chief Clerk:
A. L. White.

National Collection of Type Cultures.

(Medical Research Council).

Director:
J. C. G. Ledingham, C.M.G., D.Sc., M.B.

Curator.
R. St. John Brooks, M.D., D.P.H., M.A.

Assistant Curator:
Miss M. Rhodes.

* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 12th, 1920.

REPORT OF THE GOVERNING BODY.

The Governing Body has the honour to present the 26th Annual Report.

THE GOVERNING BODY.

There have been no changes in the membership of the Governing Body since the date of the last Annual General Meeting, when the Council re-elected Professor Andrewes, Professor Bulloch and Sir James Kingston Fowler to represent the members until December 31st, 1920.

Sir David Bruce was abroad from November, 1919, to May, 1920, and Professor Starling was appointed temporary Chairman during his absence.

In March, Professor Starling left on a visit to India, at the invitation of the Government of India, to advise it regarding a projected "All-India Institute for Medical Research" and Sir James Fowler was appointed Acting-Chairman, in his stead.

COUNCIL.

Professor A. Schuster, who represented the University of Manchester, resigned during the year and the University has appointed Professor H. R. Dean, a former member of the Staff of the Institute, in his stead.

The Governing Body have to record with sorrow the death of three members of Council, viz., Professor Sir W. Osler, Professor W. S. Greenfield and Dr. J. Sidney Turner. Professor Osler represented the University of Oxford and was for many years a valued colleague on the Governing Body. Professor Greenfield, who represented the University of Edinburgh, took an active interest in the early career of the Institute, and Dr. Sidney Turner was one of the members of the Committee which was instrumental in founding the British Institute of Preventive Medicine in 1889 and has served upon the Council of the Institute since 1903.

The Universities of Oxford and Edinburgh have not yet appointed representatives to replace Professor Osler and Professor Greenfield.

The three members who retire by rotation, and who are eligible for re-election, are the representatives of the Universities of Cambridge and Edinburgh and the British Medical Association, with which learned bodies the nominations rest. The members at the Annual General Meeting will, therefore, be called upon to elect only one representative upon the Council in place of the late Dr. Sidney Turner.

STAFF.

The two members of the Staff, Dr. Hartley and Mr. Greenwood, still remaining on military service at the date of the last Annual Meeting have been demobilised. Both these gentlemen have, however, since resigned their appointments, Dr. Hartley being appointed to take charge of the research laboratories for bio-chemistry sustained by Messrs. Burroughs, Wellcome & Co., and Mr. Greenwood to a medical inspectorship at the Ministry of Health where a department of medical statistics is in contemplation.

Miss Cecily Thompson and Miss Hilda Woods, formerly temporary assistants in the department of Statistics, have also resigned on receiving appointments in the Ministry of Health under Mr. Greenwood.

The Governing Body has not thought it advisable, owing to the greatly increased cost of maintaining the Institute, to fill the positions thus vacated and for the same reason it is improbable that it will continue to have a department of medical statistics at the Institute in the near future. Mr. Greenwood and his staff are for the present accommodated at the Institute by arrangement with the Ministry of Health so that his former colleagues still have the advantage of his expert statistical knowledge on occasion.

During the war, the position of assistant bacteriologist at the serum department has been held in succession by Miss Homer, Dr. Zilva and Mr. Roger. The last mentioned resigned in October last, and in order to diminish the strain upon the bacteriologist-in-charge, the Governing Body considered it advisable to secure the services of a more experienced bacteriologist who could relieve Dr. MacConkey of some measure of the responsibility attached to the position. To this end, they have transferred Dr. Petrie, who began his career on the staff of the Institute at Elstree, in 1904, under the late Dr. George Dean, to the serum department. It has also appointed a clerk to the serum department in order to relieve Dr. MacConkey and the central office of the work of record-keeping, petty administration and accounting. Mr. J. W. Brown, formerly an assistant in the statistical department has been transferred to Elstree for the purpose.

The transfer of Dr. Petrie and the departure during the last few years of Dr. Henderson Smith and Dr. Penfold, who have accepted appointments elsewhere, has seriously reduced the staff of the Bacteriological Department. Upon this department has fallen the burden of a considerable amount of routine investigatory work for public bodies and the manufacture of large quantities of prophylactic vaccines for the Ministry of Health and other public authorities in this country, or its colonies and dependencies, thereby curtailing the time available to the staff for their own researches. Nevertheless, the Governing Body regrets that, owing to the depreciation in the value of money and the unsettled financial conditions prevailing, it has not so far, felt justified in increasing the permanent staff of the department. It is not, however, unmindful of the position of affairs and also of the considerate way in which Dr. Ledingham and his colleagues have met the great demands upon their time in order to supervise and carry out the unusual amount of routine work which has been required of the department.

Miss Homer, who was a temporary assistant in the bio-chemical department during the latter years of the War, has left the Institute. During her stay at the Institute, Miss Homer continued to devote herself with success to the elucidation of problems connected with the concentration of Antitoxic Serum commenced by her whilst at the serum department. Miss Homer's researches will be referred to when considering the scientific work of the Institute during the year.

Dr. Zilva, another temporary assistant, continues to work in the bio-chemical department under Dr. Harden, and his salary is found by a grant from the Medical Research Council. In consideration of the valuable services rendered by Dr. Zilva to the serum and chemical departments during the war, he has been appointed an honorary assistant whilst he continues to work in the Institute.

In the department of experimental pathology, several minor changes in personnel have occurred. On account of the restriction of the food supply during the war, Dr. Chick, in 1916, gathered together a number of scientific and medical women to work with her upon accessory food factors and more particularly to ascertain the content of the various vitamines in different foodstuffs and the effect of cooking and preservation upon them. Most of these ladies held collegiate appointments elsewhere and have had to return to their pre-war duties. Mesdames Barnes, Davey, Delf, Price and Runge have left on this account, and Miss Henderson Smith and Miss Rutherford have temporarily joined the staff of the department to assist to carry on this work.

Some members of the staff have been seconded for scientific service abroad. In August last, at the request of the Accessory Food Factors' Committee, appointed jointly by the Lister Institute and the Medical Research Council, Dr. H. Chick was granted leave to proceed to Vienna to study diseases due to food deficiencies, which are so rife in that unfortunate city. The object of Miss Chick's mission will be discussed later when dealing with the work of the Committee on Accessory Food Factors.

Miss Chick was accompanied by Dr. Elsie Dalyell, a Beit Fellow, who before the outbreak of war was conducting researches at the Institute. In February of this year the personnel of the mission was increased by the transfer of Miss Margaret Hume, a temporary assistant in the department, to Vienna.

In March, 1920, the services of Mr. Bacot, entomologist to the Institute, were lent to a commission appointed by the League of Red Cross Societies which proceeded to Poland to investigate the etiology of typhus fever.

Miss Fletcher, the librarian and private secretary to the director, resigned in August, 1919, and returned to Australia. The Governing Body accepted her resignation with regret, for not only had she rendered valuable service to the Institute in both capacities for several years, but, during the absence of the director on military service, had acted as secretary to the board to their complete satisfaction. Her position has not been filled, the care of the library being, for the present, undertaken by the chief clerk with a member of the scientific staff as honorary librarian.

Miss Rhodes has also resigned on being appointed, by the Medical Research Council, assistant curator of the National Collection of Type Cultures which is located at the Institute and subsidised by the Medical Research Council.

Dr. R. St. John Brooks, formerly a research student at the Institute, who has been appointed Curator of the National Collection by the Medical Research Council, has been made an honorary member of the staff of the bacteriological department so long as the collection is located at the Institute.

RESEARCH WORK.

The scientific activities of the Institute have not yet reached the pre-war level. This is to be accounted for to a large extent by the diminished staff, and the correspondingly increased demands upon those remaining for the performance of routine duties. This fact has already been alluded to in the case of the bacteriological department in which its operation has been most marked. Another factor which has been contributory is the considerable amount of re-adjustment at the Institute contingent upon the war, but the most important cause which has been operative is the scarcity of research workers. For five years past the supply of young men suitably trained and willing to devote a few years to medical research has been seriously curtailed and those who have sought the hospitality of the Institute have done so, more with a view to learning methods of investigation prior to resuming or entering upon scientific research. In this direction the various departments have performed a deal of useful post-graduate instruction, particularly to colonial officers who have served in the war, but the actual return for this labour is not yet.

The investigations on accessory food factors which are being carried out at the Institute, the nature of which is described in some detail below, were materially assisted during 1919 by grants from the Medical Research Council and the Governing Body is glad to report that the Council has allocated a further very substantial sum towards their continuation during the present year.

It is the practice of the Medical Research Council to subsidise researches, the programmes of which have received its approval and the heads of the departments of biochemistry and pathology are responsible to the Council for the appropriate expenditure of these grants.

Department of Bacteriology.

On his return from service Dr. Ledingham was invited by Sir David Bruce, the Chairman of the War Office Trench Fever Committee, to assist the committee in its work, and he took up the question of the transmissibility of the trench fever virus to laboratory animals, using for the most part lice excreta collected by Mr. Bacot from lice fed on experimentally infected volunteers at the New End Military Hospital. Though the results have been in the main negative, so far as one can judge from the temperature charts in inoculated animals, there have been a few striking exceptions both in guinea pigs and rabbits in which a definite febrile phase has intervened after an incubation period of 7—10 days. The actual proof of transmissibility however, even in the apparently successful cases cannot yet be held as established and a further series of experiments in the same direction is contemplated. There is a danger that the trench fever virus may perish in the near future unless facilities be given for its occasional propagation in man with a view to the renewal of the stock of infective lice excreta. In the course of his work on this question Dr. Ledingham has been able to establish the fact that the peculiar coccoid bodies (Rickettsia) found in the excreta of lice fed on trench fever patients and to the study of which Dr. Arkwright and Mr. Bacot have notably contributed, are capable of being agglutinated in a similar manner to bacteria in general by the sera of immunised animals. This fact will be of great assistance in further experimental studies, but owing to the virtual disappearance of trench fever it does not seem likely that the reaction can be effectively tested from the diagnostic point of view.

Dr. Ledingham was some months ago invited to join the "Pathological Methods" Committee of the Medical Research Council. Dr. Arkwright has maintained his connection with the Trench Fever Committee now about to be dissolved owing to the closure of the New End Military Hospital. The records are now in the Lister Institute and decision is awaited as to the form in which the final report is to appear. Some work in tabulating the material has already been done by Dr. Arkwright.

Dr. Arkwright has also been engaged in a study of certain problems in bacterial variation and has elicited the fact that cultures of dysentery bacilli and probably other organisms of the great coli-typhoid group which agglutinate perfectly uniformly with the respective immune serum when tested in the mass, may as the result of examination of individual colonies, be found to consist really of two types of organisms, the one re-acting like the parent mass, the other possessing little or no serological affinity with it, though in other respects similar. The demonstration of these variants in cultures will certainly have to be reckoned with in connection with modern attempts to classify bacteria on serological grounds. Dr. Schütze has continued his researches on the serological interrelationships of the Salmonella group of organisms to which the paratyphoids infecting man belong, in addition to many others associated with, or responsible for disease in animals. Some results of his work he has published during the year. Many problems however remain for solution and the research is being continued.

Dr. Lepper, who was some months ago elected to a Beit Fellowship, is carrying out an experimental enquiry into the pathogenesis of bacterial infections of the bladder and urinary tract.

Major Gloster, I.M.S., is engaged in the preparation of diagnostic sera for pneumococcal types with a view to the classification of the pneumonias prevalent in this country. Information on this subject is not available and in view of the success obtained in U.S.A. with the serum treatment of pneumonia, urgently requires investigation.

In the last report, mention was made of the valuable work carried out by Miss M. Robertson during the War on the anaerobes associated with gas gangrene. The Anaerobic Committee which was originated by the Medical Research Council and of which Miss Robertson acted as secretary, published its final report in the Autumn of 1919 and sets of cultures collected by Miss Robertson and described in detail in this report have been distributed to universities and scientific institutes at home and abroad. This collection is particularly valuable as being the outcome of the critical collaboration of the members of the Committee. A set has been deposited with the National Collection of Type Cultures and will be maintained by the staff.

Miss Robertson has also made a special study of *Vibrion septique* strains especially from the standpoint of serological relationships and toxin production. This research has recently appeared and the important fact has been established that the toxin elaborated by strains differing in their agglutination relationships can be neutralised by an antitoxin prepared by immunisation with the toxin of any member of this group. In Tetanus strains also this law would appear to hold and the point is one of very great importance in the manufacture of antitoxic sera.

Miss Robertson has given instruction in anaerobic studies to many workers including Dr. Duke, Uganda Medical Service and Col. Fairley, A.A.M.C., while the hospitality of the department has been tendered to the following workers for shorter or longer periods; Capt. Watson, of the Canadian Vet. Service, to complete a study of Epizootic Lymphangitis, Dr. Marjorie Little, Miss Dorman, Major Seddon, A.A.V.C. and Major Inglis.

Department of Biochemistry.

Much of the work in this department has been a continuation of the programme of experiments on accessory-food-factors outlined in last year's report.

There are reasons for supposing that rickets and xeropthalmia in children and osteomalacia in adults may be due to deficiency of the "Fat-soluble A" factors in the diet. This supposition has been strengthened by experience gained in many countries subjected to food restrictions during and since the War. Experiments made in the department upon monkeys, to which a diet deficient in this respect was administered for upwards of nine months have, however, so far thrown no definite light upon this question. In one animal general oedema developed but it is not certain that this was caused by the deficiency in the fat-soluble A. factor. The experiments are being repeated with various modifications.

Experiments with the fat-soluble factor have hitherto been rendered somewhat indecisive owing to the necessity of administering the fat-soluble factor associated with the fat in which it occurs. By employing, as a source of the fat-soluble factor, an alcoholic extract of green leaves and carrots, both of which contain it in considerable amount, Dr. Zilva proposes to avoid this uncertainty.

Endeavours are also being made to isolate the active principles responsible for the actions of both the fat-soluble factor and the anti-scorbutic substance. All attempts have hitherto failed here, as elsewhere, but further efforts are being made.

An estimate of the antiscorbutic requirements of the monkey has been concluded and has led to the interesting result that this animal requires the same absolute amount of orange-juice to prevent the onset of scurvy as the guinea-pig, an animal of about one-eighth its weight, although the time of onset of the disease is very different, being about three weeks in the guinea-pig and two months in the monkey.

From the experience of clinicians as to the amount of orange juice which it is necessary to administer daily to a child to obviate the occurrence of scurvy when the diet is otherwise devoid of antiscorbutic, the requirements of the human organism are probably much nearer to those of the monkey than of the guinea-pig, but an exact determination of this point has not yet been made.

Experiments have also been made on the need for accessory factors among frogs and insects, partly to ascertain how far down the animal kingdom the need for these factors extends, and partly with the hope of finding an experimental animal with which results could be obtained more rapidly than heretofore.

Adult frogs appear to require the water-soluble factor, but the relations for larval frogs have not yet been made clear.

The question of the production of the water-soluble accessory by yeasts has also been under investigation and preliminary results have been obtained which indicate, in opposition to some results published in America, that this accessory is actually produced by yeast in a medium originally quite free from it. In this connection the remarkable impulse given to the growth of yeast in synthetic media by the addition of small quantities of materials such as milk and lemon-juice, is being investigated by Drs. Sato and O. K. Wright in order to ascertain whether they act by the direct supply of a suitable food material, by affording time for adaptation of the yeast to the synthetic media, or by supplying accessory food factors. It is probable that these results will be of considerable interest in relation to many problems of bacterial growth.

It is generally recognised that a deficient diet renders the subject more liable to disease but no exact study of the relative importance of the various constituents of the diet in this respect has yet been made. This is now being done by Dr. Zilva, animals being kept on diets deficient in definite constituents and their susceptibility being tested by their capacity to produce agglutinins and other anti-bodies in response to immunisation as well as by direct infection.

The concentration of orange-juice so as to preserve its antiscorbutic properties has been investigated by Dr. Robison, who has found that this juice by rapid evaporation at a low temperature can be reduced to a dry residue without suffering appreciable loss of its antiscorbutic power and that this residue still retains a considerable degree of potency after storage for two years in the dry condition. The preparation on a commercial scale of dried fruit juices of high antiscorbutic power appears to be quite practicable and should prove of considerable value where an antiscorbutic food is required in a highly concentrated and stable form.

The experiments on the effect of cold storage on the fat-soluble factor in butter, undertaken for the Food Investigation Board have been concluded and a report is in course of publication. The importance of accurate information on this point, in connection with the importation of butter from Australia and New Zealand will be obvious.

In addition to the work on deficiency diseases outlined above, the constitution of the hexosemonophosphate found in yeast-juice and the structure of hexosediphosphoric acid are being worked out by Dr. Robison and the function of aldehydes in alcoholic fermentation by the Hon. F. R. Henley, these questions being of considerable importance for the intimate comprehension of alcoholic fermentation and probably also of the chemical changes produced by bacteria.

The research into the principles underlying the concentration of antitoxins by fractional precipitation with neutral salts, undertaken by Miss Homer during the past few years, and referred to in previous reports, has been continued by her during the year. Further useful results have been attained. Hitherto, the process as employed in serum laboratories has been largely empirical and large quantities of antitoxin have often been lost during refinement for reasons which have escaped comprehension.

The action of sodium sulphate, which possesses an advantage over ammonium sulphate in that it is not necessary to remove the last trace of this salt by tedious dialysis, as is the case with ammonium sulphate, has been studied. The relation between concentration of the salt and the proportion of antitoxin carried down with the protein precipitated has been quantitatively determined under a variety of conditions. As a result of this investigation it is possible to refine and concentrate antitoxin with a loss of less than 3 per cent. as compared with 20 per cent. by the older processes.

The distribution of antitoxin in the protein fractions in the case of the serum of a horse immunised against diphtheria, tetanus and dysentery respectively, has been studied. Considerable differences have been discovered in the relationship of these various antitoxins to the serum proteins. These have been provisionally determined. The results are important and indicate that a routine process of concentration which affords excellent results with say, diphtheria antitoxin, will, if applied without modification to other antitoxic sera, be followed by serious loss of the active substance. Two papers giving an account of these experiments have been published during the year.

Department of Experimental Pathology.

The main work of this department has been the continuation of the researches commenced by Dr. H. Chick, in 1916, upon diseases due to deficiency of accessory food factors. The programme outlined in the last Annual Report which was largely concerned with the content of various foodstuffs in antiscorbutic and the influence of heating and preservation upon this principle, has been to a large extent completed by Mesdames Barnes, Chick, Delf, Hume, Rhodes, Henderson Smith and Rutherford, and it is now possible to give the approximate value of a number of common articles of diet.

The following list summarises the results of some of these laborious experiments. The value attached represents the conclusions from hundreds of observations each extending over 3—6 months, but nevertheless is susceptible of a considerable error owing to the idiosyncracy of the animals subjected to experiment. For purposes of comparison the average value of 1 gram. of lemon juice is given as 100:

Fresh Lemon Juice	100
Fresh Orange Juice	100
Fresh Cabbage Juice	100
Ripe Onion...	100
Fresh Swede Juice	60
Fresh Turnip Juice	60
Green French Beans, uncooked... ...	30
Germinated Peas	30
Carrot Juice	7
Beet Juice	7
Potato, boiled 30 mins.	7
Grape Juice	5
Fresh Cow's Milk...	1 to 1·5
Dried Cow's Milk...	less than 0·5

By a similar series of experiments the influence of heating and drying upon the antiscorbutic value of cabbage, fruit juices and milk has been determined by Mesdames Delf, Barnes and Hume. In the case of vegetables drying even at low temperature was found to reduce their value to 10 per cent. or less of the original, but in acid fruit juices the factor is much more stable. The cause of this is not yet clear for on heating and drying cabbage, artificially made of the same acidity as the fruit juices, rapid destruction of the active principle occurred. Dried milk was found to possess less than half the antiscorbutic value of fresh milk and a monkey developed acute scurvy on a maximum diet of dried milk and was cured by the same quantity of fresh, a result of obvious import for infant feeding.

The value of three Indian dried fruits, tamarind, coccum and mango was evaluated by Dr. Chick and Miss Hume and found to be equal to that of fresh carrots or cooked potatoes.

Early in the year an attempt was started by Dr. Chick and Miss Hume to produce pellagra in five monkeys by feeding them on a diet in which the protein was derived from maize. The diet was deficient in protein of good biologic value but complete in every other respect. The experiments lasted in each case over six months. All the animals gradually lost in weight and became very weak. One of them developed cutaneous lesions strikingly like those of pellagra in the human subject and two others patches of dermatitis of the same nature. The loss of weight was stayed by the daily addition of tryptophane and diamino acids but otherwise no improvement was noticed. In the case with the severe skin lesions, a dramatic cure was, however, brought about directly casein was added to the diet.

These experiments are of interest as supporting by experiment, the conclusions arrived at by Goldberger in America and Wilson in Egypt.

The histology of the bone lesions occurring in animals due to deficiency in antiscorbutic and fat-soluble factors, both separately and together, has been undertaken by Miss Tozer. Hitherto, her results have been published as appendices to various papers by other workers in the department, but she is now engaged in the preparation of a full account of her observations, which have an important bearing upon the pathology of rickets and scurvy in young children.

At the beginning of the year 1920, a valuable addition to the workers upon deficiency diseases occurred by the accession of Dr. Helen Mackay, who was appointed a Beit Fellow from that date. Dr. Mackay is engaged in observations upon the prophylaxis and cure of rickets by dietary means at an infant clinic of which she is Medical Officer and is endeavouring to produce rickets in young animals experimentally by diets deficient in various directions, with a view to contributing to our knowledge of the etiology of this common disease fraught with so many evil consequences to the population.

After an absence of four years on military service, Dr. J. O. Wakelin Barratt resumed his tenure of a Beit Fellowship and has been continuing the investigations he was previously engaged upon in the department, upon the coagulation of blood. These have, during the year, been more particularly concerned with the essential nature of the action of thrombin upon fibrinogen and the mechanism of subsequent fibril-formation. An account of Dr. Barratt's recently obtained results appears in the current number of the *Biochemical Journal*.

The histological study of a large amount of pathological material showing a great variety of types of broncho-pneumonia following influenza which was collected by Major Patterson and Dr. Martin in France during the epidemic of November—December, 1918, was commenced by the former but suspended owing to the departure of Major Patterson for Australia to take up the position of Director of the Institute for Medical Research attached to the Melbourne Hospital.

A critical examination of Barger's method of determining in capillary tubes the molecular weight of a soluble substance when but small quantities are available has been made by Dr. Yamakami. The method gives sufficiently accurate results but the equilibrium appears not to be brought about entirely by differences in vapour pressure as was supposed. With this method, the molecular weight of casein has been determined by Dr. Yamakami.

Dr. Yamakami has also investigated the pathology of so-called hæmolytic fever. When haemolysis occurs in man, both in blackwater fever and in Raynaud's disease, it is associated with a rise of temperature. This he finds to be due to the pyrogenetic action of some constituent of the blood corpuscles other than the hæmoglobulin. These researches have recently been published in .the *Biochemical Journal* and *Journal of Pathology*.

Work has also been carried out on methods of adjusting the reaction of culture media, &c., to any desired hydrogen ion concentration and the influence of subsequent sterilization and keeping, on the reaction. A simple and rapid method of attaining this end with sufficient accuracy has been developed, which should be useful to bacteriologists and others.

The nature of acidosis and the share of the plasma proteins in carrying CO_2 in the body has also been under investigation. Incidentally a method of titrating the available bases in serum, suitable for clinical use, has been arrived at.

Colonel Stewart, I.M.S., is continuing his observations on the life history of *Ascaris lumbricoides* and the mechanism of infection of man by this parasite, in the department. An account of his previous experiments appeared recently in *Parasitology*.

The hospitality of the department has also been extended to Sir J. Rose Bradford and Drs. Bashford and Wilson; to Dr. Nathan Raw, Lt.-Col. Fairley, A.M.C., Major Kellaway, A.M.C., and Major Douglas, A.M.C., over various periods for their researches.

The transfer of Dr. H. Chick and Miss M. Hume from the department to Austria and the work they are engaged upon will be described under the heading "Committee on Accessory Food Factors."

Department of Entomology.

The most important part of the work carried out has been Mr. Bacot's contribution to the research on the etiology of trench fever (*see* Trench Fever Committee). He has had control of the entomological side of the enquiry and been responsible for the supply of infected lice, the superintendence of feeding them on patients and the collection of their excreta for further experiments.

The appearance and distribution of Rickettsia bodies in the insects after being fed on patients has been studied in further detail and has confirmed the opinion arrived at, that such bodies do not occur in lice unless they have had a meal of blood from a patient suffering from the disease. They appear first of all in immense numbers in the stomach of the insects 8—12 days after the meal, the time varying with the temperature at which the lice are kept Their occurrence in the stomach and gut thus corresponds with the period at which the lice are found to become infective. They are not discoverable in the sections of the insect anywhere else than in the alimentary canal.

A trial of Colonel W. G. Liston's method of destroying vermin by means of HCN. gas was carried out by Mr. Bacot and Lt.-Col. Liston. It was found effective, but it was also found that in the temperate climate of London, either the concentration of HCN. or the time of exposure must be considerably increased beyond that required in Bombay, where the original experiments were carried out.

Other experiments which have been made by Mr. Bacot on the destruction of lice, are the determination of the survival periods of lice and nits when submerged in salt water, tap water, lysol, and kerosene, and after subjection to varying pressures of SO_2. These experiments which were undertaken in view of their urgent military need, are described in detail in papers by Messrs. Bacot and Talbot, the titles of which appear in the list appended to this Report. The incubation period of the eggs of the horse louse, *Haematopinus asini* has under various conditions, been determined by Messrs. Bacot and Linzell.

After extensive experience with a great variety of insecticidal substances, Mr. Bacot is more and more confirmed in his opinion that to destroy vermin, recourse should be had wherever possible to the application of dry or moist heat. It is not necessary to heat to an extent that would be detrimental to clothing, 55°C. for 30 minutes being amply sufficient.

For some months Major Boyd, R.A.M.C., was attached to the department in order to study methods of entomological investigation.

Department of Protozoology.

Owing to the death of Professor Minchin, in 1916, the absence of Dr. Woodcock on military service, and the fact that during the War Miss Muriel Robertson turned her attention to the bacteriology of anærobes infecting wounds, as presenting problems, the solution of which was urgent in the interest of the wounded, protozoological work at the Institute has, until recently, been in abeyance.

On the death of Prof. Minchin, Dr. Woodcock was appointed by the University of London, "Acting Head of the University Department of Protozoology," but it is doubtful whether the University now has sufficient funds available to continue the professorship and even supposing an adequate sum to re-establish the chair were forthcoming, it would not necessarily be attached to the Institute as heretofore. The Governing Body is in negotiation with the University and hopes that some arrangement may be made to establish a readership in the meantime and attach this to the Institute. It is of opinion that such an appointment should be held by one who approaches the subject of protozoology from the broad standpoint of general biology.

Dr. Woodcock returned to this country in the summer of 1919, and is at present accommodated at the Institute. He is engaged in working up the extensive material illustrating various phases in the life-history of the malarial parasites which he collected in Palestine.

Miss Robertson's energies were, for the first half of the year under review, devoted to the completion of her work on the bacteriology of the anaerobes, to which reference has already been made and to the publication of the report of the Anærobic Committee of the Medical Research Council of which she was the Secretary.

Miss Robertson has now turned her attention once more to work on Protozoa and is engaged in a research upon the mechanism of the immunity to *Trypanosoma lewisi*, so readily acquired by rats. Should she be successful in interpreting the means by which these animals protect themselves against this trypanosome, it may be possible to apply the knowledge to the treatment of the fatal trypanosome infections of human beings.

During the year Lt.-Col. Fairley, A.M.C. (Assistant Director, Research Institute, Melbourne Hospital) and Dr. Sulcz (Government Bacteriologist, Danzig), had the advantage of studying methods of protozoal research in the department under Miss Robertson.

Department for the Preparation and Study of Anti-toxic Sera.

During the year much work has been carried out in order to find a method of standardising anti-meningitis serum and antistreptococcus serum, but hitherto without any great measure of success. In the case of the latter serum some encouraging results have, however, been obtained.

The method of standardising antidysentery serum adopted in the department has given fairly consistent results during the year. Unfortunately, reliable clinical reports concerning the use of this serum are difficult to obtain, so that the value of laboratory tests as a measure of therapeutic efficacy cannot be arrived at. Until such reports are forthcoming we shall not make any progress in the knowledge of either the administration or the preparation of this serum.

The experiments as to whether antitoxic serum saturated with sodium chloride would prove stable enough to be used as a standard antitoxin have been proceeded with during the year. The brined Diphtheria antitoxin and the brined Tetanus antitoxin have retained their original potency during the twelve months and proved quite as stable as the standard sera sent out by the U.S.A. Government laboratory at Washington. These salted sera have proved a great boon. It has been possible to include a "standard-antitoxin" control whenever a test of antitoxic sera was carried out (a proceeding which could not previously be carried out on account of shortage of standard serum), and thus check results more closely. Some of these salted sera have been sent to the Hygienic Laboratory, U.S. Public Health Service, Washington, with the request that they compare them with their standard sera. If, as is hoped, the comparison prove favourable, then brined serum will come into use in every serum laboratory to supplement the supply received from the Central station. Brined Antidysentery serum is now being studied with the same object in view, and the possibility of exploiting the method in the case of vaccines is also being tested.

The investigation of the best routine method of concentrating antitoxin by means of sodium sulphate has been continued. Our knowledge of the subject has been thereby considerably extended but the problem is not yet completely solved. The solution appears, however, to be approached and a good routine method is in sight.

Prior to 1915 it was the practice of all serum laboratories to obtain "standard" diphtheria antitoxin from an official German source, and each batch of serum issued was evaluated by comparison with such standard antitoxin. When this supply was no longer available, the Public Health Service of the U.S.A. undertook the provision of standard antitoxin for the use of manufacturers in America and generously placed this also at the disposal of serum laboratories in allied countries. In 1907, the Public Health Service of the U.S.A. defined a unit of Tetanus antitoxin in terms of which the potencies of all anti-tetanic sera sold in the States must be stated. This unit proved to be vastly more satisfactory than those previously employed and was adopted by the Institute shortly afterwards. Since then, through the courtesy of the Director of the Public Health Service, supplies of standard tetanus toxin for the use of the serum department have been received from time to time as required.

The Governing Body desires to again express its thanks to the Director of the Hygienic Laboratory, U.S. Public Health Service, Washington, for his great kindness in continuing to supply the Institute during the year with standard tetanus toxin and antitoxin and with standard diphtheria antitoxin.

Department for the Preparation and Study of Anti-Variolous Vaccine.

The problem of the cultivation and identification of the specific organism of vaccinia has been proceeded with. Its solution is still hampered by the fact that, under artificial conditions, the virus loses its virulence, and thereby its ability to cause specific results *in vivo*. The experiments indicate that the organism can be propagated, although it is no longer capable of producing its specific effect. Evidence that certain animal products are especially congenial to the virus of vaccinia, has opened up an encouraging avenue and this is being explored.

A practical difficulty in the manufacture of antivariolous vaccine which is frequently encountered in hot and dry weather, is the hardening of the vesicular surface. This occasions a diminution of both the supply and potency of the yield. It can be successfully met by the simple expedient of applying vaseline to the vaccinated area at the time of inoculation.

COMMITTEE ON TRENCH FEVER.

During the past year the Institute has contributed the sum of £622 19s. 6d. towards the expenses of this investigation into Trench Fever. Further observations have confirmed the experience of the Committee gained during the previous year. As far as circumstances have permitted, the work has been carried on in connection with the New End Hospital, Hampstead, up to the time of closing the hospital by the War Office in the middle of March, 1920.

Dr. Arkwright and Mr. Bacot have continued and extended their observations on the peculiar small micro-organisms discovered both by Töpfer and themselves in the intestines and fæces of lice some time after feeding upon a patient suffering from trench fever. These microbes conform to the description given by Ricketts, of those found by him in ticks, fed upon cases of Rocky Mountain fever, and by Ricketts and Wilder in lice fed upon typhus patients.

This microbe can be seen in the excreta of lice which have been fed a few days previously on a patient and the probability that it is the causal organism has been increased both by repeated observation of its close association with the disease and their absence in the excreta of normal lice and also by Dr. Ledingham's experiments with animals already referred to in this report. The immediate importance of acute trench fever as a cause of inefficiency ceased with the armistice and the consequent increased opportunities for cleanliness and disinfestation. The disease itself—trench fever—has almost disappeared as an acute disease. The knowledge gained by its investigation is, however, valuable both for future guidance and as a help to elucidating the closely analagous problem of the etiology of typhus fever. Mr. Bacot is at present in Poland where he is making use of knowledge acquired whilst investigating trench fever, in an investigation into the etiology of typhus fever under the auspices of the League of Red Cross Societies. The importance of ridding the population of this country from lice has been very much emphasised by the work of the committee and the means of doing this have been learnt largely as the result of Mr. Bacot's work. The fact that trench fever has not been introduced into this country by returning soldiers must be to a great extent due to the advice which the Trench Fever Committee has been in a position to give as to the real danger from lice and the simplest methods of destroying them.

Communications have been made on the subject of trench fever and its cause by Mr. Bacot and Dr. Arkwright to the epidemiological section of the Royal Society of Medicine, and to the Society for Tropical Diseases and Hygiene, in February, 1919, and more complete papers on this subject have appeared in the *Journal of Hygiene*, April, 1919.

COMMITTEE ON ACCESSORY FOOD FACTORS.

(Appointed jointly by the Lister Institute and the Medical Research Council.)

This Committee, the formation, objects and personnel of which were described in the last report, is still alive. It has issued a valuable monograph on the present state of knowledge concerning accessory food factors containing a bibliography of the subject to date, and a shorter memorandum on the importance of accessory factors in food for the guidance of those engaged in the administration of food-relief to famine-stricken districts. The latter has been, and the former is being translated into German by the public health authorities at Vienna.

In August, 1919, the committee requested the Governing Body to allow Dr. Harriette Chick, the secretary to the committee, to proceed to Vienna, accompanied by Dr. Elsie Dalyell (a Beit Fellow), to study deficiency diseases there and particularly to ascertain how far conclusions arrived at by laboratory experiments applied to mankind. Permission was granted to Miss Chick to transfer her investigations to Austria. The Medical Research Council voted a sum sufficient to meet the expenses of the investigation for several months and through the kind offices of Sir William Goode, in charge of the food relief work of the Supreme Economic Council, both ladies were attached to the British Relief Mission in Vienna. Recently the working party has been increased by the addition of Miss M. Hume, an assistant in the department of experimental pathology.

The Committee has received two interim reports from Vienna indicating that the amount of material for study is almost overwhelming. In this famine-stricken city 70—80 per cent. of the children, from 1 to 4 years of age, suffer from rickets and cases of infantile scurvy and osteomalacia are abundant.

Miss Chick has been successful in establishing cordial relations with the medical profession and public health authorities in Vienna and has, in consequence, obtained every facility for her investigations in the Viennese clinics and hospitals and the active collaboration of their staffs.

The mission has concerned itself chiefly with the study of scurvy, rickets and osteomalacia. An outbreak of infantile scurvy occurred during October and November, 1919, and the mission had the opportunity of treating several cases in the infant ward under the charge of Professor von Pirquet. A variety of substances found by experiment on animals to be the most potent antiscorbutics, were added to the diet, and the results were gratifying, cures being more rapid and more complete than those usually obtained in the clinic and other hospitals.

With the co-operation of Dr. Zafl, the Physician in Charge of a Home for 500 Infants, in Vienna, certain additions were made to the diet of children suffering from scurvy. As extra antiscorbutics, raw swede juice, orange juice, or neutralized lemon juice were used, extra antirachitic material was given in the form of butter and cod-liver oil; to some children both these extras were given. The effect after two or three months was so encouraging that the scope of the experiment was continually enlarged at the desire of Dr. Zafl, so that there may soon be no untreated infants left to serve for comparison.

In Vienna, not only scurvy, but rickets, developed with great frequency in breast-fed infants, often less than six months after birth. An experiment is in progress by which mothers, nursing young infants, are provided with a daily ration of butter (50 grams) and raw swede (30 grams). Careful investigations made in New York by Hess and Unger, in 1917, afforded statistical evidence in favour of the common belief that cod-liver oil has an effect in preventing rickets, and it is proposed to make a similar investigation in Vienna, where almost all children of the poorer classes over one year old are rickety. On the same lines a precise study is being made in the University childrens' clinic; where Professor von Pirquet's so-called "Nem" system of nutrition is adopted. Under this system the energy value of the diet is nicely adjusted to the needs of the growing child, but no attention is paid to the vitamine value. Professor von Pirquet has assigned to the mission six cots in a ward served by a kitchen in which all food is prepared with laboratory exactness and subject to regular analysis.

It appears that osteomalacia became a common disease in both sexes and at all ages in the spring and summer of 1919. The cases that then occurred improved during the later part of the summer, but patients again became numerous about the beginning of December. Formerly the disease was rare and confined to pregnant women in Vienna, as elsewhere, but enquiry showed that it had been present almost continuously during the war in many of the convents of the city, where, especially since the revolution, great privation as regards both food and fuel has been suffered. In one convent a large proportion of nuns were, in December, 1919, found to be suffering from the disease, some of them in a very severe form. Between twenty and thirty cases were treated in three groups: One received extra calories in the form of sugar and cereals, another, extra food in the form of vegetable fats, the third, extra fat containing "fat soluble" accessory factor in the form of butter, eggs and cod-liver oil. The results obtained during the first two months are held to make it probable that deficiency of the "fat soluble" accessory factor is the cause. An enquiry begun at the Allgemeines Krankenhaus in January, 1920, is considered to point in the same direction. Cases there are under the care of Professor Schlesinger, who is of opinion that the disease is probably nutritional and due to some special deficiency in the diet rather than to general undernourishment. He, therefore, seems to be approaching the opinion formed on the experiments here, in India and in America, as to the importance of the accessory food factors, experiments which it would appear, have hitherto attracted little attention in Vienna. Another enquiry is in progress in Professor Wenckebach's clinic. Cases of osteomalacia are selected from among those applying to the medical departments of the insurance benefit societies and it is proposed to institute a trial, on a large scale, of the value of cod-liver oil.

Dr. Chick has given several lectures to medical, scientific and pediatric societies which were followed by interesting discussions. A large number of physicians related their personal experience of deficiency diseases during the War, and put on record many significant observations concerning "hunger-polyneuritis," "hunger-oedema," and scurvy. The fact that recent work on the subject of accessory food factors is not well known in Germany and Vienna is to be accounted for by the circumstance that it has been published almost exclusively in English and American journals, which have for some time been out of reach of Austrian and German readers.

The Committee on Accessory food factors has met from time to time with the idea of co-ordinating the work of different observers which is supported by grants from the Medical Research Council, or carried out at the Institute. In this way each investigator is made acquainted with that which is taking place in the different laboratories and an economy of effort obtained.

On Dr. H. Chick's departure from this country, Professor Martin was appointed a representative of he Institute on the committee and Professor Harden undertook the secretaryship.

NATIONAL COLLECTION OF TYPE CULTURES OF BACTERIA AND PROTOZOA.

The importance to biologists generally and to bacteriologists in particular, of having some reliable bureau to which application may be made for authentic bacterial and protozoal cultures is one that cannot be underrated, especially at a time like the present when so much attention is being devoted to the study on improved lines of fundamental principles in bacteriological technique and to the systematic classification of bacteria. In the past the needs of workers in this connection have never been fully met though the Lister Institute has for many years assisted workers both at home and abroad so far as the resources of its own private collection permitted.

The Medical Research Council have had this question under consideration since its inception and with the object of supplying what is after all an urgent national need, have recently proceeded to the establishment of a National collection of type cultures of bacteria and protozoa. By arrangement with the Governing Body, the collection is housed at the Lister Institute, which provides accommodation and all facilities for the work of the collection. The Governing Body have placed the part time services of Dr. Ledingham at the service of the Medical Research Council to be director of the bureau. Dr. Ledingham will be responsible for its efficient management. Dr. R. St. John Brooks has been appointed by the Medical Research Council to the full time post of curator and Miss M. Rhodes to that of assistant curator.

It is proposed to collect and maintain bacterial strains from all departments of bacteriology, human, veterinary and economic, but for some time to come the efforts of the staff will be directed more particularly to the securing of fully authenticated strains responsible for, or associated with disease in man and animals. Particular attention will be devoted to ensuring accurate pedigrees. Cultures will be supplied on demand to all workers at home or abroad and as a rule a nominal charge per culture will be made to defray postage and media. At present the bureau is in a position to supply strains representative of at least the common human infections. At a later date it is proposed to prepare a catalogue for publication.

PRODUCTION OF SERA, VACCINES AND ANTI-VARIOLOUS LYMPH.

During the year ending March 31st, 1920, considerable demands by the Military and Naval Authorities were received for sera, although as anticipated, these were somewhat less than those of the years during which the war was in progress.

An enquiry from the Ministry of Health as to whether the Institute would undertake the preparation of influenza vaccine was received at the end of 1919, and the Institute has supplied that Department with 1,550,000 c.c. of this preparation. Large quantities of plague vaccine have also been supplied to the War Office.

The quantities of the Institute's products supplied to the Army, Navy and Ministry of Health, is set forth below:—

	War Office.	Admiralty.	Overseas Forces, &c.	Ministry of Health.
Diphtheria Antitoxin (Doses of 2,000 U.) ...	20,700	1,115	7,026	—
Tetanus Antitoxin (Doses of 1,500 U.) ...	100	872	3,216	—
Antidysentery Serum (Doses of 20 c.c.) ...	76,582	605	1,370	—
Antistreptococcic Serum (Doses of 10 c.c.) ...	14,300	504	9,374	—
Antimeningococcic Serum (Doses of 30 c.c.) ...	12,603	8	1,020	—
Agglutinating Sera (Phials of 1 c.c.)	1,352	87	500	—
Bacterial Vaccines (c.c.), Plague, Influenza, &c.	295,650	552	10,000	1,550,000
Normal Horse Serum (Doses of 10 c.c.) ...	500	84	90	—
Anti-plague Serum (Doses of 20 c.c.)	1,900	312	250	—

The preparation of antivariolous vaccine has continued during the year as heretofore. The demand has increased steadily and been accompanied by occasional requests for large quantities. It has been possible to supply all requirements.

The bulk of the antivariolous lymph produced by the Institute is destined for our Crown Colonies and most of it is despatched to tropical Africa. For many years particular attention has been devoted by the department to the production of a vaccine which, even after transport and sojourn in a tropical climate, shall retain sufficient potency for successful vaccination. According to the satisfactory reports received from medical officers in Africa, these efforts have been successful.

GENERAL AND FINANCIAL.

In the last annual report the proposal to change the name of the Institute to the "Lister Institute of Medical Research" was discussed. A resolution to effect the necessary alteration in Section I. of the Memorandum of Association was proposed by the chairman at an extraordinary general meeting called for June 11th, 1919, but did not meet with the approval of a majority of the members and the motion was lost.

At the same meeting a resolution to modify Section 3 *(d)* of the Memorandum of Association so as to get rid of the disability to establish a hospital in connection with the Institute contained therein, was carried unanimously. The resolution was confirmed by a second unanimous vote of the members at the second extraordinary general meeting on June 25th.

When, however, the Governing Body proceeded with the necessary legal formalities to have the amendment approved by the Court, the Institute's legal advisers expressed the opinion that owing to the omission to specifically mention in-patients at the beginning of the sentence it was questionable whether the amendment as drafted would permit the Governing Body to establish a residential hospital. As this opinion was confirmed by counsel, the Governing Body decided to re-draft the wording of the amendment and submit it again to the members. As the matter was not urgent they have postponed doing so until the present annual general meeting and have called an extraordinary general meeting for the same date so as to avoid summoning the members to attend for purely formal business.

The amendment to Section 3 *(d)* which was passed last June reads :—

"To treat persons suffering from disease or threatened therewith in buildings of the Institute or "elsewhere as OUT-PATIENTS, especially in cases where similar treatment cannot conveniently be "obtained at any London hospital, but nothing herein contained shall authorise the establishment or "maintenance of a residential or in-patients' hospital out of any funds of the Institute other than "such funds as shall be specifically subscribed for that purpose."

The one the members will be asked to vote upon at the extraordinary general meeting is identical with the above with the words "RESIDENTS OR IN-PATIENTS OR" inserted before OUT-PATIENTS. Counsel is of opinion that with this addition the amended section will give the Governing Body the powers it seeks.

The accounts and balance sheet for the year ended 31st December, 1919, are attached and, in-so-far as they show a small balance of income over expenditure, are satisfactory.

The sales of the Institute's products during the year were £5,974 less than in 1918, a diminution smaller than was anticipated. It was expected that the requirements of the Army would have fallen off more rapidly than has been the case. They amounted during the year to £18,700, as against £23,505 for 1918.

Expenditure, on the other hand, shows an increase of about £6,655, attributable to many causes, of which the return of members of the Staff during 1919, and consequent increased activity of the Institute, the great increase of rates and taxes—two year's income tax under Schedule D, being defrayed out of the revenue for the year—the unusually heavy repairs to buildings, which could not be attended to during the War and lastly, the steady rise in the cost of labour and materials, are the more important.

The Governing Body is glad to be again able to set aside £1,700 for the Pension Fund in accordance with the recommendation of the Actuary referred to in the last Annual Report.

During the year £5,100 6% Exchequer Bonds and £18,200 5% National War Bonds, which appeared in the list of investments of various funds in the Balance Sheet for the year ended 31st December, 1918, and also £450 5% National War Bonds purchased in January, 1919, have been exchanged for 4% Funding Stock.

The Governing Body cannot conclude its report without again expressing their appreciation of the cordial assistance which it has received from the director and all the members of the staff in carrying on the work of the Institute during a period of exceptional difficulty.

JAMES K. FOWLER,

Acting-Chairman.

The Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				2,509 12 4
To Pension Fund—				
Lord Lister's Bequest	17,200 15 0			
Profit on Sale of Investments	2,468 15 0			
		19,669 10 0		
Interest, Dividends and Contributions from Income Accounts to 31st Dec., 1918 ..		16,256 5 11		
Interest and Dividends on the Investments, and Contribution from Income Account, 1919		3,471 7 9		
				39,397 3 8
To Contingency Fund as per account 31st December, 1917				8,228 18 1
To Sinking Fund to December 31st, 1919 ..				8,464 16 7
To Income Tax Schedule D. Reserve Account ..				6,000 0 0
To Capital Fund to December 31st, 1919—				
Balance of Income and Expenditure to 31st December, 1918		96,018 17 0		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)..		2,000 0 0		
The Berridge Trustees (1893/98)		46,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Lord Iveagh (1900)		250,000 0 0		
Other Donations (1891-1907)		20,120 8 3		
Jenner Memorial Fund (1899)		5,768 0 11		
Add			430,286 16 3	
Balance of Income and Expenditure Account, 1919			859 12 10	
				431,146 9 1
				£495,746 19 9

JAMES K. FOWLER, *Acting-Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the state of the Institute's affairs, according to the best of our information and the explanations given to us and as shown

London, 16th April, 1920.

	£ s. d.	£ s. d.
By Cash—		
At Bankers	9,322 10 7	
In hand	61 19 5	9,384 10 0
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4,570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 5½ per cent. Stock, 1922-32	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
£25,600 5 per cent. War Stock, 1929-1947	24,324 16 2	
£10,375 4 per cent. Funding Stock, 1960—1990	10,300 0 0	
		60,677 1 11
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	
		250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	
		5,768 0 11
By Investment Contingency Fund (at cost)—		
£8,700 5 per cent. War Stock, 1929-1947		8,228 18 1
By Investments, Pension Fund (at cost)—		
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,738 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debenture Stock	936 0 0	
£1,876 Port of London 4 per cent. B. Stock	1,800 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debenture Stock	984 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debenture Stock	656 19 7	
£500 Canada 4 per cent. Stock (deposited with Treasury)	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debenture Stock	891 2 9	
£11,200 5 per cent. War Stock, 1929-1947	10,558 18 0	
£17,800 4 per cent. Funding Stock, 1960 -1990	14,153 10 6	
Balance Uninvested	1,494 16 2	
		39,397 3 8
By Investments, Sinking Fund (at cost)—		
£7,350 5 per cent. War Stock, 1929—1947	6,916 12 7	
£1,900 4 per cent. Funding Stock, 1960—1990	1,468 4 1	
		8,384 16 8
(The above Investments, at the market value, 31st December, 1919, show a depreciation of approximately £125,624.)		
By Debtors		12,122 16 10
By Stock of Tuberculin, Mallein, Bacterial Vaccines, &c.		37 13 8
*By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1908		2,746 17 2
By Expenditure on Institute Buildings at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea, as per account, 31st December, 1912		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,339 0 9	
Less amount written off	65 2 0	
		2,173 18 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	2,809 9 3	
Stock of Anti-Toxins	1,655 2 6	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	
		5,284 2 4
		£495,746 19 9

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view by the books of the Institute.

COOPER, BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Lister Institute of

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.
To Interest and Dividends on General Investments	11,255	18	7
To Interest and Dividends on Pension Fund Investments	1,771	7	9
To Interest and Dividends on Sinking Fund Investments	393	18	6
To Investigation, Diagnosis and Analysis Fees, &c.	3,408	0	6
To Sales of Tuberculin, Mallein, Sera, &c., and Stock at 31st December, 1919, less Stock at 31st December, 1918	35,722	7	2
To Rent of Rooms in the Institute	902	1	11
	£53,453	14	5

Preventive Medicine.

for the year ending 31st December, 1919. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	8,148	3	1
By Salaries and Wages of Staff	19,673	16	0
By Stationery, Printing and Postage	464	16	6
By Printing of Collected Papers	154	8	0
By Office Expenses and Sundries	145	14	5
By Travelling Expenses	29	18	4
By Auditors' Fee and Accountants' Charges	78	15	0
By Gas, Water and Fuel	1,517	17	9
By Electric Light and Power	220	0	5
By Director's Laboratory Expenses, including General Apparatus	476	1	2
By Bacteriological Laboratory Expenses	491	11	5
By Water and Bio-chemical Laboratory Expenses	338	12	11
By Tetanus Research Expenses	114	12	2
By Trench Fever Research Expenses	622	19	6
By Capt. Bashford's Research Expenses	50	2	6
By Serum and Calf Lymph Laboratory Expenses, including Apparatus and Cost of Bottles	5,482	5	0
By Culture Media	147	14	6
By Animals	804	3	11
By Animal House Expenses and Forage	6,986	7	7
By Repairs and Alterations to Buildings, including Workshop Expenses	1,728	13	8
By Library Expenses	143	6	0
By General Stores	421	15	7
By Bad Debts	11	4	4
By Contribution to the Pension Fund £1700 and Interest on Pension Fund Investments	3,471	7	9
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments) ...	804	12	1
By Balance, being Excess of Income over Expenditure, Transferred to Balance Sheet ...	859	12	10
	£53,458	14	5

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR.

ARKWRIGHT, J. A.	A Criticism of certain recent claims to have discovered and cultivated the Filter-passing virus of Trench Fever and of Influenza. *British Medical Journal*, Vol. II., 1919.
"	Variation of Bacteria in relation to Agglutination by Common Salt. *Journal of Pathology and Bacteriology*, Vol. XXIII., 1920.
BACOT, A. W.	The Fleas found on Rats and their Relation to Plague. *Journal of the Royal Sanitary Institute*, Vol. XL., 1919.
BACOT, A. W. and LINZELL, L.	The Incubation Period of the Eggs of *Haematopinus asini*. *Parasitology*, Vol. XI., 1919.
BACOT, A. W. and TALBOT, G.	Experiments on the destruction of Lice and Nits. *British Medical Journal*, Vol. II., 1919.
BARNES, ROSAMUND E. and HUME, E. MARGARET	A Comparison between the Antiscorbutic properties of Fresh, Heated, and Dried Cow's Milk. *Lancet*, Vol. II., 1919.
" "	Relative Antiscorbutic Value of Fresh, Dried, and Heated Cow's Milk. *Biochemical Journal*, Vol. XIII., 1919.
BARRATT, J. O. WAKELIN	The Action of Thrombin upon Fibrinogen. *Biochemical Journal*, Vol. XIV., 1920.
CAMPBELL, MABEL E. D. and CHICK, HARRIETTE	The Antiscorbutic and Growth-promoting Value of Canned Vegetables. *Lancet*, Vol. II., 1919.
CHICK, HARRIETTE	Die Rolle der Vitamine in der Ernährung. *Wiener Medizinischen Wochenschrift*. Vol. XXXIII., 1920.
CHICK, HARRIETTE and HUME, E. MARGARET	Note on the importance of Accurate and Quantitative measurements in experimental work on Nutrition and Accessory Food factors. *Journal of Biological Chemistry*, Vol. XXXIX., 1919.
" "	The production in monkeys of Symptoms closely resembling those of Pellagra, by prolonged feeding on a diet of low Protein content. *Biochemical Journal*, Vol. XIV., 1920.

CHICK, HARRIETTE AND DALYELL, ELSIE — Über die Verhütung des Skorbuts. *Mitteilungen des Volksgesundheitsamtes im Staats amt fur Soziale Verwaltung.* No. 1, 1920.

" " — Ueber die Gefahr des Skorbuts in Wien. *Wiener Klinischen Wochenschrift.* Vol. XXXII., 1919.

CHICK, HARRIETTE, HUME, E. MARGARET & SKELTON, RUTH F. — The Antiscorbutic value of some Indian Dried Fruits: (*a*) Tamarind, (*b*) Cocum, (*c*) Mango ("Amchur"). *Lancet*, Vol. II., 1919.

CHICK, H. AND DELF, E. M. — The Antiscorbutic value of dry and germinated seeds. *Biochemical Journal*, Vol. XIII., 1919.

DALYELL, ELSIE — Von den Gewichtskurven einiger Fälle von Säuglingsskorbut in Wien. *Wiener Medizinischen Wochenschrift.* Vol. XXXIII., 1920.
(See also Chick, H. and Dalyell, E.)

DELF, ELLEN MARION — Effect of Heat on the Antiscorbutic Accessory Factor of Vegetable and Fruit Juices. *Biochemical Journal*, Vol. XIV., 1920.
(See also Chick, H. and Delf, E. M.)

GREENWOOD, M. — Sydenham as an Epidemiologist. *Proceedings of the Royal Society of Medicine*, Vol. XII., 1919.

HALDANE, J. S., KELLAS, A. M. AND KENNAWAY, E. L. — Experiments on Acclimatisation to reduced atmospheric pressure. *Journal of Physiology*, Vol. LIII., 1919.

HARTLEY, P. — On the Agglutination of *B. Influenzae* (Pfeiffer) by the serum of patients suffering from Influenza. *Medical Research Committee Special Report Series.* No. 36.

HARTLEY, P. AND MARTIN, C. J. — The rate of disappearance of diphtheria bacilli from the throats after an attack of the disease; conclusions arrived at from observations upon an adult population, B.E.F., France. *Journal of Hygiene*, Vol. XVIII., 1920.

HARDEN, A. AND ROBISON, R. — The Antiscorbutic properties of Concentrated Fruit Juices. Part III. *Biochemical Journal*, Vol. XIV., 1920.

HARDEN, A. AND ZILVA, S. S. — Oedema observed in a monkey fed on a diet free from the Fat-soluble "A" Accessory Food Factor and low in Fat. *Lancet*, Vol. II., 1919.

" " — The Antiscorbutic requirements of the Monkey. *Biochemical Journal*, Vol. XIV., 1920.

" " — Dietetic Experiments with Frogs. *Biochemical Journal*, Vol. XIV., 1920.

HOMER, ANNIE — A Comparison between the Precipitation of Antitoxic Sera by Sodium Sulphate and by Ammonium Sulphate. *Biochemical Journal*, Vol. XIII., 1919.

" — On the Association of Antitoxins with the Proteins of Immunised Horse Serum. *Biochemical Journal*, Vol. XIV., 1920.

HUME, MARGARET — Vitamines, or Accessory Food Factors, in their relation to Infant Feeding. *Maternity and Child Welfare*, Sept.-Nov., 1919.

(See also Barnes, Rosamund E. and Hume, E. Margaret; Chick, Harriette and Hume, E. Margaret and Chick, Harriette, Hume, E. Margaret and Skelton, R. F.)

KELLAS, A. M. — (See Haldane, J. S., Kellas, A. M. and Kennaway, E. L.)

KENNAWAY, E. L. — (" " ")

LEDINGHAM, J. C. G. — Dysentery and Enteric Disease in Mesopotamia. *Journal of the Royal Army Medical Corps*, Vol. XXXIV., 1920.

" — Agglutination Experiments with Trench Fever Rickettsia. *Lancet*, Vol. I., 1920.

LINZELL, L. — (See Bacot, A. W. and Linzell, L.)

MARTIN, C. J. — The Preparation of Sorensen's Phosphate solutions when the Pure salts are not available. *Biochemical Journal*, Vol. XIV., 1920.

" — Observations on the Influence of Various Conditions on the reaction of Culture Media, with a description of a simple method of approximately adjusting the reaction to any desired ph. *Journal of Pathology and Bacteriology*, Vol. XXIII., 1920.

" — Limitations to the Accuracy of determining "Agglutinin units" (Dreyer) encountered in practice. *Journal of Pathology and Bacteriology*, Vol. XXIII., 1920.

" — (See also Hartley, P. and Martin, C. J.)

ROBISON, R. — (See Harden, A. and Robison, R.)

SCHÜTZE, H. — The Paratyphoid B. Group. *Lancet*, Vol. I., 1920.

SKELTON, RUTH — (See Chick, Harriette, Hume, E. Margaret and Skelton, R.)

TALBOT, G. — (See Bacot, A. W. and Talbot, G.)

WOODCOCK, H. M. - - - New Classification of Trypanosomes: A question of nomenclature. *Lancet*, Vol. I., 1920.

" - - - Note on the Relative Proportions of amœbic and bacillary dysentery among the Troops of the Egyptian Expeditionary Force during the season of 1917, together with some remarks on the question of Cytodiagnosis. *Journal of the Royal Army Medical Corps*, Vol. XXXIV., 1920.

" - - - Notes and Comments on my Malarial Experiences while with the Egyptian Expeditionary Force, 1916-1918. *Journal of the Royal Army Medical Corps*, Vol. XXXIV., 1920.

YAMAKAMI, KUMAO - - - Barger's Microscopical Method of Determining Molecular Weights, Part I. The Principle of the method with reference to the Molecular and Ionic attraction of Solute for Solvent. *Biochemical Journal*, Vol. XIV., 1920.

" - - - Barger's Microscopical Method of Determining Molecular Weights, Part II. The Molecular Weight of Casein. *Biochemical Journal*, Vol. XIV., 1920.

" - - - On Haemolytic Fever. *Journal of Pathology and Bacteriology*, Vol. XXIII., 1920.

ZILVA, S. S. - - - - - (See Harden, A. and Zilva, S. S.)

Memorandum Published by the Committee on Accessory Food Factors.

The Importance of Accessory Factors in the Food. Some facts concerning Nutrition, for the Guidance of those engaged in Administration of Food Relief to Famine-Stricken Districts. London, 1919.

THE LISTER INSTITUTE
OF
PREVENTIVE MEDICINE.

Report of the Governing Body, 1921.

CHELSEA GARDENS,
LONDON, S.W. 1.

June 15th, 1921.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W. 1;
ELSTREE, HERTS; HAYLE, CORNWALL.

THE GOVERNING BODY.

MAJ.-GENL. SIR DAVID BRUCE, K.C.B., D.Sc., LL.D., F.R.S., A.M.S., *Chairman.*

LT.-COL. G. W. ADDISON, R.E., *Hon. Treasurer.*

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THE STAFF.

Director:

*Professor C. J. Martin, C.M.G., M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, C.M.G., D.Sc., M.B., F.R.S., *Bacteriologist-in-Chief; Professor of Bacteriology in the University of London.*
J. A. Arkwright, M.A., M.D., B.Sc., *Assistant Bacteriologist.*
E. E. Atkin, M.B., B.A., „ „
S. P. Bedson, M.D., B.S., „ „
H. L. Schütze, M.D., B.Sc., „ „
Mary M. Barratt, M.B., Ch.B. „ „ (*temporary*).

Department of Bio-Chemistry:

*A. Harden, D.Sc., F.R.S., *Professor of Bio-Chemistry in the University of London.*
R. Robison, Ph.D., F.I.C., *Assistant.*
S. S. Zilva, Ph.D., M.Sc., A.I.C., „ (*honorary*).

Department of Experimental Pathology:

*C. J. Martin, C.M.G., M.B., D.Sc., F.R.S., *Professor of Experimental Pathology in the University of London.*
Harriette Chick, D.Sc., *Assistant.*
Eleanor M. M. Hume, „ (*honorary*).

Department of Entomology:

A. W. Bacot, F.E.S., *Entomologist to the Institute.*
Honorary Adviser on Entomological Questions to the War Office.

Department of Protozoology:

Muriel Robertson, M.A., *Assistant.*

Department for the Preparation and Study of Antitoxic Sera [Elstree]:

A. T. MacConkey, M.B., B.C., D.P.H., *Bacteriologist-in-Charge of Serum Laboratories.*
*G. F. Petrie, M.D., *Assistant.*

Department for the Preparation and Study of Anti-Variolous Vaccine [Hayle]:

Alan B. Green, M.A, M.D., B.C., *Bacteriologist-in-Charge of the Anti-Variolous Vaccine Laboratories.*

Secretary and Accountant:
George Cooper.

Assistant Secretary:
A. L. White.

National Collection of Type Cultures.

(Medical Research Council).

Director:
Professor J. C. G. Ledingham, C.M.G., D.Sc., M.B., F.R.S.

Curator:
R. St. John Brooks, M.D., D.P.H., M.A.

Assistant Curator:
Miss M. Rhodes.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

June 15th, 1921.

REPORT OF THE GOVERNING BODY.

The Governing Body has the honour to present the 27th. Annual Report.

THE GOVERNING BODY.

No changes in the membership of the Governing Body have taken place since the date of the last Annual General Meeting, when the Council re-elected Sir Frederick W. Andrewes, Professor Bulloch and Sir James Kingston Fowler to represent the members until December 31st, 1921.

COUNCIL.

The Universities of Oxford, Cambridge and Edinburgh, and the British Medical Association have appointed Professor Georges Dreyer, Professor G. H. F. Nuttall, Professor J. C. Meakins and Sir Dawson Williams as their respective representatives upon the Council.

At the last Annual General Meeting the members of the Institute elected Sir Walter M. Fletcher as one of their representatives upon the Council in place of the late Dr. J. Sidney Turner.

The Governing Body has to record with sorrow the death of Lord Moulton of Bank, who for many years represented the University of London on the Council. The University has nominated Dr. John Fawcett as its representative in his stead.

The three members, who this year retire by rotation, but who are eligible for re-election, are the representative of the Royal College of Surgeons, and Sir Thomas Barlow and Sir E. Ray Lankester, both of whom represent the Members.

STAFF.

During the year the title of Professor of Bacteriology has been conferred upon Dr. Ledingham by the University of London. He has also been elected a Fellow of the Royal Society.

Dr. Arkwright has been seconded to take charge of an investigation into Foot and Mouth Disease which is being undertaken by the Ministry of Agriculture.

Dr. S. P. Bedson, late of the College of Medicine, Newcastle-on-Tyne, has been appointed an assistant in the Bacteriological Department.

Dr. Harriette Chick has again been seconded for service abroad. Accompanied by Dr. Dalyell (Beit Memorial Research Fellow), Dr. H. Mackay (Beit Memorial Research Fellow), Miss Hume and Miss Henderson Smith (temporary assistants in the department of Experimental Pathology), she proceeded to Vienna in October to carry out further studies on diseases due to food deficiencies, under the Accessory Food Factors Committee, appointed jointly by the Lister Institute and the Medical Research Council.

Miss Tozer, who has for some years been an assistant in the department of Experimental Pathology, has resigned on appointment as lecturer on cytology and histology at the University of Liverpool.

Mr. G. Cooper, late assistant secretary, has been appointed Secretary to the Institute, and Mr. A. L. White, late Chief Clerk, Assistant Secretary.

Mr. J. W. Brown resigned his position as Clerk to the Serum department on taking up an appointment with the Battersea Borough Council.

RESEARCH WORK.

The investigations on Accessory Food Factors which have formed a large part of the work of the departments of Experimental Pathology and Biochemistry, and are briefly described below, have again been materially assisted by grants from the Medical Research Council to Professors Martin and Harden towards the expenses of work carried out under their direction.

Department of Bacteriology.

Dr. Ledingham has continued his investigations on the problem of transmitting the virus of trench fever to laboratory animals, having been fortunate in securing some fresh virus from lice fed on Mr. Bacot during his attack of trench fever contracted in Warsaw in April, 1920. The results were, as before, indecisive, only isolated instances occurring in rabbits, guinea-pigs, and goats in which a transmission was apparently successful.

More recently Dr. Ledingham has in collaboration with Dr. Woodcock resumed his investigation of purpura. It has been demonstrated that in mammals the inoculation of the corresponding anti-blood-plate serum has the property of producing an outburst of purpura simultaneously with a disappearance, partial or complete, of the platelets from the circulating blood. In view of certain physiological and morphological peculiarities of the blood of birds, for example, slowness of clotting and apparent absence of elements morphologically similar to blood-plates in the mammal, it was decided to enquire whether certain elements of avian blood, known for many years as thrombocytes or spindle-cells could be similarly acted upon by the corresponding antiserum with consequent production of purpura. The difficulty of isolating these thrombocytes from the other blood elements in sufficient concentration for immunisation purposes has been much greater than in the case of mammalian blood-plates. It has, however, been possible to secure an antithrombocyte serum sufficiently potent to produce when inoculated into the pigeon, a typical purpuric eruption with disappearance of the thrombocytes from the circulating blood.

Dr. Bedson, who formerly collaborated with Dr. Ledingham on purpura in mammals, is engaged in working out some of the many problems remaining for solution in connection with the experimental production and possible cure of the purpuric state.

Dr. Arkwright brought to a conclusion his work on bacterial variation, which has now been published. It was hinted in last year's report that Dr. Arkwright's demonstration of the lack of serological affinity exhibited by organisms emanating from the same parent culture but appearing on plates as colonies of different form, would have to be reckoned with in the serological grouping of species in general. This has proved to be the case, and Dr. Schütze, who in recent years has devoted much time and labour to the study of the serological relationships of the salmonella group of micro-organisms, finds that the "state" of a culture as determined by the relative proportions of organisms which appear as "rough" or "smooth" colonies on plates, influences very greatly the results obtained from serological analysis. Further study of the property of "roughness" is being undertaken.

Dr. Schütze has also shown that it is possible to determine the blood group of an individual from specimens of the dried blood and in a published paper deals with its application to medico-legal practice. With Dr. Zilva, of the Department of Biochemistry, he is also conducting certain experiments to test whether some forms of induced malnutrition in animals are associated with increased susceptibility to bacterial infection.

Dr. Atkin has been collaborating with Mr. Bacot on various questions connected with the properties and propagation of the virus of typhus fever.

Dr. Lepper (Beit Memorial Research Fellow) has carried out an interesting research on the production of lesions in the urinary system by organisms of the coliform type intravenously injected. She has examined the conditions which favour a settlement in the urinary system of organisms so injected and in a paper recently published she shows that while certain organisms isolated from cases of cystitis in man appear to have a selective tendency to infect the kidney when intravenously administered, others require some preliminary disturbance of the kidney, such as that occasioned by a temporary constriction of the ureter. For an effective involvement of the urinary system so short a period of obstruction of the ureter as ten minutes is sufficient.

Dr. M. Cowan (Beit Memorial Research Fellow), commenced work in the department in February last upon the serological grouping of Streptococci.

Dr. J. Pratt-Johnson (Johannesburg) has worked in the department on methods of preparing lipovaccines. He employed a type of *B. suipestifer*, which was extremely virulent for rabbits and compared the antigenic value of a lipovaccine made with this organism with that of the ordinary type in saline suspension. So far as agglutinin production was concerned, a somewhat higher response was obtained with the saline vaccine, but neither variety of vaccine gave the slightest protection to the immunised animals against an intravenously injected dose of the living organism.

Dr. Kanai (Kitasato Institute, Tokio), has been investigating the claims made by Besredka for the efficiency of orally administered vaccines as immunising agents with special reference to *B. dysenteriae*, Shiga. With this organism he has attempted oral immunisations of rabbits, but so far, the results point to the great superiority of the subcutaneously immunised series, when tested by the intravenous administration of the live organism.

Dr. Khaled (Hygienic Institute, Cairo), has undertaken the investigation of the remarkably close affinity which Evans has shown to exist between the causative agent of Mediterranean fever *(M. melitensis*, Bruce), and that of abortion in cattle *(B. abortus*, Bang.) The strains for this research have been placed at his disposal from the resources of the National Collection of Type Cultures.

Dr. Barratt, in the intervals of her work in the diagnosis department, is engaged in a systematic investigation of the organisms of the diphtheroid group. The results will be placed at the disposal of the Pathological Methods Committee of the Medical Research Council on which Professor Ledingham continues to act.

Other workers to whom facilities for study have been given are Colonel A. W. M. Harvey, I.M.S., Dr. Hans David (Stockholm) and Mr. E. H. Fenwick, C.B.E., F.R.C.S.

Department of Biochemistry.

In 1920, as during the previous two or three years, the work of this department has been to a large extent concerned with the accessory food factors.

The work of Professor Harden and Dr. Zilva on the influence of a diet free from the fat-soluble factor was continued, and a condition of the eye resembling the keratomalacia observed by Bloch in infants subsisting on a diet which was low in the fat-soluble factor, was successfully obtained in some of the experimental animals.

Perhaps the most obvious necessity in work upon the fat-soluble factor is a sound method by which quantitative comparison can be made of the amount of this vitamin in various materials, or in the same material after various modes of treatment. A method of this kind is being worked out by Drs. Zilva and Miura and they have good prospects of success. They have already succeeded in establishing the important fact that cod-liver oil is about 250 times as potent as butter-fat and there can be little doubt that the acknowledged therapeutic value of cod-liver oil is due to this exceptionally high potency.

The absence of the fat-soluble vitamin from most commercial samples of lard suggested an investigation, which has been carried out by Dr. Zilva in conjunction with Dr. J. C Drummond and Captain J. Golding, at Reading, on the influence of the diet of pigs on the production of the fat-soluble factor in pig fat, and the influence of a rigorous deficiency of the accessory food factors on the rearing of pigs. It has already been ascertained that pigs fed on grass produce a fat which contains the factor, in contradistinction to those animals which received a diet poor in the principle, and further that the process of preparation for the market causes a loss of the factor present in the crude fat.

In view of the destructive influence of oxidation and bleaching, and of the results obtained in the foregoing investigation, Drs. Drummond and Zilva submitted a scheme to the Accessory Food Factors Committee, appointed jointly by the Institute and Medical Research Council, for an investigation of the methods employed in the preparation and purification of edible oils. A substantial grant has been made by the Medical Research Council and they have already visited various oil mills and lard factories in England where extremely useful information was obtained. A visit to Northern Norway is planned for the early summer, in order to study the production of cod-liver oil, so that the best method for the production of this highly active oil may be devised.

Dr. Zilva has also continued his work on the extraction of the fat-soluble vitamin from vegetables, and by treating carrots with alcohol and ether has succeeded in obtaining an extract which is potent in very small quantities. Continuation of his work on the action of ultra-violet rays on the fat-soluble factor has led Dr. Zilva to the conclusion that the inactivation which had been previously observed, was due to the ozone produced by the rays from the atmospheric oxygen. This is in agreement with the results of other workers which has led to the conclusion that this factor is readily inactivated by oxidation.

With regard to the antiscorbutic vitamin, the former experiments on beer have been repeated. The results confirm the earlier conclusion that beer is practically free from this vitamin.

The behaviour of both the antiscorbutic and antineuritic factors towards ozone has been investigated by Dr. Zilva who found that ozone inactivates the antiscorbutic in a similar manner to the fat-soluble, but that the antineuritic is decidedly more resistant to the influence of this gas than the other two factors. As an outcome of these observations the study of the influence of exposure of the antiscorbutic factor to atmospheric oxygen was undertaken and the interesting fact was revealed that it was unstable under these conditions. Experiments are now in progress in which the action of heat under aerobic and anaerobic conditions is being studied and results already obtained point to the fact that the data on the action of heat on the antiscorbutic factor in food-stuffs will have, in future, to be reconsidered with reference to the degree of aeration which may occur during the process. The behaviour of these two vitamins on dialysis has also been investigated by Drs. Zilva and Miura, in order to establish an approximate conception of the size of the molecules of these active principles.

Experiments by Professor Harden on the production of the water-soluble or antineuritic factor by yeast grown on media free from the factor have shown that these organisms can synthesise the factor. A considerable amount of progress has been made in the work carried out by Professor Harden in conjunction with Mr. Bacot, on the nutritional requirements of insects, but the subject is a somewhat difficult one and further work will be necessary before any definite conclusions can be drawn.

In addition to this work on the deficiency diseases, progress has been made by Dr. Robison in his study of the hexosephosphates of yeast-juice and by the Hon. F. R. Henley in his work on the function of aldehydes in alcoholic fermentation, several papers having been published on this latter subject.

The hospitality of the department has also been extended to Mrs. Norris, Professor Hata, Drs. Sato and Wright, and Mr. A. C. Bescoby.

Department of Experimental Pathology.

The principal work of the department has continued to be concerned with animal nutrition and the pathology of deficiency diseases.

The antiscorbutic value of sweetened condensed milk has been determined by Miss Hume by experiments on monkeys. This widely used product seems to retain its antiscorbutic properties unimpaired. The sample examined was a well-known brand which in its preparation is concentrated by boiling in vacuo, thus avoiding the destructive action of high temperature and oxidation upon this sensitive vitamin.

Miss Tozer has been engaged in the study of the pathological histology of rickets in monkeys, and in the various degrees of disorganisation and cessation of osteogenesis occurring in laboratory animals submitted to different dietary deficiencies. Before leaving to take up her appointment at the University of Liverpool, Miss Tozer collected together the most significant part of her observations, and these have now been published.

Experiments on the influence of storage at different temperatures, upon the antiscorbutic virtue of various fruits and fruit-juices were continued by Miss Davey. She has completed her observations which have extended over three years, and published the results.

The etiology of rickets is being studied from several points of view. Professor Korenchevsky (Petrograd), has examined the histology of the glands of internal secretion in monkeys in which the disease was produced and compared them with those of normal animals. There was no indication of any abnormality except in the case of the parathyroids. The observations of McCollum that rickets is produced most readily in rats by deprivation of the fat-soluble vitamin A. and simultaneous reduction of the calcium in the diet has been confirmed. The effect of various deficiencies in the diet separately and in various combinations, upon the growth of the animals, the structure of their bones, and the calcium content of their skeletons, has been studied and has afforded interesting and important results. Further, the influence of removal of the different glands of internal secretion upon the results in the above conditions, is being determined.

Earlier in the year under review, Professor Korenchevsky was engaged in ascertaining the influence of thyroid feeding and removal upon the progress of tuberculosis. In some series of observations a moderate excess of thyroid appeared to be beneficial, but the results in other series were negative.

Dr. E. M. Luce, who is working with Professor Korenchevsky, is engaged in a research upon the histology of the ductless glands in animals in which rickets has been experimentally produced, and in other animals subjected to the influence of a deficiency of fat-soluble vitamin A. alone.

Dr. Helen Mackay (Beit Memorial Research Fellow), who is now working with Dr. H. Chick, in Vienna, carried out a series of experiments in which she brought up two litters of kittens, one upon a diet of bread and milk, the other upon the same diet, but in which the butter-fat was removed and replaced by olive oil. This last diet was one similar to that which when given to puppies, was followed, in the experiments of Dr. Mellanby, by the onset of rickets. The kittens did not develop rickets, but those which were fed on a diet in which olive oil replaced butter-fat grew but little and became marasmic. Both series were carefully nurtured. The calcium and other mineral content of the two diets was the same.

Dr. Mackay also carried out a series of observations upon ricketty children attending the out-patient clinic of a hospital to which she was Medical Officer. The diets of these children were augmented in various directions by special foods prepared at the Institute, and careful observations of their weight and condition recorded. The conditions for close and continued observation were not satisfactory and much labour was lost. Miss Mackay concludes from her observations that rickets is a dietetic disease, but that some other factors, and not a deficiency of fat-soluble vitamin A. alone, is concerned in the production of the disease.

Drs. Martin and Robison have been occupied in re-examining the question of the biological value of different proteins by experiments on man. That different proteins must have very different value for repair or growth is obvious from the difference in the amount of particular amino acids which they contain, and the apparent inability of the body to synthesise the more complex ones. Previous experiments on biological value for adults are, however, open to criticism on several grounds. The amount of protein in the form contained in different foodstuffs which is necessary to maintain nitrogenous equilibrium, must be known with considerable accuracy if this information is to be a useful guide in dietetics, but hitherto this degree of accuracy has not been attained. The value of the nitrogen in the protein contained in wheat and milk has been determined. The experiments have in each case, extended over some months. Incidentally, the research has opened up a number of interesting avenues in the domain of metabolism which are being explored.

Dr. Robison has also determined the biological value of gelatin as a sole source of nitrogen. His results do not confirm the older observations on this subject.

Dr. J. O. W. Barratt has been studying the intimate nature of fibrin formation in fibrinogen solutions and its bearing upon gel-structure generally. He has also continued the investigation of the quantitative relationship in the action of complement and amboceptor in haemolysis and similar reactions. Dr. Barratt was occupied with this enquiry prior to the War and the first part of his results was published in 1913.

Lt.-Col. F. H. Stewart, I.M.S., has been following up his discovery that the embryos of *Ascaris lumbricoides*, after hatching out in the intestine migrate at once to the lungs. After passing the first stage of their development in the lungs, where they occasion more or less pneumonia, they are coughed up and swallowed and can now continue their development to the adult stage in the intestine of suitable animals such as the pig. The developmental changes in the Ascaris embryos during their journeyings and the route to the lungs commonly taken has been worked out.

Miss A. Homer has made a further contribution to the subject of concentration of antitoxin. In the procedure commonly employed, the serum is subjected to a preliminary heating during which more or less of the proteins are denaturated and can then be removed by precipitation. It is during this stage that considerable loss of antitoxin may occur. Miss Homer has determined the rate of this loss according to the temperature employed.

Department of Entomology.

Since his return from Poland, Mr. Bacot has been occupied with work upon the development of Rickettsia bodies in insects, more especially those associated with trench and typhus fevers, using material which he obtained in Warsaw. At the commencement of the year attention was concentrated on a parasite of the bed bug *(Cimex lectularius)* which was discovered, in collaboration with Dr. Arkwright, while experimenting on the possible conveyance of trench fever by bed bugs. This parasite shows many similarities to Rickettsia and in its development comes nearest to *Rickettsia prowazeki*, which is thought to be the causal organism of typhus fever; it has apparently, however, no second host, being passed on from one generation of the bug to the next through the egg. In collaboration with Dr. Atkin, attempts were made to cultivate the parasite, but so far they have proved abortive.

Mr. Bacot finds it comparatively easy to transmit typhus from monkey to monkey by injecting the contents of the gut of infected lice, but so far has succeeded but once by allowing infected lice to feed upon an animal. The striking discrepancy in the successful transmission by the two methods suggests that it is only in certain stages in the development of the parasite within the insect that the lice can transmit the disease.

The hospitality of the department was extended to Dr. H. D. Hacker, Medical Entomologist to the Federated Malay States, for the study of the conditions determining the successful spreading of oil films as a means of exterminating mosquito larvae.

Department of Protozoology.

Dr. Woodcock has completed the examination of the protozoological material collected by the "Terra Nova" Antarctic expedition. This is now published. He is investigating the life-history of several new coprozoic flagellates, particularly with reference to the occurrence of syngamy in these lowly forms, and more recently has been collaborating with Professor Ledingham in a cytological study of thrombocytes in birds and frogs.

Miss Robertson has compiled the account of the bacteriology of anaerobes infecting wounds, for the medical history of the war. She has been investigating the influence of pyronin injections on trypanosome infections and finds this drug only causes the disappearance of the parasites from the blood when administered at certain periods of the disease. She has confirmed the interesting observation of Werjbitzki that pyronin causes the disappearance of the kinetonucleus in trypanosomes and is endeavouring to ascertain the significance of this phenomenon. The conditions determining the acquisition of immunity to trypanosomes are also being studied on rats infected with *Tryp. lewisi*.

Department for the Preparation and Study of Antitoxic Sera.

The problem of producing reliable standard antitoxins in liquid form, simply and easily, is being followed up. The method introduced by Dr. MacConkey and referred to in previous reports seems to be proving satisfactory, as the samples have continued unaltered during the year—that is, three years in all. The same method appears to be applicable to toxins also. The minimal lethal dose of "brined" dysentery toxin has remained steady for the last 10 months and the results with diphtheria toxin are such as to raise hopes that this may be stabilised in the same manner.

Experiments on the refinement and concentration of antitoxin have been continued throughout the year. Although all diphtheria and tetanus antitoxin issued by the department is now refined, and if necessary concentrated, the procedure is far from perfect and often occasions considerable loss and trouble.

The toxigenic features of strains of diphtheria bacilli isolated from superficial lesions in horses by Captain Minett, have been studied by Dr. Petrie. The occurrence of true diphtheria bacilli from such superficial sores does not appear to be very uncommon and serves to explain why so many normal horses contain small amounts of diphtheria antitoxin in their blood. Some of the strains proved to be excellent toxin producers.

The Governing Body desires, once more, to convey its thanks to the Director of the Hygienic Laboratory, U.S. Public Health Service, for his kindness in supplying the department with standard toxins and antitoxins.

Department for the Preparation and Study of Anti-Variolous Vaccine.

An important point bearing on the successful use of anti-variolous vaccine is the length of time that it can be stored without loss of specific activity. It has been known for some time that anti-variolous vaccine stored at a temperature below freezing point, *e.g.*, at −8°C, will retain its potency for a much longer period than a portion of the same vaccine stored at a temperature above freezing point, *e.g.*, at 10°C. Evidence, however, has been obtained that anti-variolous vaccine stored at −8° to 10° C. for from 6—12 months, has become more sensitive to subsequent deleterious influences. This is especially shown when anti-variolous vaccine so stored is used in tropical climates; the vaccination results then tend to be markedly less satisfactory than the results obtained from the use of more recent anti-variolous vaccine of approximately the same original potency. This of course has a special significance in the treatment of anti-variolous vaccine destined for use in the tropics.

A new method of preparing dry anti-variolous vaccine is being developed. So far this has given encouraging results; if these are established, it is probable that anti-variolous vaccine, so prepared, may be more resistant to tropical conditions than anti-variolous vaccine prepared by the method more generally in use at the present time.

COMMITTEE ON ACCESSORY FOOD FACTORS.

(Appointed jointly by the Lister Institute and the Medical Research Council.)

This Committee, which now consists of—

DR. HARRIETTE CHICK (Lister Institute),
DR. DRUMMOND (University College),
PROFESSOR HARDEN (Lister Institute) *Secretary*,
W. B. HARDY, ESQ. (Food Investigation Board),
PROFESSOR HOPKINS (University of Cambridge), *Chairman*,
DR. MACFADDEN (Ministry of Health),
PROFESSOR MARTIN (Lister Institute), and
PROFESSOR MELLANBY (University of Sheffield),

has met on several occasions during the year.

Many assurances of the value of the monograph on Accessory Food Factors, compiled by the Committee, have been received from scientific workers and medical men, and it has been reprinted more than once in response to the large demand for it here and in America. It has also aroused great interest in European countries, where scientific men have not had access to the important results gained by British workers in this subject during recent years. In view of their value for students in this country, the Committee arranged also for the translation and publication of two papers by Dr. Bloch, of Copenhagen, on xerophthalmia and on carbohydrate dystrophy in children. These have appeared in abbreviated form in the *Journal of Hygiene* and *British Medical Journal* respectively.

The work of the Committee comes into close relation to the industrial applications of science which fall to the Food Investigation Board of the Department of Scientific and Industrial Research, and Mr. W. B. Hardy, F.R.S., Director of the Board, has accepted an invitation to join the Committee for the better organization of the studies near the common boundary. The work done by the Committee has also been co-ordinated with that of the Food Department of the Ministry of Health by the appointment of Dr. A. W. J. MacFadden, C.B., in charge of that department.

The expenses of work in this subject are heavy because of the large number of carefully controlled feeding experiments that are required, yet perhaps no other research work has greater or more fundamental importance than this, whether because of the immediate importance of the knowledge already being won for the maintenance of health and the control of "deficiency diseases," or because of its significance in the study of primary biological laws of metabolism and growth. The Committee has recently recommended, and the Medical Research Council provided, a number of grants for the ensuing financial year. Among these are grants to Professor Martin and Professor Harden for the payment of special assistants in the departments of Experimental Pathology and Biochemistry at the Institute. The work in progress in these departments is reviewed above.

A grant has also been approved towards the expenses of a combined investigation by Dr. Drummond, of the Physiological department of University College, and Dr. Zilva, of the Lister Institute, into the causes of the disappearance of vitamin A. from various vegetable and animal oils during the process of their preparation and refinement for use as foods. This disappearance is a matter of moment as such oils are being increasingly utilized in the dietary of individuals, especially the less well-to-do, in substitution for animal fats.

At Cambridge the special expenses of Professor G. Hopkins in his well-known studies of the relations of food deficiency to growth have been provided. The stability of accessory food factors under varied conditions is being examined; results of great biochemical interest and of immediate practical value in relation to the treatment of materials for food have been obtained during the past year. Some new constituents of body tissues are also being investigated, and the part played by them in nutrition.

At King's College, Dr. C. Da Fano is working on the histology of the ductless glands and the central nervous system after the onset of deficiency diseases, towards the expenses of which a grant has been made.

MISSION FOR THE STUDY OF DEFICIENCY DISEASES IN VIENNA.

As mentioned in the last Annual Report, Dr. Harriette Chick, Dr. E. Dalyell and Miss M. Hume spent the larger part of the year studying deficiency diseases in Vienna.

Many interesting facts were collected with regard to infantile scurvy, and the antiscorbutics which had been recommended for infants as the result of animal experiments were given extensive trials with extremely satisfactory results. Highly encouraging and suggestive results were obtained from the treatment of nursing mothers with butter or cod-liver oil and antiscorbutics; in many cases their infants, who

had failed to thrive before the treatment of their mothers, made instant improvement, which was maintained. The weight of the babies which had previously been far below normal at once began to approach normal. Cod-liver oil gave better results even than butter. Children, so backward that at three years of age they could not even sit alone, were themselves given butter and lemon juice. In a few weeks they began to shake off the lethargy in which they had lain for months, in many cases even for years, and in six months all could stand and many could walk.

The increased prevalence in Vienna of rickets among infants and of late rickets among young adults supports a dietetic theory of the etiology of this disease. No other external circumstance in this city, other than the food deprivations of the last few years, is found to account for this increase, and many general observations point to the same conclusion. But in the work during 1919-1920, with one exception about to be described, none of the observations yielded direct evidence upon this point.

From the clinical records of the University Kinderklinik (directed by Professor v. Pirquet) it was apparent that infants remaining for more than 4—6 months in this institution usually showed some degree of rickets. In the hospital the general hygiene and care of the babies is irreproachable. The diet, controlled in every detail, is generous as regards calorie value, rich in sugar and other carbohydrates, low in milk, and consequently low in milk fat and the fat-soluble accessory factor. By the generosity of Prof. v. Pirquet, the Mission was permitted the use of 6 beds from March to June, 1920, in which backward and undernourished children were observed upon diets of calorie value equal to the Pirquet standard, but containing adequate supply of milk fat and vitamines. The progress of these patients was satisfactory, and they showed no development of rickets.

"Hunger Osteomalacia," a disease prevalent in Vienna, in which the bones undergo softening and distortion was also studied. The Mission was inclined to believe that this disease was the effect in the adult of the same causes as those responsible for rickets in children, a belief to some extent shared by the medical profession in Vienna. Many cases of the disease were cured by treatment with different fats, cod-liver oil, butter, rape oil, olive oil and margarine, and on the whole it appeared that the curative value of these fats stood in the order of the degree to which they are known to contain the vitamin A. Papers on these observations will shortly be published.

The Mission returned to England in June, 1920, and reported to the Accessory Food Factors Committee. A short summary of some of their results was contributed to the discussion upon "Vitamines in Clinical Medicine," at the meeting of the British Medical Association, at Cambridge, in July last, and aroused considerable interest.

In view of the importance of the preliminary results obtained by Dr. Chick and her colleagues in the face of many difficulties, of the excellent relationships which they had established with the medical profession in Vienna and the various food relief organisations there, and of the abundant opportunities for further study, it was decided, upon the strong recommendation of the Committee, that the investigations should be continued on a larger scale during the winter and that the special object of the enquiry should be to throw further light upon the causation of rickets and to ascertain the part played in it by dietary factors. Dr. Chick put forward a programme for further work during 1920—21, involving observations upon a larger number of children, and including a series upon "Pirquet" diets to act as controls. Miss Chick's proposals were approved by the Committee and in view of the responsibilities to be undertaken, the staff was increased by the addition of Dr. Helen Mackay (Beit Memorial Research Fellow), and Miss Henderson Smith, R.R.C., to the personnel. The plan of the investigation met with the sympathy and active co-operation of Prof. v. Pirquet who offered for the work a first-class clinical ward of 20 beds in his own clinic. This offer was gratefully accepted, and infants have been under observation in the ward since last November. The cost of the upkeep of this ward is borne by the Klinik, and no charges have been permitted to the Mission. Results from these investigations are just beginning to accumulate after six months' interval.

Extra accommodation was also arranged at the Amerikanische Kinderheilstatte at Meidling, Vienna (Primararzt Dr. Rach), where a hut has been equipped as an infants' ward. This hospital is under the general direction of Prof. v. Pirquet and is staffed with personnel from his own klinik. All diets are controlled, as in the Kinderklinik, on the Nem system of v. Pirquet. It has been found necessary to admit children at a much earlier age than was originally proposed, as some degree of rickets was so often found to be present in children of four months and upwards that for prophylactic work the age of admission had to be reduced to three months or less. This has rendered the provision of suitable nursing staff more difficult and has increased the risk and anxiety associated with intercurrent disease, and the total number of cots for admission of cases has been reduced to 60 instead of 100 as originally planned. The clinical work is associated with systematic X-ray photography. In this the Mission is fortunate in having the co-operation of Dr. Hans Wimberger, Radiologist to the Klinik. The results obtained so far are very suggestive, and it is hoped that definite and valuable information will accumulate during the coming months.

The work initiated last year at the Landes Central Kinderheim is also being continued on a larger scale. In this institution which contains about 500 children and 200 nursing mothers, rickets is almost universal and specially good opportunity exists for treatment upon a larger scale. As it is not possible to control the diets in detail, the observations have consisted in watching the effect upon the onset of rickets, of enriching the diets of mothers and children by the addition of the food stuffs whose value is to be studied. This work is being carried out in one section of the Institution by Drs. Dalyell and Mackay and Miss Hume with the co-operation of Dr. Max Zarfl, as before. The remaining section of the hospital serves as a control. The materials used have been tested for vitamine content by Dr. Zilva, at the Institute, and include butter and margarine as well as cod-liver oil both in the natural condition and after treatment with oxygen at a high temperature to destroy the fat-soluble accessory factor contained.

In cases of mothers or infants whose condition offered points of special interest, the growth-promoting properties of the mothers' milk has been tested by experiments with guinea-pigs. This work is being carried out by Miss Hume, at the University Kinderklinik, where laboratory facilities and a supply of animals have been provided free of all cost to the Mission.

Post-mortem material is being investigated at the Pathological Institute of the University by Professor Erdheim, who is specially interested in this aspect of rickets, and by his assistant, Dr. Adolf Feller. The material for examination is selected by Dr. Dalyell and Dr. Mackay in collaboration with Dr. Feller.

The League of Red Cross Societies has given £2,000 for the hospital maintenance required in this work and material contributions in the form of hospital supplies. The Lister Institute has allocated £3,000 and the balance of the expenditure incurred by the Mission, including the salaries of Dr. Dalyell, Miss Hume and Sister Henderson Smith, and estimated at about £5,000 will be borne by the Medical Research Council.

The Mission has been afforded the most generous hospitality by Professor Dr. Clemens v. Pirquet and his staff and has had the great advantage of the co-operation of all departments of the University Kinderklinik. Without this help it would have been impossible to carry out the investigations. It is indebted to the Society of Friends for undertaking the entire transport of stores from England, and for continual help in various ways from the members of the Friends' Mission in Vienna. Sir William Goode and members of his staff on the Reparations Commission in Vienna, have frequently afforded valuable help in official matters and in the problems of postal communication and transport; and the investigation has been materially assisted by donations of foodstuffs from the Marrickville Margarine Company, Ltd., and Messrs. Prescott & Co., both of Sydney, New South Wales.

The Committee has also under contemplation an enquiry with the co-operation of Dr. MacFadden, of the Ministry of Health, into the influence of an increased ration of milk upon the growth and well-being of children in an institution in this country.

NATIONAL COLLECTION OF TYPE CULTURES.*

*(*The National Collection is subsidised by the Medical Research Council and is at the service of bacteriologists and others throughout the Empire.)*

The National Collection of Type Cultures has now been in existence for over twelve months and there is reason to believe that the work of the staff has been greatly appreciated by workers both at home and abroad. The collection of cultures at present maintained amounts to over 1,000 and these include a considerable number of organisms associated with economic and industrial processes and with plant diseases. A catalogue of the cultures has been made and will shortly be published by the Medical Research Council.

A selection of 500 authenticated cultures of fungi which are of importance in plant pathology and technical mycology, has been made by a special committee of the Mycological Society, and arrangements have been made for the collection to be maintained and distributed by the curator.

PRODUCTION OF SERA, VACCINES AND ANTI-VARIOLOUS LYMPH.

During the year ended 31st March, 1921, the demands by the Military and Naval authorities were, as anticipated, practically negligible, the sera and vaccines supplied being for outstanding contracts.

No extraordinary demands for sera or bacterial vaccines have been received during this period. In the case of anti-variolous lymph, however, in addition to usual demands, a number of large orders were received from Crown Colonies, all of which it was possible to execute.

GENERAL AND FINANCIAL.

The Amendment to Section 3 (d) of the Institute's Memorandum of Association, passed by the members at Extraordinary General Meetings held on November 10th and December 1st, 1920, was approved by the Court in February, 1921. This Section now reads:

> "To treat persons suffering from disease or threatened therewith in buildings of the Institute or "elsewhere as residents or in-patients or as out-patients, especially in cases where similar treatment "cannot conveniently be obtained at any London hospital, but nothing herein contained shall "authorise the establishment or maintenance of a residential or in-patients' hospital out of any "funds of the Institute other than such funds as shall be specifically subscribed for that purpose."

The accounts and balance sheet for the year ended 31st December, 1920, are attached and, as will be seen, show a substantial balance of income over expenditure.

The sales of the Institute's products during the year were £13,826 more than in 1919, an increase much greater than was anticipated, and due, in a large measure, to the demand for Influenza vaccine by the Ministry of Health referred to in last year's report and increased demands for anti-variolous lymph from West Africa.

Expenditure shows an increase of £5,530 18s. 2d. but includes a special contribution of £5,000 to the Pension Fund, against £1,000 last year, and £3,000 towards the expenses of the Investigations of the Accessory Food Factors Committee, in Vienna. Rent, rates, taxes, insurance, &c., serum and lymph laboratories' expenses, and animal house expenses show reductions of £1,832 10s. 9d, £2,425 10s 5d. and £1,424 16s. 5d. respectively, while there is an additional expenditure of £1,437 18s. 4d. for vaccine laboratory and an increase of £2,762 3s. 11d. for repairs and alterations. Included in this last item is a considerable expenditure incurred in the renovation of the Institute's property both at Chelsea and Elstree to make good dilapidations of the past seven years.

The following changes in investments during the year have been made:—For General Account, £20,000 Local Loans 3% Stock were purchased; for the Pension Fund, £10,325 Funding Loan 4% Stock and for the Sinking Fund, £1,300 of the same Stock were bought in addition to the amounts shown in the accounts for the previous year.

A bequest of £250 under the will of the late Mr. Thomas Munday has been received and the Governing Body has been pleased to elect the Rev. Wm. Gladding Alcock, one of the deceased's executors, a life member of the Institute.

The Governing Body desire, in conclusion, to acknowledge the effective and cordial co-operation of the Director and all members of the Staff in the research work of the Institute.

DAVID BRUCE,

Chairman of the Governing Body.

The Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				4,756 1 8
To Pension Fund—				
Lord Lister's Bequest	17,200 15 0			
Profit on Sale of Investments	2,468 15 0			
		19,669 10 0		
Interest, Dividends and Contributions from Income Accounts to 31st Dec., 1919 ..		19,727 13 8		
Interest and Dividends on the Investments, and Contribution from Income Account, 1920..		7,406 11 7		
				46,803 15 3
To Contingency Fund as per account 31st December, 1917				8,228 18 1
To Sinking Fund to December 31st, 1920 ..				9,307 6 2
To Income Tax Schedule D. Reserve Account ..				6,000 0 0
To Capital Fund to December 31st, 1920—				
Balance of Income and Expenditure to 31st December, 1919		96,878 9 10		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)		2,000 0 0		
The Berridge Trustees (1893/98)		46,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Lord Iveagh (1900)		250,000 0 0		
Other Donations (1891-1920)		20,370 8 3		
Jenner Memorial Fund (1899)		5,768 0 11		
Add			431,396 9 1	
Balance of Income and Expenditure Account, 1920			14,888 6 10	
				446,284 15 11

ERNEST H. STARLING, *Acting-Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

£521,380 17 1

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. of the state of the Institute's affairs, according to the best of our information and the explanations given to us and as shown

London, 21st March, 1921.

	£ s. d.	£ s. d.
By Cash—		
£10,000 Three Months Treasury Bills	9,844 3 4	
At Bankers	8,196 13 9	
In hand	63 0 10	18,103 17 11
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4 570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 5½ per cent. Stock, 1922-32	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
£25,600 5 per cent. War Stock, 1929-1947	24,324 16 2	
£12,875 4 per cent. Funding Stock, 1960—1990	10,300 0 0	
£20,000 Local Loans 3% Stock	9,962 0 7	70,639 2 6
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,630 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	5,768 0 11
By Investment Contingency Fund (at cost)—		
£8,700 5 per cent. War Stock, 1929-1947		8,228 18 1
By Investments, Pension Fund (at cost)—		
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debenture Stock	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debenture Stock	984 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debenture Stock	656 19 7	
£500 Canada 4 per cent. Stock (deposited with Treasury)	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1948-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debenture Stock	891 2 9	
£11,200 5 per cent. War Stock, 1929-1947	10,558 18 0	
£28,125 4 per cent. Funding Stock, 1960 -1990	21,359 17 10	
Balance Uninvested	1,695 0 5	46,803 15 3
By Investments, Sinking Fund (at cost)—		
£7,350 5 per cent. War Stock, 1929—1947	6,916 12 7	
£3,200 4 per cent. Funding Stock, 1960—1990	2,331 3 7	9,247 16 2
(The above Investments, at the market value, 31st December, 1920, show a depreciation of approximately £151,110.)		
By Debtors		8,636 7 7
By Stock of Bacterial Vaccines		40 9 9
*By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1908	2,746 17 2	
Less Sales during the year	275 0 0	2,471 17 2
By Expenditure on Institute Buildings at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea, as per account, 31st December, 1912		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,173 18 9	
Less amount written off	65 2 0	2,108 16 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	1,168 18 6	
Stock of Anti-Toxins and Bottles	5,802 6 2	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	7,790 15 3
		£521,380 17 1

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

In our opinion, such Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view by the books of the Institute.

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Lister Institute of

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.
To Interest and Dividends on General Investments	11,582	19	10
To Interest and Dividends on Pension Fund Investments	1,706	11	7
To Interest and Dividends on Sinking Fund Investments	431	16	0
To Investigation, Diagnosis and Analysis Fees, &c.	5,361	11	0
To Sales of Tuberculin, Mallein, Sera, &c., and Stock at 31st December, 1920, less Stock at 31st December, 1919	53,698	8	2
To Rent of Rooms in the Institute	232	0	0
	£73,013	6	7

Preventive Medicine.

for the year ending 31st December, 1920. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	6,315	12	4
By Salaries and Wages of Staff	19,597	11	5
By Stationery, Printing and Postage	569	13	7
By Printing of Collected Papers	133	14	9
By Office Expenses and Sundries	288	5	5
By Travelling Expenses	25	4	8
By Auditors' Fee	40	0	0
By Gas, Water and Fuel	1,457	17	10
By Electric Light and Power	227	4	0
By Experimental Pathology Laboratory Expenses, including General Apparatus ...	711	8	8
By Bacteriological Laboratory Expenses	379	1	3
By Vaccine Laboratory Expenses, including Bottles	1,437	18	4
By Trench Fever Research Expenses	35	19	9
By Water and Bio-chemical Laboratory Expenses	237	0	9
By Accessory Food Factors Committee, Vienna Investigation Expenses	3,000	0	0
By Serum and Calf Lymph Laboratory Expenses, including Apparatus and Cost of Bottles	3,056	14	7
By Culture Media	227	3	7
By Animals	1,267	11	4
By Animal House Expenses and Forage	5,561	11	2
By Repairs and Alterations to Buildings, including Workshop Expenses	4,490	17	7
By Library Expenses	191	10	6
By General Stores	552	16	7
By Bad Debts	5	18	6
By Contributions to the Pension Fund £5,700 and Interest on Pension Fund Investments	7,406	11	7
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments) ...	842	9	7
By Balance, being Excess of Income over Expenditure, transferred to Balance Sheet ...	14,888	6	10
	£73,013	6	7

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR.

ARKWRIGHT, J. A. - - - The Bacteriology of Cerebro-spinal Meningitis. *British Medical Journal*, Vol. II., 1920.

" " - - - Variation in Bacteria in Relation to Agglutination both by Salts and by Specific Serum. *Journal of Pathology and Bacteriology*, Vol. XXIV., 1921.

ARKWRIGHT, J. A. and BACOT, A. - A Bacillary Infection of the Copulatory Apparatus of *Pediculus humanus*. *Parasitology*, Vol. XIII., 1921.

ARKWRIGHT, J. A., ATKIN, E. E. and BACOT, A. An Hereditary Rickettsia-like Parasite of the Bed Bug (*Cimex lectularius*). *Parasitology*, Vol. XIII., 1921.

ATKIN, E. E. - - - - See Arkwright, J. A., Atkin, E. E. and Bacot, A.

BACOT, A. - - - - On the Probable Identity of *Rickettsia pediculi* with *Rickettsia quintana*. *British Medical Journal*, Vol. I. 1921.

" - - - - See Arkwright, J. A., Atkin, E. E., and Bacot, A.; also Arkwright, J. A., and Bacot, A.

BARRATT, J. O. W. - - - The Action of Sodium Hydroxide upon Coagulation of Fibrinogen. *Biochemical Journal*, Vol. XV., 1921.

" " - - - Die Struktur der Gele. *Kolloid Zeitschrift*, Vol. XXVIII., 1921.

" " - - - Brownian movement of fibril formation. *Proceedings of the Physiological Society, Journal of Physiology*, Vol. LV., 1921.

CHICK, HARRIETTE AND DALYELL, ELSIE — The present position of Vitamines in Clinical Medicine. *British Medical Journal*, Vol. II., 1920.

,, ,, ,, — The Influence of overcooking Vegetables in causing Scurvy among Children. *British Medical Journal*, Vol. II., 1920.

,, ,, ,, — Eine Skorbutepidemie unter Kindern im Alter von 6 bis 14 Jahren. *Zeitschrift fur Kinderheilkunde*, Band XXVI., 1921.

CHICK, H. AND HUME, E. M. — The production in Monkeys of Symptoms closely resembling those of Pellagra, by prolonged feeding on a diet of low Protein content. *Biochemical Journal*, Vol. XIV., 1920.

COWARD, K. H. — See Drummond, J. C., Golding, J., Zilva, S. S., and Coward, K. H. Also Zilva, S. S., Golding, J., Drummond, J. C., and Coward, K. H.

DALYELL, ELSIE — See Chick, H. and Dalyell, E.

DAVEY, A. J. — Determination of the minimum doses of some fresh Citrus Fruit Juices which will protect a Guinea Pig from Scurvy, together with some observations on the preservation of such Juices. *Biochemical Journal*, Vol. XV., 1921.

DRUMMOND, J. C., GOLDING, J., ZILVA, S. S. AND COWARD, K. H. — The Nutritive Value of Lard. *Biochemical Journal*, Vol. XIV., 1920.

DRUMMOND, J. C. — See Zilva, S. S., Golding, J., Drummond, J. C. and Coward, K. H.

GOLDING, J. — See Drummond, J. C., Golding, J., Zilva, S. S., and Coward, K. H. Also Zilva, S. S., Golding, J., Drummond, J. C. and Coward, K. H.

HARDEN, A. AND HENLEY, F. R. — The Effect of Pyruvates, Aldehydes and Methylene Blue on the Fermentation of Glucose by Yeast Juice and Zymin in Presence of Phosphate. *Biochemical Journal*, Vol. XIV., 1920.

,, ,, ,, — The Effect of Acetaldehyde and Methylene Blue on the Fermentation of Glucose and Fructose by Yeast Juice and Zymin in Presence of Phosphate and Arsenate. *Biochemical Journal*, Vol. XV., 1921.

,, ,, ,, — The Salt Effect in Alcoholic Fermentation. *Biochemical Journal*, Vol. XV., 1921.

HARDEN, A. AND ZILVA, S. S. — Note on the Production of Vitamin B. by Yeasts. *Biochemica Journal*, Vol. XV., 1921.

HENLEY, F. R. - - - - See HARDEN, A. and HENLEY, F. R.

HOMER, ANNIE - - - - THE HEAT INACTIVATION OF DIPHTHERIA ANTITOXIN. *Biochemical Journal*, Vol. XIV., 1920.

HUME, E. M. - - - - COMPARISON OF THE GROWTH PROMOTING PROPERTIES FOR GUINEA PIGS OF CERTAIN DIETS, CONSISTING OF NATURAL FOODSTUFFS. *Biochemical Journal*, Vol. XV., 1921.

,, - - - - INVESTIGATION OF THE ANTISCORBUTIC VALUE OF FULL CREAM SWEETENED CONDENSED MILK BY EXPERIMENTS WITH MONKEYS. *Biochemical Journal*, Vol. XV., 1921.

,, - - - - See also CHICK, H. and HUME, E. M.

LEDINGHAM, J. C. G. - - - THE CULTURAL DIAGNOSIS OF ENTERICA IN INOCULATED INDIVIDUALS. *The Lancet*, Vol. I., 1921.

,, - - - THE ETIOLOGY OF "DIARRHOEAS" UNDER WAR CONDITIONS. *Medical History of the War. Pathological volume.*

LEPPER, E. H. - - - - THE PRODUCTION OF COLIFORM INFECTION IN THE URINARY TRACT OF RABBITS. *Journal of Pathology and Bacteriology*, Vol. XXIV., 1921.

LODGE, OLIVE - - - - See WOODCOCK, H. M., and LODGE, OLIVE.

MACKAY, H. M. M. - - - OBSERVATIONS ON CASES OF RICKETS IN AN OUT-PATIENT DEPARTMENT. *British Medical Journal*, Vol. II., 1920.

,, ,, - - - THE EFFECT ON KITTENS OF A DIET DEFICIENT IN ANIMAL FAT. *Biochemical Journal*, Vol. XV., 1921.

MIURA, M. - - - - See ZILVA, S. S. and MIURA, M.

RAW, NATHAN - - - - A TUBERCULOSIS IMMUNISING VACCINE. *British Medical Journal*, Vol. I., 1921.

SCHÜTZE, H. - - - - HAEMAGGLUTINATION AND ITS MEDICO-LEGAL BEARING, WITH OBSERVATIONS UPON THE THEORY OF ISOAGGLUTININS. *British Journal of Experimental Pathology*, Vol. II., 1921.

STEWART, F. H. - - - ON THE LIFE-HISTORY OF *Ascaris lumbricoides*. *Parasitology*, Vol. XIII., 1921.

STILL, G. F. - - - - See ZILVA, S. S. and STILL, G. F.

TOZER, F. M. - - - - The Effect of a Diet Deficient in Animal Fat on the Bone Tissue (Rib Junctions) of Kittens. *Biochemical Journal*, Vol. XV., 1921.

,, - - - - - The Effect on the Guinea-pig of deprivation of Vitamin A. and of the antiscorbutic factor, with special reference to the condition of the costochrondral junctions of the ribs. *Journal of Pathology and Bacteriology*, Vol. XXIV., 1921.

WOODCOCK, H. M. - - - Helminthic Infections in relation to Pellagra. *The Lancet*, Vol. I., 1920.

,, ,, - - - - Dysentery Statistics: A Reply to Dr. Wenyon's Letter. *Journal of the Royal Army Medical Corps*, Vol. XXXV., 1920.

WOODCOCK, H. M. and LODGE, OLIVE - Parasitic Protozoa. Reports British Antarctic (*Terra Nova*) Expedition. *Zoology*, Vol. 6, 1921.

ZILVA, S. S. - - - - The Extraction of the Fat Soluble Factor of Cabbage and Carrot by Solvents. *Biochemical Journal*, Vol. XIV., 1920.

,, - - - - - The Action of Ozone on the Fat Soluble Factor in Fats. (Preliminary Note.) *Biochemical Journal*, Vol. XIV., 1920.

,, - - - - - The Influence of Aeration on the Stability of the Antiscorbutic Factor. *The Lancet*, Vol. I., 1921.

,, - - - - - See Drummond, J. C., Golding, J., Zilva, S. S., and Coward, K. H. Also Harden, A. and Zilva, S. S.

ZILVA, S. S., GOLDING, J., DRUMMOND, J. C., & COWARD, K. H. - The relation of the Fat Soluble Factor to Rickets and Growth in Pigs. *Biochemical Journal*, Vol. XV., 1921.

ZILVA, S. S. and MIURA, M. - - The differential Dialysis of the Antineuritic and the Antiscorbutic Factors. *Biochemical Journal*, Vol. XV., 1921.

,, ,, - - A note on the relative activity of the Fat Soluble Accessory Factor in Cod-Liver Oil and Butter. *The Lancet*, Vol. I., 1921.

ZILVA, S. S., and STILL, G. F. - Orbital Hæmorrhage with Proptosis in Experimental Scurvy. *The Lancet*, Vol. I., 1920.

The Lister Institute
of
Preventive Medicine.

Report of the Governing Body, 1922.

Chelsea Gardens,
London, S.W. 1.

May 3rd, 1922.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W. 1;
ELSTREE, HERTS; HAYLE, CORNWALL.

THE GOVERNING BODY.

MAJ.-GENL. SIR DAVID BRUCE, K.C.B., D.Sc., LL.D., F.R.S., A.M.S., *Chairman.*

LT.-COL. G. W. ADDISON, R.E., *Hon. Treasurer.*

SIR FREDERICK W. ANDREWES, O.B.E., M.D., F.R.S.

PROFESSOR W. BULLOCH, M.D., F.R.S.

SIR JAMES KINGSTON FOWLER, K.C.V.O., C.M.G., M.D.

LT.-COL. HON. W. E. GUINNESS, D.S.O., M.P.

PROFESSOR ERNEST H. STARLING, C.M.G., M.D., F.R.S.

THE COUNCIL.

MEMBERS.	REPRESENTING THE
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THE PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS	Royal College of Surgeons, England.
THE PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS ...	Royal College of Physicians, London.
SIR FREDERICK W. ANDREWES, O.B.E., M.D., F.R.S.	Royal College of Physicians, London.
THE PRESIDENT OF THE ROYAL COLLEGE OF VETERINARY SURGEONS	Royal College of Veterinary Surgeons.
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PROFESSOR J. M. PURSER, M.D., D.Sc.	University of Dublin.
JOHN FAWCETT, M.D., F.R.C.P., F.R.C.S....	University of London.
PROFESSOR HENRY R. DEAN, M.A., M.D., F.R.C.P.	University of Manchester.
J. R. DRAKE, Esq.	Worshipful Company of Grocers.
GEORGE K. MORICE, Esq.	Worshipful Company of Grocers.
SIR DAWSON WILLIAMS, C.B.E., M.D.	British Medical Association.
LT.-COL. G. W. ADDISON, R.E.	Members of the Institute.
SIR THOMAS BARLOW, BART., K.C.V.O., M.D., F.R.S.	,, ,,
PROFESSOR A. E BOYCOTT, M.D., F.R.S....	,, ,,
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SIR WALTER M. FLETCHER, K.B.E., M.D., F.R.S.	,, ,,
SIR JAMES KINGSTON FOWLER, K.C.V.O., C.M.G., M.D. ...	,, ,,
SIR RICKMAN J. GODLEE, BART., K.C.V.O., F.R.C.S., LL.D. ...	,, ,,
PROFESSOR ARTHUR HARDEN, D.Sc., F.R.S.	,, ,,
PROFESSOR R. T. HEWLETT, M.D.	,, ,,
SIR E. RAY LANKESTER, K.C.B., M.A., D.Sc., LL.D., F.R.S....	,, ,,
MAJ.-GENL. SIR WILLIAM LEISHMAN, K.C.M.G., C.B., F.R.S., A.M.S.	,, ,,
PROFESSOR CHARLES J. MARTIN, C.M.G., M.B., D.Sc., F.R.S....	,, ,,
H. DE REIMER MORGAN, M.R.C.S.	,, ,,
LOUIS C. PARKES, M.D.	,, ,,
PROFESSOR SAMUEL G. SHATTOCK, F.R.C.S., F.R.S.	,, ,,
PROFESSOR W. J. SIMPSON, C.M.G., M.D....	,, ,,

THE STAFF.

Director:

*Professor C. J. Martin, C.M.G., M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, C.M.G., M.B., D.Sc., F.R.S., *Bacteriologist-in-Chief; Professor of Bacteriology in the University of London.*
J. A. Arkwright, M.A., M.D., B.Ch., *Assistant Bacteriologist.*
E. E. Atkin, B.A., M.B., „ „
S. P. Bedson, M.Sc., M.D., B.S., „ „
H. L. Schütze, M.D., B.Sc., „ „
Mary M. Barratt, M.B., Ch.B., „ „ *(temporary).*

Department of Bio-Chemistry:

*A. Harden, D.Sc., F.R.S., *Professor of Bio-Chemistry in the University of London.*
R. Robison, Ph.D., B.Sc., F.I.C., *Assistant.*
S. S. Zilva, D.Sc., Ph.D., F.I.C., „ *(honorary).*

Department of Experimental Pathology:

*C. J. Martin, C.M.G., M.B., D.Sc., F.R.S., *Professor of Experimental Pathology in the University of London.*
Harriette Chick, D.Sc., *Assistant.*
Eleanor M. M. Hume, „ *(honorary).*

Department of Entomology:

Arthur Bacot.

Department of Protozoology:

Muriel Robertson, M.A., *Assistant.*

Department for the Preparation and Study of Antitoxic Sera [Elstree]:

A. T. MacConkey, M.B., B.Ch., D.P.H., *Bacteriologist-in-Charge of Serum Laboratories.*
*G. F. Petrie, M.D, Ch.B., *Assistant.*

Department for the Preparation and Study of Anti-Variolous Vaccine [Hayle]:

Alan B. Green, M.A., M.D., B.Ch., *Bacteriologist-in-Charge of the Anti-Variolous Vaccine Laboratories.*

Secretary and Accountant:
George Cooper.

Assistant Secretary:
A. L. White.

National Collection of Type Cultures.
(Medical Research Council).

Director:

Professor J. C. G. Ledingham, C.M.G., D.Sc., M.B., F.R.S.

Curator:
R. St. John Brooks, M.A., M.D., D.P.H.

Assistant Curator:
Miss M. Rhodes.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 3rd, 1922.

REPORT OF THE GOVERNING BODY.

The Governing Body has the honour to present the 28th Annual Report.

THE GOVERNING BODY.

No change in the membership of the Governing Body has taken place since the date of the last meeting, when the Council re-elected Sir Frederick W. Andrewes, Professor Bulloch and Sir James K. Fowler to represent them until December 31st, 1922.

Sir David Bruce has been elected a representative of the Governing Body on the Executive Council of the British Empire Exhibition, 1923.

THE COUNCIL.

Mr. Seymour Conway, one of the representatives of the Grocers' Company upon the Council has resigned, and Mr. George K. Morice has been appointed by the Company in his stead.

No other change in the personnel of the Council has taken place, the three members retiring by rotation at the last meeting, Sir E. Ray Lankester, Sir Thomas Barlow and the President of the Royal College of Surgeons, England, having each been re-elected.

The members who retire by rotation this year, but who are eligible for re-election, are Sir Frederick W. Andrewes, one of the representatives of the Royal College of Physicians, London, Professor H. R. Dean, the representative of the Victoria University of Manchester and Professor S. G. Shattock, a representative of the Members.

STAFF.

Dr. Arkwright who since November, 1920, had been in charge of an investigation into Foot and Mouth disease under the auspices of a Committee appointed by the Ministry of Agriculture, returned to duty in October. Towards the end of the year, the Governing Body was requested by the Director General, Egyptian Medical Service, to place the services of Dr. Arkwright and Mr. Bacot at the disposal of the Egyptian Government for six months in order to study the etiology of Typhus fever. This request it was pleased to grant and Dr. Arkwright and Mr. Bacot left in January for Cairo. The Governing Body grieves to state that the investigations had been in progress only two months when both Mr. Bacot and Dr. Arkwright contracted the disease, which in Mr. Bacot's case proved fatal. The condition of Dr. Arkwright was a source of grave anxiety for some days but he is now making a good recovery. Beyond the knowledge that it happened in the course of their experiments with infected lice, it is uncertain how either of them acquired the disease.

By the death of Mr. Bacot the Institute has lost one of its most valued investigators and his comrades one of their best friends.

Miss Muriel Robertson has been absent from the Institute during the greater part of the year on account of illness. The Governing Body is pleased to report there is good reason to hope that Miss Robertson will soon regain complete health.

Dr. Harriette Chick has continued to work in Vienna where she is in charge of an investigation into those diseases of young children which there is reason to believe are caused by qualitative food deficiencies. The general direction of the enquiry is in the hands of the Accessory Food Factors' Committee, appointed jointly by the Lister Institute and the Medical Research Council and will be referred to later. Miss Chick is accompanied by Dr. Elsie Dalyell (Beit Fellow), Dr. Helen Mackay (Beit Fellow), Miss E. M. Hume and Miss Henderson Smith, all former workers in the department of Experimental Pathology.

RESEARCH WORK.

Before proceeding to review the scientific activities of the various laboratories of the Institute, the Governing Body desires to record its appreciation of the support rendered by the Medical Research Council to some of the enquiries in progress.

Apart from contributing the major share of the expenses incurred by the Accessory Food Factors' Committee in Vienna, for which Committee the Medical Research Council is responsible jointly with the Institute, the Council has generously assisted the experimental investigations on rickets and accessory food factors carried out in the departments of Experimental Pathology and Bio-chemistry, under the direction of Professor Martin and Professor Harden respectively, by providing two full time investigators, Professor V. Korenchevsky and Dr. S. Zilva, and three assistants, Dr. E. M. Luce, Miss Lowe and Miss Soames, as well as contributing towards the cost of the experiments. Without this co-operation, it would not have been possible to finance the investigations on the same scale out of the revenue of the Institute.

Department of Bacteriology.

Dr. Ledingham has undertaken a study of proteolytic bacterial ferments and more especially of *B. pyocyaneus* with a view to elucidating certain phenomena of inhibition and lysis which have recently been studied in connection with the transmissible lytic body or "bacteriophage" of Twort and d'Herelle.

Dr. Ledingham has also shared in the production of a compendium of knowledge on the subject of Diphtheria, which for some considerable time past has been engaging the attention of the Bacteriological Committee of the Medical Research Council, of which committee he is a member. In this latter work he has received much help from Dr. M. M. Barratt, who has made a special study of the cultural and biochemical properties of diphtheroid organisms.

Dr. Arkwright on his return in October, 1921, from special duty under the auspices of the Ministry of Agriculture resumed his investigations on the virus of Typhus fever in conjunction with Mr. Bacot. As mentioned above, advantage has been taken of an offer of the Egyptian Government to continue the work in Cairo.

Dr. Schütze has published his work on the factors which influence the constancy of serological grouping and has, in collaboration with Dr. Zilva, been studying the influence of nutritional deficiencies on susceptibility to tuberculosis.

Dr. Atkin, who is responsible for the preparation and standardisation of the various agglutinating sera employed for determining the identity of micro-organisms, has been engaged in attempting to devise means whereby the keeping qualities of such sera may be improved.

In conjunction with Mr. Bacot he has also carried on experiments on the mechanism of infection of Typhus fever by lice, referred to in some detail under Entomological Department.

Dr. Bedson has in the course of the past year published several important papers on experimental Purpura. He has demonstrated by serological methods the cell-specificity of the mammalian platelet and has proved that in the production of purpura by anti-platelet serum, haemagglutination plays no essential part. That in the production of purpura at least two factors are concerned, is shown by the fact that purpura can be produced by inoculating an agar-serum digest into an animal which, some hours previously, has received an injection of anti-red-cell serum. Neither of these substances can independently produce purpura, though the former can effect a very considerable, though temporary, removal of platelets from the circulating blood.

Dr. E. H. Lepper (Beit Fellow) has continued her work on coliform infections of the urinary tract and means of treating them. She is at present studying a very potent inhibitory and lytic ferment which she has found in filtrates of urine from cases of coliform cystitis.

Dr. M. Cowan (Beit Fellow) has been engaged in the study of Streptococci with special reference to virulence, haemolytic activity and serological affinities. She has recently demonstrated the dissociation of Streptococcus into "rough" and "smooth" varieties which appear to be associated with remarkable variations in virulence.

Dr. Pratt-Johnson (Johannesburg) completed two studies, now published, on (1) the antigenic value of lipovaccines as compared with that of ordinary saline suspensions, and (2) on the capacity of live non-virulent organisms to confer immunity against virulent forms of the same species.

Dr. S. Kanai (Kitasato Institute, Tokio, and now of the Health Bureau, League of Nations, Geneva) brought to a conclusion his work on the comparative value of the oral and subcutaneous methods of immunisation against *B. dysenteriae, Shiga*. He was able to show that carbolised vaccines administered

subcutaneously are far superior to heat-killed vaccines administered orally, and in a further communication now in the press he traverses the work of Olitsky and Kligler, who claimed that it was possible to separate the exotoxin of *B. dysenteriae, Shiga*, from the so-called endotoxin and to distinguish their respective pathological rôles.

Dr. Z. Khaled (Hygienic Institute, Cairo) completed his investigation of the remarkable affinities of *B. abortus* and *B. melitensis*. Immunisation of the monkey with *B. abortus* was found to protect against subsequent infection with *B. melitensis*.

Dr. J. Segal (Paris) has confirmed the observations of Kusama that in the infective blood of guinea-pigs inoculated with the typhus virus, the latter is intimately associated with the platelets. Red cells, leucocytes and cell-free plasma are apparently innocuous. Mr. Bacot and he have shown further that lice inoculated intrarectally with guinea-pig platelets containing typhus virus, develop *Rickettsia* which can again initiate infection in the guinea-pig.

Dr. G. Shwartzman (Odessa) worked in the department for six months on inhibitory substances produced during bacterial growth.

Dr. Parthasarathy (Bangalore) carried out in collaboration with Dr. M. M. Barratt a comparative series of Sachs-Georgi tests in suspected syphilis. The results will shortly be published.

Miss D. B. Steabben, B.Sc. (Lond.) has been granted a Jenner Memorial Scholarship tenable at the Institute, and has commenced experimental work on certain problems connected with the influence of colloids on immunity and their therapeutic use in certain infective processes.

Dr. Mona Ross (Sydney) held the Grocers' Company Research Studentship at the Institute for a few months in 1921 and assisted Dr. Schütze in his work on "rough" and "smooth" varieties of *Salmonella* strains.

The hospitality of the department has also been extended to the following:—Mr. E. H. Fenwick, C.B.E., F.R.C.S., Dr. J. Sevi, Dr. M. Martland, Dr. M. Martin, Dr. S. Yabe, and Dr. B. P. B. Naidu.

Department of Bio-Chemistry.

As in the previous three or four years, much of the attention of this department has been concentrated on the problem of the accessory food factors and many of the questions referred to in last year's report, have been the subject of continued investigation.

Professor Harden and Dr. Zilva are investigating the presence of the antineuritic and the antiscorbutic factors in barley during the various stages of the malting process. They are also extending their work on the production of the antineuritic and antiscorbutic factors by lower organisms, and are examining various fungi and algae in this respect.

A joint investigation has also been commenced by Professor Harden and Dr. Robison on the combination of carbon dioxide with water, a subject of great importance with respect to the question of the hydrogen ion equilibrium in blood.

Joint work by Professor Harden has also been carried out with Mr. Bacot to which reference is made under the heading of Entomological Department.

Dr. Robison has continued his work on the hexosephosphates, but his main attention has been given to experiments on the biological value of proteins, carried out in conjunction with the Director.

Dr. Zilva has continued his work on the effect of inactivation of the accessory factors by heat and has ascertained that the antiscorbutic factor can withstand, under anaerobic conditions, such drastic treatment as acid hydrolysis for several hours. This is expected to be a great help in the chemical investigation of the principle which he is now pursuing in collaboration with Miss Boas.

Dr. Zilva and Dr. Miura have completed their work on the quantitative estimation of the fat soluble factor, and the method devised is proving of great value in the investigations on cod liver oil, etc., to which reference is made below.

In conjunction with their investigation on fats and oils, Dr. Zilva and Dr. Drummond, of University College, visited the main Norwegian fishing grounds in the Lofoten Islands and off the Finmark Coast, where the conditions under which cod liver oil is prepared were studied. A great quantity of material was collected which is now in course of being examined at the Lister Institute and the Physiological Institute, University College. It has already been ascertained that a high vitamin content is characteristic of liver oils of other gadoids such as coal-fish, haddocks, etc. It is also found that the cod liver oils, obtained from fishes caught off the Finmark coast after spawning, are just as potent as those obtained in the Lofoten area during the spawning season. The seasonal variation in the potency of the liver oils

is being systematically pursued and accordingly material collected in various localities is being investigated. A number of oil-bearing seeds and oils used in the manufacture of margarine have also been examined and a communication on the subject is now in the press.

At Reading, Dr. Zilva, in collaboration with Dr. Drummond and Captain Golding, is studying the etiology of rickets in pigs. So far, it has not been found possible to produce the characteristic lesions of rickets in these animals by an experimental diet, but a number of valuable observations on the effect of deficiencies in Fat-soluble A. and mineral matter on the growth and development of the pig, have been made and have formed the subject of a recent paper. The same collaborators, working with the advantages afforded by the Department of Dairy Research at University College, Reading, are also studying the influence of the diets which farmers give to cows upon the vitamin-content of their milk. The importance of knowledge upon this matter for infant feeding need not be emphasized, for evidence is rapidly accumulating to show that the cow is but a store-house of these essential dietary adjuncts and derives them from her food. The research is necessarily laborious, but important quantitative facts have already been ascertained.

Dr. Zilva and Dr. Schütze are pursuing their work on the influence of malnutrition on susceptibility to bacterial infection.

Mr. Henley has continued his work on alcoholic fermentation and a paper has been published on the cognate subject of the influence of phosphates on the oxidation of Glucose.

For some time past experiments have been made by Dr. O. K. Wright on the relation of vitamins to the growth of yeast. This stimulant has been supposed by Williams and Bachman to be identical with the Water-soluble B. vitamin and the former has gone so far as to recommend the observation of its effect upon the growth of yeast, as a convenient method for measuring the amount of this vitamin present in any product. Dr. Wright's observations do not support this and in a recent paper on the nature of this stimulant to the growth of yeast, evidence is adduced which indicates that it cannot be regarded as belonging to the class of vitamins at all.

Miss M. Boas (Grocers' Company Research Scholar) and Dr. H. D. Kay (Beit Fellow) have recently commenced work in the department.

The hospitality of the department has also been extended to Dr. Greig Smith in addition to those workers mentioned above.

Department of Experimental Pathology.

The principal work of the department has been concerned with Animal nutrition.

Professor Korenchevsky has continued the study of rickets and particularly the rôle of deficient diet in the production of the disease. He finds typical manifestation of rickets can be produced in young rats by various modifications of their diets and corresponding pathological lesions in the case of adult animals. The disease is most readily produced by a combined deficiency of the diet in animal fat and calcium or phosphate, but as first discovered by Mellanby, deficiency in "Fat soluble A" alone or some principle with a similar distribution may produce the same result, the most severe lesions being produced when the diet of the mother is impaired in the same way during the period of pregnancy and lactation.

On account of the numerous indications that the activity of the parathyroid glands are in some obscure way concerned with the metabolism of calcium, and the definite statements by Erdheim and others, to the effect that removal of these glands occasions the lesions of rickets, Professor Korenchevsky has examined this question. The results have been, so far, entirely negative. Animals which have survived removal of the parathyroids, whose diet has been carefully attended to, have grown perfect skeletons. Nor has the removal of the parathyroids appeared to influence, in any way, the progress of the disease in those animals in which it has been induced by a deficient diet.

The opinion being not uncommonly held that rickets is an infectious disease, the possibility of producing it by various infections has been explored, but without result. An occasion for testing this view of the etiology of rickets was provided, as a community of rats was discovered in which an outbreak of rickets had spontaneously occurred. In view of Morpurgo's statement that he had isolated a specific micrococcus from animals, the subjects of such a spontaneous outbreak, the inoculation of which was followed after some weeks, by typical rickets, the tissues and organs of these rats were searched for evidence of infection. No support for Morpurgo's view was obtained, the organs of the rats being sterile.

Professor Korenchevsky has confirmed and extended the observations of Mellanby, and of McCollum and his co-workers in the United States of America, and it appears that, whether rickets can be produced in other ways or not, if a diet deficient in certain definite respects is fed to rats for a sufficient period, the lesions characteristic of rickets appear. It can be cured by adjusting the diet so that it is rich in the active principle, whatever it be, contained in the fat and milk of animals and in largest amount in the liver oils of fishes.

With the assistance of Miss Carr, Professor Korenchevsky is ascertaining the conditions under which rickets may occur on a purely milk diet, such as given to young infants, and the influence of prolonged boiling upon the value of a milk diet in maintaining normal bone formation.

Jointly with Dr. Goldblatt (Beit Fellow) he is investigating the influence of parathyroidectomy upon the resistance of rats to infection by the tubercle bacillus.

Dr. Ethel Luce (now a Beit Fellow, but previously receiving a grant from the Medical Research Council) has assisted Professor Korenchevsky in the very laborious histological work connected with the researches mentioned above. She has also been studying the histology of the various ductless glands, in animals which received an insufficient supply of either Fat soluble A., calcium, or inorganic salts, or various combinations of the three. In some of these animals rickets had developed. Altogether, the glands of 90 rats have been histologically examined, but the only noticeable changes were in the parathyroids. These organs were universally enlarged beyond the normal variation for animals of the same age, the most striking difference in size being in the case of those rats in which the calcium in the diet was deficient. The enlargement is due to hyperplasia, suggesting an adaptation of this organ to increased activity in the presence of diminished calcium supply. Incidental to the above research, Miss Luce has determined the relation of the combined size of the parathyroids to age and weight in animals fed upon a normal diet.

Dr. Goldblatt (Beit Fellow) is engaged in a study of the quantitative relation of Fat soluble A. to the development of experimental rickets. It is usually impossible to ascertain to what extent the diet of an infant which develops rickets has been deficient in this principle, but from the work of Drummond and Coward and Miss Chick (referred to under the Accessory Food Factors' Committee) it is clear that the value of milk is determined by the food the cow receives. This varies greatly with the season of the year. Dr. Goldblatt's experiments will, it is hoped, determine the influence of dosage of Fat soluble A. upon the growth of the animal, and upon the calcification of the skeleton. The influence of sunlight upon the development of rickets in animals upon a deficient diet is also being investigated. In all these enquiries Dr. Goldblatt is being assisted by Miss K. M. Soames.

Dr. Barratt, to whom the hospitality of the laboratory has been again extended, has continued to study fibril-formation in fibrinogen solution. His interesting observations have been recently published and he is now engaged in investigating the intimate mechanism whereby various anti-coagulants inhibit fibrin formation. Dr. Barratt has also been endeavouring to ascertain the essential nature of the processes involved in the transaction between an agglutinin and its appropriate antigen. The observations so far made, have formed the basis of a paper on the theory of agglutinin estimation, recently published in the *British Journal of Experimental Pathology*.

Dr. Martin and Dr. Robison have continued their experiments upon the minimum nitrogen requirements of man under various conditions and the ability of different proteins to fulfil these requirements. The lack of dependable information on this latter point, capable of application to human beings, has been felt during recent years, when the problem of most economically rationing institutions, refugees and even communities has been urgent.

Attention has been concentrated on—

(1) Milk as a typical mixture of animal proteins, specially adapted for nutrition,
(2) Wheat, the commonest European foodstuff, and
(3) Gelatin, on account of its known deficiencies in certain amino acids.

The experiments were made upon the observers themselves. Each one of them occupied three months or upwards.

On taking a diet of carbohydrate and fat containing sufficient calories to meet their energy requirements, the urinary output of nitrogen fell in a regular and ordinary manner susceptible of a simple logarithmic expression to less than 2 grams. On resuming an ordinary nitrogenous diet the reciprocal process occurred.

The income and expenditure of nitrogen over periods of a week to ten days when various quantities of nitrogen in the form of wheat, milk, and gelatin were eaten, were determined. About 11 grams of nitrogen in the form of whole wheat bread had to be absorbed to cover the minimum nitrogen expenditure and remain in equilibrium. This could only just be attained without artificially increasing the proportions of proteins in the whole meal flour. In the case of bread, the ratio of bread nitrogen absorbed to body nitrogen saved, remained constant whatever the amount eaten until equilibrium was gained.

The value of nitrogen as it exists in milk, and of gelatin was determined. Milk proteins were found to have a value nearly twice that of those of wheat, but the experiments indicated that the amount of nitrogen expenditure covered was proportionally greater on the smallest quantities. Gelatin *as a sole source* of nitrogen was found by Dr. Robison to be much less valuable than found by previous workers, who, for the most part made their observations upon dogs. It slightly diminishes the negative balance when added to a diet of pure fat and carbohydrate, but this small effect is not increased whatever the amount of gelatin consumed. Gelatin, however, usefully supplements other proteins and when employed in that way covers much more of the expenditure.

It is proposed to extend the observations to other foodstuffs but it is not anticipated that the same labour will be necessary. Much time, hitherto, has been necessarily utilised in overcoming the errors of experiment, settling theoretical points and ascertaining the conditions under which the observations must be made, if they are to be comparable.

The limiting factor for accuracy in such metabolism experiments, is the accounting of the 1 to 1·5 grams of nitrogen excreted in the faeces. How much of this is unabsorbed foodstuff and how much excretion from the body? Much must belong to the latter category for the nitrogen excreted by the bowel during a nitrogen-free diet was never less than one gram. The form this nitrogen is in, is being investigated.

The opportunity afforded while the experimenters were living on a nitrogen-free diet, was taken advantage of by Dr. Robison to determine the distribution of the nitrogen among the various constituents of urine. As Folin observed, the reduction in nitrogen output is almost entirely accounted for by diminution in the urea, which in the present case fell to less than 1 gram per day.

In the course of some of the above nutritional experiments the lack of a sufficiently satisfactory method of estimating small amounts of sulphur in the urine was felt. Dr. Robison, ably assisted by Miss Carr devoted much time and ingenuity to overcoming this difficulty.

The main results of all the above investigations upon nitrogen metabolism have recently appeared in a series of papers in the *Bio-chemical Journal.*

Mrs. Burbury is engaged in determining the effect of ingestion of protein in various forms and amounts upon the basal metabolism of man.

The hospitality of the department has also been extended to Dr. Lumsden.

Department of Entomology.

Mr. Bacot, whose recent lamented death from typhus contracted in the course of his researches is referred to above, has been working at the morphology of the whole group of Rickettsia organisms and the relations of the pathogenic to the non-pathogenic ones. Prior to his departure for Egypt to investigate the entomological side of the epidemiology of Typhus fever he had, in collaboration with Dr. Atkin, devoted a large portion of his time to the question of the infectivity of typhus virus. One of the outstanding problems in connection with typhus fever is the mode of infection. It is now generally accepted that the louse is the infecting agent, and previous workers have been able to infect monkeys by smashing lice, previously fed on a typhus patient during the acute stages, and rubbing this into the abraded skin. Very careful experiments have been made by Mr. Bacot to see whether monkeys could be infected with typhus by the simple bite of the infected louse, taking great care that the excreta were not allowed to come in contact with the skin and compromise the result. The technique was similar to that employed by Bacot and Martin in their determination of the mechanism of infection of plague by fleas. As far as the experiments go, there is no evidence that infection is produced during the act of sucking, although it has been found possible to pass the virus of typhus from one monkey to another, by the injection of monkey-lice infected by feeding upon an animal known to have the disease.

The vitamin requirements of insects have also been the subject of investigation in conjunction with Professor Harden, in the hope that less expensive methods of assaying these active principles of unknown chemical composition might be arrived at. The experiments show that Vitamin B. is necessary for the development of *Drosophila* and indicate that this insect might be used for the titration of this vitamin.

Department of Protozoology.

Owing to the absence of Miss Muriel Robertson on sick leave, the activities of the Protozoological department have been restricted.

Dr. H. M. Woodcock, Acting Head of the Department of Protozoology, University of London, has been accommodated during the year. He has been engaged in a cytological study of the cell-inclusions in the lymphocytes known as Kurloff bodies, and the Negri bodies which occur in nerve cells in the course of rabies. Dr. Woodcock's observations and conclusions have recently been recorded in the *Journal of the Royal Army Medical Corps.* He is at present engaged in an histological enquiry with the object of elucidating the formation of the colloid produced in the thyroid gland.

The hospitality of the department has been extended to Miss Dixon, of the University of Manchester; to Miss Nutt, a lecturer at the Battersea Polytechnic, and to Dr. Cossery, of the Hygienic Institute, Cairo, who have worked under Dr. Woodcock's direction. Miss Dixon has been studying early stages in the life cycle of the Gregarines of Millipedes, and Miss Nutt is continuing Dr. Woodcock's work on the coprozoic flagellates and the cytological phenomena occurring during syngamy in these protozoa.

Department for the Preparation and Study of Antitoxic Sera.

Work on the concentration of antitoxic sera by means of Sodium Sulphate has been continued and it has been found most convenient to isolate the antitoxic globulins in solution, precipitate them with acetic acid, and then treat them in the usual way. Sodium Sulphate is not so good a food for organisms as Ammonium Sulphate and this inconvenience of the latter is avoided. Another point in favour of the sodium salt is that for equal concentration of protein, the final product is less viscid than is the case with Ammonium Sulphate.

Although from a solution containing but 50 units of Diphtheria antitoxin per c.cm. there has been obtained a solution containing 1,600 units per c.cm. and although a concentration of 8 to 10 times is common for certain parts of the process, the impression is gaining ground that, no matter what process is used, if it is desired to recover the maximum amount of antitoxin (*i.e.*, to have a total loss of 5% or less) one must be content with a concentration of 3 to 4 times as measured by the volume of the original plasma, and the volume of the final product.

The study of the standardisation of antidysentery serum has been prosecuted as far as circumstances allowed, and although a really satisfactory method has not yet been found, results sufficiently constant to permit of the antitoxic titre of antidysentery serum being tested, before and after concentration, by the Sodium Sulphate process has been obtained. A refined antidysentery serum is now supplied by the department and it is hoped that this will prove a success therapeutically. It would materially advance the antitoxic treatment of Dysentery, if physicians would be good enough to report the effects of antidysentery serum, used clinically. Without such information, it is not possible to correlate therapeutic effect with the results of laboratory tests.

Endeavours have been made to obtain a satisfactory stable, fully-diluted, solution of Diphtheria toxin for the Schick test, but though one batch has been produced which has, in the cold, kept stable for five months, it remains to be seen whether similar success can be attained with regularity.

The "brined" antitoxic sera, the keeping qualities of which received mention in previous reports, have retained their titre unchanged during the year. The time during which they have remained constant, is now four years.

The Governing Body desires, again, to convey its thanks to the Director of the Hygienic Laboratory, U.S. Public Health Service, Washington, for his kindness in supplying the department with standard antitoxins and toxin.

Department for the Preparation and Study of Anti-variolous Vaccine.

The new method of preparing and tubing Dried anti-variolous vaccine alluded to in the last report, has given good results and vaccine prepared by this improved method is kindly being tested by Medical Officers in two or three stations in the Tropics.

A considerable proportion of the vaccine made in the department is destined for use in tropical countries. Apart from the difficulties of maintenance and transit in hot climates, there is an increasing volume of evidence that strains of Variola vary in different parts of the World and at different times. Some degree of immunity to all is produced by vaccination, but it is not improbable that the best immunity is one aroused by a vaccine possessed of not too distant relationship to the strain of variola which is endemic. By the kind co-operation of some Medical Officers of Colonial Governments, special strains of Anti-variolous vaccines have been raised from variolous material obtained from patients in their districts, and these are being studied with the object of obtaining the best immunisation of the populations.

COMMITTEE ON ACCESSORY FOOD FACTORS (VITAMINS).

(Appointed iointly by the Lister Institute and the Medical Research Council).

This Committee, which now consists of—

Dr. Harriette Chick (Lister Institute),
Dr. Drummond (University College),
Professor Harden (Lister Institute) *Acting Secretary*,
W. B. Hardy, Esq. (Food Investigation Board),
Professor Hopkins (University of Cambridge) *Chairman*,
Dr. MacFadden (Ministry of Health),
Professor Martin (Lister Institute), and
Professor Mellanby (University of Sheffield),

has met on several occasions during the year.

In view of the great progress made in the study of vitamins, since the publication of the Committee's report on the state of knowledge of the subject in 1919, it has been decided to issue a revised report. This will be edited by Professor Harden and its preparation is now in progress.

The expenses of work in this subject are heavy because of the large number of carefully controlled feeding experiments that are required, yet perhaps no other research work has greater or more fundamental importance than this, whether because of the immediate importance of the knowledge already being won for the maintenance of health and the control of "deficiency diseases," or because of its significance in the study of primary biological laws of metabolism and growth.

The Committee has recently recommended, and the Medical Research Council provided, a number of grants for the ensuing financial year. Among these are grants to Professor Martin and Professor Harden for the payment of special assistants in the departments of Experimental Pathology and Bio-chemistry at the Institute. A grant has also been made to Dr. Drummond towards the expenses of the work at University College and the department for Dairy Research, University College, Reading, on the influence of the food of the cow on the vitamin content of its milk and on allied problems.

Further grants have been made to Drs. Drummond and Zilva, to enable them to continue their important investigations on fats and oils used for the making of Margarine, and on cod liver and other fish oils, to which reference was made in last year's report. The expenses of their experiments on the etiology of rickets and scurvy in pigs, which are being carried out in conjunction with Captain Golding at Reading, are also being defrayed by the Medical Research Council, on the recommendation of the Committee.

An investigation of the specific advantages of milk, as an addition to the diet of boys, has been approved, and is to be carried out under the direction of Dr. Cory Mann, during the coming summer, in a charitable institution in which, from lack of funds, the amount of milk supplied to the boys is minimal.

The pasteurisation of milk is rapidly becoming generalised in the milk trade in this country. The commercial plants used vary in detail, and it is considered by the Committee to be of importance to ascertain the effect of pasteurisation, by different methods, on the accessory food factors contained in milk. A sub-committee has been appointed to collect information, and suggest a scheme of research, on this important question.

The Mission for the study of deficiency diseases in Vienna has continued its labours during the year. The constitution of the mission and its programme of work were dealt with in some detail in last year's report. The conditions prevalent in Vienna since the war have made many special opportunities for study, and the scientific value of this has been greatly enhanced by the fact that the work of the mission—based on a consideration of the probable rôle of accessory food factors—has proceeded side by side with that of the Viennese school, which bases its dietetic principles without reference to these factors. The conduct of the investigation on scientific lines has been made possible by Professor Pirquet's well-organized system, by which the composition of hospital diets is carefully controlled with quantitative accuracy. A comparison of two different dietetic treatments, the results of one controlling those of the other, is thus being carried out under what are equivalent to experimental conditions.

Latterly, the main object of the mission has been to determine the influence of diet and other conditions, such as light, and fresh air, upon the incidence and cure of rickets. Rickets displays a definite seasonal incidence, and the observations have been accordingly divided into a summer-autumn period and a winter-spring period. As, however, both the amount of sunshine and fresh air which the children enjoy, and the content of the milk in Vitamin A. vary in the same direction with the changing climatic conditions, an effort is being made to discriminate between the effects of light and diet respectively. Two parallel series of observations on children are being carried out simultaneously under precisely similar conditions, except that the diet of the cows furnishing the milk to each series varies. In the one case, the animals are being fed upon the ration usually given to cows confined in stables in winter time; in the other, as much green fodder as can be procured is added to the cows' ration, with appropriate adjustments of the other constituents.

The two special milks, as also the ordinary winter supply of the city of Vienna and the dried milk used, are systematically tested for vitamine content by means of nutritional experiments with rats, by Miss Hume.

The observations of the Mission in Vienna are approaching completion. Much interesting information has been obtained. A full report of the work will be produced as soon as the present series of observations is complete and will, the Committee believes, form a valuable contribution to the solution of the difficult and vexed question of the causation of rickets.

The work at the University Kinder Klinik has involved practically every department in the Hospital in addition to the ward set aside for the purpose, *e.g.*, laboratories, X-ray, light therapy and out-patients' department, kitchens, etc., and the mission is deeply indebted to Professor Pirquet and to the medical, nursing and subordinate staffs in each section for their continual and willing co-operation.

NATIONAL COLLECTION OF TYPE CULTURES.

The scope and activities of the Collection have greatly extended during the past year. The cultures maintained number over 1,200 and on the average over 300 cultures are despatched monthly to all parts of the world. A catalogue of the Collection has recently been published by the Medical Research Council (Special Report Series No. 64, 1922.)

GENERAL AND FINANCIAL.

During the earlier part of 1921 the Governing Body had under consideration the desirability of modifying the rules of the Institute's pension scheme for the scientific staff, so as to bring it into line with that of the Federated Superannuation System for Universities and University Colleges, now nearly universally adopted by academic institutions. The Federated Superannuation System is a contributory scheme, the institution providing each year 10% and the beneficiary 5% of his salary. These contributions are invested in an endowment or annuity policy in an approved Insurance Company. The outstanding advantage of the Federated Superannuation System is that when a member of the staff of one of the Federated Institutions transfers to another, the provision for superannuation benefits is continuous, thus any hindrance of movement on account of loss of Superannuation benefit is avoided.

The Institute's original pension scheme became effective in 1913 and is described in the Annual Report for that year. It was non-contributory and based upon that of the Civil Service. Its defect was that it was of no advantage to the majority of the younger members of the scientific staff who must pass on to appointments elsewhere.

The Governing Body had to bear in mind, that, unless the Institute joined the Federated Superannuation System, it would be prejudiced in the future in filling its junior posts. Admission to the Federated Superannuation System was accordingly applied for, and this being granted, it was decided that in the case of all future appointments to the scientific staff the provision for superannuation should be in accordance with the Federated System.

The Governing Body also decided that in the interests both of the Institute and the scientific workers it was desirable that the same method should be applied, from now onwards, in the case of the existing staff.

The scientific staff having declared their willingness to transfer to the Federated System, it was next considered whether the prospective liabilities of the Pension Fund in respect of them, could be commuted, and thus avoid the complication of having concurrently two methods of providing superannuation benefits for the same persons.

Acting under actuarial advice, the Governing Body allotted from the Pension Fund, to each officer, an amount equal to the calculated liability of the fund on his or her behalf. The total sum required for this purpose was £13,620. Of this amount £13,545 has been paid to the Equitable Life Assurance Society in the form of single premiums for endowment or annuity policies, and National War Savings Certificates to the value of £75 have been purchased on behalf of a member of the staff not at present insurable. The policies and National War Savings Certificates are held by the Institute on behalf of the various members of the scientific staff as long as they remain in the service of the Institute. Thereafter, they will be dealt with in accordance with the rules of the Federated Superannuation System.

The superannuation benefits for the administrative and subsidiary staffs will be provided from the pension fund as heretofore. The only liability now devolving upon the fund in respect of the scientific staff is the payment, as annual premiums, of a sum equal to 10 per cent. of their salaries so long as they remain at the Institute.

The Accounts and Balance Sheet for the year ended December 31st, 1921, show a balance to the credit of the Pension Fund of £34,338 9s. 9d. and of the General Account of £448,336 18s. 7d.

There has been a considerable falling off in the sales of Sera and Vaccines during 1921, as compared with 1920, which, however, was an exceptional year in this respect, and excluding stocks the total nett receipts from this source have been only £27,731 against £50,334, the approximate individual decreases being Bacterial Vaccines £18,000, Anti-variolous Vaccine £3,500 and Sera £1,000.

The expenditure for the year has been £44,156 1s. 5d. against £58,124 19s. 9d. in 1920. It will be noted that the Income and Expenditure Account does not include that of the Pension Fund, which for the first time is shown separately. Rent, Rates, Taxes and Insurance (including Corporation Tax £1,012, which the Institute was called on to pay for the first time), Salaries and Wages, Printing of Collected Papers, Gas, Water and Fuel, Electric Light, Water Laboratory, and Library Expenses, show a total increase of £778 12s. 2d. while the accounts for Stationery, Printing and Postage, Vaccine Laboratory, Serum and Calf Lymph Laboratories, Culture Media, Animal House Forage, Repairs and Alterations, &c., show a total decrease of £6,080 18s. 3d. Nothing was contributed to the expenses of the Accessory Food Factors' Committee this year, and only the usual annual contribution of £700 to the Pension Fund.

During the year the following changes in investments have been made: For General Account, £11,200 5% War Stock, for Sinking Fund £1,250 4% Funding Stock, were purchased.

For the Pension Fund £3,500 Local Loans 3% Stock were bought in April, but in October this was sold in addition to £11,200 5% War Stock and £1,625 Funding Stock in order to raise the necessary funds to purchase the Superannuation Policies and National Savings Certificates on behalf of the scientific staff, referred to above.

In conclusion, the Governing Body desire to express their appreciation of the cordial co-operation of the Director and all Members of the Staff in the work of the Institute.

DAVID BRUCE,

Chairman of the Governing Body.

The Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				2,020 5 1
To Pension Fund—				
Lord Lister's Bequest	17,200 15 0			
Profit on Sale of Investments	2,468 15 0			
		19,669 10 0		
Interest, Dividends and Contributions from Income Accounts to 31st Dec., 1920 ..		27,134 5 3		
Balance of Income and Expenditure A/c 1921		1,154 14 6		
		47,958 9 9		
Deduct				
Purchase of Staff Superannuation Policies	13,545 0 0			
,, ,, National Savings Certificates	75 0 0			
		13,620 0 0		
				34,338 9 9
To Contingency Fund as per account 31st December, 1917				8,228 18 1
To Sinking Fund to December 31st, 1921 ..				10,197 17 9
To Income Tax Schedule D. Reserve Account..				6,000 0 0
To Capital Fund to December 31st, 1921—				
Balance of Income and Expenditure to 31st December, 1920		111,766 16 8		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)..		2,000 0 0		
The Berridge Trustees (1893/98)		46,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Lord Iveagh (1900)		250,000 0 0		
Other Donations (1891-1920)		20,370 8 3		
Jenner Memorial Fund (1899)		5,768 0 11		
Add			446,284 15 11	
Balance of Income and Expenditure Account, 1921			2,052 2 8	
				448,336 18 7
				£509,122 9 3

ERNEST H. STARLING, *Acting-Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. value of £14,590 11s. 0d., being held by the Institute on behalf of the Scientific Staff. In our opinion, such Balance Sheet to the best of our information and the explanations given to us and as shown by the books of the Institute.

London, March 16th, 1922.

31st DECEMBER, 1921. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers: Deposit Account	1,000 0 0	
Current ,,	5,885 2 6	
In hand	53 3 4	6,938 5 10
By Investments (at cost)—		
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4,570 11 0	
£5,000 Lancashire & Yorkshire Railway 3 per cent. Consolidated Preference Stock	4,520 3 6	
£4,900 London & North Western Railway 4 per cent. Consolidated Preference Stock	5,940 5 0	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 5½ per cent. Stock, 1922-32	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499 11 0	
£36,800 5 per cent. War Stock, 1929-1947	34,404 16 2	
£12,375 4 per cent. Funding Stock, 1960—1990	10,300 0 0	
£20,000 Local Loans 3% Stock	9,962 0 7	80,719 2 6
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000 0 0	
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000 0 0	
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	5,768 0 11
By Investment Contingency Fund (at cost)—		
£8,700 5 per cent. War Stock, 1929-1947		8,228 18 1
By Investments, Pension Fund (at cost)—		
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock	765 4 4	
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debenture Stock	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debenture Stock	984 0 0	
£661 Madras and South Mahratta Railway 4 per cent. Debenture Stock	656 19 7	
£500 Canada 4 per cent. Stock	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594 2 0	
£1,200 Great Northern Railway 3 per cent. Debenture Stock	891 2 9	
£26,500 4 per cent. Funding Stock, 1960—1990	20,126 5 2	
Balance Uninvested	645 6 7	
,, of Staff Superannuation Repayments, outstanding	376 19 0	34,338 9 9
By Investments, Sinking Fund (at cost)—		
£7,350 5 per cent. War Stock, 1929—1947	6,916 12 7	
£4,450 4 per cent. Funding Stock, 1960—1990	3,279 14 4	10,196 6 11
(The above Investments, at the market value, 31st December, 1921, show a depreciation of approximately £126,654.)		
By Debtors		8,399 8 4
By Stock of Bacterial Vaccines		43 11 0
*By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1920		2,471 17 2
By Expenditure on Institute Buildings at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea, as per account, 31st December, 1912		169 6 8
By Lease of "The Studios," Chelsea, as per last account	2,109 16 9	
Less amount written off	65 2 0	2,043 14 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,455 10 0
Stock of Animals and Forage	1,390 9 0	
Stock of Anti-Toxins and Bottles	6,223 14 8	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	8,433 14 3
		£509,122 9 3

* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.

TO THE MEMBERS.

The Superannuation Scheme for the Scientific Staff provides for Life Policies and National Savings Certificates to the present is full and fair, and properly drawn up so as to exhibit a true and correct view of the state of the Institute's affairs, according

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.
To Interest and Dividends on General Investments	12,436	0	9
To Interest and Dividends on Sinking Fund Investments	479	18	0
To Investigation, Diagnosis and Analysis Fees, &c.	4,678	12	1
To Sales of Sera, Vaccines, &c., and Stock at 31st December, 1921, less Stock at 31st December, 1920	28,304	3	3
To Rent of Rooms in the Institute	309	10	0
	£46,208	4	1

Dr. Pension Fund INCOME AND EXPENDITURE ACCOUNT

	£	s.	d.
To Interest and Dividends on Investments	1,972	10	3
To Contribution from General Fund	700	0	0
	£2,672	10	3

Preventive Medicine.

for the year ending 31st December, 1921. Cr.

EXPENDITURE.

	£	s.	d.
By Rent, Rates, Taxes and Insurance	6,594	19	1
By Salaries and Wages of Staff	20,548	13	11
By Stationery, Printing and Postage	499	11	1
By Printing of Collected Papers	204	15	0
By Office Expenses and Sundries	208	15	10
By Travelling Expenses	32	8	9
By Auditors' Fee	40	0	0
By Gas, Water and Fuel	1,634	12	8
By Electric Light and Power	309	5	0
By Experimental Pathology Laboratory Expenses, including General Apparatus ...	394	18	11
By Bacteriological Laboratory Expenses	341	6	10
By Vaccine Laboratory Expenses, including Bottles	145	13	0
By Water and Bio-chemical Laboratory Expenses, including Apparatus	411	0	0
By Serum and Calf Lymph Laboratories Expenses, including Apparatus and Cost of Bottles	2,800	19	6
By Culture Media	106	18	3
By Animals	1,289	2	7
By Animal House Expenses and Forage	3,943	3	11
By Repairs and Alterations to Buildings, including Workshop Expenses	2,349	18	10
By Library Expenses	235	18	1
By General Stores	433	6	4
By Bad Debts	5	0	3
By Contribution to the Pension Fund	700	0	0
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments) ...	890	11	7
By Balance, being Excess of Income over Expenditure, transferred to Balance Sheet ...	2,052	2	8
	£46,208	4	1

for the year ending 31st December, 1921. Cr.

	£	s.	d.
By Annual Premiums, Superannuation Policies	970	11	0
By Loss on Sale of Investments	547	4	9
By Balance, being Excess of Income over Expenditure transferred to Balance Sheet	1,154	14	6
	£2,672	10	3

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BASILE, C.... ... ... THE PATHOLOGY AND PATHOGENESIS OF *Spirochaetosis icterohaemorrhagica*. *Journal of Pathology and Bacteriology*, Vol. XXIV., 1921.

BEDSON, S. P. ... ... BLOOD PLATELET ANTI-SERUM, ITS SPECIFICITY AND RÔLE IN THE EXPERIMENTAL PRODUCTION OF PURPURA. Part I. *Journal of Pathology and Bacteriology*, Vol. XXIV, 1921.

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COWARD, K. H. ... ... See GOLDING J., ZILVA, S. S., DRUMMOND, J. C., and COWARD, K. H.

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DAUTREBANDE, L., & HALDANE, J. S. — THE EFFECTS OF RESPIRATION OF OXYGEN ON BREATHING AND CIRCULATION. *Journal of Physiology*, Vol., LV., 1921.

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THE LISTER INSTITUTE
OF
PREVENTIVE MEDICINE.

Report of the Governing Body, 1923.

CHELSEA GARDENS,
LONDON, S.W. 1.

May 16th, 1923.

The Lister Institute of Preventive Medicine,

CHELSEA GARDENS, LONDON, S.W. 1;
ELSTREE, HERTS; HAYLE, CORNWALL.

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PROFESSOR W. J. R. SIMPSON, C.M.G., M.D.	,, ,,

THE STAFF.

Director:

*Professor C. J. Martin, C.M.G., M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, C.M.G., M.B., D.Sc., F.R.S., *Bacteriologist-in-Chief; Professor of Bacteriology in the University of London.*
J. A. Arkwright, M.A., M.D., B.Ch., *Assistant Bacteriologist.*
E. E. Atkin, B.A., M.B., ,, ,,
S. P. Bedson, M.Sc., M.D., B.S., ,, ,,
H. L. Schütze, M.D., B.Sc., ,, ,,
Mary M. Barratt, M.B., Ch.B., ,, ,,

Department of Bio-Chemistry:

*A. Harden, D.Sc., F.R.S., *Professor of Bio-Chemistry in the University of London.*
R. Robison, Ph.D., B.Sc., F.I.C., *Assistant.*
S. S. Zilva, D.Sc., Ph.D., F.I.C., ,, *(honorary).*

Department of Experimental Pathology:

*C. J. Martin, C.M.G., M.B., D.Sc., F.R.S., *Professor of Experimental Pathology in the University of London.*
Harriette Chick, D.Sc., *Assistant.*
Eleanor M. M. Hume, ,, *(honorary).*

Department of Protozoology:

Muriel Robertson, M.A., D.Sc.

Department for the Preparation and Study of Antitoxic Sera [Elstree]:

A. T. MacConkey, M.B, B.Ch., D.P.H., *Bacteriologist in-Charge of Serum Laboratories.*
*G. F. Petrie, M.D., Ch.B., *Assistant.*

Department for the Preparation and Study of Anti-Variolous Vaccine [Hayle]:

Alan B. Green, M.A., M.D., B.Ch., *Bacteriologist-in-Charge of the Anti-Variolous Vaccine Laboratories.*

Secretary and Accountant:
George Cooper.

Assistant Secretary:
A. L. White.

National Collection of Type Cultures.

(Medical Research Council.)

Director:

Professor J. C. G. Ledingham, C.M.G., D.Sc., M.B., F.R.S.

Curator:
R. St. John Brooks, M.A., M.D., D.P.H.

Assistant Curator:
Mabel Rhodes.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 16th, 1923.

REPORT OF THE GOVERNING BODY.

The Governing Body has the honour to present the 29th Annual Report.

THE GOVERNING BODY.

No change in the membership of the Governing Body has taken place since the date of the last meeting, when the Council re-elected Sir Frederick W. Andrewes, Professor W. Bulloch and Sir James K. Fowler to represent it until December 31st, 1923.

THE COUNCIL.

Lord Northbrook, the representative of the Royal Agricultural Society upon the Council has resigned, and Professor W. Somerville has been appointed by the Society in his stead.

At the last meeting of the Council, the retiring members, Sir Frederick W. Andrewes and Professor S. G. Shattock were re-elected as representatives of the Royal College of Physicians, London, and the members of the Institute, respectively, and at a later date Professor W. W. C. Topley was elected by the University of Manchester in place of Professor H. [redacted] Dean.

The three members who retire by rotation this year, but who are eligible for re-election, are Sir Walter M. Fletcher, one of the representatives of the members of the Institute, Professor G. Dreyer, the representative of the University of Oxford, and Dr. John Fawcett, the representative of the University of London.

STAFF.

The Governing Body is pleased to state that Dr. Arkwright, whose illness from typhus was reported last year, is now fully recovered. Dr. Muriel Robertson has again been absent from the Institute for some months on account of illness. The Governing Body is pleased to report that her health has improved and she has now resumed her duties.

Dr. Schütze, of the Bacteriological Department, Dr. R. St. John Brooks, Curator, and Miss M. Rhodes, Assistant Curator, of the National Collection of Type Cultures, all of whom unfortunately contracted the newly discovered Californian disease, Tularæmia, have been absent for varying periods during the year. Dr. Schütze and Dr. St. John Brooks have recovered, but Miss Rhodes, who has had several relapses, is not yet sufficiently well to resume her duties.

Dr. Harriette Chick and Miss E. M. Hume returned from Vienna in June, having completed the investigation into rickets and other diseases of young children caused by qualitative food deficiencies, which they and their colleagues have carried out under the general direction of the Accessory Food Factors' Committee, appointed jointly by the Lister Institute and the Medical Research Council. The outcome of this investigation will be referred to under the scientific activities of the Institute.

RESEARCH WORK.

Before proceeding to review the scientific activities of the laboratories of the Institute, the Governing Body desires to record its appreciation of the support rendered by the Medical Research Council to some of the enquiries in progress.

During 1922, the Council has defrayed, with the exception of the salaries of Dr. H. Chick and Dr. Helen Mackay (Beit Fellow), the whole of the expenses incurred by the Accessory Food Factors' Committee in Vienna, for which Committee the Medical Research Council is responsible jointly with the Institute. The Council has also assisted the experimental investigations on rickets and accessory food factors carried out in the Departments of Experimental Pathology and Bio-chemistry, under the direction of Professor Martin and Professor Harden respectively, by providing two full time investigators, Professor V. Korenchevsky and Dr. S. Zilva, and three assistants, Miss Soames, M.Sc., Miss Carr and Miss Pickersgill, as well as contributing towards the cost of the experiments. Without this co-operation, it would not have been possible to finance the investigations on the same scale out of the revenue of the Institute.

Department of Bacteriology.

Professor Ledingham has been investigating certain problems in normal immunity with special reference to that exhibited by animals such as the rat and mouse, to *C. diphtheriæ* and its toxin.

The recent occurrence of laboratory infections with *B. tularense* contracted by three workers in the Institute while conducting passage experiments with the virus of Tularaemia, necessitated the elaboration of some method of serological diagnosis. A suitable antigen was not then available, but from the organs of infected mice which teemed with *B. tularense*, suspensions of the organism were prepared by a special process. These proved entirely satisfactory, and by their aid, the diagnosis was established. A note on the method, together with observations on the experimental lesions in mice and guinea-pigs, has been published. Professor Ledingham has also continued his work on the Bacteriological Committee of the Medical Research Council and the monograph on Diphtheria, on which the members of the Committee have been engaged, will, it is hoped, appear in the course of the summer.

For this monograph, Dr. M. M. Barratt, working under Professor Ledingham's direction, has completed an investigation of the cultural and biochemical properties of diphtheroids, and is now engaged in bringing to a conclusion another enquiry on behalf of the Medical Research Council into the relationship between toxin-production and virulence as exhibited by virulent strains of *C. diphtheriæ*. In this work she has received valuable assistance from the staff at Elstree.

Dr. Arkwright returned to work in September 1922, after convalescence from typhus fever contracted during researches into this disease at Cairo. Since his return he has been able to complete the observations made by him and the late Mr. Bacot, on the etiology of typhus fever, and these have now been published. A further communication on the morphology of *Rickettsia prowazeki* in lice has recently appeared. He is at present engaged in further studies of those phenomena of variation recently discovered by him in *B. dysenteriæ*, with special reference to agglutination of the variants by salts and serum and the action of d'Herelle's "bacteriophage" upon them.

Dr. Schütze returned to work in September 1922, after a prolonged leave of absence on account of illness. Shortly after his return to duty, he contracted Tularaemia while undertaking a passage experiment. Fortunately, the infection in his case was not a severe one and he was able to return to active work in November. Since then he has resumed his former investigations (1) on antigen-analysis in the Para-typhoid B. group and (2), in collaboration with Dr. Zilva, on variations in resistance to tuberculosis observed in the rat under dietetic control, with more particular reference to the content of Vitamin A in the diet. He has also carried out a number of experiments on the inhibitory effect of various fatty acids on the growth of the tubercle bacillus in artificial media.

Dr. Atkin concluded and published in collaboration with the late Mr. Bacot, certain observations on the infectivity of typhus virus contained in infected lice. He has recently been investigating meningococcal types from the standpoint of their viability on artificial culture and some interesting relationships have emerged from this work.

Dr. Bedson has continued his studies on the mammalian blood-platelet. He has published papers dealing with the histogenesis of the platelet and with the factors which control or modify immunity to antiplatelet serum which was recently discovered by Professor Ledingham to occasion universal purpura, if injected into animals. With Dr. Zilva he has investigated the effect on the platelet-count of diets deficient in *fat-soluble A.*, but has been unable to confirm the work of Cramer, Drew and Mottram, who record very material changes in the number of platelets under similar experimental conditions.

Dr. E. H. Lepper (Beit Memorial Research Fellow), has, during the final year of her tenure of the fellowship, made a careful investigation of the mode of production of bacteriophage and its rate and course of action on sensitive bacilli. The bacteriophage with which she worked was obtained from the filtered urine of a case of cystitis due to *B. coli*. Two communications dealing with the factors which control the production of bacteriophage and with its velocity of reaction, have recently been published.

Dr. M. Cowan (Beit Memorial Research Fellow) has continued her work on virulent and non-virulent types into which individual strains of streptococci can be split. Mice immunised with the non-virulent or "R" type acquire a certain degree of immunity against the virulent or "S" type. Rabbits treated with the live "R" type or with the killed "S" type have not, so far, yielded serum which protects mice from infection. The work on which she has been engaged has a very obvious bearing on serumtherapy in streptococcal infections and horses are being immunised at Elstree both with the "R" and "S" types in order to ascertain whether the resultant sera differ in their protective action. These "R" and "S" strains remain stable when frequently subcultured. There is evidence, however, that in freshly isolated strains left for long periods without subculture the non-virulent "R" type tends to become dominant.

Miss D. Steabben, B.Sc. (Lond.), was awarded a Jenner Memorial Research scholarship by the Institute in 1922 and had commenced research on the influence of various organic and inorganic colloids injected into laboratory animals with a view to elucidating the physiological basis of so-called "shock" therapy and non-specific vaccine therapy. This work has necessarily been suspended since September, 1922, when Miss Steabben's services were requisitioned for the National Collection of Type Cultures in the absence of the staff through illness. It will, however, be resumed shortly when she recommences her studies for the Ph.D. of the University of London.

Miss M. Johnston, B.Sc. (Lond.), is collaborating with Dr. Bedson in an experimental research on immunity to antiplatelet serum and the problem of anti-antibodies generally.

Miss M. K. Semple, M.B. (Edin.) is investigating methods of modifying the hydrogen-ion concentration of fluid serum-media with a view to their improvement for testing the fermentative activity of bacteria.

Dr. T. Toda, M.D. (Okayama), of the Nippon Yusen Kaisha line, has carried out and published some experimental work on the carriage of the cholera vibrio by the ship cockroach. Cockroaches, after ingesting cholera vibrios, cease, as a rule, to excrete them in the fæces after two to three days. He has also tested the possibility of blood-grouping by means of the platelets. These elements, however, were not found capable of being relegated into four groups by means of red-cell-typing sera.

Dr. K. Nain (Kashmir), has examined the cultural and biochemical properties of a series of micro-organisms recovered from various bacterial diseases of plants. The cultures were placed at his disposal by the National Collection.

Dr. A. Coyle (Lahore), has been given a plan of study and research in preparation for the degree of Ph.D. of the University of London in Bacteriology.

Dr. Z. Khaled (Hygienic Institute, Cairo), returned to the Institute in January 1923, and facilities were given him to carry out some further experiments on cross-immunity effects in goats with *B. abortus* and *B. melitensis*. The experiments are approaching completion.

The hospitality of the Department has also been extended to the following:—Dr. E. Knight, Dr. Martland, Dr. K. S. Krikorian (Department of Health, Government of Palestine), Mr. D. T. Mitchell, M.R.C.V.S. (Government Veterinary Department, South Africa).

Department of Experimental Pathology.

Professor Korenchevsky, who has been working in the department on the experimental production of rickets in animals during the last three years has collected together his observations up to July 1922. These have been published in the form of a monograph "On the Aetiology and Pathology of Rickets from an Experimental Point of View" by the Medical Research Council, from whom the professor receives a whole-time grant. The monograph is of value, not only because it records the author's valuable observations but because it includes an excellent resumé of the experimental work of others upon the metabolism of calcium and phosphate and its relation to rickets. It also contains a review of the literature and a nearly complete bibliography to date.

Since the publication of the above, Professor Korenchevsky has, in conjunction with Miss Carr, repeated and extended his earlier experiments to show that rickets is produced in young rats by a deficiency of anti-rachitic fat-soluble vitamin alone, even when the calcium and phosphate in the diet is optimal or excessive, provided this deficiency is commenced at a sufficiently early age and the mothers are not too well fed during pregnancy and lactation. If, however, the mothers are given cod liver oil or abundance of animal fat whilst the foetus is forming and the young are being suckled, sufficient stores of the anti-rachitic vitamin are accumulated by the offspring to carry it over the period of susceptibility to

rickets. The experiments point to a fact of importance, namely, that, in small animals, a properly constituted diet in the mother during pregnancy and lactation can protect her offspring from rickets. They suggest, that in industrial districts where rickets is prevalent, experiments should be made in the prevention of rickets by giving to the mothers during pregnancy and lactation, cod liver oil and calcium phosphates.

The investigation by Professor Korenchevsky and Miss Carr on the influence of heating and æration of milk, as in the commercial process of pasteurisation, referred to in the last report, has been proceeded with. The growth-promoting and anti-rachitic factors are found to be much less sensitive to oxidation in milk than when contained in butter. Animals fed *ad. lib.* upon milk which had been heated to 99°C. and vigorously ærated by bubbling air through it for 7 hours, grew as well as those fed upon fresh milk and developed as good skeletons. However, by quantitative experiments, slow destruction of the fat-soluble vitamins could be shown, but the rate was not such as to indicate any serious damage in this direction to the nutritive properties of milk by pasteurisation.

The research upon the changes induced in the glands of internal secretion by diets deficient in Vitamin B. which was commenced 18 months ago by Professor Korenchevsky has been recently published. The most important changes found are as follows: hypertrophy of adrenals, and atrophy of thymus and spleen (confirming McCarrison). Some new facts have emerged, viz., persistence in the spleen of the germ centres, often accompanied by an increase in number and size; frequent hypertrophy and hyperplasia of the cells in these islets; the frequent hypertrophy of the thyroid gland and of the secretory interstitial cells of the testicles; increased number and hypertrophy of the large light cells of the pituitary body.

Dr. H. Goldblatt (Beit Memorial Research Fellow), is also engaged in investigating experimental rickets. The study of the quantitative relation of the fat-soluble anti-rachitic factor in the diet to the development and calcification of the bones, referred to last year, has been completed. The results show that this dietary factor plays a very important, if not dominant, rôle in the deposition of calcium in the bones. When other constituents are maintained constant, a quantitative relation is shown between the amount of the organic factor in the diet and the degree of calcification of the bones.

Following on the discovery by others that irradiation with ultra-violet light cured or prevented rickets, Dr. Goldblatt has, in collaboration with Miss K. M. Soames, studied the effect of the rays from a mercury-vapour quartz lamp upon the growth of rats receiving a diet deficient in fat-soluble A. Rats on a diet very deficient in fat-soluble A scarcely grow, but if irradiated daily by the mercury-vapour quartz lamp, grow very much better and for a longer period than non-irradiated rats on the same diets. Irradiation stimulates temporary resumption of growth if a rat has ceased gaining weight on a —A diet, but the rays cannot effect an indefinite continuance of growth. Therefore, the conclusion is reached that the rays do not effect a synthesis of fat-soluble A, but merely economise the action of that which is already stored in the animal. Gain in weight under the influence of irradiation is always accompanied by improvement of appetite. Another investigation is now under way to determine the minimum amount of fat-soluble A which must be present in the diet, before irradiation with the mercury-vapour quartz lamp will effect as good growth and calcification of the bones, as that of control rats receiving an optimal quantity of fat-soluble A. As light exerts such a striking influence upon growth and calcification of the skeleton when the diet is faulty in the direction mentioned above, a study of the effect of keeping rats in complete darkness was made and it was found that if their diet is normal in every respect, they grow as well and their bones develop, and calcify, as well as those of rats kept on the same diet in daylight, or irradiated daily by the mercury-vapour quartz lamp.

An animal fed upon a good diet is able to store considerable quantities of fat-soluble A, and the seat of this accumulation has been investigated. Storage of fat-soluble growth-promoting factor is found to occur to a large extent in the liver of the rat and there is a quantitative relation between the amount of fat-soluble A in the diet and that which is stored in the liver.

In conjunction with Dr. Zilva, Dr. Goldblatt is also engaged in determining the rate of destruction by oxidation of the growth-promoting and anti-rachitic property respectively, in cod liver oil. MacCollum has recently shown reasons for supposing that these two properties reside in two separate vitamins. The research is being undertaken to elucidate this question by a careful series of quantitative observations.

Dr. Ethel Luce (Beit Memorial Research Fellow) has completed her study of the influence of diets deficient in fat-soluble A and calcium, upon the development of various endocrine glands, which was referred to in the last report. The results have been published in the *Journal of Pathology* during the year. Since June 1922, she has been engaged upon an intensive study of the influence of the diet of a cow and of the amount of sunlight to which the animal is exposed, upon the content of her milk in fat-soluble, growth-promoting and anti-rachitic factors. The cow is maintained at the Serum Department where the strictest control of its diet and environment is secured. To differentiate between the operation of diet and sunlight, the animal has been kept on "winter food" during summer when it lived out of doors, and on the same food in darkness, and it is proposed to reverse these in the near future. The research, which it is proposed to continue for at least 18 months, is affording some interesting information which cannot fail to be of value in infant feeding.

When working on the influence of light on rickets with Dr. Chick in Vienna, Miss Margaret Hume made the analogous observation that ten minutes' daily exposure to ultra-violet light enabled rats to grow normally for some two months when deprived of fat-soluble vitamin. These observations were published simultaneously with those of Dr. Goldblatt and Miss Soames already referred to above. Miss Hume subsequently made the discovery that it was not necessary to directly irradiate the rats, but that if the empty jars were irradiated and the rats introduced immediately afterwards, the same beneficial influence upon growth was secured. This rather astounding observation was twice repeated by Miss Hume in the department with careful control observations, after her return. Experiments were devised and carried out to ensure that it was indeed some influence temporarily impressed upon the air by the radiations, which was responsible for the action. This was found to be the case. The preliminary observations have appeared in a recent number of the *Biochemical Journal*. No interpretation of them is forthcoming at present. It is being sought after, for it may be surmised that herein may lie the secret of those subtle changes in climate to which mankind, and certain individuals in particular, are susceptible.

Miss M. Boas, B.Sc. (Grocers' Company Research Scholar) is engaged in studying the metabolism of calcium and phosphorus in the rat. So far most of the time has been occupied in developing a technique of sufficient accuracy. The numerous difficulties have been surmounted and it has been possible to keep a reliable balance sheet for normally nourished animals over periods of two months, at a time when they are rapidly growing. It is now proposed to follow by the same method what happens when the intake of calcium and phosphorus is modified, or the anti-rachitic factor in the diet diminished.

Dr. J. O. W. Barratt has continued his study of the action of anti-coagulants in inhibiting fibrin formation. The problems involved have presented considerable difficulty and progress has been slow. Considerable time has been given to an attempt to devise methods designed to cover the whole range of concentrations available for experiment. Part of this investigation, is, however, now in a fairly advanced state and the remainder is also nearing completion.

Dr. T. Lumsden has been re-examining the question of the precise nature and situation of the central nervous mechanism which subserves respiration. There were many lacunæ in our knowledge of this part of physiology, and not a little confusion owing to variations in the results of experiments with different types of animals. A first series of experiments have been recorded in the current volume of the *Journal of Physiology* (p. 153). By making sections of the brain stem of the cat at different levels and thereafter observing and analysing the type of respiratory movements, Dr. Lumsden concludes (1) that in the cat the central respiratory mechanism consists of (*a*) a part below the striæ acousticæ which when working alone causes gasping respirations. The nerve cells producing this effect may be spoken of as the gasping centre; (*b*) a part at the level of the striæ acousticæ which sends out impulses causing a series of prolonged inspirations: the prolonged inspirations may be called apneuses and the nerve cells producing them the apneustic centre; (*c*) a part in the upper pons region which inhibits the activity of the apneustic centre and so produces normal respiration: the nerve cells having this effect may be called the pneumotaxic centre: (2) that the posterior corpora quadrigemina have in the cat no appreciable influence on respiration.

Department of Biochemistry.

Accessory food factors have again been the subject of a large proportion of the work of the department.

Professor Harden has been engaged on the revision of the report issued by the Accesssory Food Factors Committee in 1919 on the state of knowledge on this subject and it is hoped that this will be issued at an early date.

The work on the antineuritic and antiscorbutic factors in barley has been continued by Professor Harden in conjunction with Dr. Zilva and he has also been engaged in the investigation of the mode of action of the growth stimulant of yeast.

Dr. Robison has continued his study of the properties of hexosemonophosphoric acid and has been engaged in conjunction with Professor Harden in studying the relation of this substance to the fermentation process. He has also made the interesting observation that growing bone contains an enzyme which hydrolyses this compound with liberation of phosphoric acid, and is studying the bearing of this observation on the problem of the deposition of calcium phosphate in bone formation.

Dr. Zilva's work on the chemical nature and properties of the antiscorbutic factor has made further progress. This principle is inactivated by treatment with absorbents at a certain hydrogen-ion concentration. There is evidence that this inactivation is due, not to absorption, but to surface oxidation. He has also found that oxidation of the antiscorbutic factor proceeds rapidly in alkaline solutions whilst in solutions of higher hydrogen-ion concentration this oxidation is greatly retarded. These results are being followed up with the object of solving some practical and theoretical problems, especially with respect to the preservation of antiscorbutic solutions.

The joint investigation of fats and oils has been continued by him in collaboration with Professor Drummond, of University College. The material collected in Norway has been tested out. A variation of about twentyfold has been observed in the potency of the larger number of oils which have been examined and this variation seems to be due to some biological factor still not ascertained. The ultimate origin of the vitamin found in active liver oils was traced to unicellular marine organisms which are consumed by copepods, larval decapods and molluscs; these in turn are eaten by the caplin and squid which are consumed by the larger fishes. Investigations are also in progress on the deodorisation and hardening of active oils without inactivation.

In the summer, Dr. Zilva visited Newfoundland where facilities were offered by the Newfoundland authorities for the investigation of the methods of preparation of cod liver oil in that Dominion. Experiments were carried out to test the methods from the point of view of preservation of the vitamin potency of the oils. Different fishing stations were also visited in the island and material systematically collected. Laboratory investigations show that Newfoundland oils are of very high and uniform potency, and that the method of preparation prescribed and enforced by the Newfoundland Ministry of Marine and Fisheries throughout the Dominion, has no deleterious effect on the vitamin. The refining processes used are also up-to-date and are favourable for the preservation of the vitamin potency. Dr. Zilva is also engaged with Dr. G. F. Still in a clinical study of the therapeutic value of certain liver oils of which the vitamin potency has been experimentally determined, and with Dr. Schütze is continuing work on the influence of malnutrition on susceptibility to bacterial infection.

In collaboration with Dr. Bedson, he has repeated the work of Cramer, Mottram and Drew on the influence of a deficient supply of vitamin A. in the diet, upon the amount of blood-platelets in the blood of the animal. They were unable to confirm the observations made by these authors that a marked diminution in the platelets takes place as a manifestation of the deficiency of this vitamin.

A chemical reaction, ascribed by Bezssonov to indicate the presence of vitamin C, has been studied by Dr. Zilva and Mr. Kay. Bezssonov's observation, if correct, would be of great importance. It appears, however, that the reaction is in reality due to some substance other than vitamin C, but usually accompanying it, and that the reaction cannot be used as a test for this principle.

At Reading, the work with Dr. Drummond and Captain Golding was continued on the effect of deficiencies in fat-soluble A, the antiscorbutic factor and mineral matter, on the growth and development of the pig, as was also the investigation on the influence of the vitamin content of the food of the cow on the vitamin potency of the milk.

Mr. H. D. Kay (Beit Memorial Fellow) has been studying the decomposition of carbohydrate derivatives by *B. coli* with the object of ascertaining the effect of changes in constitution on the nature of the products. The introduction of oxygen into the molecule leads to diminution in the amount of alcohol and to increase in the amount of acid formed, the most oxidised substance tested, saccharic acid, yielding no alcohol. He has also investigated the reversibility of the action of urease and has succeeded in definitely proving for the first time that this enzyme produces urea (although only in small quantity) from ammonium carbonate solution.

Mr. Henley has continued his work on the chemistry of the early stages of alcoholic fermentation and Professor Hemmi has also been engaged on this subject.

Department for the Preparation and Study of Antitoxic Sera.

The problem of procuring a uniformly good diphtheria toxin for the immunisation of horses, which still remains the principal anxiety of all manufacturers of anti-diphtheria sera, has been continued as usual. Of recent years the tendency has been to attribute the variations in yield, to alterations in the constituents and method of preparation and sterilisation of the culture media, on which the *Bacillus diphtheriæ* is propagated. It seems that this view has been stressed too far, for, if in the preparation of beef-water, the meat and water be autoclaved for 3 hours at a pressure of 30 lbs. the inhibiting effect of this treatment upon the subsequent production of toxin is very slight, if any.

The toxigenic power of diphtheria bacilli isolated from the throats of carriers is being investigated. The toxins obtained so far have varied in strength from less than 1 M.L.D. per c.c. to 200 M.L.Ds. per c.c.

The study of the stability of solutions of diphtheria toxin for the "Schick" test has been proceeded with. Fully diluted solutions of one particular old, well-ripened toxin keep stable for months in England, when stored under proper conditions, or if sent short distances by post, but when sent long journeys, *e.g.*, post to America, complete reliance cannot be placed on them.

A routine method for the concentration of serum has been worked out which gives satisfactory results—a concentration of 4 to 6 times and a final product which remains clear, with a loss of antitoxin of under 5 per cent. Dr. MacConkey's "brined standard serum," referred to in previous reports, has remained stable for a further period of 12 months.

Some work has been done on Ramon's method of testing *in vitro* the unitage of diphtheria antitoxic sera. The results so far confirm those of the author. Similar results have been obtained with a con-

contrated solution of antitoxic globulins, so that the method is available after concentration, which is a routine procedure in the department. The method seems much more convenient than that previously suggested by Nicolle *et alii*.

For preliminary testing of tetanus antitoxin it has been found convenient to use a fresh liquid tetanus toxin diluted with an equal quantity of pure neutral glycerine. Such a mixture appears to remain stable for a considerable time. A tetanus toxin precipitated by ammonium sulphate was dissolved in distilled water and then mixed with an equal quantity of glycerine. This also remained stable until it was all used up, *i.e.*, for 12 months.

It has been suggested that concentrated antitoxins are not so rapidly absorbed as the natural serum. Experiments have, therefore, been carried out to study the absorption of diphtheria antitoxin from the subcutaneous tissue of the rabbit. The investigation is not yet complete, but so far as can be judged at present it appears that, at any rate during the first 24 hours after administration, the concentration of protein is not of much importance. The rate of absorption at this time seems to be influenced more by the volume of the liquid in which the antitoxin is contained than by anything else.

The stock of dry powdered bodies of dysentery bacilli (Shiga type), which had been used as a "test toxin" for some years, having been exhausted, there has been used in its place a dry powdered "toxin" obtained by causing Na_2SO_4 to act on a filtered extract of dysentery bacilli (Shiga type), collecting, drying and powdering the precipitate. The M.L.D. of the powder for rabbits of 1000—1500 g. is 0·5 milligramme. The technique of using this completely soluble "toxin" differs slightly from that previously used, in that the mixture of "toxin" and serum must not be injected immediately after mixing, but an appreciable time must be allowed for the "toxin" and serum to combine.

The Governing Body desire, once more, to thank the Director of the Hygienic Laboratory, United States Public Health Service, Washington, for his continued kindness in supplying standard toxin and antitoxin.

Department for the Preparation and Study of Anti-Variolous Vaccine.

During the year the threat of a variola epidemic in England led to increased demand for vaccine. This has been met in a normal way. Considerable quantities of vaccine have also been despatched for use in Russia, with satisfactory results.

A series of experiments with a non-breakable pattern of vacuum flask, which it was hoped might give good service in the tropics, demonstrated that no useful purpose would be served by using it for insulating vaccine from heat for more than a few hours. Experiments on the depreciation of vaccine to which calcium carbonate had been added to neutralise the acid formed during storage, are in progress. So far, the depreciation has not been appreciably slower under these circumstances.

A further series of experiments, following those referred to in the last report, has demonstrated that while minor differences in the immunisation value of a stock lymph against different strains of African variola exist, a high degree of immunity is conveyed against all those experimentally tested. The view put forward by some Medical Officers of the Colonial Service, that the variola of native West Africans is not the same as the variola of Europe, is not supported.

THE ACCESSORY FOOD FACTORS' COMMITTEE.

(Appointed jointly by the Lister Institute and Medical Research Council.)

Studies of Rickets in Vienna, 1919—1922.

These investigations have been referred to in two previous Annual Reports of the Institute. A completed account of them has just been published by the Medical Research Council as one of their Special Report Series (No. 77), but, in view of the Institute's joint responsibility for the work, it will not be out of place to briefly summarise their origin, nature and results.

In 1919, Dr. Harriette Chick visited Vienna to investigate the various deficiency diseases prevalent in that unfortunate city and to see whether it might not be a useful opportunity to study human diseases due to food shortage, in the light of experimental knowledge accumulated during the war. On Miss Chick's suggestion the Accessory Food Factors' Committee considered the practicability of undertaking a lengthy enquiry into rickets in children at the University Kinderklinik, in Vienna. At the period when the investigation was under consideration, 1919—1920, much interest had been aroused by the work of Mellanby, who concluded from his experimental work on puppies, that rickets was primarily a deficiency disease. Dr. Mellanby defined the nature of the deficiency and placed great stress upon the importance in the diet of an adequate supply of fat soluble vitamin A, or some principle of similar distribution, for prevention of rickets in young growing mammals. The usual sources of this vitamin in the diet of an infant are in milk and in milk fat, and as is usual at times of privation in large cities, the milk supply of Vienna had suffered severely both in quality and amount during the last year of the war and the period which followed the armistice.

Dr. Chick had succeeded in establishing such cordial relationship with the medical profession in Vienna and notably with Professor v. Pirquet, the distinguished Director of the University Kinderklinik, that the Committee decided to carry out observations on a considerable scale in Vienna to ascertain

whether Mellanby's conclusion from experimental work upon puppies, namely, that rickets can be induced by a specific deficiency in diet extending over a sufficiently long period, was applicable to the human infant.

The University Kinderklinik with its liberal allowance of trained staff, offered unusual advantages for medical research of any kind upon infants or children. It was particularly suitable for an enquiry concerning nutrition, as a system of accurate diet control had been developed and was in force. It afforded an exceptional opportunity for this particular investigation as, owing to the food shortage obtaining in Vienna, Professor Pirquet had been constrained to adopt a dietary for his hospital which was low in animal fat and in which the caloric value was made up by the addition of sugar. Dr. Chick was invited to take charge of the enquiry. She had as colleagues from this country Dr. Elsie Dalyell (Beit Fellow), Miss M. Hume, Dr. Helen Mackay (Beit Fellow), and Sister Henderson Smith, all of whom were at the time engaged in research work at the Institute.

The expenses of the investigation have been defrayed by the Medical Research Council and the Lister Institute; substantial contributions towards the upkeep of the hospital were also received from the League of Red Cross Societies and the Society of Friends.

It was proposed to watch the growth and development of a series of young infants during the first year of life, with periodic records of the skeleton by X-ray photographs (1) upon the diet in general use in the hospital and (2) upon a diet which should supply as great a contrast as was practicable—a diet containing an adequate supply of full milk and of fat-soluble vitamins without addition of extra carbohydrates.

Professor Pirquet expressed his willingness to co-operate in such a scheme, and offered a clinical ward of twenty cots and all the other facilities of his Klinik for the purpose of the research. The offer was gratefully accepted, and Dr. Hans Wimberger, Assistant and Radiologist to the Klinik, was attached as medical officer to the ward. It was soon found, however, that twenty cots were not sufficient for a study of this kind where the children had to be kept in hospital for long periods of time. Steps were therefore taken to increase the accommodation by the establishment of a temporary hospital of 40 cots as an extension of the Klinik. The expense of alterations, equipment and furnishing of the wards was met by a grant from the League of Red Cross Societies.

The original objects of the investigation were, firstly, to determine the part played by diet, as distinct from circumstances in the environment; secondly, to ascertain whether the influence of diet, if proven, could be traced to deficiency of fat-soluble vitamin A or other substances present in animal fats. Whilst observations were in progress, however, it was discovered by Huldschinsky that rickets could be cured in children by submitting them to the action of ultra-violet light, for a short period daily. This observation was soon after confirmed in America by Hess, where it was also shown by McCollum and his co-workers that exposure to sunlight, or for a few minutes daily to the radiations of a quartz lamp, prevented the occurrence of rickets in rats fed upon a deficient diet, a diet upon which rickets inevitably ensued, when they were kept in the laboratory, illuminated by light which had penetrated window glass. Attention had, therefore, to be also directed henceforth to the action of light as well as diet.

The enquiry included—

1. Observations upon prophylaxis in 75 children admitted without signs of rickets.
2. Observations upon therapy in 53 children with well-developed rickets on admission.

In the former, two comparable groups of children were fed upon two diets of approximately equal caloric value and observed for 6 to 18 months. Diet I. was that ordinarily used in the Kinderklinik. It consisted of 400—1000 c.c. of milk, according to the size of the infant, with considerable carbohydrate additions. Diet II. arranged to contrast with Diet I. as far as was practicable, especially in the directions in which it appeared deficient or ill-balanced, consisted of full milk. Carbohydrate, if added at all, was in small amount and small additions of cod liver oil were made to ensure adequate supply of fat-soluble vitamins.

The results of the observations upon prophylaxis were unequivocal. The infants grew equally well upon both diets, but rickets developed in winter, under excellent hygienic conditions, in all infants receiving a diet of milk with much carbohydrate, while infants in the same wards, receiving more milk with a small amount of cod liver oil, were free from the disease. In summer, infants on both types of diet were protected from the disease.

The observations on the treatment of rickets were directed to ascertain the relative value of (*a*) the administration of cod liver oil; (*b*) exposure to the radiation of the mercury vapour lamp; and (*c*) outdoor treatment in the sun and shade respectively.

Each of the three methods of procedure was equally effective in restoring normal calcification of bone and bringing about complete and rapid healing of the bone lesions, whereas no case kept indoors without one or other of these special forms of treatment showed similar steady restoration of the bone to normal. The results of both sets of observations may be summarised as follows:—

Diet and light are factors of primary importance in the etiology of rickets in infants.

Light, especially ultra-violet light, appears to enable the body to deal economically with certain specific food constituents, permitting normal bone development on a diet which, when exposure to light is less, leads to the development of rickets.

A diet containing an average allowance of milk, with carbohydrate additions, did not contain sufficient anti-rachitic, fat-soluble vitamins to prevent rickets in winter. In summer the increased sunlight rendered this diet adequate.

Fat-soluble vitamins, as provided by cod liver oil, play the same important part in human as in experimental rickets.

Man has been confronted by the problem of rickets ever since he took to living in crowded cities, but, as a consequence of the concentration of experimental work upon the problem for the short space of three years, the main facts concerning the etiology of the disease appear to have been ascertained, and towards this happy result, the investigations in Vienna have made an honourable contribution. Although the interplay of the various factors influencing the satisfactory deposition of calcium phosphates in the growing skeleton is still obscure, the knowledge won will be of great service.

As long as rickets was regarded by some as an infective disease of unknown origin and by others as attributable to undefined defects in diet or hygiene, efforts towards prevention were either paralysed or imperfectly orientated. The present position is very different. The facts derived from clinical and epidemiological observations and from animal experiments now fit together into a coherent interpretation of the disease. Already sufficient sanction is provided for preventive and curative measures against one of the most widespread and most damaging diseases to which an industrial population is subject.

NATIONAL COLLECTION OF TYPE CULTURES.

(Medical Research Council).

The activities of this Department have continued to expand during the past year and many valuable additions to the Collection have been received from workers both at home and abroad. The number of cultures sent out to all parts of the world exceeded 1,500. There falls to be recorded the fact that the Curator and Assistant Curator, together with a member of the Bacteriological Staff of the Institute, contracted Tularaemia while conducting passage experiments with the virus of this disease. A culture of *B. tularense*, the causative organism, had been received from the Government Health Laboratories, Washington, in the spring of 1922 and passage experiments through guinea-pigs and mice were readily effected. In July, Miss Rhodes fell sick, and in September, Dr. Brooks and Dr. Schütze. The diagnosis was established serologically. Dr. Schütze made a rapid recovery, but the infection in the other two cases ran a tedious and chronic course. Dr. Brooks and Miss Rhodes returned to light work in the department in January of this year, but the latter unfortunately contracted what appeared to be a genuine recrudescence of infection shortly after resuming work. She was again ordered to rest but it is hoped that soon her health will be re-established.

As in the six cases which occurred in the Washington laboratories in 1921, the precise mode of infection was not ascertained. Work on this disease was entirely suspended in September 1922. In the absence of the Staff, Miss D. Steabben, B.Sc. took over the main part of the Curators' duties on behalf of the Medical Research Council.

GENERAL AND FINANCIAL.

The fact that the Institute had modified the arrangements for providing superannuation benefits for its scientific staff and had adopted that of the Federated Superannuation System for Universities, was referred to at some length in the report for 1922. The new scheme was not separated from the original pension fund started in 1913; the amount spent in purchasing superannuation policies was shown in the Balance Sheet of that fund and the sum paid for annual premiums on these policies appeared in the Income and Expenditure account of the Pension Fund for the year ending December 1921.

Monies set apart for, or accumulating on behalf of superannuation funds, are allowed certain concessions in regard to income tax, provided the scheme be approved by the Income Tax commissioners. The concessions, however, vary in accordance with the nature of the scheme, and the Board of Inland Revenue has recently decided that the Federation Superannuation Scheme for Universities is not in a strict sense a scheme for pension only, and, therefore, cannot be included in its approval of a Pension Fund for purposes of obtaining concessions under Ch. 32, of the Finance Act, 1921. To meet this difficulty it was suggested by the Inland Revenue Authorities that the old and the new pension schemes should be separately shown in the accounts, in order that they could be dealt with independently from the point of view of income tax. To meet this request, in the accounts for the year ended December 31st 1922, the expenditure on behalf of superannuation policies for the scientific staff has been charged to the general account.

As the removal from the Pension Fund of the liability for the annual premiums of the superannuation policies on behalf of the scientific staff would have left the fund considerably larger than is necessary to provide pensions for the administrative and subsidiary staff, the Governing Body has transferred the Lister Bequest of £19,669 10s. 0d. to the general funds of the Institute. At the same time £1,000 from the revenue of 1922 has been added to the Pension Fund in order to raise it to the sum estimated to be adequate by the Institute's Actuary.

The Accounts and Balance Sheet for the year ended December 31st, 1922, show a balance to the credit of the Pension Fund of £17,266 12s. 5d. and of the General Account of £472,827 6s. 0d.

Receipts from sales of the Institute's products show a net increase of £1,633. 15s. 3d. as compared with last year, viz.: Anti-variolous Vaccine, increase £2,152. 8s. 11d., Bacterial Vaccines, &c., increase £728. 5s. 1d., Anti-toxins and Sera, decrease £693. 7s. 11d., Diagnosis and Analysis Fees, decrease £553. 10s. 10d.

The total expenditure for the year has been £42,980. 15s. 2d. against £44,156. 1s. 5d. in 1921. Serum and Calf Lymph Laboratories Expenses, Animal House Expenses and Forage, Repairs and Alterations, &c., show a total decrease of £3,844. 14s. 1d. compared with last year, while Animals and Laboratory Expenses, &c., show a total increase of £1,387 17s. 1d.

A cottage, "Hill View," Hayle, has been purchased by the Institute for the accommodation of the assistant in the Anti-variolous department, at a cost of £678. 5s. 0d.

During the year the following changes in Investments have been made, viz., £5,000 Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock has been converted into £3,750 London and North Western Railway 4 per cent. Consolidated Preference Stock, making the Institute's total holding of this stock, £8,650. For the Sinking Fund £1,100 4 per cent. Funding Loan, and for the Pension Fund £2,600 of the same stock have been purchased.

In conclusion the Governing Body desire to express their satisfaction at the high quality of the work carried out at the Institute during the past year and the importance of the results obtained, and to record their appreciation of the devoted and enthusiastic labours of the Director and of the Scientific Staff in the furtherance of the objects for which the Lister Institute was founded.

ERNEST H. STARLING,

Acting Chairman of the Governing Body.

The Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				2,284 17 2
To Pension Fund—				
Balance at 31st December, 1921		34,338 9 9		
Deduct				
Lord Lister's Bequest	17,200 15 0			
Profit on Sale of Investments in 1918 ..	2,468 15 0			
		19,669 10 0		
Add		14,668 19 9		
Balance of Income and Expenditure Account, 1922		2,597 12 8		
				17,266 12 5
To Contingency Fund as per account 31st December, 1917				8,228 18 1
To Sinking Fund to 31st December, 1922 ..				11,143 10 4
To Income Tax Schedule D. Reserve Account..				6,000 0 0
To Capital Fund to 31st December, 1922—				
Balance of Income and Expenditure to 31st December, 1921		113,818 19 4		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)		2,000 0 0		
The Berridge Trustees (1893/98)		16,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Jenner Memorial Fund (1899)		5,768 0 11		
Lord Iveagh (1900)		250,000 0 0		
Lord Lister's Bequest (1913), &c. ..		19,669 10 0		
Other Donations (1891-1920)		20,370 8 3		
Add			468,006 8 7	
Balance of Income and Expenditure Account, 1922			4,820 17 5	
				472,827 6 0

ERNEST H. STARLING, *Acting-Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

£517,751 4 0

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. sum of £15,224 11s. 6d. has been paid, being held by the Institute on behalf of the Scientific Staff. In our opinion, such affairs, according to the best of our information and the explanations given to us and as shown by the books of the Institute.

London, 11th April, 1923.

31st DECEMBER, 1922.

Cr.

	£	s.	d.	£	s.	d.
By Cash—						
At Bankers: Deposit Account	8 000	0	0			
Current Accounts	4,264	9	7			
In hand	101	18	11	12,366	8	6
By Investments (at cost)—						
£5,000 Great Northern Railway 3 per cent. Debenture Stock	4 570	11	0			
£8,650 London & North Western Railway 4 per cent. Consolidated Preference Stock	10,460	8	6			
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123	19	3			
£2,900 New South Wales 5½ per cent. Stock, 1922-32	2,897	16	0			
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000	0	0			
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500	0	0			
£353 North Eastern Railway 4 per cent. Guaranteed Stock	499	11	0			
£36,800 5 per cent. War Stock, 1929-1947	34,404	16	2			
£12,875 4 per cent. Funding Stock, 1960—1990	10,300	0	0			
£20,000 Local Loans 3% Stock	9,962	0	7	80,719	2	6
By Investments, Lord Iveagh's Donation (at cost)—						
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117	17	6			
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875	0	0			
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484	7	6			
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937	10	0			
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860	5	0			
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850	0	0			
£25,000 London and South-Western Railway 4 per cent. Preferred Converted Ordinary Stock	32,000	0	0			
£25,000 Great Northern Railway 3 per cent. Preference Stock, 1898	26,000	0	0			
£25,000 Midland Railway 2½ per cent. Preferred Converted Ordinary Stock	20,375	0	0			
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500	0	0	250,000	0	0
By Investments, Jenner Memorial Fund (at cost)—						
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756	10	0			
£2,660 South Eastern Railway 3 per cent. Preference Stock, 1898	2,740	5	0			
£300 11s. Liverpool Corporation 3 per cent. Stock	271	5	11	5,768	0	11
By Investment Contingency Fund (at cost)—						
£8,700 5 per cent. War Stock, 1929-1947				8,228	18	1
By Investments, Lord Lister's Bequest (at cost)—						
£2,583 Grand Trunk Railway Company of Canada Consolidated Stock	765	4	4			
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733	12	4			
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debenture Stock	936	0	0			
£1,875 Port of London 4 per cent. B. Stock	1,800	0	0			
£3,400 Gas Light and Coke Company Ordinary Stock	3,638	0	0			
£800 Ontario and Quebec Railway 5 per cent. Debenture Stock	984	0	0			
£661 Madras and South Mahratta Railway 4 per cent. Debenture Stock	656	19	7			
£500 Canada 4 per cent. Stock	492	11	0			
£700 Western Australia 4 per cent. Stock, 1942-1962	698	7	0			
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594	2	0			
£1,200 Great Northern Railway 3 per cent. Debenture Stock	891	2	9			
£8,467 4 per cent. Funding Stock, 1960-1990	6,479	11	0	19,669	10	0
By Investments, Sinking Fund (at cost)—						
£7,350 5 per cent. War Stock, 1929—1947	6,916	12	7			
£5,550 4 per cent. Funding Stock, 1960—1990	4,227	17	7	11,144	10	2
By Investments, Pension Fund (at cost)—						
£20,633 4 per cent. Funding Stock, 1960-1990	15,896	5	5			
Balance uninvested	1,370	7	0	17,266	12	5
(The above Investments, at the market value, 31st December, 1922 show a depreciation of approximately £84,645.)						
By Debtors				7,128	3	9
By Stock of Bacterial Vaccines				42	14	9
*By Furniture, Fittings, Scientific Apparatus and Books—						
As per account, 31st December, 1920				2,471	17	2
By Expenditure on Institute Buildings at Chelsea—						
As per account, 31st December, 1910, including purchase of freehold site, £6 000				70,916	3	1
By Purchase of Freehold Land adjoining "The Studios," Chelsea, as per account, 31st December, 1912				169	6	8
By Lease of "The Studios," Chelsea, as per last account	2,043	14	9			
Less amount written off	65	2	0	1,978	12	9
By Queensberry Lodge Farm, Elstree—						
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912				20,455	10	0
Stock of Animals and Forage	642	3	3			
Stock of Anti-Toxins and Bottles	7,285	14	5			
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138	1	4			
Laboratory Apparatus, as per account, 31st December, 1903	466	1	3			
Furniture, as per account, 31st December, 1903	215	8	0	8,747	8	3
*By Purchase of Hill View Cottage				678	5	0
* Nothing has been charged for depreciation of Furniture, &c. since new purchases to a greater amount than the estimated depreciation (10%) made during the year have been written off.				£517,751	4	0

TO THE MEMBERS.

The Superannuation Scheme for the Scientific Staff provides for Life Policies and National Savings Certificates for which the Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view of the state of the Institute's

COOPER BROTHERS & CO.,
Chartered Accountants. | *Auditors.*

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.
To Interest and Dividends on General Investments	12,232	8	3
To Interest and Dividends on Sinking Fund Investments	534	19	0
To Investigation, Diagnosis and Analysis Fees, &c.	4,123	1	3
To Sales of Sera, Vaccines, &c., and Stock at 31st December, 1922, less Stock at 31st December, 1921	30,518	0	9
To Rent of Rooms in the Institute	403	3	4
	£47,811	12	7

Dr. Pension Fund INCOME AND EXPENDITURE ACCOUNT

	£	s.	d.
To Interest and Dividends on Investments	1,597	12	8
To Contribution from the General Account	1,000	0	0
	£2,597	12	8

Preventive Medicine.

for the year ending 31st December, 1922. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	6,242	19	6
By Salaries and Wages of Staff	20,233	1	6
By Premiums on Federated Superannuation Policies	950	14	0
By Stationery, Printing and Postage	540	12	5
By Printing of Collected Papers	256	4	2
By Office Expenses, Law Charges, and Sundries	164	11	2
By Travelling Expenses	28	17	0
By Auditors' Fee	40	0	0
By Gas, Water and Fuel	1,710	3	2
By Electric Light and Power	289	14	1
By Experimental Pathology Laboratory Expenses, including General Apparatus ...	554	2	10
By Bacteriological Laboratory Expenses	228	5	7
By Vaccine Laboratory Expenses, including Bottles	61	6	1
By Water and Bio-chemical Laboratory Expenses, including Apparatus	465	1	4
By Serum and Calf Lymph Laboratories Expenses, including Apparatus and Cost of Bottles	1,888	16	5
By Serum Department Farm Implements and Sundries	41	9	7
By Culture Media	123	3	7
By Animals	2,183	1	3
By Animal House Expenses and Forage	3,103	8	11
By Repairs and Alterations, including Workshop Expenses	1,169	6	0
By Library Expenses	187	19	9
By General Stores	545	18	6
By Bad Debts	1	3	9
By Contribution to the Pension Fund	1,000	0	0
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments) ...	945	12	7
By Balance, being Excess of Income over Expenditure, transferred to Balance Sheet	4,620	17	5
	£47,811	12	7

for the year ending 31st December, 1922. Cr.

	£	s.	d.
By Balance, being Excess of Income over Expenditure, transferred to Balance Sheet	2,597	12	8
	£2,597	12	8

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ARKWRIGHT, J. A. AND BACOT, A. ... OBSERVATIONS ON THE MORPHOLOGY OF *Rickettsia prowazeki* OCCURRING IN LICE (*Pediculus humanus*) INFECTED WITH THE VIRUS OF TYPHUS FEVER. *Parasitology*, Vol. 15, 1923.

" " INVESTIGATION OF THE AETIOLOGY OF TYPHUS FEVER, ESPECIALLY UNDERTAKEN FOR THE EGYPTIAN GOVERNMENT IN THE PUBLIC HEALTH LABORATORIES, CAIRO. *British Journal of Experimental Pathology*, Vol. IV., 1923.

ATKIN, E. E. AND BACOT. A. ... EXPERIMENTS ON THE INFECTIVITY OF TYPHUS VIRUS CONTAINED IN LICE (*Pediculus humanus* and *Pedicinus longiceps*). *British Journal of Experimental Pathology*, Vol. III., 1922.

BACOT, A. ... ... (See ARKWRIGHT, J. A., also ATKIN, E. E.)

BEDSON, S. P. ... ... SOME OBSERVATIONS ON THE ORIGIN OF THE MAMMALIAN PLATELET. *Journal of Pathology and Bacteriology* (*Proceedings*), Vol. XXV., 1922.

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CARR, MARJORIE ... ... (See KORENCHEVSKY, V.)

CHICK, HARRIETTE, DALYELL, ELSIE J., HUME, MARGARET, MACKAY, HELEN M. M., SMITH, H. HENDERSON and WIMBERGER, H. THE AETIOLOGY OF RICKETS IN INFANTS: PROPHYLACTIC AND CURATIVE OBSERVATIONS AT THE VIENNA UNIVERSITY KINDERKLINIK. *Lancet*, Vol. II., 1922.

" " " STUDIES OF RICKETS IN VIENNA, REPORT TO THE ACCESSORY FOOD-FACTOR COMMITTEE. *Medical Research Council's Special Report Series, No. 77*, 1923.

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COWARD, K. H. ... ... (See Drummond, J. C.)

DALYELL, Elsie J. ... ... (See Chick, Harriette.)

DRUMMOND, J. C. ... ... (See Zilva, S. S.)

DRUMMOND, J. C., COWARD, K. H., GOLDING, J., MACKINTOSH, J. and ZILVA, S. S. — Cod Liver Oil in the Winter feeding of Milch Cows. *Journal of Agricultural Science*, Vol. XIII., 1923.

DRUMMOND, J. C., and ZILVA, S. S. — The Preparation of Cod Liver Oil and the Effect of the Processes on the Vitamin Value of the Oils. *Journal of the Society of Chemical Industry*, Vol. XLI., 1922.

" " " " — The Origin of the Vitamin A. in Fish Oils and Fish Liver Oils. *Biochemical Journal*, Vol. XVI., 1922.

DRUMMOND, J. C., ZILVA, S. S., and GOLDING, J. C. ... ... — The Use of Cod Liver Oil in the Feeding of Farm Animals. *Journal of Agricultural Science*, Vol. XIII., 1923.

GOLDBLATT, H. ... ... — A Study of the Relation of the Quantity of Fat-Soluble organic factor in the diet to the degree of Calcification of the bones and the development of Experimental Rickets in Rats. *Biochemical Journal*, Vol. XVII., 1923.

GOLDBLATT, H., and SOAMES, Kathleen M. — The Effect of Radiation with the Mercury-vapour Quartz lamp on the growth of rats fed on a diet deficient in the fat-soluble Growth-promoting Factor. *Lancet*, Vol. II., 1921.

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THE LISTER INSTITUTE
OF
PREVENTIVE MEDICINE.

Report of the Governing Body, 1924.

CHELSEA BRIDGE ROAD,
LONDON, S.W. 1.

May 21st, 1924.

The Lister Institute of Preventive Medicine,

CHELSEA BRIDGE ROAD, LONDON, S.W. 1;
ELSTREE, HERTS; MARAZION, CORNWALL.

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*Professor C. J. Martin, C.M.G., M.B., D.Sc., F.R.S.

Department of Bacteriology:

*J. C. G. Ledingham, C.M.G., M.B., D.Sc., F.R.S., *Bacteriologist-in-Chief; Professor of Bacteriology in the University of London.*
J. A. Arkwright, M.A., M.D., B.Ch., *Assistant Bacteriologist.*
E. E. Atkin, B.A., M.B., ,, ,,
S. P. Bedson, M.Sc., M.D., B.S., ,, ,,
H. L. Schütze, M.D., B.Sc., ,, ,,
Mary M. Barratt, M.B., Ch.B. ,, ,,

Department of Bio-Chemistry:

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R. Robison, Ph.D., B.Sc., F.I.C., *Assistant.*
S. S. Zilva, D.Sc., Ph.D., F.I.C., ,, (*honorary*).
Ida Smedley MacLean, D.Sc., ,, (,,).

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Department of Protozoology:

Muriel Robertson, M.A., D.Sc.

Department for the Preparation and Study of Antitoxic Sera, Elstree:

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*G. F. Petrie, M.D., Ch.B., *Assistant.*

Department for the Preparation and Study of Anti-Variolous Vaccine, Marazion:

Alan B. Green, M.A, M.D., B.Ch., *Bacteriologist-in-Charge of the Anti-Variolous Vaccine Laboratories.*

Secretary and Accountant:
George Cooper.

Assistant Secretary:
A. L. White.

NATIONAL COLLECTION OF TYPE CULTURES.

(Medical Research Council.)

Director:

Professor J. C. G. Ledingham, C.M.G., D.Sc., M.B., F.R.S.

Curator:
R. St. John Brooks, M.A., M.D., D.P.H.

Assistant Curator:
Mabel Rhodes.

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* *A recognised Teacher of the University of London.*

ANNUAL GENERAL MEETING

OF

The Lister Institute of Preventive Medicine,

May 21st, 1924.

REPORT OF THE GOVERNING BODY.

The Governing Body has the honour to present the Institute's 30th Annual Report.

THE GOVERNING BODY.

No change in the membership of the Governing Body has taken place since the date of the last Annual Meeting, when the Council re-elected Sir Frederick W. Andrewes, Professor W. Bulloch and Sir James K. Fowler to represent it until December 31st, 1924.

In February last the Institute was asked by the Ministry of Health to appoint a representative upon the Court of Governors of the new London School of Hygiene and Tropical Medicine. The Board had pleasure in nominating its chairman, Sir David Bruce, to represent the Institute.

THE COUNCIL.

At the last Annual General Meeting, the retiring members of the Council, Sir Walter M. Fletcher, Professor G. Dreyer and Dr. John Fawcett, were re-elected as representatives of the Members of the Institute, the University of Oxford and the University of London, respectively.

The three members who retire from the Council by rotation this year, but who are eligible for re-election, are Professor W. Somerville, the representative of the Royal Agricultural Society, Professor A. Harden and Dr. H. de R. Morgan, two of the representatives of the Members of the Institute.

The Governing Body records with sorrow the death of a distinguished member of the Council, Professor A. C. O'Sullivan, who had represented the Royal Irish Academy for many years. Professor Adrian Stokes has been appointed successor to Professor O'Sullivan.

MEMBERS.

The Governing Body has also to announce with regret the death, during the year, of the following members of the Institute, viz., Professor J. Ritchie, Professor J. Lane Notter and Dr. P. C. Smith.

No new members have been elected during the period under review.

STAFF.

The Governing Body regret to state that Dr. Muriel Robertson has again been absent from the Institute for some months on account of illness, which has unfortunately been more protracted than was anticipated. Miss Robertson has been granted a year's leave of absence from January, 1924, and it is hoped that after a prolonged rest she may be restored to health.

Miss M. Rhodes, Assistant Curator of the National Collection of Type Cultures, has recovered from the severe attack of Tularæmia which necessitated her absence for many months, and resumed duty.

Leave of absence during the Summer was granted to the Director in order that he might take part in the Pan-Pacific Congress in Australia, as the representative of the Institute and the Royal Society. Professor Harden was appointed Acting Director during Dr. Martin's absence.

Dr. Harriette Chick has been recognised by the University of London, as a teacher in Physiology of Nutrition.

Mrs. Ida Smedley MacLean, D.Sc., who has for many years worked in the laboratories of the Institute has been appointed an assistant (honorary) in the department of Biochemistry.

Miss M. Boas, B.Sc., has held the Grocers' Company Research studentship of the Institute during the past year and Dr. A. Hunter Brown has been appointed to the Jenner Memorial Research scholarship.

RESEARCH WORK.

Before proceeding to review the scientific activities of the laboratories of the Institute, the Governing Body desires to record its appreciation of the support rendered by the Medical Research Council to these activities. In addition to furnishing the salaries of the staff of the National Collection of Type Cultures at the Institute, the Council has provided two whole-time workers in the Department of Biochemistry, Dr. Zilva and Mr. Connell, and five in the Department of Experimental Pathology, Miss Hume, Professor Korenchevsky, Miss Carr, Miss Soames and Miss Pickersgill. Their work is carried out under the direction of Professors Harden and Martin respectively and accommodation for them and the expenses of their researches are supplied by the Institute.

Co-operation in this form is particularly welcomed by the Governing Body, for, owing to the increased cost of maintaining the Institute and the uncertainty of that considerable portion of its income which results from trading, the Governing Body has not thought it prudent to fill most of the vacancies in its staff which have occurred since 1914.

Department of Bacteriology.

Professor Ledingham has continued to study problems in natural immunity with special reference to the elucidation of tissue changes at the site of inoculation. He has recently brought Vaccinia under a similar method of study with a view to determining the validity of alleged specific affinities or tropisms of certain viruses for particular tissues. So far as the work with Vaccinia has progressed, in which case the virus has been introduced intracutaneously, the histological evidence points definitely to involvement of the reticulo-endothelial system as the primary and essential lesion, the epidermis being either not involved at all or only secondarily implicated during the passage of the exudate to the surface to form scab or vesicle, according to the permeability or otherwise of the horny layer. Skin lesions have been removed by surgical procedure at daily intervals so that the tissue changes might be studied from the date of infection onwards. Control experiments with the virus neutralised by sera of immune or hyperimmunised animals have been made throughout.

The monograph on Diphtheria to which the energies of the Bacteriological Committee of the Medical Research Council have been devoted during the past three years has now appeared. As a member of this Committee, Professor Ledingham contributed his due share to its production. The volume presents a complete survey of knowledge of the subject.

With Professor F. R. Fraser, Dr. Ledingham has contributed a communication on the clinical and pathological aspects of Tularaemia from experience of the disease in this Institute.

Dr. Arkwright has completed and published an investigation showing that from certain cultures of *B. dysenteriae* (Shiga) originally entirely resistant to bacteriophage action, sensitive elements, corresponding almost invariably to the strains affording "rough" colonies on culture previously studied by him, can be isolated by a method of successive plating without contact at any point with bacteriophage. He espouses the view that in the growth of an organism, elements are evolved which exhibit at some critical point in their life history a tendency to self-destruction (lethal elements), the stimulus to which may come either from some superadded agent (bacteriophage), or from the metabolic products of the organism itself. The research links up bacteriophage action more closely than ever with the sphere of bacterial variation.

With Dr. A. N. Goyle he has also further extended his work on variation by showing the connexion between the so-called "O" and "H" forms of continental authors with the "rough" and "smooth" varieties. These "O" and "H" forms which may be isolated from a parent strain are characterised by differences in the heat-stability of their agglutinogens when tested with immune sera. He is also continuing the investigation of variants in connexion with their capacity to produce toxin. With Dr. Zilva some studies are in progress on the influence of diet-deficiencies on the inflammatory response of skin and subcutaneous tissues to bacterial and toxic stimuli. This work has undoubtedly an important bearing on problems of natural immunity.

Dr. Schütze has in the past nine months tested the reputed therapeutic value of Dreyer's diaplyte vaccine on tuberculous guinea-pigs. No evidence whatever has been obtained that the course of the disease in these animals is favourably modified by this treatment.

The sodium salts of various fatty acids (in soap form) have been claimed to exert a favourable and healing action on diseases due to acid-fast organisms (Tuberculosis and Leprosy). Dr. Schütze has investigated the potency of a series of fatty acids from a variety of sources in inhibiting the growth of *B. tuberculosis* in artificial culture. Dr. Zilva has prepared the necessary fatty acids for the work. While, as American workers have already shown, the selective action of fatty acids on acid-fast bacilli is a very striking one, it does not appear from the work already completed that any particular soaps are more efficient than others in this respect, equally good inhibiting results being obtained with derivatives of cotton seed oil as with chaulmoogra oil.

Dr. Atkin has studied by a special technique the question whether differences in serological grouping as exhibited by strains of meningococci are correlated with cultural peculiarities. In a recently published paper he shows that meningococci belonging to Gordon's serological Group I, form when grown on plates composed of a thick layer of trypsin-broth-pea-agar, large spreading papillated colonies, while those belonging to serological Group II, form smaller, smooth, and glistening colonies with a marked development of yellow pigment. The subsidiary Groups III and IV agree in the main with Groups I and II in these cultural respects. Moreover, strains of Group I are sharply marked off from all the others by their short period of viability on the particular medium used. The observations are being extended to gonococci.

Dr. Bedson has made further progress with his experimental work designed to elucidate the histogenetic relationships of the mammalian blood-platelet. In this work he has been assisted by Miss M. E. Johnston, B.Sc. A final conclusion has not yet been reached but the experimental methods employed may, it is hoped, lead to an ultimate solution. Incidentally valuable knowledge in cognate matters is being gained. He has also investigated an interesting form of severe anæmia in the domestic fowl associated with a striking yellow pigmentation of the skin, comb, body fat, and blood plasma in collaboration with Dr. E. F. Knight. The anæmia is found to be of megaloblastic type and the disease can be transmitted to normal hens by inoculation with material from actual cases. The pigment belongs apparently to the group of carotenes. With Dr. Zilva, he has carried out further experiments on the question of platelet reduction in Vitamin A deficiency but has entirely failed to confirm the alleged grave implication of these elements.

Dr. E. H. Lepper has, since the termination of her tenure of a Beit Fellowship, continued her researches on the factors which determine the reproduction of bacteriophage. She has published further work showing that, when *B. coli* is grown in conjunction with its appropriate bacteriophage in a synthetic medium containing glucose as its only organic constituent, the lytic principle can be recovered from the resultant growth, and can then be transmitted in series. It appears, however, to be less active than the original "phage" from which it was derived and, for some reason not yet elucidated, its activity cannot be restored by later incubation in peptone cultures of the test organism. Some undefined accessory substance in the medium may be necessary for reproduction of bacteriophage in full activity.

Dr. M. L. Cowan has during the final year of her Beit Fellowship continued her studies of the strains of streptococci affording "rough" and "smooth" colonies, with respect chiefly to virulence and immunising power. Her former experiments with mice had shown that these animals can be definitely protected against the "S" or virulent form by intra-peritoneal injections of the "R" or non-virulent variety. Attempts have now been made to immunise rabbits with both types, similar series of animals being treated with killed "R," live "R," and live "S" organisms. The latter could be administered subcutaneously without producing general infection, local abscess alone resulting. The results show that excellent protection is afforded by previous immunisation with living strains of "S," subcutaneously administered, against the test dose of live "S" organisms given intravenously, while that afforded by immunisation with the "R" forms is of a much lower order. Also in the series immunised with "S" forms, antibody development in considerable degree was the rule but not so in the "R" series. Though protection was afforded to the rabbits themselves their sera were found to be without obvious protective value when injected into mice, and a similar failure was experienced with sera from horses intensely immunised over lengthy periods at the Serum Department with both "R" and "S" forms. A notable feature has been the production of joint lesions in immunised rabbits which survived the final test dose of living streptococci. These lesions occurred in a high percentage of the rabbits treated, and while some have tended to disappear, others have resulted in chronically swollen and ankylosed joints. So far as the observations have gone, serum from immunised horses has had no beneficial action on these joint lesions in the rabbit.

Miss D. Steabben was awarded a Beit Fellowship in 1923 and resumed her interrupted research on the effect of introducing organic and inorganic colloids into the circulation of laboratory animals with special reference to blood changes and antibody content of their blood serum. The reputed effect of certain inorganic salts in influencing the production, degree and maintenance of antibodies will also come within her sphere of work.

Miss M. E. Johnston has been engaged in the past year on a problem which intimately concerns the practice of serum therapy and serum prophylaxis, viz., the influence of a previous injection of serum, whether normal or immune, on the effective action of a subsequent injection. She has employed as her immune serum, antiplatelet or purpura-producing serum. Her results show that the loss of effective action from a subsequent dose which, as shown by Bedson, may occur when a previous dose of normal serum has been given, can be explained solely by the development of antibodies to the original serum-proteins injected. The immunity is not of the nature of an anti-antibody reaction. Her work is being prepared for publication.

Dr. A. N. Goyle (Lahore), is engaged in research in preparation for the Ph.D. degree of the University of London. In collaboration with Dr. Arkwright he is, as stated above, investigating a problem in bacterial variation and the conclusions so far reached are embodied in a paper recently published.

Major McGillivray (late I. M. S.) has undertaken with Dr. Schütze the investigation of the relative immunising value of killed and attenuated live cultures against experimental infection with highly virulent members of the Hog-Cholera group. Very suggestive results in this field were obtained by Dr Pratt-Johnson a few years ago in this department and the question is now of increased importance in view of the occurrence of "R" and "S" varieties, and Miss Cowan's experimental results above alluded to. The problem of variants will be specially investigated as it has a distinct bearing on prophylactic vaccines such as the well known T. A. B. The test of immunity will be the injection of the live organism in doses that would be lethal to controls.

Dr. M. M. Barratt completed her work on diphtheroids and on virulence of *C. diphtheriæ*, carried out on behalf of the Bacteriological Committee of the Medical Research Council. Her main results have been incorporated in the recent monograph on Diphtheria issued by that Committee.

Dr. T. Toda (Okayama), before leaving for Japan at the end of last summer completed a short piece of work on the relationship of *B. mallei* (the organism of glanders), to *B. whitmori*, the recently discovered causative agent of Melioidosis, a fatal disease of man in the Malay States. Like *B. mallei*, *B. whitmori*, presents acute and fatal lesions in guinea-pigs, and there is also a strong serological affinity between the two organisms, as the workers at Kuala Lumpur have shown. It would appear that we have here a new instance of relationship between a well-known organism causing disease in animals and one associated with disease in man.

Dr. Z. Khaled (Cairo) before his return to Cairo in 1923, completed his experiments with *B. melitensis* and *B. abortus*, and his results are now on record showing that the milk-goat which has been immunised with living *B. abortus*, is rendered highly resistant to a subsequent injection of live *B. melitensis* and fails to discharge that organism in the milk. It appears likely that *B. abortus* may with great advantage be substituted for the more toxic *B. melitensis* in prophylactic and therapeutic vaccination against Malta Fever in man.

Dr. A. Hunter Brown (Jenner Memorial Research Scholar) is devoting himself to the study of the efficiency of immunisation methods by the cutaneous route for which claims have recently been made by Besredka.

Dr. K. Nain (Kashmir) has been engaged in the effort to differentiate by biochemical and serological methods the bacteria which cause disease in plants. Serological methods for differentiating bacteria causing disease in plants have been but little employed, and it is hoped that an investigation carried out on lines familiar to medical bacteriology will yield more certain differentiating data than the older and purely botanical criteria still employed by mycologists.

The hospitality of the department has also been extended to the following:—Dr. M. K. Semple (Cardiff), Dr. Martland (Garrett Anderson Hospital), Dr. E. F. Knight, Dr. Golliveri (Bombay), and Surgeon-Commander Morris, R.N.M.S.

Department of Biochemistry.

As in the previous year accessory food factors have been the subject of a considerable proportion of the work of the department.

The revision of the report issued by the Accessory Food Factors' Committee on the state of knowledge on this subject upon which Professor Harden had been engaged, was completed during 1923 and the report published early in the present year.

Professor Harden and Dr. Zilva completed their work on the antineuritic and antiscorbutic factors in barley and malt, but, before publishing it, deemed it advisable to extend their experiments to wort and beer, using rats as the experimental animals. It has been found that wort usually contains the antineuritic vitamin, whereas it is absent from the finished beer. The results are now being prepared for publication. Professor Harden has continued the investigation of the growth stimulant of yeast, and in conjunction with Professor Manning (Saskatchewan University) he has also commenced an investigation on the question of the function of phosphates in bacterial fermentation.

The Hon. F. R. Henley has continued his work on the early stages of alcoholic fermentation, dealing in particular with the effect of muscle extract upon fermentation reactions.

Dr. Robison has continued his study of the chemical processes involved in ossification and of the part played therein by hexosephosphoric esters and by the enzyme, which he had discovered to be present in ossifying bone and cartilage. This enzyme hydrolyses such esters with liberation of inorganic phosphate. In collaboration with Miss K. M. Soames the properties and distribution of the enzyme have been further studied. The actual deposition of calcium phosphate by the action of the enzyme has been demonstrated in bones taken from rachitic rats and immersed in a solution of calcium hexosemonophosphate or calcium glycerophosphate. The discovery of this enzyme is an important contribution to the hitherto uncomprehended mechanism of calcification.

The bearing of these facts on the problem of rickets is also being studied. The enzyme is not deficient in rachitic bones but failure to deposit calcium might be due to lack of the necessary phosphoric ester, and this point is being examined. The results so far obtained appear to show that the blood of the rachitic animals contains a somewhat smaller amount of the hydrolysable phosphoric ester than normal blood, but further work is required before definite conclusions can be drawn. The occurrence of the enzyme in the bones of human foetuses and of infants in relation to the commencement of ossification is being studied by Dr. Robison and Dr. E. M. Martland. They have also investigated certain sources of error in the methods employed for the determination of phosphorus in the blood and have shown how they can be eliminated.

In collaboration with Mr. H. D. Kay (Beit Memorial Fellow) the action of the bone enzyme on the "acid soluble" phosphorus compounds of blood has been examined. A certain fraction (20—30%) of this phosphorus is rapidly hydrolysed with liberation of phosphoric acid but the remainder is not acted on by the enzyme although it is hydrolysed by boiling with dilute acids. This indicates that the "acid-soluble" phosphorus consists of at least two different compounds. The problem of isolating the actual phosphoric esters present in blood has been attacked by Dr. Robison and Mr. H. W. Goodwin and considerable progress has already been made in overcoming the many difficulties of this work. It is not yet possible, however, to state what is the exact chemical nature of these compounds.

With Dr. F. S. Hansman examinations are being carried out on the amounts of inorganic and combined phosphoric acid in the blood of individuals suffering from endocrine disturbances associated with skeletal abnormalities. The use of the bone enzyme as a means of determining the amount of phosphoric esters of a certain type present in tissue extracts has also been applied by Dr. Robison and Mr. H. D. Kay to the study of carbohydrate metabolism. They have been able to show that the amount of readily hydrolysable organically bound phosphoric acid contained in rabbit muscle is markedly increased above the normal when insulin has been administered. If Embden's conclusion, that the "lactacidogen" of muscle is a hexose-phosphoric ester, be accepted, this increased amount would account satisfactorily for all the sugar which disappears from the blood.

Significant progress has been made by Dr. Zilva in the fractionation of the antiscorbutic factor in lemon juice. By the process of elimination of extraneous matter it is now possible to reduce the total solids of lemon juice from about 9% to about 0·04% without appreciably diminishing the antiscorbutic activity. This work is being followed up and results are being obtained indicating the possibility of further progress. The antiscorbutic principle is very readily destroyed, but as an outcome of the investigation of the conditions determining its inactivation, a method has been devised which renders it possible to store concentrated antiscorbutic preparations without any loss in potency. Successful clinical results have been obtained by the use of such stored preparations. With Mr. S. J. B. Connell, Dr. Zilva has established that the sugar and nitrogenous substances of decitrated lemon juice diffuse through membranes of appropriate permeability at rates different from that of the antiscorbutic factor. By taking advantage of this fact they hope to secure a further purification of the vitamin. With Dr. H. Goldblatt he has demonstrated that the inactivation of the fat-soluble and the antirachitic factors by heat and oxygen proceeds at different rates, and that their quantitative distribution in spinach is also different. This confirms McCollum's conclusion that the two principles are not identical. They have also found that both the antirachitic and growth-promoting functions are retained by hardened cod liver oil to a great extent. In collaboration with Dr. Arkwright, Dr. Zilva has been studying the effect of diet on inflammatory conditions and the study of the effect of deficient diets on immunity has been continued with Dr. Schütze.

At Reading, as the result of joint work by Captain J. Golding, Professor Drummond and Dr. Zilva, it has been shown that rickets can be induced in pigs by dietetic means and cases of florid rickets in pigs have been observed.

Mrs. Balfour and Mr. H. Naganishi have recently commenced work in the department.

Department of Experimental Pathology.

Dr. Ethel Luce (Beit Memorial Fellow) has continued her investigation of the influence of diet and management of the cow upon the content of growth-promoting and antirachitic principles in the milk yielded. The cow has been maintained under carefully controlled conditions at the serum farm owing to the kind co-operation of Dr. MacConkey. A pooled sample, representing one week's excretion of milk obtained and preserved under special precautions, has been subjected monthly to a biological assay of its content of vitamin A. and antirachitic vitamin. The observations have already been made over a period of twenty-one months, and will be continued for another three. They show the gradual diminution in the amount of both vitamins in the milk, as the conditions of the animal are changed from pasture to winter fodder consisting of roots, grains and straw and the reciprocal increase as the diet is changed back to green food, culminating in a maximum on turning out the animal again to pasture in the summer.

The differences in the anti-rachitic value of the milk were considerable, and may well be a factor in determining the seasonal incidence of rickets in children in addition to the varying amount of sunlight at different times of the year. The result has been confirmed by the observations of Miss Boas and Dr. Chick referred to below.

Miss Boas (Grocers' Company Research Student) having obtained command of a satisfactory method for the quantitative study of calcium and phosphorus metabolism in small animals, undertook, in the first instance, observations upon rats subsisting upon a normal diet. Later, in collaboration with Dr. H. Chick she has, by this method, determined the calcium and phosphorus metabolism of young growing rats fed upon a basal diet devoid of vitamin A. and anti-rachitic vitamin, supplemented with a small ration of milk (5 c.c.), from the same cow when fed upon dry fodder in winter and on pasture in summer, respectively. The experiment was controlled by a parallel study of the metabolism of rats to which was given a diet complete in every respect and with the addition of cod liver oil. Observations were carried out over a period of eight weeks. The results showed that the ration of milk from a cow fed on pasture occasioned a maximal retention of calcium and phosphorus, but that the same quantity of milk was far from adequate when the cow was shut up in a stall and fed upon roots, grains and straw. In the latter case the amount of calcium laid down in the skeleton was only two-thirds of that of the control animals and of those which received pasture milk. These observations are complementary to those of Dr. Luce referred to above and show that cow's milk varies according to the diet of the animal. They also dispose of the idea current in many quarters that the beneficial influence of cod liver oil upon calcification is attributable to some therapeutic substance peculiar to this oil.

Miss Boas is, by the same method, investigating the effect on the calcium and phosphorus metabolism of young growing rats when various fresh green vegetables are added to a diet which is otherwise devoid of the anti-rachitic principle but contains calcium and phosphorus in adequate amount. In this case the excretion by the urine and faeces is being estimated separately.

Miss Hume and Miss Smith have been continuing their investigation of the beneficial effects observed in the growth of rats fed upon a deficient diet when their immediate environment is irradiated periodically with ultra-violet light, although the animals themselves are not subjected to the radiation. Their earlier observations have not been confirmed by other observers, and they are engaged in repeating them in order to ascertain in what way the conditions of the two sets of experiments may have been different.

Dr. Goldblatt (Beit Memorial Fellow) and Miss Soames have completed their work upon the storage and possible synthesis of fat soluble vitamins in the body under varying conditions of diet and illumination. A further series of researches on the inter-relation of the action of ultra-violet radiation and fat soluble vitamins in the calcification of bone has been published by them during the year. By using diets containing graded amounts of fat soluble vitamin, they were able to show the specific influence of the anti-rachitic factor upon calcium deposition and the supplementary action of light rays in cases where the amount of this vitamin was deficient.

Miss Soames has also been collaborating with Dr. Robison in a study of the distribution and biological significance of the enzyme, discovered by the latter in ossifying tissues, which decomposes complex organic phosphates, and sets free inorganic phosphates. She is also studying the effect of fat soluble vitamins when administered subcutaneously instead of by mouth.

Dr. Lepper and Dr. Zilva have examined the alkali-reserve of the blood of a number of animals suffering from scurvy, in view of the importance attached to the alleged diminution in the amount of sodium bicarbonate in the plasma, as a factor in the causation of the symptoms. So far, the observations have afforded no indication that diminished alkali-reserve plays an essential part in this disease. Animals on a scorbutic diet develop scurvy notwithstanding that the alkali-reserve of their blood be maintained in excess of normal.

The clinical studies of rickets in Vienna made by Dr. Chick and her colleagues at the University Kinderklinik are being continued by Drs. Wagner and Wimberger (Assistant Physicians at the Klinik) with the collaboration of Miss Chick. These studies have already demonstrated that cod liver oil oxidised

to the point at which 95% of the vitamin A is destroyed, possesses therapeutic value against rickets not obviously inferior to that of the untreated oil, thus providing additional evidence for the existence of two separate principles (1) growth-promoting; (2) rickets-preventing, in cod liver oil.

Professor Korenchevsky with the assistance of Miss Carr, has investigated the influence of qualitative deficiencies in the diet given to parent rats upon the number, weight and composition of the young. The research was suggested by his discovery that it was impossible to produce rickets by malfeeding young rats, if their mothers had received an adequate diet, together with some cod liver oil during pregnancy and lactation. The percentage of H_2O, Ca, P, and N, in the young at birth has been determined, and from the observations already made, the conclusions have been drawn that (1) the diet of the father before conception has no influence whatever upon the composition of the offspring at birth; (2) the diet of the mother before conception and during pregnancy, influences the number and weight of the litters, but that the percentage of H_2O, Ca, P, and N, in the young at birth is not appreciably altered. The mother evidently sacrifices her own tissues to produce offspring of approximately normal composition. A first instalment of their results has been recently published in the Biochemical Journal. The effect on the subsequent development of the offspring is being followed up.

The influence of subcutaneous injection of sodium and calcium-glycerophosphates into rats fed upon a rickets-producing diet has been investigated, and it has been found to improve calcification but not to prevent occurrence of some degree of rickets.

Professor Korenchevsky and Miss Carr are at present chiefly occupied with a research into the influence of the thyroid, parathyroid and sexual glands separately and in various combinations, upon the nitrogenous and gaseous metabolism of the rabbit.

Dr. Young, under Professor Korenchevsky's guidance, has been prosecuting a parallel research upon rats.

Dr. T. Lumsden continued his experiments upon the nervous mechanism of respiration throughout the year. The first instalment of his contribution to this subject, in which he describes more accurately than had hitherto been done, the nature and position of the respiratory centres in the cat, was referred to in last year's report. Since then he has localised an expiratory centre just below the *striae acoustirae* in the medulla and extended his observations to other animals, dog, rabbit and monkey. Following on these researches he has studied the mechanism of the regulation of respiration in the light of his previous observations and ascertained the influence of diminished oxygen and increased carbonic acid tension upon the activity of the various centres and the effect of stimuli *via* the vagi and other afferent nerves upon them.

Dr. Lumsden's researches, which are set forth at length in five papers in the Journal of Physiology for 1923 and 1924, have enriched our knowledge of the physiology of respiration.

Dr. J. O. Wakelin Barratt has continued his work on blood coagulation. A large number of observations on the time of appearance of fibrils of fibrin under various conditions of experiment has been made, affording additional indications as to the mechanism of fibril formation in fibrinogen solutions. Considerable time has also been given to a further study of the action of anti-coagulants. In this connection an extended series of experiments has been devised which throw light upon the nature of the action of anti-coagulants. While carrying out the latter work it became necessary to give special attention to the equations representing such chemical and physical processes as might conceivably be in operation. The results will be published shortly.

Miss Hindmarsh (Sydney), has been engaged for a few months in studying the immediate influence of various foodstuffs upon metabolism. Simultaneous determinations of the gaseous metabolism and of the amount of sugar and urea in the blood have been made with a view to elucidate the mechanism of the dynamic action of carbohydrates and proteins.

Dr. Martin was engaged in the earlier part of the year in experiments to determine the limiting conditions as regards temperature, moisture and air movement for a man to work at the rate of $\frac{1}{10}$ H.P., which is the performance of a good miner or navvy. Incidentally, he has also studied the influence of humidity and air movement upon the rate of heat-loss of man at high temperatures. The results of his observations were incorporated in a Presidential Address to the Hygienic Section of the Pan-Pacific Conference held in Sydney, where the feasibility of white labour in the tropics and the hygienic problem of hot-mines were discussed. Dr. Martin took advantage of this voyage to Australia, during which the tropics and Red Sea at its hottest period were traversed, to investigate whether any physiological adaptation occurred by varying the minimal resting heat-production when adequate heat-loss becomes difficult. Ship life with its unvarying routine and the simplicity with which diet, exercise, and other conditions can be maintained constant from day to day offered ideal conditions for such an enquiry, and by the courtesy of Sir Kenneth Anderson, the Managing Director of the Orient S.N. Company, an extra cabin for a laboratory was placed at Dr. Martin's disposal, so that the necessary gas analyses could be carried out in comfort. Observations were made daily during thirty-four days. Until the Red Sea was reached no significant change occurred in the resting metabolism, but when the hot weather was encountered, the basal metabolism fell by 13% and rose again fifteen days later to the original level when the cool S.E. trade winds were encountered. The rise and fall did not occur abruptly, but took, in each case, three to four days to reach the final level.

Department for the Study and Preparation of Antitoxic Sera.

The problem of consistently producing a good diphtheria toxin has continued to occupy the attention of the staff of the Department. Opinions gathered from the experience of different laboratories are divided as to the importance of many points of procedure requisite to secure this end, but there is universal agreement about the necessity of employing a good toxigenic strain of the diphtheria bacillus for seeding the culture flasks. Even when this requirement is satisfied, however, success cannot be ensured and a culture which affords a good powerful toxin in one laboratory may fail to do so in another, although grown in precisely the same medium and under apparently identical conditions. At the Serum Department considerable differences in the potency of the toxin produced have been met with even when the only variation in the external conditions has been that between one incubator and another. The occurrence of such discrepancies, under uniform external conditions, suggests that the explanation is to be looked for in a variability inherent in the inoculum. In 1915, Bernhardt reported some observations which support this view. Bernhardt noticed different types of colony when a culture of the diphtheria bacillus was plated out and showed that cultures from the different forms varied in their toxigenic power. Different types of colony have also been met with by Dr. MacConkey. On one occasion, one type (thick) yielded a toxin varying from 100 to 400 M.L.D., whereas the other (thin) produced a toxin containing only 10 M.L.D. per c.c. Work is in progress along these lines.

Dr. Petrie, in collaboration with Dr. M. M. Barratt, has studied the relation between the toxin production and the virulence of diphtheria bacilli. In view of the opinion that the carrier of avirulent diphtheria bacilli is not a menace to the public health and may be disregarded, it is of interest to mention that of eight avirulent strains isolated from the nose or throat of carriers, five were found to produce toxin to some extent, when cultivated under appropriate conditions. One of these strains produced a toxin of which the minimal lethal dose was as small as $\frac{1}{50}$th c.c.

Ramon's "in vitro" method of titrating diphtheria antitoxin has been further investigated and found to be reliable within certain limits. It has been found unnecessary, however, to use the large quantities of toxin given by him, good results being obtained by the use of 5 c.cs. instead of 20 c.cs. Saturation of an antitoxin with NaCl does not interfere with the reaction. Ramon's method has been found most convenient, it not only saves experimental animals but also time, as a test can be completed in a few hours. Unfortunately it has not been found so satisfactory in the case of anti-tetanic and anti-dysentery sera.

Another line of enquiry which has been undertaken is the search for a more satisfactory method for the standardisation of anti-dysentery serum. This has occupied much of the attention of Dr. MacConkey for some 10 years. The lack of a reliable method of testing the potency of anti-dysentery serum in the laboratory is a serious handicap to its therapeutic use. Recently, much better results have followed the substitution of a liquid toxin for the bacillary emulsion previously employed for the evaluation of the serum. The test toxin, now employed in the Department, is a soluble one. It is prepared from a filtered extract of the Shiga bacillus by saturation with Na_2SO_4. The precipitate is stored as a dry powder and dissolved in water before use. Careful and thorough mixing of "toxin" and antiserum before putting them aside to combine are necessary. If this is not done the results are very irregular. Even with this toxin the law of multiple proportion does not hold strictly and large test doses (100 M.L.Ds. or more) cause a serum to be undervalued. A dose of not more than 50 M.L.Ds. is as large as it is advisable to use. In spite of every care, however, it seems impossible to entirely avoid irregularities, as some rabbits appear to be abnormally susceptible to Shiga toxin.

From work done during the war Dr. MacConkey gained the impression that the best method of estimating the therapeutic value of antimeningococcus serum was to test it on mice against an emulsion of the living organism, the emulsion and serum being mixed together and injected intraperitoneally. Thanks to the kindness of Sir Spencer Lister the department received 67 cultures of strains of meningococcus isolated in South Africa, 57 of which reached the Institute alive. When tested in the way mentioned above against type cultures of the South African strains, the Institute's serum showed distinct protection. It has also been found of some value in the treatment of cases in South Africa, though not as good as the serum made on the spot from the local strains. In the case of antimeningococcus serum its value would appear to depend not only on type but also largely on the strain used for immunisation of the horses and it has been found advisable to use as many unrelated strains as possible for the production of therapeutic serum. For growing the meningococcus a modified Cantani medium has been in use for a number of years. Two per cent. of blood and glycerine is added to ordinary agar and the medium sterilised in the autoclave.

The routine method for the concentration of serum which, after many years' experimenting, is employed in the department, has recently been described in detail by Dr. MacConkey in the *Journal of Hygiene*. It may be briefly summarised as follows:—

> The globulins are separated out by precipitation at about 35°C. with anhydrous Na_2SO_4, 18·5 grams per 100 c.c. of serum or plasma. The antitoxic globulins are removed from the precipitate by solution in water and saturation with NaCl (table salt), and filtration. The addition of 0·3% glacial acetic acid to the filtrate throws down the antitoxin, which is filtered off, dried, pressed, neutralised and dialysed in the usual way. On adding preservative to the concentrated serum a slight precipitate appears. This is removed by the subsequent filtration and the final product appears to remain clear indefinitely.

The Governing Body desires to thank the Director of the Hygienic Laboratory, United States Public Health Service, Washington, for his continued kindness in supplying standard toxin and antitoxins to the Serum Department.

Most of DR. GREEN'S available time, apart from routine work, has been occupied in supervising the construction and equipment of the new laboratory at Acton, Marazion. Nevertheless experiments have been made to ascertain the effect upon virulence of vaccinia occasioned by its passage through different species of animals, *e.g.*, calf, sheep, guinea-pig and rabbit. From recently recorded observations made in the lymph laboratories in Java, it appeared that serial passage through a variety of animals was a useful method of securing a good seed-lymph of high potency. The results obtained by Dr. Green have so far been disappointing.

NATIONAL COLLECTION OF TYPE CULTURES.

This department returned to full normal activity nine months ago with the restoration to health of the Assistant Curator after a tedious convalescence from Tularæmia. Demands on the resources of the Collection from all quarters are constantly increasing, over 3,000 cultures being distributed in 1923. The Curators have published the results of their investigations on the organisms of the Fowl-typhoid group and also a list of the Fungi maintained in the Collection. A fresh edition of the catalogue will shortly be required owing to the great accession of new material.

GENERAL AND FINANCIAL.

The department for the preparation of Anti-variolous Vaccine and the investigation of problems relating thereto, has been removed to Acton, near Marazion, Cornwall, where more suitable premises have been secured. The cost of the removal to Acton and of fitting and furnishing the new laboratories and animal houses has been defrayed out of revenue.

In July last the Institute received a legacy under the will of the late Mr. W. H. Clarke, for the general purposes of the Institute. So far the sum of £6,000 has been received under this bequest, but it is anticipated that a further small sum will be forthcoming when the final settlement of the estate is made.

The Accounts and Balance Sheet for the year ended December 31st, 1923, show balances to the credit of the Pension Fund of £18,119 5s. 7d., the Sinking Fund of £12,142 13s. 11d., and of the Capital Fund of £480,162 10s. 11d. £2,583 Grand Trunk Railway Company of Canada Consolidated Stock taken over as part of Lord Lister's Bequest at a value of £765 4s. 4d. has been written off as this is now considered valueless. The amount of this bequest is thus reduced to £18,904 5s. 8d.

The £6,000 set aside as income tax reserve which has hitherto been shown as a separate account has been transferred to the general Contingency Fund, on the understanding that it will be drawn upon for the payment of income tax, if necessary, in future.

Owing to the arrangement under which the railway companies of England are now amalgamated into groups, several changes in the Institute's investments have taken place, viz :—

		Converted into	
£5,000	Great Northern Railway 3% Debenture stock.	£5,000	London & North-Eastern Railway 3% Debenture stock.
£8,650	London & North-Western Railway 4% Consolidated Preference stock.	£8,650	London, Midland and Scottish Railway 4% Preference stock.
£353	North-Eastern Railway 4% Guaranteed stock.	£353	London and North-Eastern Railway 4% First Guaranteed stock.
£25,000	London & South-Western Railway 4% Preferred Converted Ordinary stock.	£20,000	Southern Railway Preferred Ordinary stock.
£25,000	Great Northern Railway 3% Preference stock, 1898.	£18,750	London & North-Eastern Railway 4% First Preference stock.
£25,000	Midland Railway 2½% Preferred Converted Ordinary stock.	£15,625	London, Midland & Scottish Railway 4% Preference stock, 1923.
£2,660	South-Eastern Railway 3% Preference stock, 1898.	£1,596	Southern Railway 5% Preference stock.
£1,200	Great Northern Railway 3% Debenture stock.	£1,200	London & North-Eastern Railway 3% Debenture stock.

New investments made during the year are:—For the General Fund, £3,125 4% Funding Stock, 1960-90; for the Sinking Fund, £1,300 Conversion Loan, 3½% stock, and for the Pension Fund, £1,000 of the latter stock and £1,367 4% Funding Stock, 1960-90. £7,500 has been advanced on approved Mortgages.

Receipts from sales of the Institute's products, etc., show a net decrease of £3,094 3s. 8d. as compared with last year, viz., Bacterial Vaccines, &c., increase £741 14s. 8d., Diagnosis Fees, decrease £297 0s. 10d., Anti-toxins and Sera, decrease £364 13s. 7d., Anti-variolous Vaccine, decrease £3,174 3s. 11d.

The total expenditure for the year has been £43,103 7s. 8d. against £42,990 15s. 2d. in 1922. Rent, Rates, Taxes and Insurance, Gas, Water and Fuel, Animals and Animal House Expenses and Forage show a total decrease of £3,321 13s. 11d. compared with last year, while Repairs, Renewals and Alterations and Serum and Calf Lymph Laboratories Expenses, show a total increase of £4,342 17s. 5d.

The amount expended upon repairs during the year is unusually large. This is due to two causes. The furnaces of the hot-air system at the Institute at Chelsea had become dilapidated and as this method of heating the building had proved costly and inefficient, the Governing Body decided to abandon it and instal instead hot water radiators throughout. The other reason for increased expenditure under this head was the removal of the department for the preparation of Anti-variolous Vaccine from Hayle to Marazion, and the cost of adapting the new premises and equiping the more commodious laboratories.

No contribution to the Pension Fund has been made this year, pending the quinquennial report of the Actuary upon the state of the Fund.

In conclusion, the Governing Body desire to express their appreciation of the cordial co-operation of the Director and all Members of the Staff in carrying out the work of the Institute.

DAVID BRUCE,

Chairman of the Governing Body.

The Lister Institute

Dr. BALANCE SHEET

	£ s. d.	£ s. d.	£ s. d.	£ s. d.
To Creditors				2,633 13 6
To Pension Fund—				
Balance at 31st December, 1922		17,266 12 5		
Add				
Balance of Income and Expenditure Account, 1923		852 13 2		
				18,119 5 7
To Contingency Fund—				
As per Account 31st December, 1917 ..		8,228 18 1		
Add				
Income Tax Schedule D. Reserve Account		6,000 0 0		
				14,228 18 1
To Sinking Fund to 31st December, 1923 ..				12,142 13 11
To Capital Fund to 31st December, 1923—				
Balance of Income and Expenditure to 31st December, 1922..		118,639 16 9		
Donations, &c., received to date from the following—				
Dr. Ludwig Mond (1893)..		2,000 0 0		
The Berridge Trustees (1893/98)		46,379 10 1		
The Grocers' Company (1894)		10,000 0 0		
Jenner Memorial Fund (1899)		5,768 0 11		
Lord Iveagh (1900)		250,000 0 0		
Lord Lister's Bequest (1913)	19,669 10 0			
Less £2,583 Grand Trunk Railway Co. of Canada Consolidated Stock written off	765 4 4			
		18,904 5 8		
William Henry Clarke Bequest (1923) ..		6,000 0 0		
Other Donations (1891-1920)		20 370 8 3		
Add			478,062 1 8	
Balance of Income and Expenditure Account, 1923			2,100 9 3	
				480,162 10 11

ERNEST H. STARLING, *Acting Chairman.*

G. W. ADDISON, *Hon. Treasurer.*

£527,287 2 0

REPORT OF THE AUDITORS

We have audited the above Balance Sheet. We have obtained all the information and explanations we have required. sum of £16,747 16s. 2d has been paid, being held by the Institute on behalf of the Scientific Staff. In our opinion, such affairs, according to the best of our information and the explanations given to us and as shown by the books of the Institute.

London, 21st March, 1924.

# of Preventive Medicine.

31st DECEMBER, 1923. Cr.

	£ s. d.	£ s. d.
By Cash—		
At Bankers: Deposit Account	5,000 0 0	
Current Accounts	6,978 0 9	
In hand	108 17 11	12,086 18 8
By Investments (at cost)—		
£5,000 London & North Eastern Railway 3 per cent. Debenture Stock	4,570 11 0	
£8,650 London, Midland & Scottish Railway 4 per cent. Preference Stock	10,460 8 6	
£5,000 Great Central and Midland Railway Joint Committee 3½ per cent. Guaranteed Stock	5,123 19 3	
£2,900 New South Wales 5¾ per cent. Stock, 1922-32	2,897 16 0	
£1,000 Cape of Good Hope 3½ per cent. Stock	1,000 0 0	
£1,505 7s. 3d. New South Wales 4 per cent. Stock, 1942-62	1,500 0 0	
£353 London & North Eastern Railway 4 per cent. First Guaranteed Stock	499 11 0	
£45,500 5 per cent. War Stock, 1929-1947	42,633 14 3	
£16,000 4 per cent. Funding Stock, 1960—1990	13,147 19 1	
£20,000 Local Loans 3% Stock	9,962 0 7	91,795 19 8
By Investments, Lord Iveagh's Donation (at cost)—		
£25,006 2s. 6d. New Zealand Government 3 per cent. Inscribed Stock, 1945	24,117 17 6	
£25,000 Victorian Government 3 per cent. Inscribed Stock, 1929-1949	23,875 0 0	
£25,000 Natal 3 per cent. Inscribed Stock, 1929-1949	24,484 7 6	
£25,000 New South Wales Government 3 per cent. Inscribed Stock, 1935	24,937 10 0	
£26,100 South Australian Government 3 per cent. Consolidated Stock, 1916 or after	24,860 5 0	
£25,000 Cape of Good Hope 3 per cent. Inscribed Stock, 1933-1943	23,850 0 0	
£20,000 Southern Railway Preferred Ordinary Stock	32,000 0 0	
£18,750 London & North Eastern Railway 4 per cent. First Preference Stock	26,000 0 0	
£15,625 London, Midland & Scottish Railway 4 per cent. Preference Stock, 1923	20,375 0 0	
£25,000 East Indian Railway 3 per cent. New Debenture Stock	25,500 0 0	250,000 0 0
By Investments, Jenner Memorial Fund (at cost)—		
£2,650 Southwark and Vauxhall Water Co. 3 per cent. Debenture Stock "B"	2,756 10 0	
£1,596 Southern Railway 5 per cent. Preference Stock	2,740 5 0	
£300 11s. Liverpool Corporation 3 per cent. Stock	271 5 11	5,768 0 11
By Investments, Lord Lister's Bequest (at cost)—		
£1,937 Grand Trunk Railway Company of Canada 4 per cent. Guaranteed Stock	1,733 12 4	
£800 Grand Trunk Railway Company of Canada Great Western Borrowed Capital 5 per cent. Perpetual Debenture Stock	936 0 0	
£1,875 Port of London 4 per cent. B. Stock	1,800 0 0	
£3,400 Gas Light and Coke Company Ordinary Stock	3,638 0 0	
£800 Ontario and Quebec Railway 5 per cent. Debenture Stock	984 0 0	
£661 Madras and Southern Mahratta Railway 4 per cent. Debenture Stock	656 19 7	
£500 Canada 4 per cent. Stock, 1940-1960	492 11 0	
£700 Western Australia 4 per cent. Stock, 1942-1962	698 7 0	
£600 Union of South Africa 4 per cent. Stock, 1943-1963	594 2 0	
£1,200 London & North Eastern Railway 3 per cent. Debenture Stock	891 2 9	
£8,467 4 per cent. Funding Stock, 1960-1990	6,479 11 0	18,004 5 8
By Investments, Sinking Fund (at cost)—		
£7,350 5 per cent. War Stock, 1929—1947	6,916 12 7	
£5,550 4 per cent. Funding Stock, 1960—1990	4,227 17 7	
£1,300 Conversion Loan 3½ per cent. Stock	991 7 0	12,135 17 2
By Investments, Pension Fund (at cost)—		
£22,000 4 per cent. Funding Stock, 1960-1990	17,165 3 5	
£1,000 Conversion Loan 3½ per cent. Stock	762 12 0	
Balance uninvested	191 10 2	18,119 5 7
(The above Investments, at the market value, 31st December, 1923 show a depreciation of approximately £80,360.)		
By Loans on Mortgages		7,500 0 0
By Debtors		6,612 19 0
By Stock of Bacterial Vaccines		42 5 3
*By Furniture, Fittings, Scientific Apparatus and Books—		
As per account, 31st December, 1920		2,471 17 2
By Expenditure on Institute Buildings at Chelsea—		
As per account, 31st December, 1910, including purchase of freehold site, £6,000		70,916 3 1
By Purchase of Freehold Land adjoining "The Studios," Chelsea, as per account, 31st December, 1912		169 6 8
By Lease of "The Studios," Chelsea, as per last account	1,978 12 9	
Less amount written off	65 2 0	1,913 10 9
By Queensberry Lodge Farm, Elstree—		
Purchase of freehold land and buildings and Expenditure on new buildings, as per account, 31st December, 1912		20,155 10 0
Stock of Animals and Forage	311 18 6	
Stock of Anti-Toxins and Bottles	6,555 8 4	
Stable Utensils, Farm Implements and Sheds, as per account, 31st Dec., 1903	138 1 4	
Laboratory Apparatus, as per account, 31st December, 1903	466 1 3	
Furniture, as per account, 31st December, 1903	215 8 0	7,686 17 5
By Purchase of Hill View Cottage		678 5 0
		£527,287 2 0

* Nothing has been charged for depreciation of Furniture, &c. since new purchases made during the year to a greater amount than the estimated depreciation (10%) have been written off.

TO THE MEMBERS.

The Superannuation Scheme for the Scientific Staff provides for Life Policies and National Savings Certificates for which the Balance Sheet is full and fair, and properly drawn up so as to exhibit a true and correct view of the state of the Institute's

COOPER BROTHERS & CO., *Chartered Accountants.* | *Auditors.*

Dr. INCOME AND EXPENDITURE ACCOUNT

INCOME.	£	s.	d.
To Interest and Dividends on General Investments	13,184	0	3
To Interest and Dividends on Sinking Fund Investments	588	10	0
To Investigation, Diagnosis and Analysis Fees, &c.	3,926	0	5
To Sales of Sera, Vaccines, &c., and Stock at 31st December, 1923, less Stock at 31st December, 1922	27,179	16	3
To Rent of Rooms in the Institute, &c.	325	10	0
	£45,203	16	11

Dr. Pension Fund INCOME AND EXPENDITURE ACCOUNT

	£	s.	d.
To Interest and Dividends on Investments	852	13	2
	£852	13	2

Preventive Medicine.

for the year ending 31st December, 1923. Cr.

EXPENDITURE.	£	s.	d.
By Rent, Rates, Taxes and Insurance	5,122	4	5
By Salaries and Wages of Staff	20,075	4	4
By Premiums on Federated Superannuation Policies	1,002	8	0
By Stationery, Printing and Postage	458	0	9
By Printing of Collected Papers	259	17	5
By Office Expenses, Law Charges, and Sundries	243	15	9
By Travelling Expenses	20	11	8
By Auditors' Fee	40	0	0
By Gas, Water and Fuel	1,492	5	10
By Electric Light and Power	311	19	4
By Experimental Pathology Laboratory Expenses, including General Apparatus	605	4	3
By Bacteriological Laboratory Expenses, including Apparatus	302	1	3
By Vaccine Laboratory Expenses, including Bottles	74	3	1
By Water and Bio-chemical Laboratory Expenses, including Apparatus	531	7	0
By Serum and Calf Lymph Laboratories Expenses, including Apparatus and Cost of Bottles	2,983	4	4
By Culture Media	165	2	6
By Animals	1,650	9	3
By Animal House Expenses and Forage	1,652	19	5
By Repairs, Renewals and Alterations, including Workshop Expenses	4,467	15	6
By Library Expenses	235	14	4
By General Stores	366	15	4
By Bad Debts	2	18	9
By Grant for special work at Vienna Kinderklinik	25	0	0
By Depreciation of the Lease of "The Studios," Chelsea	65	2	0
By Sinking Fund (½% per annum on Cost of Buildings and Interest on Investments)	999	3	7
By Balance, being Excess of Income over Expenditure, transferred to Balance Sheet	2,100	9	3
	£45,203	16	11

for the year ending 31st December, 1923. Cr.

	£	s.	d.
By Balance, being Excess of Income over Expenditure, transferred to Balance Sheet	852	13	2
	£852	13	2

SCIENTIFIC PAPERS PUBLISHED FROM THE LABORATORIES OF THE INSTITUTE DURING THE YEAR.

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" " ... ... (See Greenwood, M.)

ARKWRIGHT, J. A. and GOYLE, Amar N. The Relation of the "Smooth" and "Rough" Forms of Intestinal Bacteria to the "O" and "H" Forms of Weil & Felix. *British Journal of Experimental Pathology,* Vol. V., 1924.

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" " ... ... A Method for estimating the retention of Calcium and Phosphorus in young growing rats. *Biochemical Journal,* Vol. XVIII., 1924.

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" " " THE SUPPLEMENTARY VALUE OF LIGHT RAYS TO A DIET GRADED IN ITS CONTENT OF FAT-SOLUBLE ORGANIC FACTOR. *Biochemical Journal*, Vol. XVII., 1923.

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GOYLE, A. N. ... ... (See ARKWRIGHT, J. A.)

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KAY, H. D. AND ROBISON, R. ... THE POSSIBLE SIGNIFICANCE OF HEXOSEPHOSPHORIC ESTERS IN OSSIFICATION. PART III. THE ACTION OF THE BONE ENZYME ON THE ORGANIC PHOSPHORUS COMPOUNDS IN THE BLOOD.

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SOAMES, KATHARINE M. ... ... (See GOLDBLATT, H., and ROBISON, R.)

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