Twenty-Fifth Annual Report

of the

MONTREAL NEUROLOGICAL INSTITUTE

and the

DEPARTMENT OF NEUROLOGY AND NEUROSURGERY

McGILL UNIVERSITY
1959-60

CONTENTS

REPORT OF THE DIRECTOR

DR. WILDER PENFIELD

This is my twenty-fifth annual report to the University and the Staff of this Institute. It is also my message of gratitude to the Canadian public. Help and support have come to us from many sources during the six years of planning that preceded the opening of this building and the quarter century that has followed. To say thank you is like speaking into the wind that blows forever fresh from the sea. There is no one to hear and no one to answer.

As now established, the Montreal Neurological Institute will continue as long as Montreal institutions stand, serving society and the cause of science. It will repay our debt of gratitude many times, not to those who gave but to those who inherit. The ultimate aim of those who spend their working lives in this Institution is carved in stone outside on the corner of the building:

"Dedicated to the relief of sickness and pain and to the study of neurology."

Neurology might be defined as the science of the mechanisms that underlie thought and action. Expressed in more prophetic words, this Institute is dedicated to a vast project of exploration and to the hope that, through understanding of the human brain, man may come in time to understand himself and his own mind. It is my belief that when that day of understanding does dawn we shall no longer "see through a glass darkly" but know at last the nature of the spirit of man and of God.

There is no time to lose. Science which disclosed the nature of the atom has placed in the mortal hands of a blustering dictator the means of man's extermination. We must hope that science, used with gentler purpose to explore the mind of man, will point the way to harmony before it is too late.

Our last annual meeting took place a few days after the death of William Cone. I need not say now how much we have missed him. But men must die, as other members of the staff have done before him — Russel, McEachern, Kershman. And men must step aside while ranks close up and work goes on at faster pace.

I should make a report for the William Cone Memorial Research Fund. Dr. Cone's friends responded at once and others too who hoped to promote the purposes of research. A university committee under the chairmanship of Mr. Colin Webster worked willingly on the project. The Fund, which will remain open always for further gifts, has acquired a permanent capital of $380,794. The annual income from this Fund will be devoted to the broad field of neuropathology by his successor in the chair of neurosurgery — to be known in the future as the William Cone Chair.

I am delighted to report that the University Governors have appointed Dr. William Feindel to be the first Cone Professor of Neurosurgery. Dr. Feindel, who was born in Nova Scotia, has had a distinguished career as Rhodes Scholar, neuroanatomist, neurophysiologist, neuropathologist and neurosurgeon. He had the happy fortune (I might even say the unpardonable temerity) to carry off Dr. Cone's special "scrub nurse" in 1945. Faith Lyman, the Montreal girl who once served Dr. Cone so efficiently is now the charming wife of the new Professor and has presented him with six children — up to date. He returns to Montreal after building up a most successful neurosurgical clinic at the University Hospital in Saskatoon.

And now I should tell you my own plans. I am retiring today as Chairman of the University Department of Neurology and Neurosurgery and as Director of the Institute. At the same time I intend to lay down the scalpel and bring to an end a career in the care of patients.

I have enjoyed being a surgeon and have known great satisfaction in the challenge that patients bring to doctors — the challenge to cure, or if not, at least to comfort and to help them find some measure of equanimity. I have enjoyed the friendships that came to me that way and have taken strength from the courage and nobility that men and women hide from the casual eye.

I look back on pleasant hours of work, explorations made with the microscope, the physiological experiments, the carefully planned case-studies — all these things brought me excitement and sometimes happy discovery. And yet, strange to say, I leave it all without regret. I shall use a pen instead of the scalpel in what will be for me a new career.

The trustees of the Guggenheim Foundation announced on the 25th of April that I had been awarded a Fellowship for work in the field of medical education. So I shall become a Fellow as soon as I can complete the remaining projects on my desk.

I could not be content to go if this Institute were to be hurt by my going. It will not be. This has grown to be a magnificent institution, thanks to those who have brought new vigor to our group. They have the quiet loyalty that seems to be so rare. There is no selfish seeking for personal gain, no petty rivalries here. Instead there is compassion, great ability, distinguished leadership in science and in medicine. I am thrilled that I can say that. This is in truth the fulfillment of a dream.

When I turned to the surgery of the brain as a young man, I undertook to see for myself its healing reactions. In the laboratories of Columbia University I began by making experimental brain wounds, and used the available techniques to study how the brain would heal and what its cell structure was. In all innocence, I hoped at first to write a book describing every detail. In retrospect it seems amusing, preposterous! Soon, however, I saw the greatness of my own incompetence. I called on others to contribute. Instead of a single-authored book, various workers were asked to write the

chapters, men in many laboratories of many countries: Great Britain, Canada, France, the United States, Germany, Spain. And so it was that when the book called *The Cytology and Cellular Pathology of the Nervous System* did appear in 1931 it had become a three volume source-book made up of 33 chapters, written by 27 authors.

That Cytology which is now to be re-edited by a former Fellow of this Institute, Dr. Webb Haymaker, with the help of Raymond Adams and many others, opened my eyes to the compelling need for teamwork. It seemed clear to me that if man were ever to understand himself, understand his sanity and his insanity, his health and his disease, he must explore the human nervous system. This meant a broad cooperative plan. Neurosurgeon and neuropathologist must join forces with neurologist, neurophysiologist, neurochemist, neuroanatomist, psychologist, psychiatrist, neuroradiologist, anaesthesiologist. Such a team must be closely associated with other branches of medicine and surgery and with the basic sciences of a great university. The time for discovery single-handed in so vast a field was clearly long since past.

Professor Archibald it was who first saw the need here in Montreal. To borrow a figure of speech from him, a man might just as well try to reach the north pole paddling in a birch canoe, or sailing in the barque of Christopher Columbus, as to hope to solve the problems of the human brain single-handed.

So, with the advice and support of my first working companion, Dr. Cone, I wrote out the specifications, a dream, a plan of medical and scientific cooperation that might, if fortune smiled, take us and those who should join us toward that distant pole of understanding. The Premier and the Mayor in Council liked the scheme which would set up a Clinical Institute in Montreal to be owned by the University and allied to the Royal Victoria and the other hospitals.

Alan Gregg, the newly appointed Director of Medical Science for the Rockefeller Foundation, came to consider the scheme. We were the same age, he and I, both 40. But he had come to the problems of medical education and research along another path. Starting as a public health specialist, he had risen to this position of authority in the world's largest philanthropic organization devoted to health and medical science. The Montreal proposal was his first large project.

This, he told us, is the undertaking we would like to help launch. Go ahead with it, in Montreal or wherever you think the chances of future local support seem most promising. We will add a permanent endowment for the scientific and academic work.

Another university, meanwhile, in another city had offered to launch the scheme if we would move. But the choice fell on Montreal and Mrs. Penfield and I have never for a moment regretted that choice. Dr. Cone I think would say the same if he were here today. We became citizens of

this city and country. Jasper and Elliott and others who came to Canada to join us have done the same and share our pride and satisfaction.

So it was that the voyage began. Then came the war and with it the storms of sudden change. After the war there was danger that the ship might sink. The resources of scientific budget and hospital budget alike were insufficient. At the annual meeting in 1949, the Director's report closed with these words: "If there is no Canadian, or group of Canadians, ready to make permanent the organization (of the Montreal Neurological Institute) — then let the doors of the hospital close."

Help did come, and in 1953 the McConnell wing was opened. That made it possible to establish the hospital half of the Institute on a more secure financial footing, thanks to reconsideration by the Province of Quebec and the City of Montreal. Dr. Robb took responsibility for hospitalization with continuing consultation from Dr. Gilbert Turner, and Miss Flanagan re-organized her always efficient nursing and nurse-teaching structure.

Announcement was made then of further endowment of research and teaching by Mr. and Mrs. J. W. McConnell. They matched the original Rockefeller endowment. That, together with a consolidated annual grant to research from the Canadian Government through the National Research Council and other important gifts has made our progressive scientific growth possible.

At the same time, seven years ago, I handed in my resignation as Professor of Neurology and Neurosurgery. My successor was chosen then, following nomination by an extramural committee composed of a neurologist, neurosurgeon and psychiatrist, the method proposed by Alan Gregg. It brought Theodore Rasmussen back to us from the University of Chicago. He has the unselfishness which is pre-requisite to the appearance of a high morale in any institution and he is wise, modest, kind, firm, as well as being a brilliant neurosurgeon.

On his arrival in 1954, Dr. Rasmussen took up the academic responsibility. Today, by leave of Principal and University Governors, he becomes Director. With Francis McNaughton as full Professor of Neurology and with Jasper, Elliott, Mathieson in scientific neurology, the future is filled with exciting promise.

They will need progressive scientific endowment, since the work is always expanding and deepening. And I would urge the University that all endowments for this Institute should be invested for future growth to keep pace with the nation's prosperity and offset inflation. They should not be hoarded by a timorous academic investor.

Let the University continue to use the Gregg method of electing directors so you may have men like Rasmussen to follow one after another. Each in turn will bring here scientists and men of quality. If true distinction is maintained, the public will back hospitalization and the Institute will never be a drain on the University's general funds any more than it is now.

For my own part, I shall return to the freedom of a research fellowship again and will work on here in Montreal. My first project is to write the biography of Alan Gregg. He died after his retirement to California in 1957. If I can make a good job of that book, the reader will see medicine and the world through his eyes and mine.

Let me make the change quietly with no talk of rest or retirement and no fanfare. Pipe me over the side of the ship and I'll go ashore in the pilot boat. I am happy to know that those aboard are at their posts and this splendid ship is on its course.

Principal's Closing Remarks

It would be bathos, on my part, to attempt any comment on the deeply moving words of the address in which Dr. Penfield has expressed his intention to retire from active participation in the work of this Institute. We have no alternative but to pipe him over the side of the ship that he has commanded so long, and with such distinction. We agree with his statement that he leaves the Institute in the hands of a good team, and we join him in saluting his successor.

But on behalf of all this company, and indeed of all the members of McGill University who have been his colleagues, I must say to him that his spirit will always be part of the life of this Institute. He may, as he desires, go ashore in the pilot boat, and our good wishes go with him on his new venture, but we hope that he will often come aboard again to share with us his wisdom and gladden our hearts with his friendship.

Dr. Wilder Penfield will not cease to be a member of McGill during all the years of his life, and we hope to forge new links in his connection with this University. In your name, ladies and gentlemen, I express our admiration of all that he has done during the past quarter of a century, our thanks for his contributions to the health of men and women, and our confident good wishes for success in the new tasks that he is about to undertake. For you, as well as for myself, I say "au revoir" with a smile of confidence because I know that I am not saying goodbye.

CLINICAL STAFF

Director

WILDER PENFIELD, O.M., C.M.G., M.D., D.Sc., F.R.C.S. (C), Hon. F.R.C.S. (Eng.), F.R.S.C., F.R.S. (London), Hon. F.R.C.P. (Eng.)

Neurologist-in-Chief

FRANCIS MCNAUGHTON, B.A., M.Sc., M.D., C.M., F.R.C.P. (C)

Neurologist

PRESTON ROBB, B.Sc., M.Sc., M.D., C.M.

Associate Neurologist

DONALD LLOYD-SMITH, B.Sc., M.D., C.M., F.R.C.P. (C)

Assistant Neurologists

J. B. R. COSGROVE, M.D., M.Sc., (Cantab.)
BERNARD GRAHAM, B.A., B.Sc., M.D., C.M.
IRVING HELLER, M.D., C.M., M.Sc.
DAVID HOWELL, M.B., B.S. (Lond.), M.R.C.P. (Lond.)
REUBEN RABINOVITCH, B.A., M.D., M.Sc.
WILLIAM TATLOW, M.D. (Lond.), M.R.C.P. (Lond.), F.R.C.P. (C)

Neurosurgeon-in-Chief

ARTHUR R. ELVIDGE, M.D., C.M., M.Sc., Ph.D., D.C.L. (Bishop's), F.R.C.S. (C)

Neurosurgeons

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WILDER PENFIELD
THEODORE RASMUSSEN, B.S., M.B., M.D., M.S., F.R.C.S. (C)

Associate Neurosurgeon

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CHARLES BRANCH, B.A., M.D., M.Sc.

Roentgenologist

DONALD MCRAE, M.D.

Associate Roentgenologist

R. DOUGLAS SPROUL, M.D.

Electroencephalographer

HERBERT JASPER, Ph.D., D.ès Sci. (Paris), M.D., C.M.

Associate Electroencephalographer

PIERRE GLOOR, M.D. (Basle), Ph.D.

Anaesthetist

RICHARD GILBERT, M.B., B.S. (Lond.), M.R.C.S., L.R.C.P., F.R.C.P. (C), F.F.A.R.C.S., F.A.C.A.

Associate Anaesthetists

G. FREDERICK BRINDLE, B.A., M.D., C.M. (McGill), F.R.C.P. (C)
RONALD MILLAR, M.D., Ch.B. (Edin.), F.F.A.R.C.S., M.Sc.

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K. A. C. ELLIOTT, M.Sc., Ph.D., Sc.D.

Associate Neurochemist
HANNA PAPPIUS, B.Sc., Ph.D.

Neuropathologist
GORDON MATHIESON, M.B., Ch.B. (Aberdeen)

Clinical Psychologist
BRENDA MILNER, B.A., M.A., (Cantab.), Ph.D

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Consulting Roentgenologist	CARLETON PEIRCE, A.B., M.Sc., M.D., F.A.C.P.
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Professor of Neurology and Neurosurgery	THEODORE RASMUSSEN
Professor of Neurology	FRANCIS MCNAUGHTON
Assistant Professors of Neurology	J. B. R. COSGROVE DONALD LLOYD-SMITH PRESTON ROBB WILLIAM TATLOW

Lecturers in Neurology	BERNARD GRAHAM
	IRVING HELLER
	DAVID HOWELL
	REUBEN RABINOVITCH
Demonstrators in Neurology	FREDERICK ANDERMANN
	TERESITA ELIZAN
	RICHARD ROVIT
Professor of Neurosurgery	WILLIAM FEINDEL
Associate Professor of Neurosurgery	ARTHUR ELVIDGE
Assistant Professors of Neurosurgery	GILLES BERTRAND
	HAROLD ELLIOTT
Lecturers in Neurosurgery	JOHN BLUNDELL
	CHARLES BRANCH
Demonstrators in Neurosurgery	JESSE BARBER
	DES RAJ GULATI
	PRAKASH TANDON
Professor of Experimental Neurology	HERBERT JASPER
Professor of Biochemistry	K. A. C. ELLIOTT
Assistant Professor of Experimental Neurology	PIERRE GLOOR
Lecturer in Experimental Neurology	HANNA PAPPIUS
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Assistant Professor of Neuropathology	GORDON MATHIESON
Demonstrator in Neuropathology	JOHN JANE
Lecturer in Clinical Psychology	BRENDA MILNER
Demonstrator in Electroencephalography	LEWIS HENDERSON

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	WILLIAM FEINDEL
	FRANCIS MCNAUGHTON
	THEODORE RASMUSSEN
Associate Professors	ARTHUR ELVIDGE
	DONALD MCRAE
Assistant Professors	I. B. R. COSGROVE
	PIERRE GLOOR
	GORDON MATHIESON
	PRESTON ROBB

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Assistant Director (Scientific)	FRANCIS MCNAUGHTON
Assistant Director (Hospitalization)	PRESTON ROBB
Registrar	BERNARD GRAHAM
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Neurological Services	
Teaching Fellow	R. ROVIT, M.D. (Boston) U.S.P.H.S. Fellow
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W. PARSONS, M.D.†
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A. TARAZI, M.D. (Beirut) Lebanon*
G. THOMPSON, M.D. (McGill) *

Assistant Residents

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S. HUESTIS, M.D. (Dalhousie) *
R. MORRELL, M.D. (Washington)
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LABORATORIES AND DEPARTMENTS

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Associate Anaesthetist and Research Associate ..... RONALD MILLAR, M.D., Ch.B. (Edin.), F.F.A.R.C.S., M.Sc.

Associate Anaesthetist ..... G. FREDERICK BRINDLE, B.A., M.D., C.M. (McGill), F.R.C.P. (C).

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ALVIN HILDEBRANDE, M.D. (McGill) *
ALEX MATZKO, M.D. (McGill) *
MARY MORRIS, M.D. (Ontario) *
ROBERT ORR, M.D. (McGill) *
MARGARET RENSAA, M.D. (Alberta) *
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ANNEGRET UHTOFF, M.D. (Germany) *
GEORGE VARKEY, M.D. (India) *

Nurse in Charge of Anaesthetic Rooms ..... HELEN CALLANDER, R.N.

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Electroencephalographer ..... HERBERT JASPER, Ph.D., D.ès Sci., M.D., C.M.

Associate Electroencephalographer ..... PIERRE GLOOR, M.D., Ph.D.

*Six months on this service.
†On rotation from Royal Victoria Hospital.
‡On rotation from Montreal General Hospital.

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RALPH BAILEY, M.D. (Calgary) *

HENRY GOSSMAN, M.D. (England) * Durham Fellow

KENNETH KAPPHAHN, M.D. (St. Louis)

ISRAEL LIBMAN, M.D. (McGill) *

HUNTINGTON MAVOR, M.D. (Vermont) U.S.P.H.S. Fellow

WILLIAM R. MCCRUM, M.D. (Detroit) *

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Electromyographic Fellows ..... V. SUSSET, M.D. (Paris) *

S. YAMAMOTO, M.D. (Kanazawa) Japan

Chief Technician and Demonstrator ..... LEWIS HENDERSON

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Assistant Clinical Neurochemist ..... IRVING H. HELLER, M.D., M.Sc. (McGill)

Visiting Scientist ..... JAMES CROSSLAND, M.A. (Oxon), Ph.D. (Wales) St. Andrews

Fellows

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BRENDA BOLLARD, B.Sc. (University of London)

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NEUROPATHOLOGY

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RICHARD BROWN, M.D. (London) *

HENRY GARRETSON, M.D. (Arizona) *

RAYMOND GIGUÈRE, M.D. (Quebec) *

MAXWELL HOUSE, M.D. (Newfoundland) * F.H.G.F.

ISRAEL LIBMAN, M.D. (McGill) *

PABLO MARIN, M.D. (Spain) *

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CONE PEVEHOUSE, M.D. (San Francisco) N.S.F.P.D.F.

CURTIS WITHROW, M.D. (West Virginia) * Vermont Exchange Fellow

Chief Technicians ..... JOHN GILBERT

BARBARA NUTTALL, B.A.

NEUROANATOMY

Neuroanatomist ..... FRANCIS L. MCNAUGHTON, B.A., M.Sc., M.D., C.M.

Fellow ..... ALLAN MORTON, M.D. (McGill) Part-time

NEUROPHYSIOLOGY

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*Six months on this service.

Assistant Neurophysiologist ..... PIERRE GLOOR, M.D., Ph.D.

Fellows

ANTONIO AGUILAR, M.D. (Calif.) U.S.P.H.S. Fellow

EVERETT BOVARD, M.D. (Toronto) U.S.P.H.S. Fellow

JULES HARDY, M.D. (Montreal) C.N.R.C. Fellow

JERZY MAJKOWSKI, M.D. (Warsaw, Poland) Rockefeller Fellow

ROSARIO MUSELLA, M.D. (Naples, Italy)

PHANOR PEROT, M.D. (Louisiana) U.S.P.H.S. Fellow

RICHARD ROVIT, M.D. (Boston) U.S.P.H.S. Fellow

LUIGI SPERTI, M.D. (Padua, Italy)

CRISTIAN VERA, M.D. (Santiago, Chile)

Nurse in Charge of Neurophysiology Rooms ..... MARY ROACH, A.R.R.C., R.N.

PHOTOGRAPHY

Supervisor ..... GILLES BERTRAND, B.A., M.D., M.Sc.
Photographer ..... CHARLES HODGE, F.B.P.A.
Assistant Photographer ..... JEAN GARNEAU

RADIOLOGY

Radiologist ..... DONALD MCRAE, M.D.
Associate Radiologist ..... R. DOUGLAS SPROUL, M.D.
Visiting Observer ..... MALCOLM JONES
Residents

ROMÉO ETHIER, M.D. (U. of M. Diploma Course) *
FRANÇOIS HÉBERT, M.D. (McGill Diploma Course) *
FRANK LINSDELL, M.D. (McGill Diploma Course) *
JOHN LYNCH, M.D. (McGill Diploma Course) *
ROGER MALTAIS, M.D. (U. of M. Diploma Course) *
DENISE OUIMET, M.D. (U. of M. Diploma Course) *

Chief Technician ..... JOAN BROADLEY, R.T

RESEARCH IN MULTIPLE SCLEROSIS

Chief ..... J. B. R. COSGROVE, M.D., M.Sc.
Immunochemist and Research Associate ..... CATHERINE MACPHERSON, Ph.D. (Columbia) B.Sc., M.Sc.
Chemist ..... PAMELA AGIUS, B.Sc.
Technician ..... MRS. EVA MEHLHOSE

NURSING STAFF

Director of Nursing ..... MISS EILEEN C. FLANAGAN, B.A., R.N.
Assistant Director of Nursing ..... MISS BERTHA CAMERON, R.N.
Administrative Assistant ..... MRS. ELEANOR CARMEN, R.N.
Supervisor Dressing Rooms ..... MISS ANNIE JOHNSON, R.N.
Educational Director ..... MISS NORA PATON, R.N.
Clinical Instructor ..... MISS IRENE MACMILLAN, B.A., R.N.
Night Supervisor ..... MISS ELIZABETH BARROWMAN, R.N.
Assistant Night Supervisors ..... MISS LILLIAN MCAULEY, R.N.
MISS MARILYN MANCHEN, R.N.
Operating Room Supervisor ..... MISS PHOEBE STANLEY, R.N.
Assistant Operating Room Supervisor ..... MISS PATRICIA MURRAY, R.N.

*Six months on this service.

HEAD NURSES

Miss Evelyn Adam, R.N.
Miss M. Agnew, R.N.
Miss Alice Cameron, R.N.
Miss Mary Cavanaugh, R.N.
Miss Barbara Fields, R.N.
Miss Audrey Kimberley, R.N.
Miss Caroline Robertson, R.N.

SOCIAL SERVICE STAFF

Director ..... Miss Cynthia Griffin, B.A., M.S.

Social Workers:

Miss Patricia Linck, B.A., M.S.W.
Miss Kathleen MacDonald, B.A., B.S.W.
Mrs. Marguerite Puyrez, Diploma in Social Work (U. of M.)
Mrs. Bette Schon, B.A., M.S.W.
Miss Noella Vaillancourt, B.A., M.S.S.

APPOINTMENTS HELD IN TEACHING HOSPITALS OF MONTREAL

ROYAL VICTORIA HOSPITAL

Neurologist and Neurosurgeon-in-Chief ..... Arthur R. Elvidge
Neurologist ..... Francis L. McNaughton
Associate Neurologists ..... Donald Lloyd-Smith
Preston Robb
Arthur W. Young
Assistant Neurologists ..... J. B. R. Cosgrove
Reuben Rabinovitch
Clinical Assistants in Neurology ..... Bernard F. Graham
Irving H. Heller
Neurosurgeons ..... William H. Feindel
Wilder Penfield
Theodore Rasmussen
Associate Neurosurgeon ..... Gilles Bertrand
Clinical Assistants in Neurosurgery ..... John Blundell
Charles Branch
Physician-in-Charge of Electroencephalography and Electromyography ..... Herbert H. Jasper
Associate Radiologist ..... Donald L. McRae
Honorary Consulting Staff — Anaesthesia ..... R. G. B. Gilbert

MONTREAL GENERAL HOSPITAL

Neurosurgeon-in-Chief and Director ..... H. Elliott
Associate Neurologist ..... W. F. T. Tatlow
Assistant Neurologist ..... D. Howell
Consultants in Neurology ..... Francis L. McNaughton
Preston Robb
Consultants in Neurosurgery ..... Arthur Elvidge
Wilder Penfield
Consultant in Electroencephalography ..... Herbert Jasper

MONTREAL CHILDREN'S HOSPITAL

Consultants ..... Gilles Bertrand
Arthur Elvidge
Herbert Jasper
Francis McNaughton
Donald McRae
Wilder Penfield
Theodore Rasmussen
A. W. Young
Honorary Consulting Staff ..... M. Sam. Rabinovitch
Director — Neurology and Cerebral Palsy Division ..... Preston Robb

GRADUATE STUDIES AND RESEARCH

DR. HERBERT H. JASPER

In the wake of our recent quarter century celebrations it may be of interest to review the overall picture of research and graduate studies with more than the usual annual perspective. I am also stimulated to do this by the disquieting premonition that this annual meeting may be long remembered as one of unusual historical importance in the life of this Institute.

To report on "the state of the Union" in graduate studies and research is becoming increasingly difficult each year since we have not as yet discovered a metabolic inhibitor which will arrest the tendency to steady growth in each department or the addition of new departments. There are now nine laboratories engaged in basic or clinical research. When Dr. Feindel's radio-isotope laboratory becomes established there will be ten. This does not include investigative work being carried out in the various clinical services. Even with this steady growth it has not been possible to keep pace with the rapid developments in the technology of neurological research in all departments. It is becoming increasingly apparent that this should *not* be our aim for the future.

Research in neurochemistry continues at a high level of productivity under the inspiration and guidance of Dr. Elliott. In spite of his preoccupation with the biochemistry department at McGill, he has remained true to his first love. His staff has continued to make solid advances in basic knowledge of brain and nerve chemistry with particular relation to oxidative metabolism, physiologically active substances regulating brain function, and mechanisms of electrolyte exchange affecting function as well as controlling brain oedema. New conceptions of the role played by the glial cells of the brain are being developed from the work of Dr. Pappius. Dr. Heller is discovering information of basic importance about the metabolism of peripheral nerves, also related to the function of the Schwann cells. We are all looking forward to the arrival of Dr. Leonard Wolfe, a brilliant scientist with extensive training both in chemistry and in clinical medicine, who will soon take the position of full time Associate Neurochemist in this department as a Fellow of the Elizabeth Kenny Foundation.

Dr. Cosgrove is still hammering away at the stubborn problem of multiple sclerosis and allied degenerative diseases which still elude understanding and treatment. The analysis of spinal fluid proteins with modern techniques, together with immunochemical studies are proving to be promising approaches to this distressing disease. The addition of Dr. Catherine MacPherson, an expert immunochemist of long experience, will lend much strength to this work of significance not only to the problem of multiple sclerosis.

Dr. Mathieson has been thoroughly engaged in the continued reorganization of the neuropathology laboratories with an increasing number of autopsy studies of the brain and nervous system carried out on patients

from our neighbouring Institute of Pathology. His carefully prepared clinico-pathological conferences form an important part of the graduate teaching and research programme. Particularly outstanding work in this department is being carried out by Dr. Mossakowski of Warsaw who is using a histochemical method to study the succinic dehydrogenase activity in glial tumours of the brain. We are sorry to report that the tissue culture work planned for these laboratories has not yet begun. I am informed that I will probably have to repeat this statement next year again unless Dr. Mathieson can secure competent long term assistance with the large routine load of this department. Further development of histochemical methods of investigation is also being planned in the reorganization of this important department, the first one of the Institute.

Biochemical and pharmacological studies also dominate the increasing research activities of the department of anaesthesiology. Studies of catecholamines, O_2 and CO_2 metabolism, and the assessment of the many new neuropharmacological agents is being pursued. In addition Dr. Miller, with Dr. Branch and Dr. Morris, is developing a brain perfusion technique which may make possible the treatment of the brain alone, isolated from the rest of the body, by cooling or by the injection of chemical substances.

In neurophysiology Dr. Gloor's persistent programme of research into the mechanisms of epileptic discharge in the hippocampus has made notable progress with the meticulous work of Drs. Sperti and Vera, using multiple microelectrode techniques for the analysis of the electrical properties of cells and their dendrites during experimentally induced seizures. New insight into brain stem mechanisms probably involved in petit mal seizures is being provided by experiments with Dr. Perot. The importance of cortical, hippocampal and brain stem structures in the elaboration of conditioned reflexes is being studied with electrophysiological and ablation techniques with Dr. Majkowski as a continuation of a long term programme of research into the neurophysiological mechanisms of learning. Experimental and clinical studies of mechanisms of bilateral epileptic discharge, using the intracarotid sodium amytal technique, are also yielding results of both theoretical and practical value, in work being carried out with Drs. Rovit and Hardy.

It has been possible to mention only a few of the research activities being pursued by fellows and staff during the past year. It is apparent that the rapidly expanding frontiers of neurological research lie in the fields of neurochemistry and neuropharmacology, and in the application of modern electronic and biophysical techniques to the exploration of the structural and functional properties of nerve cells and synapses at the molecular and ionic level of observation. If we are to progress further along these lines we shall have to add to our full time research staff a competent biophysicist and a neuroanatomist trained in the techniques of ultramicroscopic study of nerve tissue.

At the other extreme, our work on the functional organization of large assemblies of neurones in relation to mechanisms of thought and action in

the behaviour of the total organism, a field of research in which Dr. Penfield has led us to the forefront of knowledge over the past 25 years, should be continued with new conceptions and techniques of study, permitting more refined analysis of how neurones do interact in small and large assemblies. We are beginning to realize that particular functions are organized not in centers but in complex interacting systems of neurones in many areas and at different levels of the nervous system. This requires new theoretical approaches to brain organization and new and very complicated methods of study, probably with the use of electronic computers to aid in working up the data.

With this greatly expanded field of neurological research, making use of a variety of technological advances derived from the physical sciences, we can no longer expect our Institute to remain in the forefront of all fields of investigation. We must choose a few of the most promising paths to follow and pursue these selected routes with energy and excellence to the limit of our facilities in staff and space. Space is at present our greatest limitation but perhaps this is a good thing — if it forces us to concentrate on quality rather than quantity of research activity. But the inevitable reward for good work is pressure for expansion and increased research budgets. This is our present dilemma. We have already exceeded the limit of crowding in some laboratories consistent with most efficient work. Consideration of possible means for enlarging laboratory space in the Institute will be necessary in the near future if we are to continue to fulfill our destiny and the dreams of our founder.

In closing I would like to express most sincere appreciation on behalf of the staff to the splendid group of fellows we have been privileged to work with during the past year. They deserve most of the credit for work accomplished. Also, on behalf of fellows and staff, we acknowledge with deep gratitude the devoted and skilful assistance provided by the secretarial and technical staff of the research laboratories which contributes so much in so many ways to the production and life of our laboratories.

TEACHING AND THE LABORATORIES

DR. THEODORE RASMUSSEN

The high point of this past year, which started in the first and ended in the second quarter century of the Institute's existence, was the celebration last October of the twenty-fifth birthday of the opening of the Institute's doors. The celebration was timed to coincide with McGill's Founders' Day Convocation, which had a decidedly neurological flavor, with Dr. Penfield delivering the Convocation Address and two of our most senior and distinguished former Fellows, Dr. Dorothy Russell of London, England, and Dr. Jerzy Chorobski of Warsaw, Poland, being awarded honorary degrees. Papers and reports by former Fellows and by our Staff constituted the scientific program which was highlighted by the twenty-fifth annual Hughlings

Jackson Lecture, delivered by Dr. Herbert Jasper, the third annual Fellows' Lecture, delivered by Dr. Dorothy Russell, and a symposium on the "Teachings of William Cone" chaired by Dr. Gilles Bertrand.

Former Fellows returned from five Provinces, from twenty-two States below the border and from ten other countries around the globe to take part in this happy and memorable anniversary. Nearly 100 in number, they constitute about one-third of the roster of those who have spent six months or more here during the Institute's first 25 years. This was the third major reunion of former Fellows during the past ten years. The first in 1951 and the second in 1957 celebrated birthdays of the two founders of the Institute, and this, the third, celebrated the silver anniversary of the Institute itself.

The teaching program also passed a milestone this year with the putting into effect of the curriculum changes described in last year's report. This was actually a transitional year between the old and the new medical school curricula, and I suspect its passing will not be mourned by those, like Dr. Mathieson and his staff in neuropathology, who have had to shoulder double the normal teaching load this year.

The combined second year basic course on the nervous system has been expanded with psychology added and integrated with neuroanatomy and neurophysiology. It is hoped this combined presentation of neuroanatomy, neurophysiology and psychology which runs throughout the whole of the second year will provide a still more effective and comprehensive background for the medical students' introduction in the third year to clinical aspects of the nervous system. Dr. John Blundell's work with Dr. McNaughton in revising the neuroanatomical part of the course should receive special mention.

The introduction of third year clinical clerkships in the Institute constitute the most radical change from the old curriculum. Each group of students, 8 or 9 in number, comes here four afternoons a week for a three-week period. Dr. Rovit, teaching fellow in neurology, has supervised the groups throughout the year with skill and energy. The nursing staff are also to be commended for their pleasant and efficient help in introducing the procession of neophytes to our clinical and ward routines. With further experience and the gradual development of new traditions by both the senior and resident staff this aspect of our undergraduate teaching program should become increasingly effective and popular with both students and staff.

Our afternoon conferences have been moved up to 4 o'clock to fit into the medical students' working day and to enable him to sit in on discussions of clinical and neuropathological problems on an advanced, rather than the medical student's level. We hope this glimpse into the continuing day-to-day cross fertilization of the clinic and the laboratory that is the principal reason for the Institute type of organization will provide a worthwhile stimulus to the medical student at the beginning of his clinical career.

There have been no striking changes in the graduate teaching program which continues to consist essentially in providing opportunities to learn on the wards, clinics and laboratories as originally planned and started by Dr. Penfield and Dr. Cone some 30 years ago, when the Institute was being planned and the Department of Neurology and Neurosurgery was created.

The Monday noon research seminar, displaced from the 8th to the 6th floor, has continued to provide a forum for discussion of research projects underway in the various laboratories and clinical departments, and incidentally keep the clinical and laboratory staffs up-to-date on the research work going on in each other's bailiwick. The Fellows' Graduate Seminar on Monday afternoons, 4.30 to 6.00 o'clock, has also continued in the pattern of recent years with neuroradiology in the fall, and neurophysiology, neurochemistry and special aspects of neuroanatomy in the winter and spring.

It has once again been a busy and productive year in the laboratories, as Dr. Jasper's report indicates. The problem of space, however, continues to become more urgent. This pressing need for more laboratory and office space has led to plans for the reorganization of some areas on the 6th floor to provide more efficient utilization of laboratory and office space to facilitate the routine and research activities of the laboratory of neuropathology and at the same time provide space for the expanding neurosurgical research program.

During the past 25 years the laboratories have expanded gradually as new fields of investigation have developed that were pertinent to clinical and basic problems of special interest to the Institute staff. In the future it will be of utmost importance that we continue to be alert to take advantage of new developments in those aspects of the rapidly expanding field of the neurological sciences of special interest to us. The day is past when a single institute can hope to carry out a strong investigative program in all the various aspects of the nervous system. A proper balance between the forces of expansion and the realities of limitations of space and endowment will be essential if we are to continue to maintain high standards of scientific work. Our facilities and scientific climate must promote thoughtful, well-controlled research work, with quality rather than quantity the main objective.

The opportunities for advancing the frontiers of knowledge in the neurological sciences were never brighter and the Institute's foundations in its first quarter century are well constructed. Upon these we will all strive to build with equal soundness in the years ahead.

REPORT OF THE NEUROLOGIST

Dr. Francis McNaughton

Before presenting my report, I would like to say a word of affectionate greeting to a great Neurologist and Clinical Teacher who is with us today — Sir Charles Symonds. As Physician to two remarkable medical institutions, Guy's Hospital and the National Hospital, Queen Square, Sir Charles has made a rich contribution to Clinical Neurology, and has brought distinction to both these institutions. A gifted teacher, his devoted pupils are to be found in every part of the world. We are proud to have him here for this memorable week, as Visiting Professor of Neurology, and greet him this morning with admiration and affection.

Turning to the work of the Department of Neurology, I think it may be summed up by saying that we have had another busy year, but without startling innovations or major staff changes.

The new curriculum of the Faculty of Medicine has produced, however, a major change in the pattern of undergraduate teaching of Neurology at McGill. For the first time, students are now coming to the Institute for Second Year instruction in Physical Diagnosis, and in the Third Year, each student spends some 36 hours on our wards, in close contact with neurological patients. The increased teaching load involves more members of the Institute Staff than ever before, and is also providing valuable experience for Junior and Senior Fellows. Dr. Richard Rovit deserves particular mention for his thoughtful work as Teaching Fellow during a difficult transition period.

We hope that as the new curriculum evolves, we will see greater integration of Neurology with the teaching of Medicine and Psychiatry and if our teaching proves effective, every McGill student will feel the challenge presented by the study of the Nervous System and its disorders, as never before.

Graduate training in Clinical Neurology continues along the same plan as outlined in last year's report, and we are again grateful for continued support provided by the U.S. Public Health Training Grant. There is increasing demand for advanced training in Paediatric Neurology, and we hope to strengthen our liaison with the Montreal Children's Hospital, in order to provide wider opportunities in this promising branch of Neurology.

Our Seizure Clinic in the Royal Victoria Hospital has had an active year with about the same volume of work as in the previous year. We continue to receive essential financial support through a Federal-Provincial Grant for Rehabilitation. In a recent sampling of the results of treatment of all types of epilepsy in this Clinic, we found that just over half our patients are at full time work or able to attend regular schools. Considering the disabling character of this disorder and the inevitable selection of the more resistant cases in a Special Clinic, this is encouraging. However, the need for more effective means of medical treatment is obvious. Dr. Allan Morton and others are continuing clinical trials of new antiepileptic drugs.

In connection with the Seizure Clinic, Madame Puvrez of the Social Service Department recently organized a successful series of weekly lecture-discussions for a group of some 25 parents of our younger seizure patients. This is one useful approach to Social Therapy and we hope that it will be continued.

In November last, a number of members of the Institute Staff, including the Director, took an active part in a one-day Study Conference on the needs of the Seizure Patient in Montreal. The Conference was sponsored jointly by the Montreal Council of Social Agencies and the Neurological Institute. The report of the Conference — which will be issued shortly, reveals the need for better Community Planning to meet the Social and Medical problems of the Epileptic Patient. We hope that the Continuing Committee of this Conference will have the full support of every citizen of Montreal.

Turning to another major Neurological problem, Multiple Sclerosis, I have referred in recent reports to the need for outside support to establish Dr. Cosgrove's Special Clinic on a sounder basis. This need remains, and we hope to report progress by next year.

In closing, I wish to express, with my colleagues, our thanks to the House Staff for their loyalty and good work throughout the year, with special mention of the two Residents, Dr. Teresita Elizan and Dr. Fred Andermann.

REPORT OF THE NEUROSURGEON

DR. A. R. ELVIDGE

This year the following staff changes have taken place. We welcome the return of Dr. William Feindel from Saskatoon to become the first William Cone Professor of Neurosurgery at McGill University, and Neurosurgeon at the Montreal Neurological Institute and the Royal Victoria Hospital. Dr. Gilles Bertrand becomes associate neurosurgeon. Dr. John Blundell and Dr. Charles Branch have been appointed clinical assistants in Neurosurgery. Dr. Gordon Thompson has left to take an important post at the University of British Columbia and the Vancouver General Hospital. Dr. Antone Tarazi will shortly return to the Middle East to become the first neurosurgeon in Jordan at Jerusalem.

In the field of clinical neurosurgical research, the anatomy and physiology of the temporal lobe continues to hold much attention. Temporal lobe seizure mechanisms are being studied with the aid of depth electrodes, and of microelectrodes, by Dr. Rasmussen and staff. Work is progressing in the development of stereotaxic methods in the treatment of the dyskinesias by Dr. Gilles Bertrand, and in the placement of depth electrodes particularly in the study of epilepsy, by Dr. John Blundell. Dr. Blundell has recently spent some weeks in Sweden in connection with this study. Dr. Ronald Millar of the Department of Anaesthesiology and Dr. Charles Branch are

developing a method for the perfusion of the brain toward the study of local therapy of brain tumours and other possibilities. The employment of radioactive isotopes in automatic brain scanning, a study initiated and developed in Saskatoon, is being introduced by Dr. William Feindel, particularly for the localization of intracranial lesions and for the study of cerebral circulation.

The Volume, Speech and Brain-Mechanisms by Wilder Penfield and Lamar Roberts has been published. Several papers have appeared during the year from the neurosurgical staff and much work has been recorded in association with other departments.

Tumours still form the largest number of conditions for which cranial operative procedures are performed, and continue to be studied by staff and fellows from the clinical and pathological point of view. The tumour registry, a branch of the Royal Victoria Hospital registry, which latter is under the general direction of Dr. Harry Morton, serves as a basic source of follow-up data for clinical research into the effectiveness of treatment.

The effect of cytotoxic agents on gliomas is being studied by Dr. Branch and Dr. Garretson, under the direction of Dr. Rasmussen.

Arteriography and the treatment of blood vessel anomalies, aneurysms and intracranial haemorrhage are always under study for better methods of treatment.

Spinal disease of all types is dominated by the ever present disc problem which becomes more complicated. Dr. Antonio Aguilar has made an interesting and important pathological study of brucellosis of the spine from a case which simulated intervertebral disc. Infective lesions are less common, and abscesses have been reviewed by Dr. Tarazi.

An enviable liaison exists between the Neurosurgical, Surgical, Plastic, Otolaryngological, Ophthalmological and Orthopaedic staff, in connection with traumatic work, which continues as a major seasonal item. Contributions of major importance are made from time to time in this field in association with and from other departments. Hypophysectomy carried out mainly by Dr. Rasmussen and staff, in association with Dr. John Beck and the Department of Endocrinology, is of outstanding interest.

The possibilities for research in Neurosurgery are unlimited, and, in the Institute, may be associated with the laboratories of electroencephalography, physiology, pathology, chemistry and radiology. Conferences between these subdepartments have been most stimulating.

To turn to the practical side, and we must not forget that our main undertaking is to treat patients, the neurosurgical services, wards and operating rooms have continued to be busy. During the year there were 1,264 admissions to the Neurosurgical Department alone. There were 955 operations. This figure includes 244 elective craniotomies not counting certain traumatic cases of e.g. depressed skull fracture and other minor procedures.

Many rare lesions appear on our services as more and more routine cas
are cared for in peripheral hospitals. No praise is too high for our anae
thesists who have made operation safer and happier for the patient.

In the operating room there were no reported infections and the recor
of the operating nursing staff is widely known for their operative technique
which attract many post-graduate nurses, and much help has been given b
them to other operative clinics in the process of establishment.

One cannot speak too highly of this nursing service which has kept ou
efficiency high, and has helped in the creation of so many other clinic
around the world. Similar statements should be made for the ward nurse
and the teaching department but time does not permit. I merely thank them

In the operating suite the Sterox-O-Matic gas sterilizer developed b
Castle and investigated by Miss Phoebe Stanley, operating room supervisor
with the help of Dr. A. R. Boutros, bacteriologist, and Prof. R. W. Reed
and with the advice of Dr. Hugh Starkey, is now in use and has proven
satisfactory for what it is intended, i.e. the sterilization of certain items
pneumatic tools, camera loaded with film, ampoules containing heat sensi
tive drugs, surgical gloves, anaesthetic equipment, and many items damaged
by the usual methods of sterilization which can be made aseptic. This seem
to be a great advance in technique and one in which we are again indebted
to the initiative of the late Dr. W. V. Cone.

In the Neurosurgical Outdoor clinic which is held on three afternoon
a week there were a total of 952 visits, made up of 750 re-visits and 202 new
patients. We are indebted to Miss Margaret Gurd for expert management o
those clinics and to the continued splendid attention from the Social Servic
Department under Miss Cynthia Griffin.

What will be the pattern of neurosurgery in the near future, the fa
future? At the present rate of progress it will probably be very different from
what it is at present. Will an anticancer cure be found? Will the field o
stereotaxy expand or lessen in importance? Will aneurysmal surgery become
safer? Will mental disease again be attacked surgically? Will epilepsy b
finally conquered? Will physicists and chemists take over? Will there be a
space neurosurgeon?

In the meantime the privilege to use surgical techniques must be limited
to those states in which the anatomy, physiology and pathology are clearly
defined so that the operation may be eminently successful. The surgeon, a
a doctor, must give the best available treatment to the patient as it exist
in his time.

REPORT OF THE ASSISTANT DIRECTOR HOSPITALIZATION

DR. PRESTON ROBB

It is fitting that after twenty-five years of operation, we review what might be called the vital statistics of the Institute. In 1935, the first full year of operations, 841 patients were admitted. In 1954, the first year after the McConnell Wing was opened, there were 2,145 admissions with 39,366 patient days. Last year, 1959, there were 2,577 admissions, and 46,930 patient days. This represented a daily bed occupancy of 95%. This is the highest figure we have ever had and represents the continuing and increasing demand for the type of service offered. The average length of stay was 18.1 days. There were 955 operations compared to 971 in 1958. There were 106 deaths, a death rate of 4.11% and an autopsy rate of 80%. It is of interest that for the first time there were more admissions to neurology than to neurosurgery. There are many comments that one could make about over-crowding and the pressure of work. Suffice it to say that in spite of the heavy load of patients, every effort has been made to maintain the high standard of patient care in the tradition of Dr. Cone.

Out-patient Clinics

The out-patient clinics continue to be active. In the neurology clinics there were 527 new patients and a total of 4,463 clinic visits. In the neurosurgical clinics there were 202 new patients and 952 clinic visits. These figures have slowly increased. There were 1,200 more patients in 1959 than in 1954. It should be stated that these clinics, four neurology and three neurosurgery a week, are operated by the Royal Victoria Hospital. They form an integral part of the work of both the Hospital and the Institute and continue to operate in the spirit of cooperation. I am sure that Dr. Turner would not be too critical if I pointed out the great need for financial support for the indigent out-patient.

Finance

It is traditional at this time to mention in no uncertain terms the pending deficit. This year is no exception. The cost of operating the hospital side of the Institute far outstrips the income. Even with the special grants and endowment we continue to have a deficit. Our concern over the deficit has been great, but we are equally concerned about what is costs the patient. The present cost per patient per day is $31.00. Last year, the breakdown of this was presented. The essential point was that most of it was for direct patient care.

Over the years, this Institute has provided leadership in the care of the neurologically handicapped patient. New techniques have been developed, and special nursing procedures used. Further endowment funds are needed to support and develop this aspect of the work. Miss Flanagan has stressed before the need for special funds to support the post-graduate training program for nurses. With this I concur heartily.

It is hoped that the hospital insurance act, when it is put into force, will provide relief from the loss incurred by Q.P.C.A. patients and the uncollectable accounts. We hope that the authorities will continue to recognize the fact that this is a special Institute and our patients require special care.

Records

The increased number of admissions increases the load in the Registrar's office. This requires more staff to be put into space that is not available. This, as you can imagine, presents a problem. The efficiency has been improved with the use of precarbon forms but still there is a tendency to fall behind. It is hoped that the use of a new check sheet will decrease the size of the dictated histories without affecting their quality. At the same time, we hope to survey the available space and see if something cannot be done to improve the layout. The patient's record is the heart of his stay in hospital. We have been proud of our records in the past, and we would like to continue to do so.

Building Administration

During the past year a good deal of progress has been made, but we continue to be plagued by bursting pipes, and other items that are expensive to repair, and tend to recur. The elevators in the original building were overhauled, and converted to an automatic pick-up system. The elevator in the new wing was reconditioned. It was difficult for everybody when the repairs were being carried out, but it was worth waiting for. The ventilating system in the amphitheatre was overhauled and conditions have improved a little. However, they are still not satisfactory. It is hoped that major changes may be made, so that those sitting over the air outlets do not freeze, while others suffer from the heat. Bathing facilities for the infants have been installed in the Children's Ward. With the aid of Federal-Provincial Grants, sterilizers have been renewed on all floors. A new operating table has been provided in the operating room. The emergency lighting system has been improved. A major project has been the installation of a spare electrical line from McGill in the hope of eliminating blackouts.

There is a tendency to take regular maintenance and special projects for granted. I want to assure you that they represent a great deal of work. We are indebted to the permanent staff in the Institute and the staff of Buildings and Grounds, under the direction of Mr. Cunningham, for all that they have done for us.

During the coming year there are some projects that we expect to have completed. The main air conditioning system for the operating rooms and recovery rooms is to be completely overhauled. An air conditioning system is to be installed in the amphitheatre. The electric lighting is to be improved on 4 South. A program is being started to replace all the fly screens. We are concerned over the crowded conditions in the typing pool, and hope that this can be remedied. The ticker system is now causing grave concern, and we hope before too long this may be replaced. The City has promised us that

a major repair job will be carried out on the dilapidated condition of the street in front of the Institute. Our biggest problem is space. If anyone can tell us how to solve this, we all would be grateful.

It would be impossible to mention every one who has contributed to the smooth operation of our hospital. If I were to single out any one person to thank for the successful operation, I would be unfair to all the others. Each member of the staff has worked well, and as a team. On my own behalf, and on behalf of the patients, *to all* I say — thank you.

REPORT OF THE DIRECTOR OF NURSING

Miss Eileen C. Flanagan

The Nursing Department has been extremely active this last year. The ever increasing complexity of medical and surgical care and attendant investigative procedures, not only keeps adding to nursing responsibilities, but also entails a steady teaching programme by all members of the staff.

The regular graduate staff numbers about 90, and in addition we have a rotation of students from the Royal Victoria Hospital for six-week periods of teaching and experience.

For the first time we have five undergraduate 4th year student nurses from the McGill School of Nursing, who are here for 4 weeks experience.

The Post-Graduate, or as we prefer to call it, the Post-Basic Course for Graduates was given in two classes and included members from many lands.

It is quite obvious therefore that every member of our staff must consider herself a member of the teaching staff.

We have been able for most of the time to maintain our average of 4 to 4.5 hours of nursing care for adult patients per 24 hours. This is approximately 2.5 hours from 7:30 a.m. to 3:30 p.m. — 1.5 hours from 3:30 p.m. to 11:30 p.m. — and 0.5 hours from 11:30 p.m. to 7:30 a.m.

However, it is necessary to give anywhere from this figure to total 24-hour care in many instances, and the figure for the children is 6 to 7 hours per 24 hours.

We are very grateful to Mrs. Samuel Reitman for the gift of an annual Bursary in memory of the late Dr. William V. Cone. The first one was awarded to Miss Jean MacMillan, R.N., a member of the Operating Room staff who had worked with Dr. Cone.

We also wish to thank the Dalse Welfare Club, Ladies Auxiliary, for the gift of a Bursary to be given to a nurse for further study.

It is becoming more and more essential that we acquire a suitable residence for our staff. The majority are not residents of Montreal, and it is

very difficult to keep them happy and comfortable in rooming houses with no facilities for any kind of congenial living. Apartments are extremely expensive and involve long leases.

The Department, as always, owes a great deal to the Medical Staff for the many hours of teaching and help in many ways.

I would like to record that the statue of "Peter Pan", an original by Sir George Frampton, has now been completed by the addition of a base in bronze (a replica of the one in Kensington Gardens) executed by Marjorie Winslow, and is in place in the Children's Ward. The many friends of the Montreal Neurological Institute and the Nurses on the staff who made it possible to have this work done, asked that it be dedicated to the "Children of the MNI in memory of Dr. William Vernon Cone, whose devotion, interest and skill were given to them in such unselfish measure". The inscription plate was given by Miss Helen Kendall, R.N., one of our former nurse anaesthetists, who also worked with Dr. Cone at Basingstoke.

DEPARTMENT OF SOCIAL SERVICE

Miss Cynthia Griffin

The primary concern of the Social Service Department is to help patients and families make maximum use of all the tangible and intangible resources within themselves and in the community in trying to solve the variety of problems related to illness, or accident, and to hospitalization. The social workers' contributions to this end during the past year included counselling service for individual patients and their families, group discussion with selected categories of patients or family members, teaching responsibilities for social work students, and post-graduate student nurses, and participation in community activities.

Statistics at times can be dangerously misleading. However, I think it is of interest that about one-third of the referrals to social service were from the in-patient and two-thirds from the out-patient services, the majority made by members of the medical staff. Most in-patient referrals were for help with post-discharge plans. Out-patient help was for arrangements for admission to the hospital, for problems of adjustment to the home, school or work, or for financial difficulties, so often a symptom of many other problems.

In the course of aiding individual patients and their families, the social worker makes frequent contacts outside the hospital. During the past year contacts were made with over 125 different and varied health, welfare, and related organizations and groups. These were both French and English, governmental and voluntary, and they represented various religious denominations. Some had professionally trained social workers, some not. Many were in Montreal and the Province of Quebec, but some were in other provinces and other countries. Some were used often and some seldom. All, however, were prepared to help in some facet of the total planning for the

patient. For example, post-discharge plans for one patient may be met simply by supplying the address of a nursing home. But in another such referral this past year, the social worker needed to work closely for many months with the patient and his sister in helping them to think through and carry out the best plans for his care, while keeping in mind the future welfare of his four motherless children. Collaborating in the planning were 18 organizations and individuals representing, among others, nursing, family physician, child care, the school, the clergy, legal aid, and both public and private financial assistance groups. Thus, one of the services of the social worker here is as liaison between the hospital and the community.

The French-speaking Young Adults Discussion Group, with an average attendance of 14 seizure patients, continued to meet on Wednesday evenings to discuss mutual problems and experiences under Mrs. Puvrez's guidance. Closely allied and also planned by Mrs. Puvrez was a highly rewarding lecture and discussion series of eight meetings for French-speaking parents of school-age seizure patients. From 17 to 35 parents attended — some as couples, some alone.

Members of the Social Service Department have also participated in community-wide programmes such as the Seizure Institute last November, sponsored jointly by the MNI., the Montreal Council of Social Agencies, and the Committee of Heads of Social Service Departments of all Montreal hospitals. The latter met several times with the Montreal Welfare Department, resulting in more efficient inter-agency procedures, particularly in connection with nursing home placements.

A few organizations should be mentioned specifically as having contributed immeasurably in time or financial aid: the ever faithful and ever patient clinic volunteers for their many hours of service; the Women's Auxiliary, the Cancer Aid League, and the Montreal Association for Multiple Sclerosis for their generous contributions for patients overwhelmed by the cost of medical care; also numerous other service organizations which have willingly met emergency needs when appealed to in special situations. Christmas, too, was made more cheerful for many patients because of the efforts and funds from the MNI Wives' Group, the Nurses, the Credit Womens' Breakfast Club, and the Junior Red Cross.

During the coming year, we look forward to continued service to patients — individually, in groups, or through programme planning; and as always in co-operation with doctors, nurses and other hospital staff, and with the community.

May I express my appreciation to all those responsible for the warm acceptance I felt as a newcomer to the MNI staff in September. Particular thanks go to Miss Kathleen MacDonald, who eased my taking over of the Social Service Department, both because of her smooth handling of the department during the prior ten months and because of her invaluable and considerate help during my period of orientation.

DEPARTMENT OF ANAESTHESIA

DR. R. G. B. GILBERT

Clinical

All in our Department miss most intensely the stimulating presence and companionship of Dr. Cone. He always encouraged new techniques, supported the investigation and trial of new drugs and cooperated with any measure which might lead to the improvement of work and welfare of the patient.

As formerly, all anaesthetics have been either given or supervised by a staff anaesthetist. More use has been made of the ventilator technique, with which it has been shown that in comparable cases, less blood is given by transfusion than in those cases anaesthetized by other methods. Some use has been made of hypothermia, semi-experimental drugs, and lyophilized urea.

One death occurred in the operating room, an infant aged 8 months, suffering from hydrocephalus. This was primary cardiac arrest and was not associated with respiratory arrest. One death was probably associated with anaesthesia, a 72-year old male who had a tumour at the optic chiasma, had for some years been hyperthyroid, and he was fibrillating. In spite of being on digitalis he had signs of heart failure. He was reasonably well after operation but the following morning he had another hypotensive spell, became apnoeic, and failed to respond to levophed and artificial ventilation.

There is the usual occurrence of some sequelae from anaesthesia, but the frequency is low. Some complications are definitely related to the technique of anaesthesia, but it is a small price to pay for having a perfect airway and a well ventilated patient. Post-operative vomiting is now relatively rare. When there is a history of sickness or when a combination of drugs is given that is known to predispose to vomiting, an anti-emetic preparation is given.

One case developed jaundice as the result of blood transfusions. Five bottles of blood were given, all were checked for correctness. The jaundice subsided.

One case was particularly interesting — a case of dysautonomia. There are few enough of these cases reported in the literature and many who have undergone surgery have died under anaesthesia. This case was handled from a physiological point of view and survived, in good condition, a 6-hour procedure for laminectomy, T4-T9.

All those cases needing ventilator care which were referred to the Department of Anaesthesia have been monitored by arterial blood gas samples, ventilation studies, and x-ray. Directions and advice have been given to the Residents of the doctors in charge of each case. There has been an improvement in the care of tracheotomy cases. In a few instances respiratory studies have been performed on neurological and neurosurgical patients. Equipment is available for immediate pCO_2 determination and end tidal CO_2 sampling.

Our interest in different types of anaesthesia is stimulated and kept up to date by work at the Veterans' Hospital and by chest surgery at the Royal Edward. We each endeavour to spend one day a week at these two hospitals as this forms an integral part of our teaching, clinical, and research activities.

Teaching

Undergraduate teaching has consisted of two sessions; 12 lectures each being given to third and fourth year students. Dr. Gilbert is in charge of this programme. Dr. Millar has given lectures and demonstrations in the Department of Pharmacology.

REFRESHER COURSE: A two-week programme was organized by Dr. Gilbert. Dr. Millar, Dr. Brindle, and Dr. Gilbert participated in the lecture periods.

POSTGRADUATE: All the residents, except for Dr. Bidzinski, served a six-month term of rotation from the McGill Diploma Course. Academic teaching was given by all four members of the staff.

Dr. G. F. Brindle has been attached, for teaching purposes, to the Department of Anatomy.

NURSES: A series of lectures has been given by Dr. Gilbert to each of the "post-grad" courses for nurses. Special emphasis has been paid to the care of the unconscious patient, tracheotomy and respirator drill, also to special techniques.

Equipment

An Engstrom unit and an Ird-o-meter have recently been acquired. Three old anaesthetic machines have been replaced. Intravenous sets for paediatric use have been introduced, also ancillary equipment for this tpye of case such as an electronic cardiac monitoring device. Two more Bird respirators have been added. The laboratory has benefited by a new refrigerator and a new centrifuge, while for animal work a complete DeBakey pump outfit has been obtained.

Research

We are indebted (1) to the Institute for an account to cover laboratory expenses, (2) to Parke-Davis & Company for a grant to pay for the laboratory technician and one resident who works part-time in research, (3) to the Dominion-Provincial body for a grant covering Project No. 604-9-161, being undertaken by Dr. Millar and Dr. Branch.

Dr. Millar, assisted by Dr. Mary Morris, has continued studies on the effects of CO_2 accumulation during apnoeic oxygenation in animals. These have included the plasma catecholamine levels, blood pH, blood gases and observations of cardiac and respiratory function. He has confirmed the work of Gabriel Nahas using trihydroxymethylaminomethane as a buffer. Studies have been undertaken during general anaesthesia comparing controlled and spontaneous respiration. A number of studies have been undertaken in cases

of suspect and definite Pheochromocytoma. In conjunction with the anaesthetic staff of the Sick Children's Hospital, Toronto, catecholamine responses are being worked out during open heart surgery.

Working with Dr. Branch and Dr. Morris, Dr. Millar is studying a method for isolating the cerebral circulation with a pump oxygenator. This, with a view toward selected brain cooling and perfusion with drugs. A successful start has been made. Proper control of respiration with a Bird Mark IV-Mark VIII Anaesthetic Respirator has become possible. Acidosis and alkalosis will not interfere with the experiment as in the past. Dr. Brindle continues to observe blood pressure changes (intra-arterial) during arteriograms. In conjunction with a Fellow in the E.E.G. Department, observations have been made on the effects of various agents upon the E.E.G. pattern and epileptic electrical discharges. With Dr. Jasper, an intermittent study is in progress concerning the site of action of anaesthetic and other drugs.

DEPARTMENT OF RADIOLOGY

Dr. Donald McRae

During the year 1959, 9,144 examinations were performed making it our busiest year ever. This number included 809 pneumoencephalograms, 166 ventriculograms, 276 cerebral angiograms and 411 myelograms. For several years there has been a steady increase in the number of cerebral angiograms while at the same time the number of air studies and myelograms has remained almost constant.

A number of stereotaxic procedures and ventricular shunts were carried out which required the use of x-ray equipment in the operating rooms. Each of these procedures occupies a technician for approximately half a day. The increasing number of examinations and especially the increase in the number of complex and time-consuming examinations has necessitated an increase in our technical staff to six registered technicians.

A new 180° tilting table with x-ray image amplifier has been installed for general purpose fluoroscopy and also myelography. A new bi-plane film changer and high pressure injector are being installed for cerebral angiography and aortography.

Improvements in methods of image amplification, image transmission and image recording are leading to a completely different type of radiological practice. Although it is impossible to forecast the future, it seems likely that in ten years many radiological procedures will consist of a fluoroscopic examination using some form of image amplifier with visual records being made on small size camera film instead of on large size films as used today. Our long range plans will have to include such equipment.

A new automatic laminograph is urgently needed. We have never had a laminogram but only a laminographic attachment for an ordinary x-ray unit. This has never been satisfactory in that the planes of the sections are

not sharp. Attaching and disengaging the equipment is time consuming as well.

Rapid automatic film processing has been available for about three years. The current machines are more efficient and handier than the first models. Such equipment will produce a completely processed dry film in seven minutes. This does away with the handling of wet films and cuts film processing time by over 50%. Such equipment is most desirable for our department.

The post-graduate teaching in Neuroradiology continued as in past years. Three post-graduate students in Medical Radiology, Drs. John Lynch, Roger Maltais and Robert Wilson spent periods of six months in the department as Residents in Radiology. During the year 1959, the new undergraduate medical curriculum went into effect. The new introductory course in general radiology (12 lectures) was given to the old third year and to the new second year by the director of the department. In future, this course will be given only once a year.

As always, thanks is due to the rest of the Staff of the Institute for their help and encouragement during the year. Their cooperation makes it possible to carry out the ever-increasing amount of work in our department.

DEPARTMENT OF NEUROCHEMISTRY

DR. K. A. C. ELLIOTT

CLINICAL NEUROCHEMISTRY AND WARD LABORATORIES

The 7th floor clinical neurochemistry laboratory and the 3rd floor ward laboratory continue to function at about the same level as in the past few years. Around 9,000 separate procedures were performed in the 7th floor laboratory on blood and spinal fluid samples obtained from patients. In addition, over 5,000 liters of irrigation solution were prepared for the operating rooms and over 200 liters of nupercaine solution for the clinical services.

The ward laboratory performed 12,500 separate determinations, excluding urine examinations, and 1,500 blood samples were drawn for analysis in other hospital departments. The ward technicians continue to send the blood and CSF Wasserman samples to the Provincial Laboratories.

A separate residents' tray has been placed in the 3rd floor laboratory for routine blood determinations after regular hours.

The Neurochemistry and Ward Laboratories are administered by Dr. I. H. Heller and technical supervision is provided by Dr. Hanna M. Pappius.

DONNER LABORATORY OF EXPERIMENTAL NEUROCHEMISTRY

The work in these laboratories consists of studies along four main lines, (a) the role of neurophysiologically active substances, particularly γ-aminobutyric acid (GABA) and Factor I, in the chemistry of brain activity, (b) factors concerned in metabolism of brain, with particular respect to the roles of electrolytes and phosphate derivatives, (c) the distribution of water in brain and the nature of cerebral edema, (d) the metabolism of peripheral nerve.

Before leaving to take up an overseas fellowship in Cambridge, Dr. N. M. van Gelder completed studies which showed that the "occult" or "bound" form of Factor I is apparently present in brain in a different type of particle from those which contain other neurophysiologically active substances. The amount of Factor I present in the bound form is decreased in the brains of rats suffering convulsions induced by insulin or hydrazides. The total Factor I, mainly the free form, is increased by hypoxia, hydroxylamine or iproniazid. The results suggest that the bound form is significant in the regulation of neuronal activitv.

Dr. Emanuel Levin and Miss Brenda Bollard have developed and applied chromatographic and enzymatic methods for the determination of γ-aminobutyric acid and related substances. Their preliminary results indicate that, in whole brain, GABA can approximately account for all the Factor I activity, both bound and free, as ordinarily measured but the glutamate present in brain exerts Factor I activity at moderately low pH. This could be of considerable physiological significance.

Dr. James Crossland, of the University of St. Andrews, who visited us a few years ago, spent another few months with us attempting to identify the "cerebellar excitatory substance" which he had discovered. He and Dr. Levin did many interesting experiments but the nature of the factor remains obscure.

The well-known effects of potassium on brain metabolism have been re-examined by Fernand Bilodeau. With a new technique which allows precise control of the potassium concentration, it has been found that totally different effects are obtained at different concentrations of potassium and long-accepted hypotheses concerning the role of potassium will have to be re-examined. Dr. Pappius has conluded a re-examination of the creatine phosphate content of metabolizing brain.

In view of the fact that our chemical studies indicate the presence of extracellular spaces in brain as in other tissues, whereas almost none are found by electronmicrography, Dr. Pappius has examined the effects of tissue fixation. She finds that formalin fixation abolishes the chemically-determined difference between normal and swollen tissue. But after fixation with osmic acid-dichromate, as is done for electronmicrography, the difference remains. The difference between the two types of observation is thus not explicable as an artefact and indicates that the fluid within certain glial cells behaves as "extracellular" fluid.

Continuing their studies on nerve metabolism, Dr. Irving Heller and Mr. Hesse have recently completed an investigation of the action of insulin on the respiration of rat sciatic nerve. The results indicate that insulin, when added *in vitro,* is capable of stimulating resting nerve respiration.

They have also been measuring the metabolism of electrically stimulated nerves. Results show that the oxygen consumption is increased and substrate utilization is qualitatively altered when compared to the resting state. Further studies are continuing to determine to what extent the quantitative and qualitative changes are due to alterations of Schwann cell metabolism.

Another series of experiments has demonstrated the release of a stimulatory substance from a nerve into the incubating medium. This medium is then capable of increasing the oxygen uptake rate of new nerves when they are placed in it. This release of a stimulatory substance does not occur if glucose is present in the medium. Similar results have been obtained with electrically stimulated nerves. Experiments are continuing to clarify the nature of this phenomenon.

DEPARTMENT OF ELECTROENCEPHALOGRAPHY

DR. HERBERT JASPER

DR. PIERRE GLOOR

DR. DONALD LLOYD-SMITH

The demand for E.E.G. examinations continues to increase despite the work of other laboratories in the city. The facilities and staff of this department were taxed to the limit at times during the past year with a record number of examinations and many prolonged special procedures. There were 3,165 examinations carried out on 2,449 patients. About two-thirds of the examinations were done on in-patients. There were 1,489 in-patients examined as compared to 960 out-patients. Examinations were repeated more often on in-patients.

The number of examinations and patients in principal diagnostic groups are shown in the following table:

E.E.G. EXAMINATIONS DURING 1959

Diagnosis	*Examinations*	*Re-examinations*	*Patients*
Epilepsy	1,446	531	915
Head injury	335	43	292
Tumours	265	41	224
Headache — cause undetermined	154	3	151
Cerebral thrombosis	60	14	46
Behaviour disorder	49	3	46

E.E.G. EXAMINATIONS DURING 1959 (continued)

Diagnosis	*Examinations*	*Re-examinations*	*Patients*
Brain haemorrhage	45	11	34
Syncope	43	1	42
Mental retardation	22	—	22
Brain abscess	17	5	12
Reading & Writing disability	13	—	13
Cerebral aneurysm	11	1	10
Speech disturbance	10	—	10
Subdural haematoma	9	5	4
Miscellaneous	470	54	416
Deferred	216	4	212

It will be noted in the above table that by far the largest number of examinations were carried out on epileptic patients. It is of some interest that there were 531 re-examinations carried out on epileptic patients last year as compared to only 354 the year before, even though the total number of epileptic patients examined last year (915) was somewhat less than the year before (1,005). This indicates the tendency to re-examine patients more often, particularly when they are being considered for surgical therapy.

In addition to the above E.E.G. examinations there were 101 electrocorticograms taken in the operating room during surgical procedures on epileptic patients. This is over 10% of the number of epileptic patients examined as compared to 7% the year before.

There were 132 electromyographic examinations carried out on patients with various neuromuscular diseases or nerve lesions.

There were 11 Fellows in training for different periods of time: Drs. Max House, Henry Gossman, Harilaos Mikropoulos, K. Kapphahn, R. Bailey, H. Mavor, R. Rovit, J. Garner, S. Ray, E. Berger and N. Demmy. In addition to gaining experience in techniques of examination and in the interpretation of records these Fellows were engaged in various clinical-laboratory investigations with members of the staff. Of particular interest and promise were the studies of the effect of intracarotid sodium amytal injections on patients with bilateral E.E.G. abnormalities, and the comparative studies of double bilateral sphenoidal needle electrodes and pharyngeal electrodes in the localisation of epileptic foci in patients with temporal lobe seizures.

Special mention should be made of the excellent and devoted work of the secretarial and technical staffs, led by Mr. Lewis Henderson, who deserve the most credit for the record amount of work accomplished during the past year.

DEPARTMENT OF NEURO-ELECTRONICS

DR. HERBERT JASPER

MR. ROBERT NAGLER

MR. EDWARD PUODZIUNAS

This newly created separate department, formerly a small adjunct to the departments of neurophysiology and electroencephalography, is playing an increasingly important role in the work of all departments of the Institute. All research and clinical laboratories and operating rooms now use much elaborate and complicated electronic equipment. Progress in the development of new designs is paced by the rapid development of computers on the one hand, and the demands of the "space age" on the other. The need for automatisation to handle accurately recording and measurement in experimental procedures of steadily increasing complexity also places a premium on the value of electronic engineers in our Institute.

In addition to continual maintenance of a growing inventory of electronic equipment, major developments during the past year have included rebuilding of electromyographic apparatus to increase its accuracy and versatility, building a new oscilloscopic apparatus specifically designed for use in the operating room for microelectrode and evoked potential studies of the human brain, perfection of a multi-channel tape recorder for the electrical activity of the brain, design and construction of low noise transistorised power supplies to replace batteries in all high gain amplifier equipment, and installation of a new transistorised 12-channel recorder for electrocorticography in the operating room.

Our department of neuro-electronics has been trying to meet the growing demands made upon them. They have been doing remarkably well with their limited staff and facilities. Wtih the return of Dr. Feindel, who is setting up an active radioisotope laboratory, it will be necessary to reorganise our work with additional staff, so that they will be able to serve better the increasing demands of the Institute as a whole. We need also a biophysicist-electronics engineer of senior rank to undertake the direction of this work, to act as consultant to all departments, and to keep us abreast of the times in this rapidly developing field so important to all aspects of neurological research.

DEPARTMENT OF NEUROPHYSIOLOGY

Dr. Herbert Jasper

Dr. Pierre Gloor

The past year, especially the latter half, has been a most active one for this department. There were 23 Research Fellows and 8 Staff Members engaged in a variety of experiments which taxed our facilities to the limit, in fact, beyond the limit of most efficient work. The Fellows engaged in neurophysiological experiments or in experiments related to experimental neuropathology or neurochemistry done in these laboratories, during 1959, were as follows: Drs. Aguilar, Bovard, Cordeau, Crossland, Garretson, Hardy, House, Jane, Keener, Levin, Mahut, Majkowski, Morrell, Musella, Perot, Pevehouse, Pinneo, Miss Prisko, Drs. Rovit, Smirnov, Sperti, Van Gelder and Vera. Staff men working with the Fellows included Drs. Branch, Elliott, Gloor, Heller, Jasper, Mathieson, Miller and Rasmussen. Fortunately not all of these men were working during the same period of time, but during the latter part of the year there were 22 Fellows and staff making use of the facilities of this department for experimental work during the same period of time. Close scheduling of space and equipment by Miss Roach has made it just possible, though not easy, to fulfill the demands as well as our limited space would permit. There were times when the apparatus did not have time to cool off between one research team and another. The congestion and difficulties in providing adequate facilities were not always conducive to the most efficient work.

There are only six experimental rooms in these laboratories and two of these are too small for experiments requiring much apparatus. We need four to six more rooms at least in order to properly take care of present demands. We would not like to see an increase in the number of Fellows, though the demand for fellowships in neurophysiology is steadily increasing.

We are particularly pleased to have Dr. George Smirnov of Moscow with us for an extended period to engage in an intensive series of experiments on factors affecting sensory evoked potentials in cortical and subcortical structures in freely moving unanaesthetized animals prepared with chronic electrode implantation. His contribution to the year's activities went far beyond the interest of his experimental work, in the lively discussions of both scientific and social problems, and in many congenial personal relationships which helped to improve our understanding of life and work in the Soviet Union.

We have also had the pleasure of working with two other senior neurophysiologists, Dr. Luigi Sperti of Padua and Dr. Jerzy Majkowski of Warsaw, both of whom have contributed much to our team during the past year. Dr. Majkowski is an expert in the physiology of conditioned reflexes in the tradition of Pavlov, but with modern electrophysiological techniques, and Dr. Sperti has done some outstanding work on the physiology of the cerebellum.

Space does not permit an account of progress along the many lines of research followed by these many workers. Mention of some will be made in the report on Graduate Studies and Research. Suffice it to say that it has been a very good year indeed.

DEPARTMENT OF NEUROLOGICAL PATHOLOGY

DR. GORDON MATHIESON

During the year 1959, postmortem examination was carried out on 60 patients who died in the Institute. This figure is a composite one, made up of 10 cases from the Neurology Services in the period from January to June and 50 cases from the Institute as a whole from July to December. During this second half of the year there were 62 deaths in the Institute, the autopsy rate thus being 80.6%. The department also undertook the examination of the brains, and also occasionally the spinal cord and peripheral nerves, from some 341 autopsies conducted in the Pathological Institute on patients from the Royal Victoria and associated hospitals; of these, 38 were examined in detail. Muscle biopsies were performed on 8 occasions and 3 cerebral biopsies were done on obscure progressive encephalopathies. We received 28 specimens for opinion from other hospitals.

Many Fellows shared in this work — during the first six months Drs. Dave, Garretson and Mavor and in the second Drs. Garretson, Osterholm, Jacob and Libman. Dr. Max House worked part time in neuropathology at this time.

Dr. Garretson reviewed all autopsied cases of intrinsic cerebral tumour (some 324 in all) in connection with the problem of apparent multiplicity in gliomas. He is continuing his observations on gliomata in anterior eye chamber transplants in animals.

In the Fall, Dr. Miroslaw Mossakowski of the Polish Academy of Sciences from Warsaw joined the department for one year. He is carrying out a histochemical investigation of succinic dehydrogenase activity in glial tumours with special reference to its variation with varying degrees of dedifferentiation.

Looking to the future, the establishment within the department of the newer techniques of morphological investigation clearly demands the investment of much time, energy, and technical resource; these must come from streamlining the routine work of the department and we hope that rearrangement of organization and layout, presently in train, will achieve this. The relatively large number of Fellows spending a short time in the laboratory raises problems of continuity and makes it essential to guard against superficiality. We aim to develop an even closer degree of collaboration with the Pathological Institute.

MULTIPLE SCLEROSIS RESEARCH LABORATORY

DR. J. B. R. COSGROVE

During the past year work has continued on the study of cerebrospinal fluid proteins by paper electrophoresis. It has been established that the ratio of beta to gamma globulin in the spinal fluid is a more reliable diagnostic aid in Multiple Sclerosis than either elevation of gamma globulin alone, or an abnormal Lange colloidal gold curve. The laboratory is now prepared to offer this diagnostic index as a service to patients on a routine basis.

Data has continued to be accumulated for a correlative study of electrophoretic protein patterns in various neurological diseases and postmortem material.

Several immunochemical studies in Multiple Sclerosis were started in the past year. These have been concerned with the specificity of gamma globulin in spinal fluid, the source of gamma globulin, and the antigenic differences of Multiple Sclerosis serum. The techniques used included (1) tube precipitation with absorption of homologous antigens, (2) Ouchterlony plate methods for qualitative identification of antigenic differences, and (3) immuno-electrophoresis. Preliminary results are promising and we have been fortunate to obtain the services of Catherine MacPherson, Ph.D. to continue these studies. Dr. MacPherson is an immunologist of long experience and we are looking forward to her association with us.

Clinical investigations have continued and include (1) Long term follow-up of patients treated by Dr. Swank's low fat diet. (2) The effect of cortisone and ACTH on the electrophoretic patterns of cerebrospinal fluid protein in Multiple Sclerosis. (3) Correlative study of the clinical state with the electrophoretic protein changes in the spinal fluid of patients with Multiple Sclerosis.

The Multiple Sclerosis Clinic at the Royal Victoria Hospital has continued to grow and additional physicians' services are needed to help carry the increasing load.

DEPARTMENT OF NEUROANATOMY

DR. FRANCIS MCNAUGHTON

Under the new Medical Curriculum, the combined course on the nervous system has been allotted a greater number of lecture and laboratory hours, and now runs from December to June. The course is planned jointly with the Departments of Physiology and Psychology. Dr. John Blundell and Dr. Allan Morton directed the teaching in Neuroanatomy in the 1959-60 session, with the assistance of Drs. Bovard, Brown, Garretson, Giguere, Jacob, Kapphahn, Libman, Mavor and Osterholm as demonstrators.

Dr. Morton is continuing his study of the glial changes in the supraoptic nucleus associated with retrograde degeneration. He is also studying

the correlation between neuronal loss in this nucleus and diabetes insipidus, in collaboration with Dr. John Beck of the Department of Medicine.

A major event for us was the visit of Dr. Elizabeth Crosby of the University of Michigan to conduct a course in human neuroanatomy for a two-month period from October to December, 1959. Over fifty persons from the Institute and other University departments attended her lectures and demonstrations with great enthusiasm. Dr. Crosby also gave a course of lectures on comparative neuroanatomy. We are most grateful to her for this valuable contribution to the teaching program of the Institute.

We look forward to the establishment of the Department of Neuroanatomy on a broader basis, in the near future, with a full time Neuroanatomist who will work in close liaison with the Department of Anatomy at McGill.

TUMOUR REGISTRY

DR. ARTHUR R. ELVIDGE

The Tumour Registry was established in 1950 as a subdivision of the central tumour registry of the Royal Victoria Hospital, which is under the direction of Dr. H. S. Morton. In the last ten years 1,483 verified tumour cases of the nervous system have passed through the files of the tumour registry, compared to 349 tabulated in the years 1930-49. The tumour census has increased 5 times in half the time interval. Since 1950 it has remained on a plateau with fairly wide fluctuations. Practically all tumours have been listed and followed from the foundation of the Institute and the previously existing neurosurgical service in the Royal Victoria Hospital.

The principal purpose of the Registry is to accurately catalogue and record the follow-up of patients who have been admitted to the hospital for the diagnosis and treatment of tumours in, or, affecting the nervous system. This serves as a source of basic material for research and is of considerable value to the treating physician and patient. In addition, clinic patients are reminded to return for treatment and suitable arrangements made through the Social Service Department to help them during convalescence. Follow-up data is collected, sometimes with difficulty, from the clinics, private offices, through correspondence with referring doctors, and, when necessary, from the Department of Demography at Ottawa.

During the last year, 1959, the records of 216 patients passed through the files of the tumour registry. Of these, 94 were verified tumours of the nervous system. Altogether these necessitated 149 operations, and a total of 105 patients were given Roentgen therapy. In addition, patients with tumour of the nervous systems were responsible for 275 outdoor clinic visits.

The tumour registry plays a role in basic research by the utilization of survival and morbidity figures under different forms of treatment. Over the years it has been found that the overall results of glioma surgery are better

when combined with radiation therapy. Certain tumours may even be treated as well with radiation as with surgery. The treatment by radiation therapy has been accomplished principally by the Department of Radiation Therapy of the Royal Victoria Hospital under the immediate supervision of Dr. Jean Bouchard.

The following men have contributed to the work of the Tumour Registry directly or indirectly during the year. Dr. Pevehouse has studied changes in growth rate in gemistocytic astrocytoma. Dr. Antone Tarazi has studied certain types of pituitary growth. Dr. Emil Berger has investigated the results of radiation therapy combined with biopsy and with radical surgery in the medulloblastomas and sarcomas.

Dr. Harilaos Mikropoulos commenced a study of intraventricular tumours. Dr. John Roth has completed an extensive analysis of glioblastoma multiforme. Dr. Jean Bouchard, of the therapeutic division of the Department of Radiology of the Royal Victoria Hospital, has made an exhaustive analysis of roentgen therapy of the tumours treated at the Montreal Neurological Institute. The gliomas of childhood were reviewed for the Ninth International Congress of Paediatrics by Dr. Arthur Elvidge.

NEUROPHOTOGRAPHY

DR. GILLES BERTRAND

The department again had a very busy year under the direction of Mr. Charles Hodge. The main lines of work were as usual; operating room photography, patient photographs, gross specimen work as well as copy photography and photomicrography.

During the year, a number of clinical movies were taken on cases of Parkinson's disease; both pre- and post-operative visual records were made on all such cases.

With the addition, on a part-time basis, of Mrs. Ruby MacKenzie, together with regular staff, this department has been able to design and make 95% of all illustrative charts which had been made previously by medical staff.

Mr. Vincent left our department to take a new position with the National Film Board of Canada. He has now been ably replaced by Mr. Jean Garneau.

An exhibit was designed and built this year on Nerve Injuries; this was displayed at several medical meetings. We are hoping that more of these displays will be made in the future. We also hope to receive more cooperation regarding the completion of some of the movies now in progress.

THE FELLOWS' LIBRARY

DR. BERNARD F. GRAHAM

"To study the phenomena of disease without books is to sail an uncharted sea, while to study books without patients is not to go to sea at all." —Wm. Osler.

The medical mariner at the Montreal Neurological Institute is certainly encouraged to put to sea and the Fellows' Library is his supplementary chart room. Here he should find what is not in his own library and not readily available elsewhere. When he prepares for new voyages, when he approaches the difficult or the unknown, he should be able to extract information and guidance from the knowledge stored on our shelves.

Books and journals that are relevant to our work seem to flow from the publishers in an ever-increasing volume, while the space to store and use them remains relatively unchanged. In order to have the new and the useful more readily available we have had to stop acquiring certain journals and stop storing several others; all of these journals are easily available in other parts of the university and hospital.

In reorganizing our resources we have been mindful of younger libraries which might be able to use well what we have had to relinquish.

In addition to our own purchases, we have received various gifts, including nearly fifty journals from Doctor Penfield, Doctor Jasper and the "Journal of Electroencephalography and Clinical Neurophysiology".

It is important to have our library available when it is needed. However, books continue to be lost, and measures will be needed to reduce this risk without unduly curtailing the use of the library.

Mrs. Cone has enriched the Fellow's Library with many of Dr. Cone's books.

To Mrs. Casselman, our part-time librarian, all who use the library owe a debt of gratitude. During the past year she has brought our subject-index up to date; she has graciously executed those daily chores which are essential to keeping a library continuously useful; she has sought out and recovered many seemingly lost volumes; she has observed our reading habits, and along with others has helped us to determine where our library is deficient and where it is redundant.

THE MONTREAL NEUROLOGICAL SOCIETY

President ..... DR. JEAN SAUCIER
Vice-President ..... DR. J. B. R. COSGROVE
Secretary-Treasurer ..... DR. GILLES BERTRAND

Twenty-six meetings of the Section of Neurology of the Montreal Medico-Chirurgical Society were held weekly from October 14th, 1959 to May 4th, 1960.

Clinical meetings were held at Notre Dame Hospital, Hotel Dieu, Ste. Justine Hospital, the Montreal General Hospital, the Montreal Children's Hospital, Maisonneuve Hospital and the Montreal Neurological Institute.

A special joint meeting was held with the Montreal Otolaryngological Society, at which an address was given by Dr. Robert Galambos of the Department of Physiology of the Walter Reed Army Institute of Research in Washington, D.C. on "Our Present Knowledge of the Neurophysiology of Audition".

A special joint meeting was held with the Cerebral Palsy Association of Quebec. Dr. William Cruickshank, Director of the School for Education of Exceptional Children, Syracuse, N.Y. spoke on "Education of the Cerebral Palsied Child".

Of special interest during this past season was a talk by Dr. Elizabeth Crosby, Emeritus Professor of Neuroanatomy at the University of Michigan on "Inter-Relationships Between Cerebral Hemispheres and Cerebellum".

Other papers read before the Society by distinguished visitors and local colleagues were as follows:

DR. MALCOLM JONES, Department of Radiology, University of California Medical School, San Francisco: "Cineradiographic Studies of the Human Cervical Spine".

DR. J. B. R. COSGROVE, The Montreal Neurological Institute: "Clinical Presentation of Familial Ramsay-Hunt Syndrome".

DR. R. ROVIT, The Montreal Neurological Institute: "Hemicranial Aplasia with Pulsating Exophthalamus — An Unusual Manifestation of Von Recklinghausen's Disease".

DR. W. FEINDEL, The Montreal Neurological Institute: "Localization of Intracranial Lesions with Radio-active Isotopes".

DR. J. B. R. COSGROVE, The Montreal Neurological Institute: "The Value of Cerebro-Spinal Fluid Electrophoresis in Multiple Sclerosis".

DR. ELLIOTT MANCALL, Jefferson Medical College of Philadelphia: "Multi-focal Leucoencephalopathy".

Dr. A. Earl Walker, Johns Hopkins Hospital, Baltimore, Md.: "The Spread of Focal Motor Seizures".

Dr. Theodore Rasmussen, The Montreal Neurological Institute: "Lateralization of Speech Dominance as Studied by Carotid Amytal Tests".

Dr. William Gibson, Department of Neurological Research, University of British Columbia: "Ramon y Cajal, Charles S. Sherrington, Ross G. Harrison and the History of the Neurone Doctrine".

Dr. David Bates, The Royal Victoria Hospital: "Respiration and the Nervous System".

Dr. Charles Branch, The Montreal Neurological Institute: "Anticoagulants in Neurology and Neurosurgery".

Dr. Frank Morrell, Department of Psychiatry and Neurology, University of Minnesota: "Electrophysiological Studies of the Mirror Focus".

Mr. J. Pennybacker, F.R.C.S., The Radcliffe Infirmary, Oxford, England: "Observations on Benign Tumors".

THE FELLOWS' SOCIETY

Dr. Phanor Perot, *President*
Dr. Cristian Vera, *Vice-President*
Dr. Henry Garretson, *Secretary*

Since its beginning in 1938-39 under the presidency of Dr. Theodore Erickson, the mission of the Fellows' Society has undergone a gradual change from that of a primarily scientific to a social organization. However, this has been a year of marked activity from both standpoints.

At present there are 49 Fellows in the Society from eleven countries. Early in the year it was a great privilege for us to meet and welcome many Senior Fellows who returned for the Quarter Century Celebration. In conjunction with these activities Professor Dorothy Russell gave the Third Annual Fellows' Society Lecture, "Reflections on Neuropathology," and a dinner was held for Professor Russell and the former Fellows Lecturers, Dr. Joseph Evans and Dr. Webb Haymaker. In February there was a square dance, and in March Dr. Preston Robb was host to a Fellows' party at his home. Our annual spring program consisted of a one-hour session of current research papers by the present Fellows followed by the Fourth Annual Fellows' Society Lecture, "Rigidity Due to Spinal Interneurone Destruction," which was delivered by our honored guest, Dr. I. M. Tarlov. This was followed by cocktails at the Fellows' residence and our annual dinner for the departing Fellows.

We were pleased to have several guest speakers at informal evening meetings during the year, including Dr. Kristian Kristiansen, Dr. Edward L. Margetts, Mr. W. Bryan Jennett, Dr. Robert Galambos, Dr. A. Earl Walker, Dean Arthur Porter, Mr. Laurence Walsh and Dr. Joe Pennybacker.

CLINICAL APPOINTMENTS AND FELLOWSHIPS*

Appointments to the Resident Staff in Neurology or Neurosurgery are made for January 1st or July 1st. All candidates are expected to have previous interneships in Medicine or Surgery.

The posts of Senior Resident in Neurosurgery, Resident in Neurosurgery and Resident in Neurology are available only to men who have had previous clinical service in the Institute.

Assistant Resident in Neurosurgery — one year's duration — available January 1st and July 1st.

Assistant Resident in Neurology — six to twelve months' duration — available January 1st and July 1st.

Appointments for periods of research and training in one of the laboratories are made by Professor Rasmussen and the Chief of the laboratory in question. Research stipends are available for the following Fellowships.

Senior Fellowship in Neuropathology — six to twelve months' duration — available January 1st and July 1st.

Junior Fellowship in Neuropathology — six to twelve months' duration — available January 1st and July 1st.

Senior Fellowship in Clinical Electroencephalography—six to twelve months' duration — available January 1st and July 1st.

Fellowship in Neuroanatomy — six to twelve months' duration — available January 1st and July 1st.

The Diploma in Neurosurgery, McGill University, requires at least four years study, including periods of investigative work and neurology.

The Diploma in Neurology, McGill University, requires at least four years of study, including periods of investigate work, neurosurgery and psychiatry.

Applicants for clinical services are preferred who have a speaking knowledge of the French language.

COURSES OF INSTRUCTION

UNDERGRADUATE

The Department of Neurology and Neurosurgery cooperates intimately with the Departments of Medicine, Surgery, Pathology, and Radiology in their undergraduate teaching. Thus the teaching of neurology, neurosurgery, neuropathology, and neurological radiology is carried out as part of the regular course planned by the Chairman of each of the above departments.

*Graduate physicians or surgeons who wish to be enrolled in clinical or scientific work as something more than an observer must fill out application forms obtainable from the Director's office and provide names of reference.

GRADUATE

In the Faculty of Graduate Studies and Research, courses are offered leading to the degrees of Master of Science and Doctor of Philosophy. Throughout the year, the following elective courses are given for graduate students, Fellows and members of the house staff, and are open to undergraduates by arrangements.

A. SEMINAR IN NEUROANATOMY, M.N.I.

1. This course is given in combination with course Med. 2A "The Central Nervous System".
2. Additional graduate seminars will be held co-ordinated with Course B.
3. Graduate students are expected to pass the same examination which is given in undergraduate course Med. 2A, but with higher standing, and to act as demonstrators.

Professor McNaughton

4. Advanced Neuroanatomy for selected group; times to be arranged.

Professor McNaughton

B. SEMINAR IN NEUROPHYSIOLOGY.

1. Lectures and examination together with undergraduate course Med. 2A "The Central Nervous System".
2. Weekly seminars and demonstrations co-ordinated with Course A-2 (4 months, beginning in December). Mondays, 4:30 to 6:00 p.m.
3. Under exceptional circumstances, a paper on a neurophysiological subject may be written by special arrangements as a substitute for B-1.

Professors Jasper, Elliott, and Gloor

C. COLLOQUIUM IN CLINICAL NEUROLOGY.

1 hour weekly, clinics and lectures, Wednesdays, 5:00 p.m. M.N.I. (9 months).

Staff and Visiting Lecturers

D. SEIZURE MECHANISMS AND CEREBRAL LOCALIZATION: Clinical Electroencephalographic, and Roentgenographic Conference.

M.N.I. 1½ hours weekly (9 months). Tuesdays, 4:00 to 5:30 p.m.
Professors Rasmussen, Jasper, McNaughton, and McRae

E. OUTLINE OF NEUROCHEMISTRY.

Instruction in neurochemistry in addition to that provided in course B-2 may be obtained by special arrangement.

Professor Elliott

F. NEUROPATHOLOGY.

1. Six months laboratory work in medical or surgical neuropathology.
Professors Mathieson and Bertrand

2. Conference in neuropathology, Fridays, 4:00 to 5:00 p.m.
Professors Mathieson and Bertrand

3. Introduction to histopathology of the Nervous System. A short basic course for a limited number. By special arrangement with Professor Mathieson.
For graduate credit, courses Nos. 1 and 2 are required. Under special circumstances written and/or oral examinations may be substituted for Nos. 1 and 2 for students who have taken course No. 3.

G. NEUROLOGICAL RADIOLOGY.

1. Lecture demonstrations (3 months beginning in September). Mondays, 4:30 to 6:00 p.m.

2. Colloquium, 1 hour weekly (9 months) Mondays, 9:00 a.m.
Professor McRae

PUBLICATIONS

1959-60

AGUILAR, J. A., MARTIN, H., BURNETT, W. W., MAYOR, H. and MCNAUGHTON, F. L.
Anti-histamines in Treatment of Gingival Hyperplasia Caused by Diphenylhydantoin. American Medical Association Archives of Neurology, v. 1, p. 513-515, 1959.

BERTRAND, G.
Tumeurs du Système Nerveux. Montréal Médical, v. 9, p. 37-40, 1960.

BRYANS, W. A.
Mitotic Activity in the Brain of the Adult Rat. Anatomical Record, v. 133, p. 65-73, 1959.

COSGROVE, J. B. R.
Treatment of Multiple Sclerosis, Current Therapy, ed. H. F. Conn. Philadelphia and London, W. B. Saunders Co., 1960, p. 548-551.

ELLIOTT, K. A. C.
Amino Acid. An Inhibitory Factor in Brain. Proceedings of the IV International Congress of Biochemistry. Section III. Biochemistry of the Central Nervous System, p. 251-263, 1958.
Observations on Glial Metabolism: Water and Electrolyte Distribution. The Biology of Myelin. Progress in Neurobiology IV, ed. S. R. Korey. 1959, p. 230-236.

ELLIOTT, K. A. C. and HOBBIGER, F.
Gamma Aminobutyric Acid: Circulatory and Respiratory Effects in Different Species; Re-Investigation of the Anti-Strychnine Action in Mice. Journal of Physiology, v. 146, p. 70-84, 1959.

ELLIOTT, K. A. C. and JASPER, H. H.
Gamma-Aminobutyric Acid. Physiological Reviews, v. 39, p. 383-406, 1959.

ELVIDGE, A. R.
Doctor W. V. Cone. The McGill News, v. 40, no. 3, 1959.

FEINDEL, W. H., COWAN, G. A. B., STRATFORD, J. G. and FEDORUK, S.
Localization of Intracranial Lesions Using Radio-Active Iodinated Human Serum Albumin and an Automatic Scanner. Journal of the Canadian Association of Radiologists, v. 11, p. 15-22, 1960.

FEINDEL, W. H.
Stimulation of the Amygdala and Deep Temporo-Insular Cortex in Man, Electrical Stimulation of the Brain — Sub-Cortical Integrative Systems, ed. D. E. Sheer. Houston, University of Texas Press, 1960.

GILBERT, R. G. B., NOBLE, A. B. and BROMAGE, P. R.
Anaesthesia, Textbook of Surgery, ed. H. F. Moseley. St. Louis, C. V. Mosby Co., 1959, p. 165-199.

GLOOR, P.
Amygdala, Handbook of Physiology, Section on Neurophysiology. Washington, American Physiological Society, 1960, p. 1395-1420.

HELLER, I. H. and HESSE, S.
Oxidative Metabolism of Sciatic Nerves of Hens following Insecticide Poisoning. Experimental Neurology, v. 1, p. 125-129, 1959.

HELLER, I. H. and HESSE, S.
Substrate Utilization by Rat Sciatic Nerve. Experimental Neurology, v. 1, p. 117-124, 1959.

JASPER, H. H.
Unspecific Thalamo-Cortical Relations, Handbook of Physiology, Section on Neurophysiology. Washington, American Physiological Society, 1960, p. 1307-1321.

KEENER, E. B.
An Experimental Study of Reactions of the Dura Mater to Wounding and Loss of Substance. Journal of Neurosurgery, v. 16, p. 415-423, 1959.
Regeneration of Dural Defects. Journal of Neurosurgery, v. 16, p. 424-447, 1959.

MCRAE, D. L.
Fallout and the Radiologist. Journal of the Canadian Association of Radiologists, v. 10, p. 17, 1959.

MATHIESON, G. and OLSZEWSKI, J.
Central Pontine Myelinolysis with Other Cerebral Changes. Neurology, v. 10, p. 345-354, 1960.

MILLAR, R. A., KEENER, E. B. and BENFEY, B. G.
Plasma Adrenaline and Noradrenaline after Phenoxybenzamine Administration, and during Haemorrhagic Hypotension, in Normal and Adrenalectomized Dogs. British Journal of Pharmacology, v. 14, p. 9-13, 1959.

MILLAR, R. A.
Plasma Adrenaline and Noradrenaline during Diffuse Respiration. Journal of Physiology, v. 150, p. 79-90, 1960.

MILLAR, R. A. and BENFEY, B. G.
Plasma Adrenaline and Noradrenaline Levels during Haemorrhage Induced after Chlorpromazine Injection. British Journal of Anaesthesia, v. 31, p. 258-261, 1959.

MILLAR, R. A., GILBERT, R. G. B. and BRINDLE, G. F.
Second Thoughts on Halothane in Neurosurgery. Canadian Anaesthetists Society Journal, v. 7, p. 52-55, 1960.

MILNER, B.
The Memory Defect in Bilateral Hippocampal Lesions. Psychiatric Research Reports, v. 11, p. 43-52, 1959.

MOLINER, E. R.
A Study on Neuroglia. The Problem of Transitional Forms. Journal of Comparative Neurology, v. 110, p. 157-171, 1958.

MORRELL, R.
Radio-Telemetry of Whole Nerve Action Potentials. XII Annual Conference on Electrical Techniques in Biology and Medicine, November, 1959.

OLSZEWSKI, J. and VULPE, M.
Lipolytic Activity of Lymph Nodes in Experimental Allergic Encephalomyelitis. Journal of Neuropathology and Experimental Neurology, v. 18, p. 324-327, 1959.

PAPPIUS, H. M., JOHNSON, D. M. and ELLIOTT, K. A. C.
Acid-Labile Phosphate Content of Incubated Brain Slices. Canadian Journal of Biochemistry and Physiology, v. 37, p. 999-1010, 1959.

PENFIELD, W.

Les Crises Temporales et la Localisation de Certaines Fonctions Psychiques, Bases Physiologiques et Aspects Cliniques de l'Epilepsie. Paris, Masson, 1958, p. 131-137.

Dr. William Vernon Cone. An Appreciation. Journal of the Canadian Medical Association, v. 81, p. 55-56, 1959.

The Interpretive Cortex. Science, v. 129, p. 1719-1725, 1959.

J. G. Greenfield. Appreciation of the Man. American Medical Association Archives of Neurology and Psychiatry, v. 80, p. 587-589, 1958.

William Vernon Cone, 1897-1959. Proceedings of the Royal Society of Canada — 3rd Series, v. 53, p. 89-91, 1959.

RASMUSSEN, T.

Dr. William V. Cone — Obituary. Transactions of the American Neurological Association, p. 224-225, 1959.

ROBERTS, L.

Aphasia, Textbook of Medicine, ed. R. L. Cecil and R. S. Loeb. Philadelphia, W. B. Saunders, 1959, p. 1440-1444.

ROVIT, R. L. and SOSMAN, M. C.

Hemicranial Aplasia with Pulsating Exophthalmos. An Unusual Manifestation of Von Recklinghausen's Disease. Journal of Neurosurgery, v. 17, p. 104-121, 1960.

WADA, J. and RASMUSSEN, T.

Intracarotid Injection of Sodium Amytal for the Lateralization of Cerebral Speech Dominance. Journal of Neurosurgery, v. 17, p. 266-282, 1960.

RESEARCH FUNDS

1934 — Rockefeller Foundation Endowment
1947 — Federal Government Consolidated Grant
1951 — Donner Canadian Foundation Grant
1954 — Lily Griffith McConnell Endowment
1957 — Hobart Anderdon Springle Memorial Endowment

FELLOWSHIP FUNDS

1948 — Duggan Fellowship
1950 — Lewis L. Reford Fellowship
1956 — Dr. and Mrs. Charles F. Martin Fellowship

GRANTS FOR SPECIAL PROJECTS

Dominion-Provincial Health Grant — Dr. McNaughton
" " " " — Drs. Penfield and Rasmussen
Elizabeth Kenny Foundation Grant — Dr. Rasmussen
U.S. Public Health Neurological Training Grant — Dr. McNaughton

DONATIONS TO SPECIAL FUNDS — 1959-60

Research, Education, Social Service

ANAESTHESIA RESEARCH FUND:	
Parke Davis & Co.	$ 10,000.00
CLARENCE BERNSTEIN MEMORIAL RESEARCH FUND:	
Lionel and Nathalie S. Friedman Fund	1,000.00
BRAIN TUMOUR RESEARCH FUND:	
Freedman Co. Factory Employees Fund	15.00
BORDEN FELLOWSHIP FUND	4,800.00
BRONFMAN GRANT FOR NEUROPHYSIOLOGY	20,000.00
FRED BROWN FUND (PENFIELD)	
CANCER CLINICAL RELIEF FUND:	
Freedman Co. Ltd.	15.00
Cancer Aid League, Inc.	1,500.00
Canadian Cancer Society	40.00
JACK COHEN FUND FOR RESEARCH IN NEUROLOGY	
COSGROVE RESEARCH FUND:	
Mr. J. Edouard Simard	500.00
Miss V. Crawford	5.00
Mr. Alan Howard	400.00
Mr. L. Bradley	30.00
Mrs. L. Cotter	5.00
Mr. and Mrs. John Wright	10.00
Northern Electric Co.	10.00
Montreal Star Chapel	14.00
Service Fund	10.00
Upjohn Co. of Canada	475.00
Mr. Stanley Entwhistle	10.00
DICK EPILEPSY FUND:	
Anonymous	949.37
GORDON LIBRARY AND INFORMATION FUND:	
Anonymous	4,834.89

Graduate Study Fund (Penfield)	
Harvey Cushing Clinical Relief Fund:	
R.V.H. Women's Auxiliary	2,000.00
Mrs. F. Stott	10.00
Mr. J. Clare Wilcox	100.00
Les Religieuses Hospitalières de l'Hôtel-Dieu St. Vallier, Chicoutimi	50.00
Miss Shirley Reid	5.00
Estate of the late Miss Gwyneth Cole	500.00
Mrs. Helen Maron	25.00
Miss Suzanne Cohen	30.00
Mr. A. Gerald Smith	10.00
In His Name Society	50.00
Hospital Equipment Fund:	
Credit Women's Breakfast Club	300.00
R.V.H. Women's Auxiliary Fund	700.00
Anonymous	28.50
Massabki Foundation Research Fund	206.11
M.N.I. Neurosurgical Resfarch Fund	
M.N.I. Staff Loan Fund	
Miscellaneous Special Funds:	
R.V.H. Women's Auxiliary Fund for Christmas Cheer	200.00
Mr. A. G. Massabki	200.00
Mrs. Evelyn Griffith	25.00
Wellcome Trust	10,300.00
Multiple Sclerosis Research Funds:	
Anonymous	25,000.00
Multiple Sclerosis Clinical Relief Fund:	
Multiple Sclerosis Bowling League	114.12
Multiple Sclerosis Golf League	250.00
Montreal Association for Multiple Sclerosis	500.00
MacDougall Nursing Scholarship	
McNaughton Neuroanatomy Research Fund:	
Mrs. Robert Reford	500.00
Neurological Research Fund	
Neurophysiology Research Fund (Jasper)	
Neuroradiology Research and Teaching Fund	
Nursing Education Fund	
Oaklawn Foundation Fellowship Fund	2,000.00
Penfield Research Fund	
Lewis Reford Fellows Fund	
Eveline Robins Memorial Fund for Research in Vascular Diseases	3,000.00
In Memory of the late Mrs. Alexander Cameron	50.00
" " " " " *Mrs. Maxwell Dunbar*	12.00
" " " " " *Mr. J. Nelson Fenner*	2.00
" " " " " *Mrs. Milton F. Gregg*	5.00
" " " " " *Mrs. Douglas B. Hyndman*	294.40

Donations to the Montreal Neurological Institute may be made to any of the above funds or for other purposes as specified by the donor. Receipts for such contributions are valid for income tax purposes in Canada and by arrangement in the United States.

Bequests and donations should be made out to the Montreal Neurological Institute, McGill University, and sent to the Director.

STATISTICS

CLASSIFICATION OF DISEASES

Nervous System Generally:

Multiple Sclerosis	11
Motor Neurone Disease	2

Meninges:

Meningocele & Myelomeningocele	2
Acute Purulent Meningitis	1
Tuberculous Meningitis	
Headache	6
Subdural Haematoma	2
Subdural Hygroma	
Epidural Haematoma	
Subarachnoid Haemorrhage	2
CSF Rhinorrhea	
Arachnoiditis	
Miscellaneous	

Brain:

Congenital Anomalies	
Hydrocephalus	2
Brain Abscess	1
Cerebral Concussion	11
Cerebral Contusion, Laceration, Traumatic Encephalopathy	9
Syncope	1
Ischemia	
Epilepsy	51
Migraine	4
Parkinsonism	2
Vertigo	1
Cerebral Thrombosis, Encephalopathy due to Arteriosclerosis	14
Cerebral Haemorrhage	1
Cerebral Embolism	
Intracranial Aneurysm	1
Encephalitis	3
Miscellaneous	1

Tumours:

Gliomas	1
Perineurial Fibroblastoma	
Meningeal Fibroblastoma	1
Craniopharyngioma	
Angioma	
Glioblastoma Multiforme	2
Metastatic Carcinoma — General Body	3
Meningioma	
Astrocytoma	2
Medulloblastoma	
Tumour Brain	1
Secondary Tumours, Brain, Spinal Cord	
Pinealoma	
Sarcoma	
Neurofibroma	

Dermoid Cyst	3
Stenosis Aqueduct of Sylvius	4
Brain Cyst	1
Chromophobe Adenoma Pituitary	7
Recklinghausen's Disease	3
Granuloma, Eosinophilic	6
Sacral Radiculopathy due Metastases	4
Miscellaneous Tumours, Body Generally	6
Miscellaneous CNS and Skull	11

Spinal Cord:

Compression of the Spinal Cord	10
Transverse Acute Myelitis	4
Guillain-Barré Syndrome	8
Myelopathy	24
Syringomyelia	11
Radiculitis	7
Poliomyelitis	7
Miscellaneous	13

Cranial and Peripheral Nerves:

Optic Neuritis	7
Trigeminal Neuralgia	45
Bell's Palsy	5
Menière's Syndrome	22
Traumatic Peripheral Nerve Lesions	7
Other Neuralgias	13
Peripheral Neuropathy	17
Diabetic Neuropathy	2
Ocular Myopathy	11
Miscellaneous	14

Muscles:

Myasthenia Gravis	3
Muscular Atrophy	4
Miscellaneous	11

Mental Diseases:

Mental Retardation	10
Depression	14
Drug Addiction	4
Psychoneurosis	17
Alzheimer's Disease	4
Dementia, due chronic alcoholism	3
Dementia, due cerebral atrophy	2
Behaviour Disorder, Post-traumatic	4
Miscellaneous	8

Other Systems:

Protrusion Disc — Lumbar	277
— Cervical	48
— Thoracic	4
Fracture and/or Dislocation of Vertebral Column	31
Fracture Skull	135
Back Pain	34
Facial Pain	8
Traumatic Lesions and Infections — Misc.	27
No CNS Disease	14
Miscellaneous	27

OPERATIONS

Craniotomy (Osteoplastic, miscellaneous, etc.)

Hemispherectomy	2
Pedunculotomy	1
and Biopsy	3
and Decompression	1
and Drainage of Subdural Haematoma	12
and Drainage of Intracerebral Haematoma	4
and Drainage of Extradural Haematoma	5
and Excision of Cicatrix	1
and Excision of Epileptogenic Focus	65
and Exploration	8
and Hypophysectomy	6
and Incision & Drainage of Cyst	2
and Clipping of Aneurysm	4
and Obliteration of Cyst	4
and Plastic Repair of Dura	5
and Removal of Adhesions	2
and Removal of Tumour	93
and Rhizotomy	1
and Sinusotomy	2
and Lobectomy	25

Trepanations & Craniocentesis

and Aspiration of Cyst	2
and Biopsy	5
and Drainage of Subdural Space	7
and Placement of Electrodes (Stereotaxic)	8
and Ventricular Puncture	1
and Ventriculography	7
and Exploration	8
and Pallidotomy	7
Elevation of Depressed Skull Fracture	51
Plastic Repair of Skull Defect, Metal	3
Plastic Repair of Skull Defect, Bone	3
Suture of Lacerated Wound of Scalp	4
Ventriculocisternostomy (Torkildsen's)	5
Vena Cava Shunt	13
Artificial Cranial Suture	5

Laminectomy or Hemilaminectomy

and Anterolateral Cordotomy	8
and Decompression of Spinal Cord	8
and Exploration	9
and Incision & Drainage of Intramedullary Cyst	1
and Ligation of Arterial Varix	1
and Removal of Adhesions	2
and Removal of Tumour	18
and Rhizotomy	2
and Spinal Fusion with Bone Graft	20
and Spinal Fusion with Wire	1
and Discoidectomy	149
and Cervical Discoidectomy	4
and Cervical-Occipital Fusion	2
and Cutting of Dentate Ligament	3

Sympathectomy:

Sympathetic Ramisection, Lumbar	1
Plastic Repair of Cranium Bifidum	5
Plastic Repair of Spina Bifida	10
Ligation of Artery	1
Exploration of Nerve	5
Ligation of Artery with Selverstone Clamp	8
Avulsion of Nerve	12
Neurectomy	2
Removal of Neuroma	4
Nerve Anastomosis	1
Re-opening of Wound with Evacuation	2
Re-opening of Wound with Exploration	2
Re-opening of Wound with Removal of Bone Flap	1
Re-suturing of Wound	1
Miscellaneous	30
Plaster Cast	23
Ventriculo-Peritoneal Shunt	5
Lumbar Peritoneal Shunt	1
Cerebral Arteriography — Cutdown	9
Aortogram	2
Cerebral Arteriography — Percutaneous	194
Tic Injection	2
Diagnostic Spinal	3
Nerve Blocks	24
Tracheotomy	4
TOTAL	955

CAUSES OF DEATH

Head Injury	34
Tumour	15
Myasthenia Gravis	1
Aneurysm	3
Cerebral Haemorrhage	12
Subarachnoid Haemorrhage	6
Subdural Haematoma	4
Meningitis	2
Encephalitis	1
Cerebral Embolus	1
Thrombosis	12
Fracture Cervical Spine	2
Muscular Atrophy, Progressive	1
Carcinoma (General)	6
Other Systems	6
TOTAL	106