



MNI

45th

ANNUAL REPORT

1979/1980

Montreal Neurological Hospital
Montreal Neurological Institute



45th Annual Report

**MONTREAL
NEUROLOGICAL
HOSPITAL**

**MONTREAL
NEUROLOGICAL
INSTITUTE**

1979-1980

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Montreal Neurological Hospital



More operations for focal epilepsy are performed at the Montreal Neurological Hospital than anywhere else in the world. Overleaf, director general Dr. William Feindel and nurse Ursula Steiner examine a young patient.

Board of the Corporation

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Dean of Medicine, McGill University

David Lloyd Johnston, BA, LLB*°
Principal and Vice-Chancellor, McGill University

Colin Webster, BA, LLD

*Executive Committee member

°*Ex officio* member

Board of Directors

March 31, 1980

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Elected by the Corporation

Vice-President

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Elected by the Corporation

Ex officio member

William Feindel, BA, MSc, MD, DPhil, DSc, FRCS(C), FACS, FRSC*
Director General, Montreal Neurological Hospital

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Appointed by the Lieutenant-Governor of Quebec
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Neuroradiologist-in-chief, Montreal Neurological Hospital
Elected by the Council of Physicians and Dentists

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Elected by the Corporation

Susan Foucault
Elected by non-clinical staff

Gordon Selby Francis, MD
Elected by interns and residents

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Dean of Medicine, McGill University
Appointed by McGill University

Peter Leggat, CA*
Appointed by the Lieutenant-Governor of Quebec
(Representing Socio-Economic Groups)

Jill Price
Elected by the users

Joy Shannon, BA
Elected by the users

Laughlin Taylor, BEd, MSc
Associate Neuropsychologist, Montreal Neurological Hospital
Elected by Clinical Staff Advisory Council

Alan Gibb Thompson, MD, DABS, FACS, FRCS(C)
Elected by the Corporation

Lloyd MacLean, MD, PhD, FRCS(C)
Surgeon-in-chief, Royal Victoria Hospital
By invitation

Secretary

Roland Saint-Arnaud, BA, MHA, Adm A
Associate Director General, Montreal Neurological Hospital
By invitation

*Executive Committee member

Council of Physicians Executive

Executive Committee, 1979-80

Chairman, George Karpati, MD

Vice-Chairman, Denis Melançon, MD

Members

Andrew Eisen, MD*

William Feindel, MD (*ex officio*)

André Olivier, MD

Allan Sherwin, MD

Executive Committee, 1980-81

Chairman, John Woods, MD

Vice-Chairman, André Olivier, MD

Members

Andrew Eisen, MD*

William Feindel, MD (*ex officio*)

George Karpati, MD

André Olivier, MD

Allan Sherwin, MD

Chairman, Admission and Duration of Stay Committee

André Olivier, MD

Chairman, Credentials Committee

Denis Melançon, MD

Chairman, Infection Control Committee

Jean-Guy Villemure, MD

Chairman, Library Committee

Theodore Rasmussen, MD

Chairman, Medical Evaluation Committee

Michel Aubé, MD

Chairman, Medical Records Committee

Bernard Graham, MD

Chairman, Nursing (Patient Care) Committee

Allan Sherwin, MD

Chairman, OR-ICU Committee

Gilles Bertrand, MD

Chairman, Outpatient Committee

Irving Heller, MD

Chairman, Pharmacology Committee

Allan Sherwin, MD

Chairman, Research Evaluation Committee

Francis McNaughton, MD

Representative to the Board of Directors and to the Board of the Corporation

Roméo Ethier, MD

*Resigned, August 1980

Clinical and Laboratory Staff

Director General

William Feindel, BA, MSc, MD, DPhil, DSc, FRCS(C), FACS, FRSC

Anesthesiology

Anesthesiologist

Davy Trop, MA, MD, MSc, FRCP(C), FACA

Associate Anesthesiologist

Mounir Abou-Madi, MB, DA, FRCP(C), DABA, FACA

Assistant Anesthesiologists

Jennifer Barnes, MB, ECFMG, LMCC

David Thomas, MB, FFARCS

Muriel Yarde, MB, FRCP(C)

Biomedical Engineering

Biomedical Engineer

John Ives, MSc

Brain-Scanning Laboratory

Director

Lucas Yamamoto, BSc, MD, PhD

Electroencephalography

Electroencephalographer and Neurophysiologist

Pierre Gloor, MD, PhD, FRCP(C)

Associate Electroencephalographer

Frederick Andermann, BA, BSc, MD, FRCP(C)

Assistant Electroencephalographers

Eva Andermann, BSc, MD, MSc, PhD, FCCMG

Michel Aubé, BA, MD, FRCP(C)

Luis Felipe Quesney, BSc, MD, PhD

Ivan (John) Woods, MB, BAO, MSc, FRCP(C)

Electromyography

Electromyographer and Assistant Electroencephalographer

Andrew Eisen, MD, MRCS, LRCP, FRCP(C)*

George Elleker, MD

Neuroanatomy

Neuroanatomist

Donald Lawrence, BSc, MD, FRCP(C)

Assistant Neuroanatomists

Alain Beaudet, BA, MD, PhD

Barbara Jones, BA, MA, PhD

Neurochemistry

Honorary Consultant in Neurochemistry

K.A.C. Elliott, MSc, PhD, ScD, FRSC

Neurochemist and Medical Research Council Career Investigator

Leonhard Wolfe, BSc, MSc, PhD, MD, FRCP(C), ScD, FRSC

Neurochemist

Hanna Pappius, BSc, MSc, PhD

Neuroendocrinology

Associate Neuroendocrinologist

Yogesh Patel, MD, PhD, FRACP

Neurogenetics

Neurogeneticist

Eva Andermann, BSc, MD, MSc, PhD, FCCMG

Neurology

Senior Consultant in Neurology

Francis McNaughton, BA, MSc, MD, FRCP(C)

Neurologist-in-chief

Donald Baxter, MD, MSc, FRCP(C)

Neurologists

Frederick Andermann, BA, BSc, MD, FRCP(C)

James B.R. Cosgrove, MD, MSc, MSc (Med), FRCP(C)

Irving Heller, BSc, MD, MSc, PhD, FRCP(C)

George Karpati, MD, FRCP(C)

J. Preston Robb, MSc, MD, FRCP (C) *

Allan Sherwin, BSc, MD, PhD, FRCP(C)

Associate Neurologists

Andrew Eisen, MD, MRCS, LRCP, FRCP(C)*

Bernard Graham, BA, BSc, MD

Ivan (John) Woods, MB, BAO, MSc, FRCP(C)

Assistant Neurologists

Michel Aubé, BA, MD, FRCP(C)

George Elleker, MD

Serge Gauthier, BA, MD, FRCP(C)

Antoine Hakim, BS, MS, PhD, MD

Assistant Neurologist and Consultant in Pediatrics

Sergio Pena, MD, PhD, FRCP(C)

Neuro-ophthalmology

Neuro-ophthalmologist

Trevor Kirkham, MB, DO, FRCS

Neuropathology

Neuropathologist

Stirling Carpenter, AB, MD

Assistant Neuropathologists

Kathleen Meagher-Villemure, BA, MD

Yvon Robitaille, BA, MD, FACP

Neurophotography

Neurophotographer

Charles Hodge, RBP, FBPA, AIMBI

Neurophysiology

Honorary Consultant in Neurophysiology

Herbert Jasper, OC, PhD, DèSc, MD, FRSC, DSc

Electroencephalographer and Neurophysiologist

Pierre Gloor, MD, PhD, FRCP(C)

Associate Neurophysiologists

Robert Dykes, BA, PhD

Luis Felipe Quesney, MD, PhD

Assistant Neurophysiologists

Daniel Guitton, BEng, PhD (Eng), PhD (Neurophysiol)

George Kostopoulos, MD, PhD

Neuropsychology

Neuropsychologist and Medical Research Council Career Investigator
Brenda Milner, BA, MA, PhD, ScD, FRCS, FRS

Associate Neuropsychologist

Laughlin Taylor, BSc, BEd, MSc

Assistant Neuropsychologists

Marilyn Jones-Gotman, BA, MA, PhD

Michael Petrides, BSc, MSc, PhD

Clinical Assistants, Neuropsychology

Mary Kay Ajersch, BA, MA

Eva Flannery, BSc, MA, PhD

Gabriel Leonard, BA, DAP

Clinical Psychologist

Clara Strauss, BA, MA

Neuroradiology

Neuroradiologist

Roméo Ethier, BA, MD

Associate Neuroradiologist

Denis Melançon, BA, MD

Assistant Neuroradiologist

Gary Bélanger, BA, MD

Neurosurgery

Honorary Neurosurgeon

Arthur Elvidge, MD, MSc, PhD, DCL, FRCS(C)

Honorary Consultant in Neurosurgery

Theodore Rasmussen, BS, MB, MD, MS, FRCS(C), Hon DM

Neurosurgeon-in-chief

Gilles Bertrand, BA, MD, MSc, FRCS(C)

Neurosurgeon

William Feindel, BA, MSc, MD, DPhil, DSc, FRCS(C), FACS, FRSC

Associate Neurosurgeon

André Olivier, BA, MD, PhD, FRCS(C), Dip ABNS

Assistant Neurosurgeons

Elaine Joy Arpin, BSc, MD, FRCS(C)

Jean-Guy Villemure, BA, MD, FRCS(C)

John Wells, BA, MD

Psychiatry

Psychiatrist

Louise Demers-Desrosiers, BA, MD, FRCP(C)

Assistant Psychiatrists

Martine Lalinec-Michaud, MD, FRCP(C)

Joannis Nestoros, MD, FRCP(C)

Radiochemistry

Radiochemist

Mirko Diksic, BSc, MSc, PhD

Research Computing Laboratory

Computer Systems Engineer

Christopher Thompson, BSc, MSc

Assistant Computer Systems Engineer

Jean Gotman, ESE, MEng, PhD

Medical Physicist

Terence Peters, BE, PhD

*Resigned August 1980

Consulting and Visiting Staff

Anesthesiology Consultant Member

Harold Griffith, OC, BA, MD, FACA, LLD, Hon FFARCS, FRCP(C)

Anesthesiology Consultants

Richard Catchlove, MB, BS, MSc, FFARCS

John Sandison, MB, FFARCS

Employee Health Service Consultant

Eric Ivor Beckett, MB, MRCP

Neuroendocrinology Consultant

George Tolis, MD, MSc, FRCP(Gr)

Neurology Consultant Member

Roma Amyot, BA, MD, FRCP(C)†

Neurology Consultants

Albert Aguayo, MD, FRCP(C)

André Barbeau, BA, PhD, MD, FRCP(C), FACP, FRSC

Edward Bass, BSc, MD, FRCP(C)

Sabah Bekhor, MB, FRCP(C)

Garth Bray, BSc, BSc (Med), MD, FRCP(C)

Morrison Finlayson, MB, FRCP(C)

Peter Humphreys, BSc, MD, FRCP(C)

Mortimer Lechter, BSc, MD, FAAN

Israel Libman, BA, MD, FRCP(C)

Calvin Melmed, BSc, MD, FRCP(C)

Allan Morton, MD, MSc, PhD, FRCP(C)

Michael Rasminsky, BA, MD, PhD, FRCP(C)

Léo Renaud, BA, MD, PhD

Bernard Rosenblatt, BSc, MD, FRCP(C)

John Stewart, BSc, MB, BS, MRCP, FRCP(C)

William Tissington-Tatlow, MB, MRCP, FRCP(C)

Danica Venecek, MD, FRCP(C)

Gordon Watters, BA, MD, FRCP(C)

Neurology Visiting Consultants

Claude Bélanger, BA, MD, FRCP(C)

André Bellavance, BA, MD, MSc, PhD

Guy Courtois, BA, MD, MSc, FRCP(C)

Jean-Léon Desrochers, BA, MD, FRCP(C)

Norman Giard, BA, MD, FRCP(C)

Raymond Lafontaine, MD

Guy Marcel Rémillard, BA, MD, FRCP(C)

Neuro-otolaryngology Consultant

Athanasios Katsarkas, MD, MSc, FRCS(C)

Neurophysiatry Consultant

Dorothy Stillwell, BA, MD, MS, FRCP(C)

Neurosurgery Consultants

John Blundell, MA, MB, MD, MRCP, FRCS

Robert Ford, BA, MD, FRCS(C)

Robert Hollenberg, BA, MD, FRCS(C), FACS

Peter Richardson, BA, MD, FRCS(C)

Harold Rosen, BSc, MD, FRCS(C), FACS

Joseph Stratford, BSc, MD, MSc, FRSC(C), FACS

Neurosurgery Visiting Consultants

Claude Bertrand, CC, BA, MD, FRCS(C)

Maurice Héon, MD, FRCS(C), FACS

Gérard Leblanc, BA, MD, FACS, DABNS, FRCS(C)

Pathology Consultant

John Richardson, BSc, MD, PhD

Psychiatry Consultant Member

Robert Cleghorn, MD, DSc, FRCP(C), FRC Psych

Psychiatry Consultants

Maurice Dongier, MD, FRCP(C)

Heinz Lehmann, OC, MD, FRSC, FRCP(C)

Radiation Oncology Consultant

Joseph Hazel, BSc, MD, FRCP(C), DABTR, DNBME

Radiology Consultants

Jean Gagnon, BA, MD, DMR, DABR, FRCP(C), FACR

Lawrence Stein, BSc, MD

Radiology Visiting Consultants

Jean Léger, BA, MD, FRCP(C), FACR

Jean-L. Vézina, BA, BM, MD, FRCP(C)

†Died July 1980

Professional Advisors

Administration

Steve Herbert, BSc, MHA

François Schubert, BSc (Pharm), DPH

Neurochemistry

Bruce Livett, BSc, PhD

Physiology

Kresimir Krnjevic, BSc, MB, PhD, FRCP

Resident and Rotator Staff July 1979 — June 1980

Elizabeth Angus
Douglas Arnold
Paul Assad
William Barkas
Beverly Barnett
Werner Becker
Gilles Bernier
Scott Brown
Yves Carcanague
Joseph Carlton
Matthew Chandy
Jean-Marc Coté
Burke Dial
Michel Duplessis
Marguerite Dupré
George Elleker
Peter Ender
Marcel Fournier
Gordon Francis
Daniel Gendron
Peter Herscovitch
Rick Holmberg
Sandra Horowitz
Paul Hwang
Pierre Jacob
Albert Joern
Daniel Keene
Thomas Kovacs
Charles Krieger
Guy Lalonde
Louise Lapointe

Denny Laporta
Richard Leblanc
Jean Letarte
Dawood Lockhat
Mohammad Maleki
Mark Mandell
Henry Milam
José Montes
Elizabeth Moore
James Nelson
Albert Ngoyi-Mukanku
Rachel Ochs
David Patry
Stanislav Prelevic
Diane Provencher
Seth Pullman
Paul René de Cotret
Ivan Ribaric
Sandra Richardson
Per Roland
Marie Saint-Jacques
Philippe Saltiel
Pierre Savard
Jay Schechter
Mary Schraufnagel
Jean Shapiro
Sandra Shefrin
Sean Spelliscy
Ian Stiell
Peter Vaktor
Benjamin Zifkin

Electroencephalography Laboratory

Dr. Jean-Marc Coté (Laval University)
Dr. Michel Duplessis (Sherbrooke University)
Dr. Chantal Hausser (University of Montreal)
Dr. Daniel Keene (University of Saskatchewan)
Dr. Rachel Ochs (Indiana University)
Dr. Samuel Potolicchio (University of Geneva)
Dr. Ivan Ribaric (University of Belgrade)
Dr. Benjamin Zifkin (McGill University)

Electromyography Laboratory

Dr. George Elleker (University of Alberta)
Dr. Peter Herscovitch (McGill University)

Neuroanesthesia

Dr. Marlene Gauthier (Laval University)
Dr. Leslie E. Hall (University of Manitoba)
Dr. Mannie Joel (University of Pretoria)
Dr. Klaus-Peter Karsunky (University of Heidelberg)
Dr. Thanh-long Le (University of Saigon)
Dr. Richard Robinson (Welsh National School of Medicine)
Dr. James Sloan (Dalhousie University)
Dr. Alexander Tang (University of Toronto)
Dr. Gary Townsend (University of Ottawa)

Neuro-ophthalmology

Dr. Stuart Coupland (Simon Fraser University)
Dr. David Nelson (University of British Columbia)

Neuropathology Laboratory

Dr. Douglas Arnold (Cornell University)
Dr. William Barkas (McGill University)
Dr. Marie Guerard-Desjardins (University of Montreal)
Dr. Rick Holmberg (University of Calgary)
Dr. Sandra Horowitz (McGill University)
Dr. Richard Leblanc (University of Ottawa)
Dr. Henry Milam (Meharry University)
Dr. Louise Nolet (Laval University)

Neuroradiology

- Dr. Gilles Blackburn (Laval University)
- Dr. Jocelyn Blais (Laval University)
- Dr. Bernice Capusten (University of Saskatchewan)
- Dr. Raquel Del Carpio (Cayetano Heredia University)
- Dr. Yves Fortier (Sherbrooke University)
- Dr. Norman Just (McGill University)
- Dr. Alfred Leblanc (Sherbrooke University)
- Dr. Jacques Lévesque (Laval University)
- Dr. Mohammad Maleki (Pahlavi University)
- Dr. James Nelson (Howard University)
- Dr. Robert Williams (Queen's University)

Nursing Administration and Education Staff

Director of Nursing and Assistant Professor, School of Nursing, McGill University

Caroline Robertson, N, BN, MScA

Assistant Directors of Nursing

Elizabeth Barrowman, N

Irene MacMillan, BA, N, MScA

Assistant Director of Nursing Education

Marilyn Manchen, N, BA, BN

Nursing Coordinators

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Cecilia Largo, BSc, N

Linda Maruska, N

Lillian McAuley, N*

Abdool Saumtally, N, BN

Margaret Smeaton, N

Coordinator of Staff Education

Felicia Stretkowicz, N, BN

Nurse Clinician Lecturer, School of Nursing, McGill University

Linda Robbins, N, BN

Nurse Clinician Teacher

Geraldine Fitzgerald, N, BN

Operating Room Supervisor

Norma Isaacs, N, BN

Consultant in Nursing

Florence Mackenzie, N, BN, MScA

Head Nurses

Mary Cavanaugh, N

Lucy Dalicandro, N

Marion Everett, BA, N

Georgette Jotic, N

Frances Murphy, N

Barbara Petrin, N

Ursula Steiner, N

Winsome Wason, N

Assistant Head Nurse

Berta Natucci, N

*Retired July 1979

Graduates of the Post-basic Clinical Program in Neurological and Neurosurgical Nursing

September 1979 — February 1980

Helen Attwood (Vanier College, St. Laurent, Quebec)
Esther Cowhard (Dawson College, Montreal, Quebec)
Jocelyne Faille (CEGEP Saint-Laurent, St. Laurent, Quebec)
Mitsuko Hasegawa (Second Tokyo National Hospital, Tokyo, Japan)
Maura Kolb (Evanston Hospital School of Nursing, Evanston, Illinois)
Donna Murray (Dawson College, Montreal, Quebec)
Teiko Sato (Niigata Prefectural Hospital, Joetsu City, Japan)
Barbara Stark (Dalhousie University, Halifax, Nova Scotia)
Heather Stevens (Humber College, Toronto, Ontario)
Colleen Taft (Royal Columbian School of Nursing, New Westminster, British Columbia)

March — August 1980

Melanie Child (Hammersmith Hospital, London, England)
Elisabeth Dipchan-Gill (Hospital Training School of San Fernando, San Fernando, Trinidad)
Jutta Ensin (Northeastern University, Boston, Massachusetts)
Sheila Ohn (Port-of-Spain School of Nursing, Port-of-Spain, Trinidad)
Nancy Thornton (George Brown College, Toronto, Ontario)
Yasue Tsujibayashi (Kyushu University, Fukuoka, Japan)
Dianne Waitkus (Dawson College, Montreal, Quebec)
Sonia Zola (CEGEP Limoilou, Quebec, Quebec)

Administrative Staff

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J. Taylor Kennedy

Director General

William Feindel

Associate Director General

Roland Saint-Arnaud

Director of Nursing

Caroline Robertson

Director of Finance

Gean-yuan Pwu

Director of Personnel

Paul Dussault

Director of Social Work

Verna Bound

Administrative Assistant

Winston Rochette

Registrar

Bernard Graham

Assistant Registrar

Danica Venecek

Planning Officer

Harry Marpole

Administrative Consultant

Charles Gurd

Supervisory Officers

Admitting

Margaret Bernard

Dietician

Oresta Podgurny

Employee Health Service

Rita Lacombe

Librarian

Marina Boski

Medical Records

Dorothy Lawson

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Victoria Hospital Auxiliary**

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Jane Osterland

Executive Vice-President

Pixie Tilden

Treasurer

Judy Sura

Assistant Treasurer

Elizabeth Yuile

Secretary

Helen Munson

Pavilion Representative to the MNH

Toni Newman

Clergy

Anglican

Reverend Lionel Temple-Hill

Hebrew

Rabbi Mordecai Glick

Lutheran

Pastor Heinz Dahle

Orthodox

Reverend Father Anthony Gabriel

Protestant

Reverend Mel McDowell

Roman Catholic

Father George Novotny, SJ

Montreal Neurological Institute



Research on a host of neurological disorders is carried out in twenty-five research laboratories at the Montreal Neurological Institute. Overleaf, Dr. N.M.K. Ng Ying Kin adjusts equipment in the Donner Laboratory of Experimental Neurochemistry.

Neurosciences Advisory Council

Sir Arnold Burgen, MB, MD, FRCP, FRS
Director, National Institute for Medical Research
Medical Research Council of Great Britain

Ronald Christie, MSc, MB, MD, DSc, FRCP, FRCP(C), FACP
Emeritus Dean of Medicine, McGill University

Marc Colonnier, BA, BPh, MSc, MD, PhD, FRS
Professor, Neurobiology Laboratories, Laval University

Pierre Gendron, BSc, PhD, LL.D, DSc, FCIC, FRSC
Deputy Chairman, Board of Directors
Pulp and Paper Research Institute of Canada

Frank MacIntosh, MA, PhD, FRSC, FRS
John Morley Drake Professor of Physiology, McGill University

Robert Marston, BS, BSc, MD
President, University of Florida

Guy Odom, MD
Professor of Neurosurgery, Duke University

Theodore Sourkes, BSc, MSc, PhD, FRSC
Professor, Departments of Biochemistry and Psychiatry, McGill University
Director, Laboratory of Neurochemistry, Allan Memorial Institute

Donald B. Tower, AB, MSc, MD, PhD
Director, National Institute of Neurological and Communicative Disorders
and Stroke
US Department of Health and Human Services

Advisory Board

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William Feindel, BA, MSc, MD, DPhil, DSc, FRCS(C), FACS, FRSC
Director, Montreal Neurological Institute

Vice-Chairman

Colin Webster, BA, LL.D.
Governor, McGill University

Members

Donald Baxter, MD, MSc, FRCP(C)
Chairman, Department of Neurology and Neurosurgery, McGill University
Appointed by the Board of Governors, McGill University

Pierre Beaudry, MD, FRCP(C)
Associate Dean of Graduate Studies and Research
Faculty of Medicine, McGill University
Appointed by the Principal, McGill University

Gilles Bertrand, BA, MD, MSc, FRCS(C) *
Associate Director (Neurosurgery), Montreal Neurological Institute
Elected by the staff of the Montreal Neurological Institute

Samuel Freedman, BSc, MD, FRCP(C), FACP, FRSC *
Dean of Medicine, McGill University
Appointed by the Principal, McGill University

Yves Fortier, QC, BCL, BLitt
Governor, McGill University
Appointed by the Board of Governors, McGill University

Pierre Gloor, MD, PhD, FRCP(C)
Associate Director (Neurosciences), Montreal Neurological Institute
Elected by the staff of the Montreal Neurological Institute

Walter Hirschfeld, B.A.Sc., PhD, FRSC, FRMetsS
Vice-Principal (Research), McGill University
Appointed by the Principal, McGill University
To September 1980

J. Taylor Kennedy, BEng, MEng*°
President, Board of the Corporation, Board of Directors, Montreal
Neurological Hospital
Governor, McGill University
Appointed by the Board of Governors, McGill University

Gordon Maclachlan, BSc, MA, PhD
Vice-Principal (Research), McGill University
Appointed by the Principal, McGill University
From September 1980

Alan Gibb Thompson, MD, DABS, FACS, FRCS(C)
Governor, McGill University
Appointed by the Board of Governors, McGill University

Leo Yaffe, BSc, MSc, PhD, FCIC, FAPS, FRSC
Vice-Principal (Administration), McGill University
Appointed by the Principal, McGill University

Member-at-large

Donald Byers, QC, LL.D.
Trustee, Estate of Dorothy Killam
Elected by the staff of the Montreal Neurological Institute

*Executive Committee member

°*Ex officio* member

Scientific Staff

Honorary Neuroscientists

K.A.C. Elliott, MSc, PhD, ScD, FRSC, *Neurochemistry*
Herbert Jasper, OC, PhD, DèSsc, MD, FRSC, DSc, *Neurophysiology*
Francis McNaughton, BA, MSc, MD, FRCP(C), *Neuroanatomy*
Theodore Rasmussen, BS, MB, MD, MS, FRCS(C), Hon DM, *Neurosurgery*
J. Preston Robb, MSc, FRCP(C), *Neurology*

Neuroscientists

Pierre Gloor, MD, PhD, FRCP(C), *Neurophysiology*
Brenda Milner, BA, MA, PhD, ScD, FRSC, FRS, *Neuropsychology*
Hanna Pappius, BSc, MSc, PhD, *Neurochemistry*
Leonhard Wolfe, BSc, MSc, PhD, MD, FRCP(C), ScD, FRSC, *Neurochemi*

Associate Neuroscientists

Alain Beaudet, BA, MD, PhD, *Neuroanatomy*
Mirko Diksic, BSc, MSc, PhD, *Radiochemistry*
Robert Dykes, BA, PhD, *Neurophysiology*
Jean Gotman, ESE, MEng, PhD, *Computer Systems Engineering*
Daniel Guitton, BEng, MEng, PhD, PhD, *Neurophysiology*
Charles Hodge, RBP, FBPA, AIMBI, *Neurophotography*
John Ives, MSc, *Biomedical Engineering*
Barbara Jones, BA, MA, PhD, *Neuroanatomy*
Marilyn Jones-Gotman, BA, MA, PhD, *Neuropsychology*
George Kostopoulos, MD, PhD, *Neurophysiology*
Donald Lawrence, BSc, MD, FRCP(C), *Neuroanatomy*
Leo Nikkinen, BSc, MSc, *Physics*
Yogesh Patel, MD, PhD, FRACP, *Neuroendocrinology*
Sergio Pena, MD, PhD, FRCP(C), *Neurology*
Terence Peters, BE, PhD, *Computer Systems Engineering*
Michael Petrides, BSc, MSc, PhD, *Neuropsychology*
Laughlin Taylor, BSc, BEd, MSc, *Neuropsychology*
Christopher Thompson, BSc, MSc, *Computer Systems Engineering*
Lucas Yamamoto, BSc, MD, PhD, *Brain-Scanning*

Clinical Neuroscientists

Donald Baxter, MD, MSc, FRCP(C), *Neurology*
Gilles Bertrand, BA, MD, MSc, FRCS(C), *Neurosurgery*
Stirling Carpenter, AB, MD, *Neuropathology*
Roméo Ethier, BA, MD, *Neuroradiology*
William Feindel, BA, MSc, MD, DPhil, DSc, FRCS(C), FACS, FRSC,
Neurosurgery
George Karpati, MD, FRCP(C), *Neurology*

Allan Sherwin, BSc, MD, PhD, FRCP(C), *Neuropharmacology*
Davy Trop, MA, MD, FRCP(C), FACA, *Anesthesiology*

Associate Clinical Neuroscientists

Mounir Abou-Madi, MB, DA, FRCP(C), DABA, FACA, *Anesthesiology*
Eva Andermann, BSc, MD, MSc, PhD, FCCMG, *Neurogenetics*
Frederick Andermann, BA, BSc, MD, FRCP(C), *Electroencephalography*
Michel Aubé, BA, MD, FRCP(C), *Electroencephalography*
Elaine Joy Arpin, BSc, MD, FRCS(C), *Neurosurgery*
Jennifer Barnes, MB, ECFMG, LMCC, *Anesthesiology*
Gary Bélanger, BA, MD, *Neuroradiology*
J.B.R. Cosgrove, MD, MSc, MSc(Med), FRCP(C), *Neurology*
Louise Demers-Desrosiers, BA, MD, FRCP(C), *Psychiatry*
Andrew Eisen, MD, MRCS, LRCP, FRCP(C), *Electromyography* *
Serge Gauthier, BA, MD, FRCP(C), *Neuroanatomy*
Bernard Graham, BA, BSc, MD, *Neurology*
Antoine Hakim, BS, MS, PhD, MD, *Neurochemistry*
Irving Heller, BSc, MD, MSc, PhD, FRCP(C), *Neurology*
Trevor Kirkham, MB, DO, FRCS, *Neuro-ophthalmology*
Kathleen Meager-Villemure, BA, MD, *Neuropathology*
Denis Melançon, BA, MD, *Neuroradiology*
André Olivier, BA, MD, PhD, FRCS(C), Dip ABNS, *Neurosurgery*
Luis Felipe Quesney, BSc, MD, PhD, *Electroencephalography*
Yvon Robitaille, BA, MD, FACP, *Neuropathology*
David Thomas, MB, FFARCS, *Anesthesiology*
Davy Trop, MA, MD, MSc, FRCP(C), FACA, *Anesthesiology*
Jean-Guy Villemure, BA, MD, FRCS(C), *Neurosurgery*
John Wells, BA, MD, *Neurosurgery*
Ivan (John) Woods, MB, BAO, MSc, FRCP(C), *Electroencephalography*
Muriel Yarde, MB, FRCP(C), *Anesthesiology*

*Resigned August 1980

MNH/MNI Academic Appointments
Department of Neurology and Neurosurgery
McGill University
(Brackets denote joint appointments.)

Chairman

Donald Baxter

Neurology

Emeritus Professor

Francis McNaughton

Professors

Frederick Andermann

Donald Baxter

George Karpati (Pediatrics)

Donald Lawrence (Anatomy)

J. Preston Robb

Allan Sherwin

Associate Professors

Michel Aubé

J.B.R. Cosgrove

Andrew Eisen*

Bernard Graham

Irving Heller

Ivan (John) Woods

Assistant Professors

Eva Andermann

Serge Gauthier

Sergio Pena (Pediatrics)

Lecturers

George Elleker

Antoine Hakim

Neurosurgery

Emeritus Professor

Theodore Rasmussen

William Cone Professor

William Feindel

Professor

Gilles Bertrand

Associate Professor

André Olivier

Assistant Professors

Elaine Joy Arpin

Jean-Guy Villemure

John Wells

Neurosurgical Research

Associate Professor

Lucas Yamamoto

Neurophysiology

Professor

Pierre Gloor

Associate Professors

Robert Dykes (Surgery, Physiology)

Luis Felipe Quesney

Assistant Professors

Daniel Guitton

George Kostopoulos

Neurochemistry

Emeritus Professor

K.A.C. Elliott (Biochemistry)

Professors

Hanna Pappius (Biochemistry)

Leonard Wolfe (Biochemistry)

Lecturer

N.M.K. Ng Ying Kin

Radiochemistry

Assistant Professor

Mirko Diksic (Chemistry)

Neuroradiology

Professor

Roméo Ethier (Radiology)

Associate Professor
Denis Melançon (Radiology)

Assistant Professor
Gary Bélanger (Radiology)

Neuroanesthesiology
Associate Professor
Davy Trop (Anesthesia)

Assistant Professors
Mounir Abou-Madi (Anesthesia)
David Thomas (Anesthesia)

Lecturers
Jennifer Barnes (Anesthesia)
Muriel Yarde (Anesthesia)* *

Neuropathology
Professor
Stirling Carpenter (Pathology)

Assistant Professor
Yvon Robitaille (Pathology)

Lecturer
Kathleen Meagher-Villemure
(Pathology)

Neuropsychology
Professor
Brenda Milner (Psychology)

Assistant Professors
Marilyn Jones-Gostman

Clinical Psychology
Lecturer
Clara Strauss

*Resigned September 1, 1980
**Resigned September 30, 1980

Neuroanatomy
Professor
Donald Lawrence (Anatomy)

Assistant Professors
Alain Beaudet
Barbara Jones (Psychology)

Biomedical Engineering
Assistant Professors
Jean Gotman
John Ives
Terence Peters (Radiology)
Christopher Thompson

Neuro-ophthalmology
Associate Professor
Trevor Kirkham (Ophthalmology)

Neuroendocrinology
Associate Professor
Yogesh Patel (Medicine)

Neuropsychiatry
Assistant Professor
Louise Demers-Desrosiers (Psychiatry)

Executive Committee of the Montreal Neurological Institute

Director

William Feindel, MD

Director Emeritus

Theodore Rasmussen, MD

Associate Director (Administration)

Roland Saint-Arnaud, MHA

Associate Director (Finance)

Norman Bleakley, FCMA

Associate Director (Neurology)

Donald Baxter, MD

Associate Director (Neurosciences)

Pierre Gloor, MD

Associate Director (Neurosurgery)

Gilles Bertrand, MD

Associate Director (Nursing Research and Education)

Caroline Robertson, MScA

Associate Director (Publications)

Victoria Lees, PhD

Associate Director (Research Evaluation Committee)

Francis McNaughton, MD

Associate Director (Special Projects)

Joy Shannon, BA

Senior Executive Secretary

Sophie Malecka

Assistant Executive S

Linda Kandestin, BA

Biochemical Genetics Laboratory

Dr. Maria Teresa Costa (University of Ottawa)

Cone Laboratory for Neurosurgical Research

Dr. Norio Arita (Osaka University Medical School)

Dr. Philippe Magistretti (University of Geneva)

Dr. Masayuki Matsunaga (Kyushu University)

Dr. Mineo Motomiya (Hokkaido University Medical School)

Dr. Per Roland (University of Copenhagen)

Dr. Hiroyuki Shimizu (University of Tokyo)

Dr. Takashi Shibasaki (Gunma University)

Dr. John Wells (Tulane University)

Dr. Hwa-shain Yeh (National Defense Medical Centre)

Donner Laboratory of Experimental Neurochemistry

Uwe Goehlert (McGill University)

Dr. NMK Ng Ying Kin (University of Wales)

Experimental Neurophysiology Laboratory

Dr. Massimo Avoli (University of Rome)

Dr. Ioannis Siatitsas (Athens National University)

Deborah Taylor (McGill University)

Dr. Christian Ménini (visiting scientist, Centre National de la Recherche Scientifique, France)

Neuroanatomy Laboratory

Lee Friedman (University of Chicago)

Mitch Shiller (McGill University)

Neurogenetics

Linda Dansky (McGill University)

Richard Nagy (McGill University)

Neurological Research

Dr. Somchai Jiaravuthisan (Mahidol University)

Neuromuscular Research Laboratory

Dr. Ju-sung Wu (University of Taipei)

Neuropharmacology Laboratory

Dr. Kayode Odusote (University of Ibadan)

Neuropsychology

Dr. Henry Buchtel (McGill University)

Dr. Antonio Incisa della Rocchetta (University of Rome)

Dr. Raymonde Labrecque (University of Montreal)

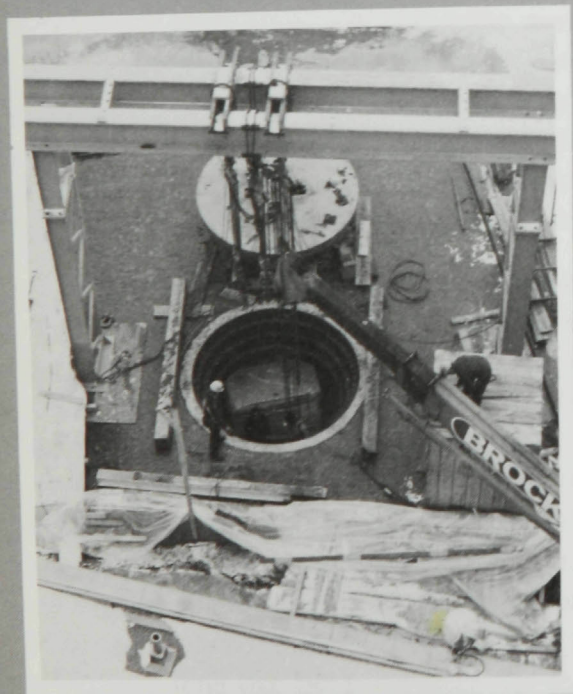
Dennis Rains (Cornell University)

Donald Read (McGill University)

Dr. Carlos Roldan (University of Stirling)

Mary Louise Smith (St. Francis Xavier University)

Director's Report



On March 17, 1981 the Montreal Neurological Institute installed North America's first mini-cyclotron. Overleaf, the 19-ton machine for producing medical isotopes is lowered by crane into a concrete bunker at the rear of the institute.

Report of the Director

This *Annual Report* gives a double record of two closely related but separately financed organizations. The summary of activities of the Montreal Neurological Hospital is directed to the Board of Directors, the Council of Health and Social Services of Metropolitan Montreal, and the Ministry of Social Affairs of the province of Quebec. The account of our progress in research and post-graduate teaching at the Montreal Neurological Institute is submitted each year to the principal and the Board of Governors of McGill University. It is sent as well to our many supporters and friends, and to the Conseil de la Recherche en Santé du Québec, the Medical Research Council of Canada, and other research foundations and societies from which we have been awarded grants.

This past year has seen some of the fruits of our long-term planning: steady progress in our renovation program, a substantial increase in research staff and funding, further advances in our pioneer work on brain imaging, continuing connections with Chinese neurology and neurosurgery, the World Health Organization, Japanese Steel Works, Atomic Energy of Canada, and the National Film Board of Canada. The neurosurgical residency program, which was threatened by serious budget reductions, has now been restored to an adequate working level of training positions, with a full complement of excellent candidates accepted for the coming year. New administrative staff and reorganization of procedures have greatly strengthened the operations of both the hospital and the institute. Our development campaign is well launched with support from many benefactors, not the least important of whom are our own staff members.

Penfield Pavilion: Operation Completed

The Penfield Pavilion, officially opened in September 1978, has been put into use in several stages. In the last and most complex of these, we activated a new operating suite with three modern theatres, two of which are specially equipped for surgical x-ray procedures, brain recording, and radioisotope examination. This suite was planned in detail by our neurosurgeons, anesthetists, and nurses working closely with the architect and engineer. The detailed blueprints loaned by our neurosurgical colleagues in many other centres proved most useful. The MNI system of brain photography during operations by means of an overhead mirror and telephoto lens has been cleverly up-dated with electronic controls to the specifications of our expert neurophotographer Charles Hodge. Combined with our custom-planned intensive care unit on the floor just below, these new resources provide our patients with the most advanced technical aids for surgery of the brain, spine, and nerves.

Once the move into the new wing was completed, we were able to launch the final stages (phase IV) of the renovation program. The first project was

modernization of the former No. 1 operating room, so familiar to generations of neurosurgical residents who worked here with Dr. Wilder Penfield and his associates from the opening of the institute in 1934. In that theatre were performed over 2,300 operations for the treatment of epilepsy, a series which must now be the largest and most intensively studied in the world. Many of the original windows in the building are being replaced, and urgent repairs made to roof and stonework. Custom-made equipment for the central kitchen and the new ventilation system has been ordered.

Research Activities

The Montreal Neurological Institute remains the only organization of its kind in Canada designated solely for research and teaching in neurological disorders. When it opened it was also the first scientific research institute at any McGill teaching hospital. Within the past decade or so the other teaching hospitals have also set up such centres with the Royal Victoria Hospital being the most recent on this list.

We now have sixty investigators working in twenty-five different laboratory units. Some of these are full-time scientists, but many are members of the clinical staff who manage to devote a major part of their efforts to research in the pattern set years ago by Dr. Penfield and his early associates.

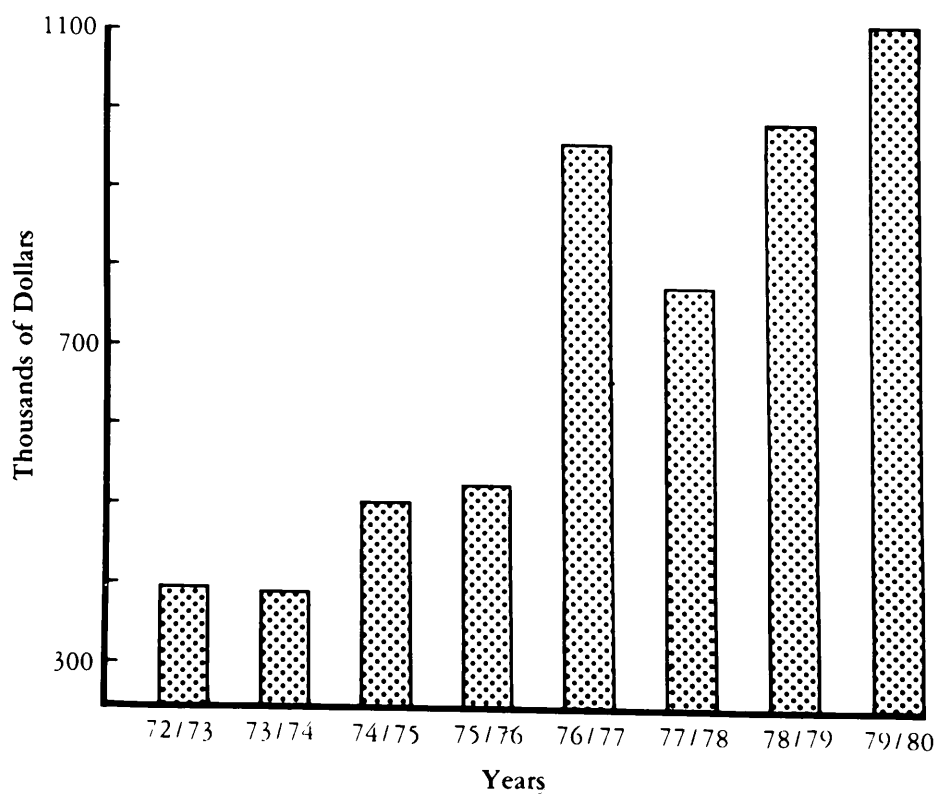


Figure 1: External Grants for Research and Fellowships

The MNI research activities have been financed over the years partly by generous gifts and bequests, and partly by external research grants. During 1979-80 these external research awards exceeded for the first time the \$1,000,000 mark. An increase of 300 per cent over the past eight years, this figure is an impressive tribute to the work of our scientific staff (Fig. 1). These funds derived mainly from the competitive awards of the provincial and federal research councils, and from foundations supporting research in multiple sclerosis, muscular dystrophy, and epilepsy. Two more neuroscientists were awarded Medical Research Council scholarships in the past year, bringing the number of these prestigious awards at our institute to a total of six. Thirteen research scholars were funded by the institute's Killam scholarship endowment. About half of our thirty research fellows were registered for advanced degrees in McGill's Faculty of Graduate Studies and Research.

The institute's burgeoning research is also reflected in the exponential rise in scientific publications (Fig. 2). When we list these publications, we do not include the numerous lectures, panel discussions, and papers presented at meetings or symposia in which our staff participate during the year. These, too, are important for the exchange of medical knowledge.

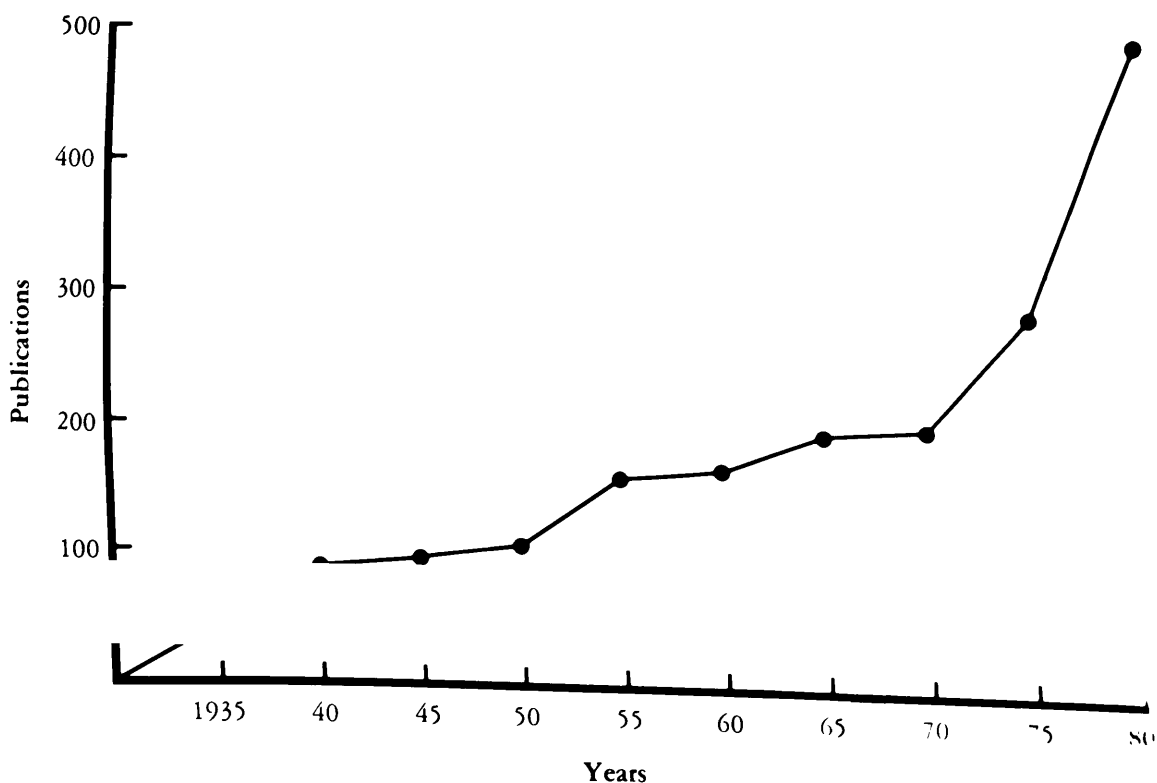


Figure 2: Publications per Five-year Period

Scientific honours have come to many of our staff this year. The Michael Prize, given in recognition of distinguished scientific work in convulsive disorders, was awarded jointly to Dr. Pierre Gloor and the distinguished professor Otto Creutzfeldt at the Twelfth Epilepsy International Symposium. Dr. Brenda Milner, elected last year a Fellow of the Royal Society of London, was further honoured by a Doctor of Laws degree from Queen's University for pioneer work in speech and memory functions. For his outstanding contributions to the surgical treatment of epilepsy, Dr. Theodore Rasmussen, formerly director of the MNI, was named professor emeritus at McGill and honorary doctor of medicine at Edinburgh University. Many other staff members, recipients of a variety of distinctions, continue to work as editorial consultants, members of committees both inside and outside McGill, officers in scientific and medical societies, and consultants in their particular field of scientific endeavour. They have represented the institute and the university at national and international levels.

PET Project

We have made further advances in positron emission tomography (PET), a technique that produces remarkable action-images of brain chemistry. Over the past five years our program has expanded rapidly, with the MNI PET unit being the only one operational in Canada. The MNI imaging device, or positron camera, developed by our research team, is being produced by Atomic Energy of Canada Ltd. Our novel miniature cyclotron, which will create isotopes for PET, has arrived from Japan and awaits installation. It will greatly enhance the range of our research on brain metabolism.

These sophisticated instruments — the camera and the cyclotron — and the associated radiochemistry laboratory, the computer system, and the concomitant research activities, are all expensive operations. However, in the face of the enormous socio-economic costs inflicted by such common neurological disorders as epilepsy, stroke, brain tumors, and head injuries, the cost of developing and operating such research projects seems modest by comparison. In Canada we spend each year a billion dollars on cosmetics, and far more on recreation, liquor, and tobacco. We should be prepared to pay more realistically to support medical research: without good health so much else is of little value.

A Collaborating Centre of the World Health Organization

The MNI continues as one of eight world centres in the neurosciences program of the World Health Organization. Following a survey we carried out in China in July 1979, Dr. Donald Tower and I strongly recommended that two WHO neurosciences centres be established, one at the Peking Institute of Neurosurgery and the other ~~at the Neurological Institute~~ in

Shanghai. We also emphasized the importance of exchanges among our clinical and research teams. In light of this, Dr. Rasmussen and Dr. J. Preston Robb recently took part in lecture courses and medical demonstrations to over a hundred Chinese physicians in Peking under the sponsorship of the WHO and the MNI. With the approval of the Bethune Foundation of Canada, we have established a Bethune-Chao exchange scholarship in the neurosciences. This scholarship combines the names of Dr. Norman Bethune, now legendary in China, and Dr. Chao Yi-ching, a Rockefeller scholar at the MNI in 1938 who returned to Peking and Tientsien to establish the first neurosurgery residence training program for China. Among the first scholars appointed will be Dr. Chao Ke-ming, the neurosurgeon son of Dr. Chao.

Our WHO program also includes a project in peripheral neuropathy directed by Drs. George Karpati and Donald Baxter. Again under WHO's auspices, we participated in a task force to outline some of the problems of aging and dementia. Because certain forms of dementia are now being related to chemical defects in the brain, positron emission tomography offers a new avenue of research that may contribute to our understanding of this common neurological disability.

Long-term planning

The opening of the splendid resources of the Penfield Pavilion in September 1978 emphasized the important role of long-term planning in the life of the institute and hospital: we began mapping out the new wing twelve years in advance. But flexibility and attentiveness to new developments are also necessary. None of us was aware in 1966 of the advent of computer axial tomography, a technique that has radically improved our neurodiagnosis. Much less did any of us foresee our present involvement in positron emission tomography. In 1965 Dr. Lucas Yamamoto had only just begun his collaborative work on positron emission for physiological studies of the brain with the scientists at the Brookhaven National Laboratory. It was not until 1975 that this method, developed independently in several research centres, was able to give the dramatic imaging of the brain's blood flow and chemistry that has so excited the neuroscientific world. Fortunately, on the advice of Harry Marpole, our building planner, and with the approval of the university, during demolition of the Molson Stadium's old sports fieldhouse we had retained its large basement structure. The unique cyclotron that produces the radioactive tracers for our research program will find a place there, only a short distance from our PET laboratory. The PET project demands substantial long-term planning; it requires a high financial investment in scientific equipment, organization of data acquisition, storage, retrieval, and analysis, and the coordination of some twenty-five basic and clinical neuroscientists in six major research programs (Fig. 3).

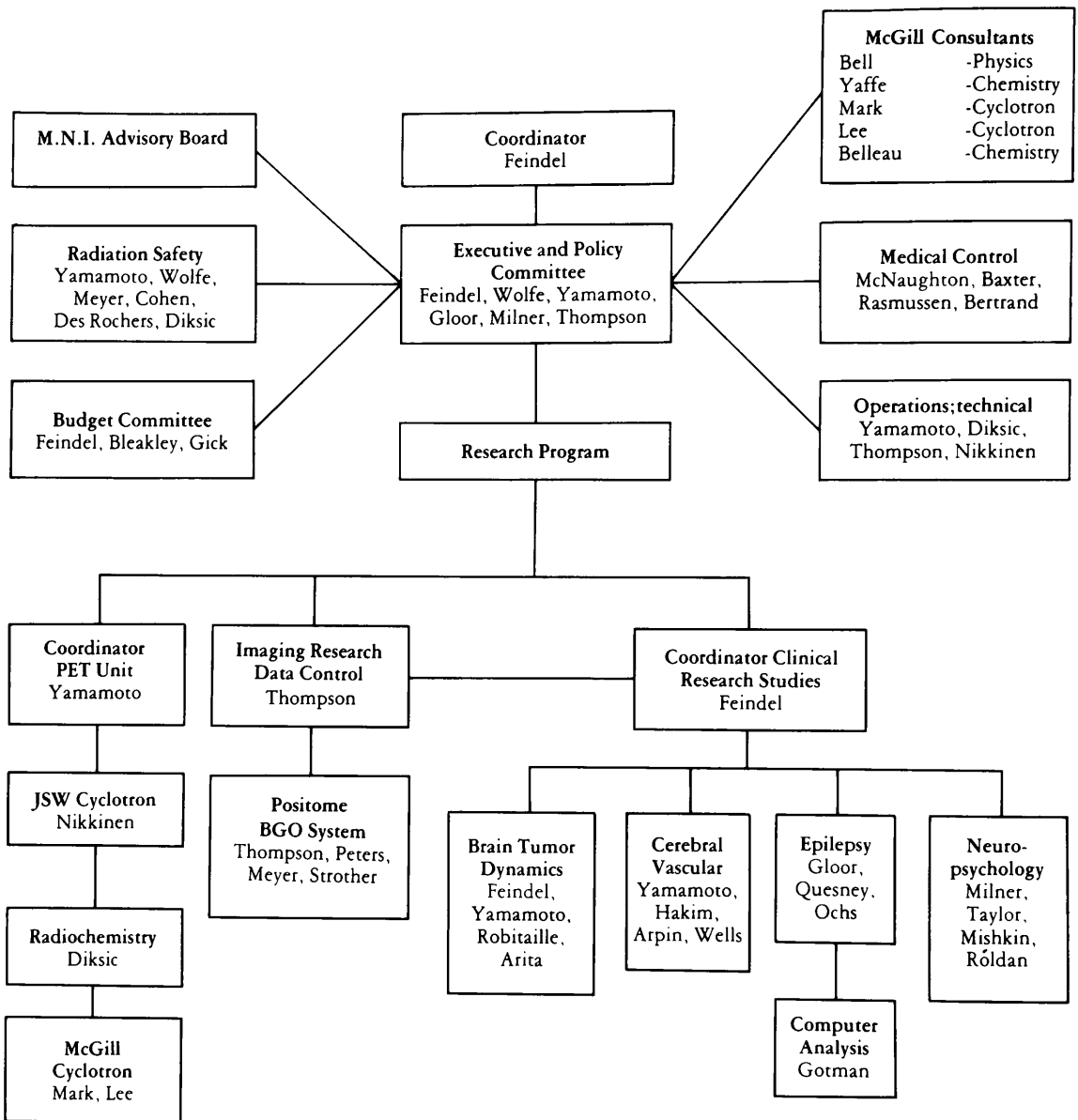


Figure 3: Positron Emission Tomography Project

Development Campaign

Our fund campaign, based on our immediate and long-term needs, has as its first purpose the acquisition of a million and a half dollars needed to match the government grants for the final steps of our modernization of the Rockefeller and McConnell wings. We expect to collect, in total, \$5 million. We also seek immediate support for installation of the positron equipment. We must bolster our scholarship funds to attract and support young

neuroscientists. We need further endowment for “seed money” to initiate novel research approaches and to provide stability for long-term research. With these funds in hand, the Montreal Neurological Institute and Hospital will be in an excellent position for the 1980’s. With updated resources, an enthusiastic and dedicated staff, and ongoing financial support, the Neuro will continue its role among the world’s leading centres for treatment, research, and teaching in the mysterious disorders related to the brain and mind.

Reorganization — Hospital

Dr. Penfield and Dr. William Cone planned the MNI as a combined hospital and research institute to provide specialized treatment for neurological disorders, and to carry out advanced research and training in the understanding of the nervous system. At the same time, the institute served as a focal point to establish McGill’s first integrated teaching program at the undergraduate and post-graduate levels in the basic neurosciences and clinical subjects related to neurology and neurosurgery.

A significant reorganization took place in 1963, when, to meet the requirements of provincial legislation, the Montreal Neurological Hospital was established by charter, with its own Board of the Corporation and Board of Management. This change was readily effected because, as stipulated by the original deed of gift of the Rockefeller Foundation, the institute budget had been kept separate from that of the hospital. In 1970, under a more detailed act and subsequent regulations governing health and social services in Quebec, the hospital structure was further identified.

During this past year a Neuro-McGill ad hoc committee set up by the principal at the request of Vice-Principal (Administration) Dr. Leo Yaffe and myself completed negotiations to transfer remaining hospital accounting procedures from the university offices to the hospital. This hospital, like the other McGill teaching hospitals, has always retained its close relationship to teaching and research in the university. All professional members of the hospital, for example, must have a university appointment, and members of the university who wish to work actively within the hospital require, in turn, a hospital appointment.

The Montreal Neurological Hospital operates within the detailed regulations laid down by the Act Respecting Health Services and Social Services of the Province of Quebec. For the fiscal year ending March 31, 1980, the budget totalled just over \$11 million. Our residual deficit can be attributed largely to the additional operating costs incurred by the new Penfield Pavilion. This will be reduced by a supplementary budget request submitted to the Ministry by the Board of Directors in 1977 and approved by the Conseil du

Trésor. If we had also been granted indexation for our real increases in costs over the past three years, our deficit would be non-existent. But with only a 5 per cent increment in its budget allotment, and inflationary rates of double that amount, no organization, private or governmental, could survive without a deficit in spite of the most stringent cost controls. While coping with the inflationary spiral, we must at the same time carry out our mandate — to maintain high standards of medical and nursing care consistent with Canadian hospital practice, and to ensure by short- and long-term planning of staff and facilities a continuity as an internationally recognized neurological centre.

Reorganization — Institute

Since 1934, the Montreal Neurological Institute has had three successive directors who, with the help of the senior scientific and medical staff, administered the affairs of the hospital and institute. Until 1977, each director was also chairman of McGill's department of neurology and neurosurgery; as such, he was responsible for the teaching program at the undergraduate and postgraduate levels in McGill's four teaching hospitals. Three years ago, on the recommendation of Principal Dr. Robert Bell and with the approval of the Board of Governors, the department's activities were more clearly identified by the appointment of a separate chairman. The first, Dr. Preston Robb, was followed in succession by Dr. Joseph Martin and Dr. Donald Baxter. With this separation of powers, the departmental budget became the responsibility of the chairman, who reported directly to the dean of Medicine. It should be pointed out that up to 1977, this budget consisted entirely of funds that Dr. Rasmussen had negotiated in 1968 from the Ministry of Social Affairs for geographic full-time clinical teaching staff of the Montreal Neurological Hospital. In 1969-70 these funds were transferred to the Ministry of Education and then to the university, where they were set up as a budget within the Faculty of Medicine, still earmarked for clinical teachers in neurology, neurosurgery, and neuroanaesthesia at the Montreal Neurological Hospital.

The mandate of the institute, and its relationship to the two other organizations — the hospital, and the university teaching department — has now been clearly defined. The institute funds remain, as from the beginning, the responsibility of the director, who reports to the principal and the Board of Governors. In 1972 we formed a neurosciences advisory council of distinguished educators and scientists who willingly accepted my invitation to help the director and the scientific staff plan long-range scientific policy. In 1974 we initiated an MNI Advisory Board made up of senior university members from the Faculties of Medicine, Graduate Studies, and the administration, along with physicians and scientists elected by the

staff of the institute, and an outside representative nominated by the director. Under the auspices of this board a formal list of scientific staff of the institute was drawn up. Associate directors were appointed to cover the areas of neurology, neurosurgery, neurosciences, finance, development, publications, and administration.

Last year a strong committee was established for our development campaign with Colin Webster as honorary president and Taylor Kennedy as president. Joy Shannon, formerly our hospital administrator, was appointed coordinator of this campaign and associate director (development) of the institute.

Dr. Victoria Lees, who came to us from the editorship of the *McGill News* to reorganize institute publication procedures, has been responsible at the same time for public relations. She brought much order and creativity into an area critical for both our scientific and public image.

With the help of Norman Bleakley, associate director (finance), the institute budgeting operations handled by McGill were consolidated in order to provide better cost control. A happy result of this is reflected in our statement for the fiscal year 1979-80: six of the eight institute departments remained within their estimated operating budgets. This was no mean feat in light of severe escalation in costs of scientific and medical supplies, as well as of research salary levels.

Penfield Day

The highlight of the institute year, the annual reporting by the research staff, took place on a day in October that we designated as Penfield Day. By something of a *tour de force*, we managed to have every member of the research staff summarize his or her individual research projects. We also had the pleasure of hearing from the neurosciences group of the Montreal General Hospital Research Institute. This exercise provided an overall glimpse of the active investigative program going on within our orbit. The high point of the day was the 46th Hughlings Jackson Lecture given by Dr. Donald B. Tower, director of the National Institute for Neurological and Communicative Disorders and Stroke at Bethesda, Maryland. His talk was titled "Prospects and Challenges for Neurology and the Neurosciences." Dr. Tower studied neurosurgery with Dr. Penfield and Dr. Cone from 1947-1949. Tempted by Dr. K.A.C. Elliott into a career in neurochemistry, he became an outstanding authority in the field before taking on the directorship of the world's largest neurosciences research organization, a post he has filled with great distinction and inspiring leadership. As we go to press we have just learned of Dr. Tower's retirement from this directorship. We hope he will continue as a consultant on our Neurosciences Advisory Council, and

that he and Mrs. Tower (formerly a nurse on 2S) will enjoy the health and happiness they richly deserve.

National Film Board of Canada

We are now collaborating on no less than three projects with the National Film Board of Canada. First, Colin Lowe, the distinguished cinematographer who was a partner in the creation of "Labyrinth" at Man and His World, is planning a scientific film based on the exciting new brain imaging technique provided by our PET project. A second team, from the western regional office of the NFB, is filming a biography of Dr. Wilder Penfield produced by Michael Scott and directed by Robert Lower. The institute staff have been most active in this project and their involvement will continue until the final version of the film is released in September. In a third project, our PET scientific team is collaborating closely with animators at the NFB in Montreal to devise three-dimensional techniques for the display of brain images produced by the PET system. We expect that this partnership will provide significant advances in handling masses of visual data derived from research.

Envoi

Dr. Penfield aptly named his autobiography *No Man Alone* and the truth of the concept is everywhere evident in the activities of the hospital and institute. We have had continuing support from the staff in the Ministry of Social Affairs, though we never cease to be amazed at the quantities of forms, questionnaires, data, and correspondence which they are able to generate. Our expansion program was heavily supported by the Health Resources Fund of the Ministry of Health and Welfare of Canada, where the institute and hospital's expansion and modernization were recognized as a project of "national interest."

This annual reporting gives me the opportunity to thank all the members of staff for their excellent and enthusiastic work in the face of serious interruptions due to the building and renovation program, and to the constraints on hospital and research funds. As in past years, we are pleased to express our gratitude for continuing help and support from many friends and patients whose understanding and generosity are indispensable in maintaining the institute's and hospital's position of leadership in teaching, research, and treatment. We have had the full cooperation of the administrative and medical staff of the Royal Victoria Hospital, of Dean Samuel Freedman and his associates in the Faculty of Medicine, of Vice-Principals Leo Yaffe, Walter Hitschfeld and John Armour, and of Principal David Johnston. Donations to our development campaign often arrive with

heartwarming letters from friends in all parts of the world. To that wide community of MNI nurses, fellows, physicians, and scientists, and especially to our ever-thoughtful patients and their relatives, we extend our deep appreciation. May I say to all, “We thank you; do keep the Neuro in mind.”

— William Feindel, MD

Hospital Reports

April 1, 1979 — March 31, 1980



The Montreal Neurological Hospital has one of the finest intensive-care units in the country. Overleaf, head nurse Barbara Petrin updates a patient's chart.

Neurology

During 1979-80 the three neurology in-patient services and clinics continued to function effectively with case loads similar to those of recent years. One of the in-patient services, under Dr. Frederick Andermann, has undergone reorganization; the majority of patients now admitted have seizure problems. We hope in the next year to increase the clinical strength of this unique teaching service as well as its liaison with clinical neurophysiology, neuropsychology, pharmacology, and psychiatry.

For a variety of reasons, the number of neurology residents assigned to the Montreal Neurological Hospital during the past year was smaller than usual, and this has meant that residents carried heavy service loads. They rose to the occasion with efficiency, hard work, and good humour. The attending staff is most grateful to them. Fortunately, the problem of resident understaffing should not recur during 1980-81. During this coming year we plan to make significant changes in the neurology residency program. We hope to improve the quality of training, and to encourage residents who finish their clinical years to spend further time exploring one of the neurosciences in greater depth. Medical residents from the Royal Victoria and other hospitals have rotated regularly through our teaching services. We have learned much from them, and have convinced more than a few that neurology is an exciting career choice.

A committee headed by Dr. Donald Lawrence has thoroughly reviewed our undergraduate teaching activities this year. Within the hospital, each neurological service has usually been assigned one or two students taking electives or options in neurology. The majority of these are from McGill but there remain a gratifying number of undergraduates from American and European schools who choose to spend elective periods here.

The neurologists have met monthly during the year to help ensure the proper functioning of our in-patient services, undergraduate and postgraduate teaching activities, and office practices. We have taken concrete steps towards forming a group practice which we believe will increase the economy and efficiency of our out-patient work, the demands for which appear to be increasing steadily. We look forward to new office space on the first floor, to the development of the neurodiagnostic centre, and to integration of the so-called "clinic patient" into our regular office practices. Such changes may well alter the existing work profiles of both staff and secretaries. We owe special thanks to our secretaries for their help and cooperation during this period of change.

We were fortunate to have Dr. Antoine Hakim join the neurological staff in July 1979, and we welcomed Dr. George Elleker a year later. Unfortunately, Dr. Andrew Eisen left us in September to move to Vancouver. Dr. Eisen was

with the hospital as resident and staff man for more than fifteen years. His contribution to the hospital and the institute was outstanding. He built the foremost laboratory of electromyography in the country, established an enviable personal reputation as a clinical neurophysiologist and investigator, and shared his knowledge and skills with many trainees who now head electromyography laboratories in other centres. He takes with him the best wishes of all his colleagues here for many more years of productive work in his new setting.

Finally, on behalf of all the neurologists, I would like to thank the nurses on each of the floors, the undiscourageable social service workers, and our colleagues in neurosurgery and the diagnostic laboratories for helping to make our work in the past year so much easier and more pleasant.

— Donald Baxter, MD
Neurologist-in-chief

Neurosurgery

At last we did it. We moved into our new operating room suite. The three theatres are roomy and bright, and two of them are equipped with sophisticated x-ray equipment that will help us greatly in the surgery of pituitary tumors, vascular lesions, and stereotactic procedures. Everyone is happy with the rooms, and we look forward to the renovation of Theatre I, which will give us a total of four new operating rooms in a compact, well-integrated suite.

From April 1, 1979 to March 31, 1980 we carried out 617 major surgical procedures. This figure is similar to the 1977-78 total, but lower than last year's. We performed a record 82 operations for epilepsy, but treated fewer pituitary tumors, aneurysms, brain tumors, and endarterectomies. The popularity of bromocriptine for medical treatment of prolactin-secreting tumors, and the departure last year of two of our surgeons, Dr. John Little and Dr. Robert Hansebout, no doubt account for these differences in surgical activity profiles.

This year, there were only three post-operative infections, a rate of 0.5 per cent. Bravo, Miss Isaacs.

Direct admissions to the neurosurgical services were down slightly to 895. However, there are now only two senior residents and two services, and one service admitted 534 of these patients. If one adds to these figures the number of transfers from neurology and the Royal Victoria Hospital, one eventually arrives at a large number of discharges and therefore a large number of discharge summaries to be dictated by the residents. A formidable task. Dr. Henry Milam, Dr. José Montes (who was recently given the Wilder Penfield Award of Excellence) and, in the latter part of the year, Dr. Burke Dial and Dr. Mohammad Maleki all fought valiant, though not always successful battles to keep up with this flood of paper work, striving at the same time to be present in the operating rooms and to keep abreast of what was happening on the wards.

Our neurosurgical services have clearly been short of manpower. Although our training program is approved by the Royal College and the American Board for 12 positions, we were granted only 5 funded posts last year, and 7 for the year to come. I sincerely hope that the McGill post-graduate education committee will help us to obtain the minimum 10 residents recommended by the Royal College survey team.

I should like to take this opportunity to welcome to our neurosurgical staff Dr. John D. Wells. Born in Long Beach, California, he studied at the Tulane University Medical School in Louisiana. Upon completion of his residency in neurosurgery at the MNI in 1979, he was given the Penfield

Award of Excellence. Dr. Wells also received the McKenzie Award of the Canadian Neurosurgical Society for experimental work on the effect of hypothermia on spinal cord trauma, carried out under the direction of Dr. Robert Hansebout. Now a Canadian citizen, he holds the certificate of specialist in neurosurgery from the Professional Corporation of Physicians of Quebec, and has just been appointed assistant professor in the department of neurology and neurosurgery.

I understand Dr. Wells is an expert ambulance driver, has worked as an emergency room technician, and has even been a scrub nurse at one time. Some day we must ask him to play for us the string quartet that earned him the Saint Cecilia Prize in Composition.

Another young man has also joined our ranks in the department of anesthesia. Dr. David Malcolm Thomas was born in England, of a Canadian mother. He is a graduate of the Welsh National School of Medicine, and has studied anesthesiology in Cardiff, Liverpool, and and at the Atkinson-Morly Hospital in London. Dr. Thomas is a fellow of the faculty of anesthesia of the Royal College of Surgeons in England, and is now assistant professor of anesthesia at McGill. We are glad to have him with us. We cannot have a strong department of neurosurgery without an equally strong department of neuroanesthesia.

Each year a certain note of sadness filters into my report as I tell of the retirement or departure of masters or colleagues. I fear this year is no different. Dr. Theodore Rasmussen has announced his desire to retire from the active practice of neurosurgery this summer. He has always been so vigorous and busy that although we all knew this day would come, we cannot believe it has dawned so soon. His absence from the operating room will create an emptiness that will be difficult to fill. Fortunately he will not be going too far. He will continue his review of the 2,500 epileptics operated upon in this institute since its opening. Since his office is only a few steps from the observation gallery of the new operating rooms, we will make sure that he is given a key so that we can call him in often for advice and support.

Nursing

Nursing at the Neuro is always interesting because of the continuing process of change. In the last year we moved into a new intensive care unit, a new ward (3S), and a new operating room, all in the Penfield Pavilion. These moves have resulted in long-sought improvements in patient care. We look forward to the further improvements in central supply, and throughout the Rockefeller and McConnell Wings that will result from Phase IV planning. There have been staff changes as well. Anne Johnston, day coordinator, and Lillian McAuley, night coordinator, both retired this year. Between them they provided seventy-five years of service to this hospital. We wish them a continuing enjoyable retirement. Linda Maruska has taken over the position of day coordinator, and once again we have managed to stay within the allotted staffing hours. This enormous achievement on the part of our head nurses and coordinators helps us to keep within our budget. Abdool Saumtally and Catherine Negus have joined the evening and night supervisory staff.

Faced with the restrictions imposed by budget, and the amount of learning now required of our staff as a result of new technology, it is an accomplishment for nurses to provide even minimal care. I am happy to report that our nursing audits show a documented improvement in meeting patients' needs. In the past year the nurses have also taken on much of the dressing work and catheter care.

The multidisciplinary committees of OR-ICU, spinal trauma, infection control, and pharmacy continue their work. The tube feeding study committee searches for ways to improve nourishment of patients who cannot eat. The nursing education committee assesses learning needs and evaluates the programs provided. The nursing practice committee this year set up the standards and rationale for effective care of patients with spinal trauma.

We are making advances in the area of patient assessment. Our workshop in March, "Setting Standards for Assessment of Neuro Patients," was held to honour the memory of Helena Kryk, former assistant director of nursing education. Leader of the group was Mona Callin, director of the educational program in primary care for nurses at McMaster University. Dr. Michel Aubé, neurologist, and Verna Bound, our director of Social Work, provided information as a basis for six afternoon workshops. One hundred and twenty nurses from hospitals throughout Montreal participated.

We are extremely grateful to the Women's Auxiliary of the Royal Victoria Hospital for providing equipment we cannot buy ourselves. Ward 4-S benefits from a medication cart. We are also purchasing slides to accompany our teaching module, "Learning to care for your own back."

McGill nursing students study with us in their basic program. Linda Robbins has been appointed lecturer, and I have been appointed assistant professor in the McGill School of Nursing. Our own post-basic course in neurological and neurosurgical nursing continues to prosper. Within the last year, eighteen nurses from six countries obtained their post-basic certificates here. It is with great satisfaction that I report that Quebec's Ministry of Education has accepted the transfer of our post-basic curriculum from the Ministry of Social Affairs to its own jurisdiction. This course, which Ministry representatives described as "a jewel not to be lost" will thus be assured of permanent support, and will continue within our hospital milieu.

— Caroline Robertson, BN
Director of Nursing

Council of Physicians

The Council of Physicians and Dentists in a hospital centre is responsible for the regulation of its medical activities, with the ultimate aim of optimizing patient care.

This year was particularly busy for the Council of Physicians at the Montreal Neurological Hospital, because it followed an inspection by both the Corporation Professionnelle des Médecins du Québec and the Canadian Association of Hospital Accreditation. The organizations made a host of recommendations which we have set about implementing. Following their advice, we have established a credentials committee and a clinical investigations and research review committee. We have adopted a new format for the medical evaluation rounds, finalized and distributed the hospital by-laws, and created departmental operational and organizational by-laws. Closer cooperation with our sister institution, the Royal Victorial Hospital, was encouraged by the regular attendance of the chairman of the MNH executive committee at meetings of the corresponding body at the RVH.

The medical evaluation committee has intensified its activities by regular review of selected records in order to improve the documentation of our professional activities. A thorough analysis of the investigation and management of patients who died in our hospital is made once a month before the entire medical staff, with extensive analysis and documentation of pathological features. The medical evaluation committee has also dealt with problems that were brought to its attention concerning the adequacy of medical care.

The corporation requested the reorganization of some aspects of patients' records. The major backlog of uncompleted discharge summaries on certain services continued to be of concern.

The committee on admissions and stay designed a new form for patient's admission that has considerably helped the admitting office, the doctors, and the patients. We hope it will also help reduce the number of long-stay patients in the hospital.

The nursing liaison committee dealt with many administrative matters concerning day-to-day patient care. It recommended a modification in the organization of daily entries by professionals.

The OR-ICU committee had the task of helping with the logistics of the new operating room facilities and intensive care unit, as well as of the for the coming renovations in the OR suite.

The out-patient committee has examined the possibilities of improving our

out-patient care in the general clinics, possibly by a gradual transfer of the general clinic patients to expanded office facilities at the MNH. The increasing need for an ambulatory day-care centre at the MNH was repeatedly emphasized.

The clinical investigation and research review committee has been reorganised and given the responsibility of examining all clinical research project proposals at the MNH and the MNI.

The infection control, pharmacology, and library committees have also discharged many important responsibilities during the past year.

Under the direction of the new president, Dr. Ivan Woods, the council can look forward to further achievements during the coming years.

— George Karpati, MD
President

Administration

It is indeed a pleasure and an honour to report on the administrative activities of the Montreal Neurological Hospital for the period between October 1, 1979 (the date of my appointment to the hospital) and March 31, 1980. During these months I have studied the history and existing work-patterns of the hospital with the aim of understanding the present structure. I hope to adapt to the patterns where possible, and to suggest changes where needed. With the collaboration of Gean-yuan Pwu, director of finance, and Paul Dussault, director of personnel, payroll duties have been transferred from personnel to the finance department. Booking of all conference rooms, as well as accommodation for residents and medical visitors, have been centralized. Catering has been transferred from the housekeeping to the food service department.

A few years ago, the Board of Directors approved an extensive renovation program for the hospital. I have spent many hours with our director Dr. Feindel, our co-ordinator of construction Harry Marpole, several department heads, and representatives from McGill's Physical Plant to organize what is referred to as "Phase IV." As the original \$8.5 million approved in 1975 was not sufficient to complete our project, we had to revise working documents, prepare drawings, itemize financial needs, and submit them to the Ministry of Social Affairs to obtain a supplementary decree. As of March 31, 1980 we had not officially received the decree, but were informed that since the Minister of Social Affairs had already given his approval, it should be expected to pass the Treasury Board.

Our operation for the 1979-80 fiscal year concluded with a deficit of over one quarter of a million dollars, largely due to additional costs of operating the Penfield Pavilion. I can assure you that each chief of service and each head of clinical department has exercised the strictest control possible over expenditures.

After analysing the administrative structure of the hospital, we have set a number of objectives for 1980-81. These include the creation of a word processing centre in Medical Records; centralisation of medical dictation in the hospital; restructuring of our business office so that all phases of normal accounting functions will be performed within the hospital, and reorganisation of our purchasing department so that we will manage
ies at McGill.

Among our long-term objectives is the organization of a group of volunteers dedicated to the objectives of this hospital. We are most thankful to the Auxiliary of the Royal Victoria Hospital, which has been doing excellent work supervising our coffee shop, and supporting generously our critical needs for special clinical equipment, teaching aids, and urgent social service

work. We believe, however, that it would be most advantageous for our patients if we could have our own group of dedicated volunteers at the Neuro, and we are confident that such a group will become active during the next year.

This report would not be complete without a few words of thanks to those who have made my work interesting and rewarding. I offer my gratitude to all our chiefs of services and heads of clinical departments for their help and support. I also wish to thank our director-general, Dr. William Feindel, who, with his confidence and advice, is a constant source of new ideas.

— Roland Saint-Arnaud, MHA
Director of Administrative Services

Finance

Our total expenditure for the fiscal year April 1, 1979-March 31, 1980 was \$11,269,237. Of this amount 70.25 per cent was spent on salaries, 4.31 per cent on fringe benefits, 2.67 per cent on medical and surgical supplies, 1.86 per cent on drugs, 7.64 per cent on purchased services, 1.77 per cent on repairs, and 11 per cent on other supplies.

Revenue during the year totalled \$10,977,893. Of this amount 72.34 per cent was received from the Ministry of Social Affairs, 21.83 per cent from in-patients, 0.66 per cent from out-patients, 0.44 per cent from "other revenues," and 4.73 per cent from the Régie de l'assurance maladie du Québec for salaries of interns and residents. We ended the year with a deficit of \$291,344. We are, however, still awaiting approval from the Ministry of Social Affairs for our supplementary budget to cover the cost of operating the new Penfield Pavilion.

During the year, 2,056 patients were admitted, giving us a total of 44,105 patient-days. We treated 2,041 patients. The total days' stay was 42,093, for an average stay of 19.8 days. The hospital was occupied at 89.26 per cent capacity, which is 1.82 per cent higher than last year.

The business office underwent many changes during the year. We accepted responsibility for the payroll, and we look forward to a new automatic accounting system which will be implemented during the next fiscal year.

In the year to come, automation will affect many other areas of the hospital as well. This step will require the cooperation and understanding of all.

—Gean-yuan Pwu, BCom
Director of Finance

Social Work

“There are still many gaps in resources, and too often we find ourselves in a position of helping patients accept the limitations which lack of resources imposes.” This line appeared in this department’s annual report of twenty years past. *Plus ça change...* The lack of suitable extended care facilities — in particular for people who cannot be cared for at home — remains. Is this persistent need an inherent social problem, like poverty, or is there a solution? Governments and social agencies all over North America have devoted much time (and perhaps less money) to this issue. The Montreal Regional Council is attempting to alleviate the problem through coordination of resources and centralisation of information. This new scheme will not solve the problem in terms of creating new “beds” but should lead to more accurate information on the types of care required, and the setting of priorities for those beds that do become available. It is doubtful, however, whether there will be any positive impact on reducing the number of our own long-stay patients.

Discharge planning for long-stay patients has become a primary preoccupation of our department. It is frustrating for medical staff to recognize that we continue to look after chronic patients for several months and even years, while acute neurological problems wait precariously for admission. Because part of the social work mandate is discharge planning, we are often made to feel responsible for this frustration. Actually, the problem begins on admission. The committee on stay has been most active this year, resulting in more global involvement of the hospital staff in the search for solutions to our problem of long-stay patients.

This year we received 508 new in-patient referrals, compared to 261 last year. We served 1,260 out-patients and 2,070 members of families. We had 5,365 interviews in 1978-79, and 8,066 in 1979-80. Our time study showed that 64 per cent of our time was spent on patient-related activity, 23 per cent on education, research, and administrative procedures, and 13 per cent on lunch and breaks.

Two factors brought about the increases in direct service: first, an additional post in our intensive care unit; second, the reorganization of the neurology service with the social worker becoming an important member of the team. This reorganization led to case review, exchange of patient information, and more comprehensive planning. The social worker identifies social problems sometimes overlooked in the urgency of the medical condition.

We have continued our community involvement through the Multiple Sclerosis Association, Epilepsy Association, and CLSC Guy Métro. My own professional activity in the community has increased considerably this year, in particular with the Ville Marie Social Service Centre Board committees,

and with the Canadian Association of Social Work Administrators in Health Facilities. This has given me valuable experience that can be translated into improved patient programs and care.

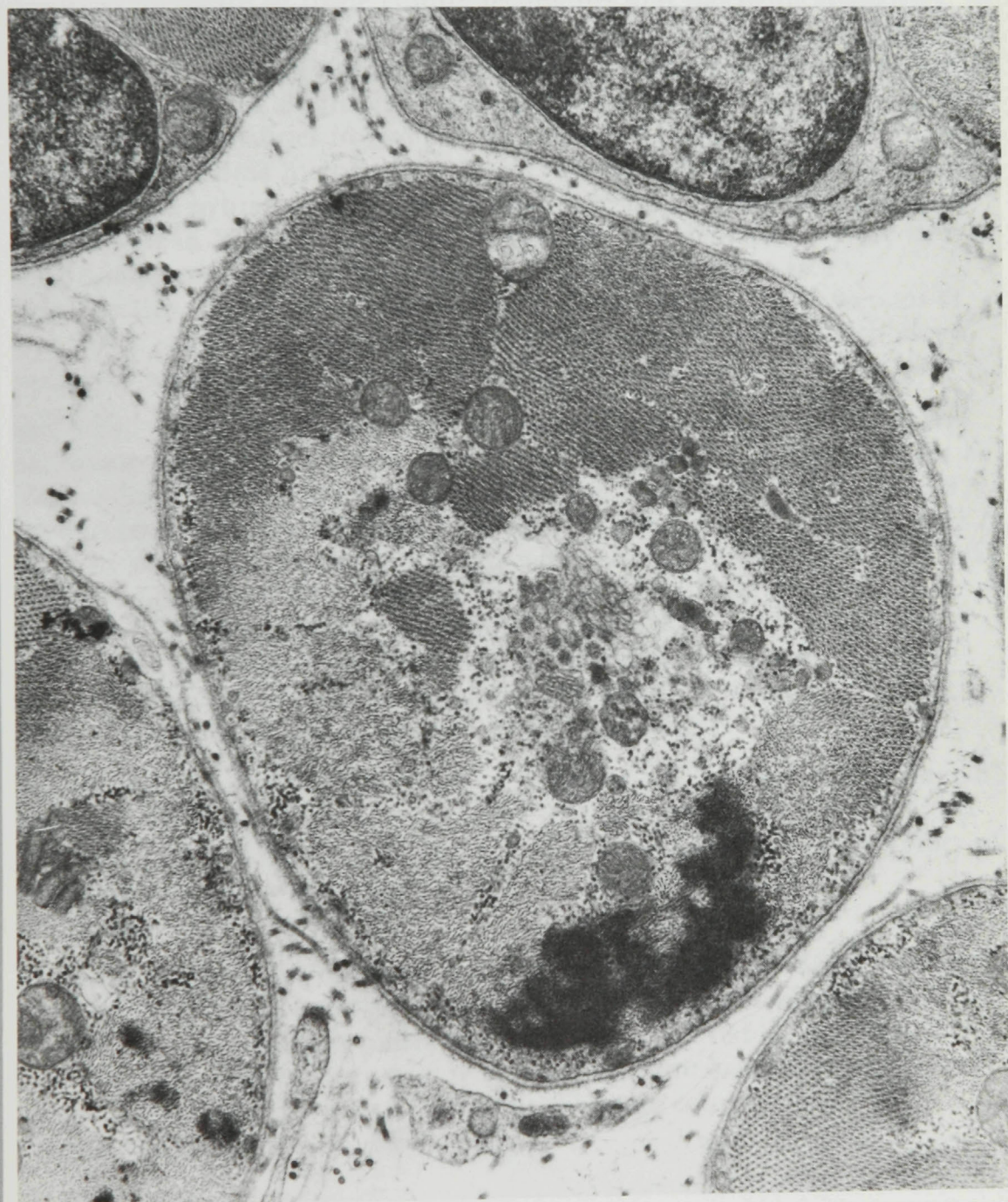
We have two research projects under way — a depth-electrode seizure patient study, and a crisis-intervention study in the ICU. Our education continues — workers have attended courses and conferences on group therapy, couple therapy, sexual counselling for the handicapped, and the International Conference on Epilepsy. We continue to supervise the training of students from the McGill School of Social Work and to teach throughout the hospital. Formal presentations were made at conferences on crisis intervention and psycho-social assessments.

Although we have been unable to obtain a volunteer coordinator position in the hospital, 56 McGill student volunteers gave many hours to Neuro patients, under direct supervision of our department.

— Verna Bound, MSW
Director

Institute Research Reports

August 31, 1979 — September 1, 1980



Electroencephalography and Clinical Neurophysiology

In this laboratory research and diagnostic function are interdependent: clinical problems provide impetus for research, while the fruits of that research improve our diagnostic acumen and clinical management. One of our primary interests is epilepsy. We put much effort into the detailed diagnostic work-up of epileptic patients, particularly of those whose seizures are medically intractable. In these cases we attempt to establish an accurate localizing diagnosis which may render the patient's problem amenable to surgical therapy.

Intensive monitoring of the EEG in conjunction with audio-video monitoring of the patient's seizures has become an indispensable tool in our diagnostic work-up.

Thanks to the ingenuity of John Ives and Dr. Jean Gotman we are now able, with the help of a new PDP-11/60 computer, to monitor from almost anywhere in the hospital the sixteen-channel EEGs of two patients simultaneously. We are about to extend the capacity of the system to thirty-two channels when monitoring the EEGs of patients with stereotaxically implanted depth electrodes.

Computer monitoring has also been used in patients with medically intractable seizures in whom the extracerebral EEG investigations proved incapable of locating the seizure focus with the desired degree of accuracy. Most of these patients had depth electrodes stereotaxically implanted in both temporal lobes. This provided us with the opportunity to study some of the more intricate psychical phenomena that accompany temporal lobe seizures or that can be evoked by electrical stimulation within the temporal lobe. We found that not only emotional responses, but also experiential illusions and hallucinations, like the feeling of familiarity or complex visual illusions, seemed to depend upon activation of limbic (as opposed to neocortical) structures of the temporal lobe. Using computer-averaged evoked potential techniques, Dr. Rachel Ochs is about to undertake a study of higher cognitive, perceptual, and emotional functions of the temporal lobe in these patients.

In collaboration with Dr. Lucas Yamamoto's group, we have also begun to correlate EEG localization of epileptic foci with local changes in regional blood flow detectable by positron emission tomography. In the majority of cases, preliminary results show a fairly good agreement between the EEG localization and an area of increased cerebral blood flow shown on the interictal positron emission tomogram.

Dr. Jean Gotman has continued to develop means by which computer technology can help the electroencephalographer identify the site of onset of

a patient's seizures. We can now program the computer to detect interictal spikes and sharp waves and to produce a quantitative topographical display of the distribution of interictal epileptiform discharges. The computer can also be programmed to recognize actual seizure discharges in the EEG. This programming greatly extends the usefulness of the automatic sixteen-channel cable-telemetry monitoring system.

Other techniques developed by Dr. Gotman make it possible to filter out muscle activity digitally from a surface EEG seizure record. We can now retrieve unmistakable seizure activity from an otherwise diagnostically non-contributory ictal EEG recording. Spectral and cross-spectral analyses of ictal EEGs in cases in which the discharge appears generalized or bilateral from the start may disclose linear phase lags over several frequencies between discharges occurring on the two sides of the head. Such measures, converted into delay times, can localize the focus driving the seizure discharge to one side or the other. The accuracy of this method has been confirmed in over twenty patients as well as in an experimental model of focal epilepsy.

Dr. Luis Felipe Quesney has continued his studies on the possible involvement of dopaminergic systems in the genesis of photosensitive epilepsy. He has shown that only in the photosensitive variant of generalized corticoreticular epilepsy can a discharge be blocked temporarily by apomorphine, a dopamine agonist, this drug being ineffective in hyperventilation-induced or spontaneous spike and wave discharges.

In collaboration with Dr. Athanasios Katsarkas from the department of otorhinolaryngology of the Royal Victoria Hospital, Dr. Quesney has introduced into our laboratory a new diagnostic method, the naso-ethmoidal electrode. This electrode, which rests on the roof of the nasal cavity facing the orbitofrontal cortex, allows us to record the activity of that cortex.

Dr. Eva Andermann has continued her neurogenetic studies on focal epilepsy. It appears from her recent work that the EEG spike and wave trait is more commonly represented among first degree relatives of patients with temporal lobe seizures than among first degree relatives of patients with other focal seizure disorders.

In collaboration with Dr. Daniel Keene, Dr. Andermann has applied to a population of surgically treated epileptics a prognostic index derived from a study carried out many years ago in our laboratory by Dr. Alfredo Bengzon and collaborators. This method may prove to be a useful prognostic tool in the identification of patients suitable for surgical treatment.

— Pierre Gloor, MD

Electromyography

During the past year, the greatest change that occurred in the department of electromyography was the departure of its chief, Dr. Andrew Eisen, who resigned to become head of the electromyography section in the department of diagnostic neurophysiology at the Vancouver General Hospital.

The heavy clinical load that has been building up in this department over the previous three years has continued to increase during the past twelve months. Just over 2,000 patients were examined, representing a slight increase over the previous year's total. This increase appears to stem from two sources: first, referrals for conventional electromyography from the community as a whole, and second, requests for somatosensory cerebral evoked response studies, now a routine clinical procedure in the assessment of plexopathies, radioculopathies, and disorders of the spinal cord.

Our research in the last twelve months has centered on the development of somatosensory evoked potential techniques for assessing conduction through proximal segments of the peripheral nervous system. These segments had previously proved relatively inaccessible to conventional nerve conduction study techniques. Dr. Eisen and I were able to evoke cerebral responses after stimulation of numerous purely sensory peripheral nerves, and thereby to sample the segmental input through the plexuses and roots of multiple levels.

We have also become involved in the World Health Organization collaborative study of diabetic peripheral neuropathy. This international study will attempt to determine the natural history of diabetic polyneuropathy from both a clinical and electrophysiological point of view, with the goal of eventually establishing controlled studies of therapeutic modalities.

We have continued to develop single fibre electromyography with computerized EMG analysis as a routine paraclinical procedure. It has proved particularly valuable in increasing the sensitivity of clinical electrophysiological tests of disorders of neuromuscular transmission.

— M. George Elleker, MD

Experimental Neurophysiology

During the past year, scientific research in neurophysiology has progressed at a rapid pace on three main fronts: the mechanism of generalized epilepsy, the central nervous system control of eye and head movement, and central and peripheral aspects of somatosensory physiology.

Various aspects of feline generalized penicillin epilepsy, which can be regarded as a model of human generalized corticoreticular epilepsy, have been investigated in the past year.

Deborah Taylor demonstrated that in penicillin-induced epilepsy, cats are unable to respond to extraneous stimuli during spike and wave bursts, while their responsiveness between bursts remains unaltered. This is similar to human absence attacks.

Dr. Massimo Avoli has reinvestigated the role of the thalamus in epilepsy. Even though thalamic activity undergoes EEG changes similar to those seen in the cerebral cortex when feline generalized epilepsy develops, decorticated thalamus fails to show these changes. Conversely, the essential role of the thalamus in triggering the cortical spike and wave bursts has been confirmed in studies using thalamic spreading depression. It seems, therefore, that the thalamus triggers the cortical discharges, but secondarily, it is also affected by them. Dr. Avoli is presently studying the normal interactions between thalamus and cortex and how these are modified in response to the intramuscular injection of large amounts of penicillin.

Dr. George Kostopoulos and Dr. Avoli have studied some of the cortical electrophysiological features of this model. They have shown that the intracortical laminar profiles of spindles, recruiting responses, and spike and wave discharges are very similar. This supports our hypothesis that spike and wave discharges result from the activity of the same cortical neurons that generate spindles under normal conditions. Our hypothesis also postulates that the transformation of spindles to spike and waves is the consequence of an increased excitability of these cortical neurons. Thus, after penicillin, not only are a higher number of action potentials discharged in coincidence with each spindle wave now being transformed into the spike of the spike-and-wave complex, but also this brief period of increased action potential discharge is followed by a prolonged period of inhibition. We tentatively attributed this inhibition to a powerful activation of the recurrent intracortical inhibitory pathway. Dr. Kostopoulos and Dr. Avoli have gathered microphysiological evidence supporting the major tenets of this hypothesis.

In addition, Dr. Kostopoulos has applied microiontophoretic techniques to the study of this model. He was able to show that spike and wave discharge

is very sensitive to chemical manipulations at the single cell level. Preliminary findings suggest that the inhibition that follows upon excitation in spike and wave discharge is of the classical postsynaptic type and is probably mediated by GABA.

Dr. Luis Felipe Quesney has demonstrated that, when tested under proper conditions, abnormal photosensitivity is a common feature of feline generalized penicillin epilepsy. This abnormal photosensitivity is dependent upon a diffuse cortical hyperexcitability, rather than upon one involving the visual cortex specifically. As in humans with generalized corticoreticular epilepsy, the dopamine agonist, apomorphine, temporarily abolishes the abnormal photosensitivity, suggesting that some deficiency in dopaminergic mechanisms may be involved in the genesis of this disorder in both man and cat. Dr. Quesney is presently investigating the role that ascending dopaminergic systems in the brainstem possibly play in the feline form of this disorder.

Dr. Christian Ménini, from the Centre National de la Recherche Scientifique in Gif-sur-Yvette, France, who spent a sabbatical year with us, studied other aspects of photosensitivity in feline generalized penicillin epilepsy. He found that after penicillin injection and prior to the occurrence of spontaneous spike and wave discharge, the visual evoked potentials in cortical association areas are greatly enhanced, while those in the primary cortex are not. These features are similar to those which he had observed in the naturally photosensitive Senegalese baboon, *Papio papio*.

Using Sokoloff's deoxyglucose method, Dr. Ménini, in collaboration with Dr. Hanna Pappius and Dr. Ioannis Siatitsas, tried to determine whether regional metabolic changes can be demonstrated in cats during and after the development of generalized penicillin epilepsy. The results of this study are not yet available, since the autoradiographs have not yet been analysed. With Dr. Siatitsas and Dr. Nico van Gelder of the Université de Montréal, Dr. Ménini studied amino acid changes in the cerebral cortex of cats with feline generalized penicillin epilepsy.

Dr. Daniel Guitton has been carrying out research on central nervous system control of eye and head movement. In collaboration with Dr. Robert Douglas, he has investigated the role of the frontal eye fields and the superior colliculus in controlling the orientation of eye and head. The two researchers recorded the activity of single collicular neurons during orienting manoeuvres made by alert and unrestrained cats. In other experiments, the normal pattern of coordinated movements of the eyes and the head was modified by having the animals wear special optical devices like reversing

prisms which disrupt the normal coordination of eye and head movement. The role of the superior colliculus and the frontal eye fields in mediating the adaptive responses the animals make under such conditions was studied by examining movements evoked by microstimulation of these structures. This study of neuroplasticity in motor control is particularly vital to our understanding of how the brain adapts to motor or sensory deficits.

Dr. Robert Dykes, although a member of our department, carries out research on somatosensory physiology in the research laboratories of the department of surgery at the Royal Victoria Hospital. There he collaborates with plastic surgeons in their studies of nerve repair in humans and experimental animals. In collaboration with Dr. Julia Terzis, Dr. Dykes studied cutaneous receptor function following peripheral nerve injury. The two researchers found that about six months after nerve crush, and ten months after nerve transection, mechanoreceptors in glabrous skin once again (1) subserve single round or oval areas, providing input from only one receptor submodality, (2) have thresholds within normal limits, and (3) display dynamic response properties that are essentially normal. These data do not explain the continuous sensory deficits observed in patients after such injury.

The problem of how the body surface is represented topographically in the central nervous system was studied by Dr. Dykes in collaboration with Dr. Douglas Rasmusson. The two researchers have shown that in primary somatosensory cortex not only one, but several homunculi can be delineated, each subserving a particular submodality of the somatosensory system. The same principle applies to the dorsal column-medial lemniscal system and the thalamus. With Dr. Paul Herron, a visiting scientist from the University of Massachusetts, Dr. Dykes has begun a series of spinal cord experiments to search for segregated regions subserving different classes of receptors.

— Pierre Gloor, MD

Library

For the first time since 1954, the MNI library last year underwent a physical expansion — small, to be sure, but a step in the right direction: Room 647, assigned to the library in the fall of 1979, became the librarian's office. Later this room will also house part of the Historical Collection, now languishing in storage.

However, other problems continue to arise. The library's budget allocation for 1980-81 has not yet been received. In the past our budget formed part of the hospital's global one, but as of May 1980 it became the responsibility of the department of education. Like all other hospital libraries in the province, we do not know whether our expenses will be met in full this year.

In an attempt to cut costs, we no longer place subscriptions through an agent. All periodical subscriptions are now under the control of the Library Committee and delivery has markedly improved. However, the upward-whirling price spiral makes it necessary to trim our periodical collection: we are eliminating less frequently used material that is already held by the McGill Medical Library, and material too expensive to justify limited use. This year the price of one subscription reached US \$2,226. It is, however, a journal we must keep — the Neuro could hardly function without *Brain Research*. Currently books are purchased from the Rabinovitch Memorial Fund only — the regular budget allocation has gone to meet increased periodical costs. Yet the information explosion in the neurosciences continues....

On the positive side, the number of book purchases for the past year equalled that of 1978-1979 (123 titles), and one more gift was received than in the previous year, for a total of 135 added titles. Departmental purchases, on the other hand, dropped this year from 102 to 88, no doubt reflecting the sharp increase in costs.

The time has come for the library's needs to assume primary importance to the individuals, the institute, and the hospital it serves. If the current level of book purchasing is maintained, the Rabinovitch Memorial Fund will rapidly be depleted. We welcome gifts of current books or journals; our staff will be pleased to assess any potential gifts to avoid duplication. The Library Committee is hopeful that the institute's development campaign will be successful and that the library may share in this much-needed support.

— Marina Boski, BLS

Multiple Sclerosis Clinic and Laboratory

Multiple Sclerosis Clinic

During the past year, clinics were held on three half-days per week. A total of 650 patients were seen; 82 were new referrals. As before, the patients were interviewed by a team composed of nurse co-ordinator, social worker, and neurologists.

Dr. Yves Lapierre has contributed greatly to the care of this large number of patients. Françoise Vanderland, as nurse coordinator, gave educational lectures to twelve different community health centres in the past year. She also organized and gave a course concerning the care of MS patients to forty home aides in the local health centre of Longueuil West.

We continue to keep careful clinical records. The Kurtzke scale disability rating is given at each visit and the neurologist's notes of the patients' complaints and symptoms are included in the chart.

Over the past twenty-five years we have accumulated more than 1200 records which are a great resource for the study of the natural history of multiple sclerosis.

Clinical Research Activities

The clinic has continued to cooperate with others interested in multiple sclerosis, and has supplied clinical material to the following research projects: radio-immune assay of myelin basic protein in cerebrospinal fluid (Dr. Peter Braun); immunological studies in multiple sclerosis (Dr. Gilles Lamoureux); sensory evoked potentials in multiple sclerosis (Dr. Andrew Eisen); visual and auditory evoked potentials in multiple sclerosis (Dr. Luis Felipe Quesney); a study of eye and head movement deficits associated with internuclear ophthalmoplegia in patients with multiple sclerosis (Drs. Trevor Kirkham and Daniel Guitton); investigation of electroretinal abnormalities in multiple sclerosis (Dr. Stuart Coupland).

Multiple Sclerosis Laboratory

Dr. Peter Braun has continued to develop new techniques to measure basic myelin protein and has been diligent in supervising the clinical laboratory procedures of total protein, IGG estimations, and oligo-clonal banding in the cerebrospinal fluid of multiple sclerosis patients. During the year, 2,125 different assays were completed of which 325 were from other hospitals in the Montreal area — continuing evidence that our laboratory is a needed community resource.

— JBR Cosgrove, MD

Neuroanatomy

Since 1977 the laboratory of neuroanatomy has grown from one staff member to four; an active and varied research program now complements the heretofore predominant emphasis on teaching. Our major contribution to teaching continues to be the CNS course for medical undergraduates. In future, our enlarged staff will make possible an increase in teaching at the graduate level.

The most notable development during the past year was the addition of Dr. Alain Beaudet to the staff, with a joint appointment in the departments of anatomy and neurology and neurosurgery. Dr. Beaudet obtained his medical degree and his PhD in neurological sciences from the Université de Montréal; from 1977 to 1980 he was engaged in postdoctoral work in Paris and Zurich. His doctoral thesis, based upon electron microscopic radioautography, dealt with the distribution of serotonin nerve terminals in the forebrain. In his early postdoctoral work he studied the plasticity of serotonin nerve terminals in the cerebellum of normal and irradiated rats; he plans to continue this research by studying the development of serotonin terminals in normal newborn rats. More recently, he has used a tritiated synthetic analogue of met-enkephalin to label opiate receptor sites in the rat central nervous system. The reliability of the method has yet to be confirmed, but when this is done it will be possible to determine precise localization of opiate receptors in such structures as the locus coeruleus, striatum, and substantia gelatinosa. More generally, the method should provide further information concerning the morphological substrate of chemical transmission. Finally, in collaboration with Dr. V.M. Pickel of Cornell, Dr. Beaudet is combining the techniques of radioautography and immunocytochemistry to study at an electron microscopic level the interaction of aminergic and peptidergic neurons in the central nervous system.

Dr. Barbara Jones has made progress in all three areas of her investigation into the sleep-waking cycle. In collaboration with graduate student Lee Friedman she has developed a computer program for the analysis of the electroencephalographic and electromyographic parameters of sleep. This method of analysis has enabled her to show that lesions within any part of the bulbar tegmentum disrupt the coordinated change in EEG activity and the alternation of muscle tone characteristic of the sleep cycle. In addition, she has shown that the motor inhibition, activated EEG, and rapid eye movements that characterize paradoxical sleep are entirely eliminated by large bilateral lesions in the pontine tegmentum. In order to investigate the anatomical substrate of the alterations in muscle tone, Dr. Jones is also studying the axonal projections of neurons in the pontine tegmentum by

the method of anterograde transport of radiolabelled protein. Preliminary results show that reticulo-reticular and reticulospinal projections are much more specifically organized than hitherto recognized. Dr. Jones is being assisted in these studies by Dr. Yang Tian-zhu, an anatomist from the Hopei Medical College and a visiting scientist in the China-Canada Scholarship Programme. Previously, Dr. Jones demonstrated that catecholamine neurons located in and around the locus coeruleus exert a modulatory influence on the sleep-waking cycle. Using the histofluorescence technique, she has extended this work by determining the localization and projection fields of these neurons in kittens following discrete injections of 6-OH dopamine. In addition, in order to assess the potential role of these neurons in regulating cerebral circulation, and thereby possibly contributing to arousal mechanisms, she is studying the distribution of catecholamine axons and terminals in cerebral blood vessels.

Dr. Serge Gauthier carries out research more directly related to clinical problems. As a neurologist he is particularly interested in movement disorders, and in collaboration with other researchers he is obtaining CSF from patients with and without movement disorders in order to study the metabolism of CNS transmitters. Preliminary results show that serotonin turnover is normal in patients with complex partial epilepsy, but reduced in patients with palatal myoclonus, and that tryptamine metabolism is greater in man than rat and more responsive than serotonin to oral tryptophan. It has been shown that patients with Alzheimer's disease have a deficiency of the transmitter acetylcholine in areas of the cerebral cortex that are particularly concerned with memory. Lecithin is a precursor of this transmitter than can be taken orally. Dr. Gauthier has taken part in a double blind study of the efficacy of this substance in patients with this disorder. Unfortunately, results have been disappointing. In other studies, Dr. Gauthier continues his investigation of the cerebrospinal autonomic pathways concerned with the regulation of the adrenal medulla in the stress response, and he is now endeavouring to relate this work to the autonomic dysfunction found in patients with Parkinson's disease.

— Donald Lawrence, MD

Neuro-anesthesiology

Clinical Activities

Construction in the hospital has seriously affected the clinical activities of this department. For many months at a time, while contending with innumerable problems in the new operating rooms, we have also been separated from our main area of work. As a result of the construction activities, operating rooms, offices, laboratories, examining and consulting rooms have been scattered all over the hospital. Since the situation is likely to continue for many months, we must resign ourselves to continued disruption for some time.

Research Activities

Research activities in the department of anesthesiology have centred around three specific areas. First, clinical problems related to day-to-day activities have provided the material for setting up a protocol for treatment of head injuries. Because of inherent limitations of this study, conclusions cannot be drawn for many years. Nevertheless, the project is of major interest to patients and physicians both.

Second, a double-blind project evaluated the efficacy of a new non-steroidal and non-narcotic analgetic drug, Zomepirac, in the relief of post-operative pain. Results have shown the new compound to be a good alternative to codeine in this condition.

Finally, one of our anesthesiologists has been studying muscle fatigue as affected by various drugs and conditions. Animal studies and human investigations are presently under way.

— Davy Trop, MD

Neurochemistry

Donner Laboratory of Experimental Neurochemistry

In the past year researchers in the department of neurochemistry have concentrated on four main areas:

1. Dr. Hanna Pappius has been studying the measurement of local cerebral glucose utilization *in vivo* following focal brain injury, vascular lesions, and the administration of steroids and other drugs.
2. Dr. Antoine Hakim has carried out research on the effects in brain of thiamine deficiency, folate deficiency, and hypercalcemia followed by the deoxyglucose method.
3. With Dr. NMK Ng Ying Kin, and in close association with Drs. Frederick Andermann, George Karpati, and Stirling Carpenter I have studied the biochemistry of a variety of inherited neurological diseases.
4. In collaboration with Uwe Goehlert, I have been examining the involvement of oxygenated derivatives of arachidonic acid (prostaglandins, thromboxanes, leukotrienes, and hydroperoxyeicosatetraenoic acids) in brain vascular and neuronal responses.

Space permits only a few specific achievements of the past year to be listed here. An autofluorescent component of the storage material in late infantile and juvenile forms of Batten disease has been isolated and purified by high performance liquid chromatography (HPLC), and its chemical properties and mass spectrum obtained. The complete structure of this component is not yet apparent, but it is almost certainly a new type of molecule.

Lipofuscinosis has been induced experimentally in rats. The chemical properties of this pigment are now being compared to age pigment and the ceroid storage pigment in Batten disease.

Screening tests using thin layer and HPLC are now routinely employed to aid in the diagnosis of a variety of storage diseases, and in many other neurological conditions of unknown etiology.

The profile of synthetic capacity of human brain for endogenous formation of various prostaglandins has been determined. We have discovered that human and rodent brain profiles are quite different. Cerebral capillaries and small arterioles have been shown to synthesize principally prostacyclin; this vasodilator, platelet antiaggregatory prostaglandin could be an important autocoid in cerebral vascular autoregulation.

The synthesis of leukotrienes in cerebral microvessels and the meninges is under examination; these compounds could have important effects on vascular permeability and the generation of pain in several inflammatory and immunologic diseases affecting the brain and meninges.

We now know that thiamine deficiency causes an initial generalized decrease in brain glucose utilization, followed by a secondary rise even though the brain thiamine levels remain low. The cause of this new finding is under study.

Steroids have been found to resolve dramatically the metabolic effects of brain trauma. At present we are examining the possibility that the metabolism of biogenic amines is involved in the effects of brain trauma and is normalized by steroids.

In the cat model of generalized epilepsy, changes in glucose utilization in the preictal period are being reviewed in collaboration with Dr. Pierre Gloor, Dr. Ioannis Siatitsas, and Dr. Christian Ménini.

For the past year I have been on sabbatical leave at the neurometabolic unit (under the direction of Dr. J.S. O'Brien), department of neurosciences, University of California at San Diego. In my absence the department was excellently directed by Dr. Pappius.

— Leonhard Wolfe, MD

Neurochemistry Clinical Laboratories

In the period from April 1, 1979 to March 31, 1980, the unit total for the neurochemistry clinical laboratories was 538,024.

While the volume of work in the seventh floor laboratory has remained constant in the last few years, the third floor total of 418,685 units represents an increase of 31 per cent over the previous year. This is the second consecutive year that this increment has occurred.

We performed 18,622 hematological determinations this year, compared to 12,040 last, 2,690 (2,712) urinalysis, and 10,608 (12,948) miscellaneous tests. As well, we procured 12,291 (11,794) blood samples for analysis in other laboratories.

The increased work load under crowded and difficult working conditions hinders, on occasion, the efficient operation of our laboratories.

— Hanna Pappius, PhD

Neurogenetics

Clinical Activities

In the past year, over 300 patients and relatives, comprising about 90 families with various hereditary neurological disorders, were seen for genetic consultation and counselling in our department. Work-ups included detailed family and pregnancy histories, various clinical and laboratory examinations in both patients and relatives for confirmation of diagnosis and/or carrier detection, and explanation of the recurrence risks to the patients and/or their relatives.

Research Activities

We continue to concentrate on two main research areas: genetics of epilepsy, including studies of pregnant epileptic women, and the teratogenic effects of anticonvulsant medication; and genetic studies of hereditary degenerative disorders in Eastern Canada. These studies have been carried out with the help of two graduate students, Linda Dansky and Richard Nagy, and two research assistants, Catherine Harvey and Susan Zeesman. However, all the studies in which we have been involved are multidisciplinary in nature, involving specialists from many clinical and laboratory fields.

In the field of genetics of epilepsy, we have carried out several studies.

(1) Genetics of focal epilepsy

The EEG data on relatives of patients operated on for focal epilepsy were re-analyzed, employing stricter electroencephalographic criteria for epileptiform EEG abnormalities, and newer methods of quantitative genetics. Relatives of patients with focal epilepsy were again found to have a higher frequency of epileptiform EEG abnormalities than control relatives, and the differences were even more significant. When we attempted to study the frequency of EEG abnormalities in relatives according to the location of the epileptiform focus in the patient, it was found that spike and wave EEG abnormalities were most frequent in relatives of patients with temporal lobe epilepsy.

(2) Prognostic index for surgical therapy of focal epilepsy

This logarithmic index was first devised in this laboratory, based on eighteen prognostic criteria developed by Bengzon et al. in 1968. In the past year, with Drs. Daniel Keene and Theodore Rasmussen, we have scored on the index 100 patients operated on after 1968 who have had at least a five-year follow-up. Preliminary results suggest that there appears to be a good correlation between the score on the prognostic index and the surgical outcome. It is to be hoped that this index can be employed in both the pre-operative workup and follow-up of patients undergoing surgical treatment for focal epilepsy.

(3) Seizures and EEG abnormalities in offspring of epileptic patients

Data were analysed from three different samples: 92 children of patients with generalized cortico-reticular epilepsy studied by Metrakos and Metrakos; 28 children of patients treated surgically for focal epilepsy; and 152 children of epileptic females with different types of epilepsy. History of seizures and EEG abnormalities were compared according to the type of epilepsy in the patient, and the sex and age of the offspring.

In our studies of the teratogenic effects of anticonvulsant medication, we have now followed over 70 epileptic women prospectively, some with pre-pregnancy counselling. Over 50 pregnancies have been followed to term with regular monitoring of plasma anticonvulsant levels during pregnancy. Of the babies born to these mothers, 19 per cent had a major congenital malformation. The most important finding to date is a significant positive correlation between maternal plasma anticonvulsant levels during pregnancy and the risk of major congenital malformations in the offspring. In addition to the teratogenic risks, we have also analyzed the seizure frequency during pregnancy and the puerperium with Dr. Guy Remillard; the variation of plasma anticonvulsant levels during pregnancy and the puerperium; and various maternal and perinatal factors, including gestational age and birth weight. These data were presented at the International Symposium on Epilepsy, Pregnancy, and the Child held in Berlin in September, 1980.

In the area of degenerative diseases, we have continued to work on Friedreich's ataxia, as part of the Quebec Collaborative Study. Endocrine studies with Dr. George Tolis have shown a high incidence of abnormal glucose tolerance in parents and siblings of patients with Friedreich's ataxia, and this finding may be related to the basic metabolic defect. HL-A studies have been carried out in these families by Dr. Ronald Guttman of the Royal Victoria Hospital, and we are attempting to correlate the glucose tolerance findings with the HL-A results. Working with Dr. André Pasternac at the Institut de Cardiologie de Montréal, we have found significantly elevated catecholamine levels in these patients.

With graduate student Richard Nagy, epidemiological and genetic studies on the autosomal recessive syndrome of agenesis of the corpus callosum with sensorimotor neuronopathy are continuing. We have now ascertained nearly 200 cases originating from Charlevoix County and the Saguenay-Lac St. Jean region of Quebec. Prenatal diagnosis of this condition by means of ultrasound may be feasible.

The Tay-Sachs heterozygote screening program in French Canadians continues. Working in collaboration with the department of biochemical genetics of the Montreal Children's Hospital, we have screened over 1200

individuals to date, and have recently tested over 400 individuals in Notre Dame du Lac, Temiscouata County, where two children have already died of this disease. Our goal is to extend the screening program, not only to the extended families of the patients, but also to high-risk areas of Quebec. Another clinic is planned in the Maniwaki region.

In the past year, we completed our studies of several new neurological syndromes, including an autosomal recessive syndrome of mental retardation, neonatal seizures, and multi-system degeneration; an autosomal dominant syndrome of hemiplegic migraine, nystagmus, and tremor; and another autosomal dominant syndrome involving hemiplegic migraine in association with hereditary hemorrhagic telangiectasia; as well as a study on startle disease, or hyperekplexia. These studies were carried out in collaboration with Drs. Benjamin Zifkin, Trevor Kirkham, Daniel Keene, and Frederick Andermann.

We have also performed detailed family studies — including neuro-ophthalmological, dermatological, EEG, and radiological examinations — in families with tuberous sclerosis, neurofibromatosis, and myotonic dystrophy. We are doing a more thorough study of myotonic dystrophy in an attempt to detect asymptomatic carriers of the gene and determine a prenatal diagnosis of this condition. This involves linkage studies of the secretor locus, which we are performing in collaboration with the department of hematology of the Royal Victoria Hospital. A collaborative study of neonatal myotonic dystrophy is also being carried out with Dr. Clarke Fraser of the department of medical genetics at the Montreal Children's Hospital.

— Eva Andermann, MD

Neuro-isotope Laboratory

During the past year, 3,464 patients were investigated in the brain scan department. We have made progress in the use of ^{77}Kr PET studies as guidance both for prognostic and therapeutic evaluation in occlusive cerebrovascular disease, and for selection of intracranial and extracranial anastomosis in occlusive cerebrovascular disease. In this study, we utilized our knowledge of the effect of carbon dioxide in experimental focal cerebral ischemia. Repeat ^{77}Kr PET studies before and after inhalation of 5 per cent carbon dioxide for fifteen minutes were performed on over fifty patients with occlusive cerebrovascular disease to identify the potential development of collateral flow into the focal ischemic area. This technique was also used to enhance the cerebral steal phenomenon in the arteriovenous malformation area.

— Lucas Yamamoto, MD

Neuromuscular Research Laboratory

Research has been active in both animal experimentation and clinical studies during the past year. We have discovered that denervation of muscle cells performed in the pre-necrotic stage of hamster dystrophy prevents muscle cell necrosis. This is the first method devised for consistent prevention of necrosis *in vivo* in an inherited muscle disease. We have also proved that the extensive central nucleation of muscle cells in this disease is related to a peculiarity of regeneration in the hamster, and is not a specific feature of the dystrophy. When regeneration was included in normal hamster muscles after ischemic necrosis, most regenerated fibres had single or multiple central nuclei that persisted for many months. Autoradiographic characterization of adrenergic receptors and cytochemical study of sympathetic nerves in muscle are now under way. We intend to test our hypothesis that in this dystrophy muscle cell necrosis is caused by a defective regulation of blood flow to muscle.

Studies of micropuncture-induced damage of muscle fibres continue. The role of calcium and complement deposition in the production of necrosis, and the mechanism of t-tubule dilatation are being investigated in this model.

At the initiative of Dr. Sergio Pena, we have adopted a cytochemical technique, using plant lectins in skeletal muscles and in peripheral nerves, to visualize and characterize carbohydrate composition of surface membrane glycoproteins. This method may provide information concerning surface membrane characteristics important in muscle cell fusion during development, regeneration, and tissue culture. It may also aid in the identification of factors that determine the recognition between motor nerves and skeletal muscles for precise target matching during reinnervation.

Experiments concerning the utilization of long chain fatty acid by skeletal muscle cells suggest that most of the molecules entering resting muscle fibres become esterified in tryglycerides. Very few are transported directly into mitochondria for immediate oxidation.

On-going clinical studies include quantitative scrutiny of muscle cell destruction in the pre-clinical stage of Duchenne dystrophy. We have also discovered that typical polyglucosan storage occurs in sweat duct cells of biopsied skins in Lafora's disease.

This laboratory has collaborated extensively with Dr. Stirling Carpenter and with Dr. Sergio Pena, especially in the tissue culture studies of human neuromuscular diseases.

— George Karpati, MD

Neuro-ophthalmology

The past year has been a particularly rewarding one for the department of neuro-ophthalmology. Local service organizations donated money towards the purchase of equipment for the establishment of a small laboratory. Grants from the Multiple Sclerosis Society of Canada and the Canadian National Institute for the Blind have enabled us to make considerable progress.

Alas, in our department as in many others in the institute, clinical and teaching commitments leave too little time for thought and research. In the past year, however, we were fortunate to have the help of clinical fellow Dr. David Nelson, neurosurgery resident Dr. Burke Dial, and a number of enthusiastic elective interns.

Recently we established normative data for electroretinography and visual evoked potentials on our newly purchased equipment. We have developed computer programs for analysis of data, and are now carrying out ocular motility research. We hope to develop a model of gaze paretic and rebound nystagmus, and to record multiple sclerosis patients with internuclear ophthalmoplegia. We have carried out a number of tests on spectacle lenses with anti-reflective coatings, and found that they improve both spatial contrast sensitivity and visual field isopter sizes. The effect of timolol maleate, a new anti-glaucoma therapy, on the kinetics of the pupil has also been examined.

Dr. Stuart Coupland studies electroretinographic abnormalities in patients with multiple sclerosis; he is currently developing spatial contrast sensitivity function studies that promise to be useful in the diagnosis of multiple sclerosis and other diseases of the eyes and the nervous system. These tests are being correlated with visual evoked potential studies.

Work is progressing on the development of computerized visual fields in which the true area of the field can be mapped, rather than the usual flat field projection. Already, we can measure in minute detail the central area of the visual field. Vastly superior to conventional perimetry, the computerized method affords us a means of examining the temporal sensitivity of the visual system.

As the establishment of our laboratory progresses, the contribution which the department of neuro-ophthalmology can make to the clinical investigation of patients will certainly increase.

— Trevor Kirkham, MD

Neuropathology

Research has been active in this department. Dr. Yvon Robitaille is investigating the high affinity uptake system in the brain for beta alanine. This substance, believed to be localized in astrocytes, has not yet been studied in pathological conditions. Using radioautography, Dr. Robitaille is monitoring the uptake of tritiated beta alanine in experimental epileptogenic cortical lesions in rats. Dr. Kathleen Villemure is studying, by electron microscopy, the many samples of pituitary adenomas removed at the Montreal Neurological Hospital since 1978.

My own research, carried out in collaboration with Drs. George Karpati and Sergio Pena, centres on the neuromuscular field. Four experimental models are under consideration. (1) We are studying the reaction of rat muscle fibres to micropuncture — *in vivo* puncture by a 5 to 10 micron filament. The fibres thus transfixed undergo segmental necrosis. The eventual demarcation of the necrotic part of the fibres from the surviving stumps is under special study. (2) We have embedded a great deal of material from dystrophic hamsters for electron microscopy. (3) We have discovered that an interesting vacuolization of muscle fibres can be produced by incubation in normal saline, *in vitro*, for thirty minutes. The vacuolization is caused by dilatation of t-tubules. (4) Electron microscopy on tissue culture has failed to show any difference between myoblasts from Duchenne patients, grown in Duchenne serum, and those grown in normal human serum. The necrosis of muscle fibres that occurs *in vivo* in Duchenne dystrophy has not been reproduced so far in tissue culture.

Many interesting muscle biopsies have been a focus for further investigation. Our studies on inflammatory myopathies have now covered adult polymyositis. This disease, from which we have sixteen biopsies, seems to be distinguishable, on pathological grounds, from dermatomyositis. The principle difference is the lack of vascular lesions in polymyositis. We are writing up two cases of a fascinating inflammatory myopathy of infancy distinguished by peculiar nuclear changes.

A unique case of proliferation of smooth muscle cells within the skeletal muscles awaits follow-up. A case of Kleine-Levin syndrome, followed by Dr. Ramsay Yassa at the Douglas Hospital, turned out to have extensive inflammatory infiltrates not in the hypothalamus, where the seat of this disease is generally believed to lie, but in the thalamus. Ours was probably the first post-mortem examination of a reasonably typical case of the disease.

We are grateful to the Medical Research Council and to the Muscular Dystrophy Association of Canada for their continued support.

— Stirling Carpenter, MD

Neuropharmacology

Clinical Activities

In the past year, our laboratory continued to provide therapeutic drug monitoring services. We test samples from patients not only in our own hospital and clinic, but also in the greater Montreal area and places as far away as Frobisher Bay and the Arctic. Specialized studies undertaken here include drug protein binding, drug interactions, and the effects of pregnancy on anti-epileptic drug levels. Recently, in collaboration with the department of neuroanesthesiology, we began to monitor pentobarbital levels in patients receiving this drug for raised intracranial pressure or status epilepticus.

Research

Our laboratory is dedicated primarily to the definition of the biochemical characteristics of focal epileptogenic cerebral cortex excised during the course of neurosurgical therapy. Human focal epilepsy has numerous etiologies but they all have in common evidence of slow maturation of the lesion prior to epileptogenesis, as well as often subtle neuropathological changes. Such minimal lesions are difficult to reproduce in animals and are best studied in man. In collaboration with Dr. André Olivier (neurosurgery), Dr. Luis Felipe Quesney (neurophysiology), Dr. Yvon Robitaille (neuropathology), and Dr. Nico van Gelder of the Université de Montréal, we have undertaken a detailed study of human epileptogenic cortex. Epileptic foci, localized by electrocorticography, are compared to the distal, surrounding, non-discharging cortex included in the therapeutic excision.

During the past year we measured the activity of three enzymes involved in the regulation of glutamic acid and GABA metabolism. At the site of active focal epileptogenic spike discharge, we found a highly significant increase in the activity of glutamic acid dehydrogenase. (This enzyme links glucose metabolism with glutamic acid production; it also subserves the need to detoxify free ammonia.) Glutamic acid decarboxylase activity was also higher in the focus. (This enzyme catalyzes the conversion of glutamic acid to GABA, an inhibitory neurotransmitter.) The activity of GABA-T, however, which regulates the degradation of GABA, was uniform in the focus and in the surrounding tissue. Our project, which includes detailed measurement of enzyme kinetics, is the first systematic study of these important enzymes in human brain.

This year our experimental studies utilized a new model of focal post-traumatic epilepsy. Injection of iron salts into rat cerebral cortex produced a mild form of focal epilepsy which we hope will be suitable for our biochemical studies now underway.

— Allan Sherwin MD

Neurophotography

This year saw the opening of two new operating rooms in the Penfield Pavilion. After a rough start, the splendid facilities for photography built into these rooms are working out well. A glass-walled photographic unit separating the two theatres, and a series of electronically controlled mirrors, permit us to take pictures of procedures without entering the OR. We reported on these facilities at the meeting of the Institute of Medical and Biological Illustration, held this year in Stirling, Scotland.

Sky-rocketing prices of silver and therefore of photographic film have forced us to begin charging the Neuro staff for materials used on their projects. After a few initial grumbles, the new procedure has gained acceptance.

For an article titled *Cerebral and fluorescein angiography of the brain — the photographic procedure*, by C. Hodge, L. Yamamoto, and W. Feindel, the Biological Photographic Association recently honoured us with the award for best journal paper of the volume.

— Charles Hodge, RBP

Neuroradiology

Clinical Activities

From a statistical point of view, the activities in neuroradiology are little different this year from last. This year we did fewer examinations, but saw more patients. The change results largely from the impact of computed tomography on plain film examinations. In many cases, for instance in cerebral vascular problems, skull x-rays are no longer taken; instead, patients undergo immediate CT scanning. This, of course, is making CT increasingly cost-effective.

Although we are managing to maintain the quality of radiological care, because of the irregular inflow of residents we now find it difficult to maintain our high teaching standards. As a result of government regulations about foreign students, our international role and responsibility in training future leaders is shrinking rapidly. Restrictive immigration measures can result only in international neglect and ignorance regarding medical activities in this province.

As a result of the high price of silver and film, and the poor response of budget officers to this problem at both the hospital and the governmental level, we may be forced to close the x-ray department for a period of time. Only under government-controlled health plans is such an eventuality even conceivable.

Research Activities

Our main research interest during the past year was the evaluation of high resolution CT in conjunction with metrizamide. We studied the spinal and intracranial subarachnoid spaces in a series of patients undergoing metrizamide myelograms for various clinical entities. With the help of a rapid image reconstruction program, sagittal and coronal sections of the spine were obtained. This proved extremely valuable in the diagnosis of spinal stenosis and hydromyelia. In a few cases, we used the technique to study the patency of the subarachnoid spaces along the optic nerves, and also to evaluate cerebral spinal fluid leak.

Although we can still carry out good research, our scanners have become obsolete. In CT scanning, data acquisition is important, and faster is better. Because of limitations imposed by our equipment, we are missing out on exciting new applications of CT, for example, cerebral dynamics. With our present machinery, we will not be able to provide valid correlation for positron studies. As well, extremely ill patients who cannot undergo general anesthesia cannot benefit from our techniques. It has become imperative that both scanners be replaced in the near future if we are to continue to provide the best of care.

— Roméo Ethier, MD

William Cone Laboratory for Neurosurgical Research

In the past year we have further examined the pathophysiology and evaluation of microsurgical procedures in cerebral ischemia by means of fluorescein angiography of the brain, focal cerebral blood flow measurement by beta-emitting krypton-85 and xenon-133 using miniature probes, and autoradiographic techniques using ^{14}C -iodoanipyrine and ^{14}C -2-deoxyglucose. The following progress has been made during the past year.

1. *The role of carbon dioxide in cerebral ischemia*

Using the model of focal ischemia in cats, the quantitative techniques described above were used to examine the effect of different levels of pCO_2 . Increasing these levels from 40 to 50 torr resulted in a moderate increase of rCBF that was uniform in cortical and subcortical structures. With increase of the arterial pCO_2 level to between 61 and 69 torr, striking changes in the perfusion pattern were demonstrated. In the cortex, heterogenous changes of rCBF ranged from less than 50 to more than 100 per cent of the normal value. There was also an rCBF increase of over 100 per cent in the cingulate gyrus, hippocampus, and some subcortical structures. Studies at different time intervals after occlusion and under different levels of arterial pCO_2 continue.

2. *Extracranial-intracranial vascular bypass*

Microvascular anastomosis between the common carotid artery (CCA) and the intracranial internal carotid artery (ICA) with autogenous vein plus a dacron sleeve has been compared with a similar anastomosis between the superficial temporal artery (STA) and the middle cerebral artery (MCA) in dogs. After appropriate vascular occlusion, the *in vivo* techniques of fluorescein angiography of the brain and rCBF measurement with ^{85}Kr and ^{133}Xe indicated that the vein graft dacron sleeve provides a higher flow and more extensive collateral flow than the STA-MCA anastomosis.

3. *Mathematical analysis of rCBF*

As part of his doctoral thesis, Ernst Meyer developed a transform analysis method applied to the measurement of rCBF by inert gas clearance curves. This analytical method has given us, for the first time, a quantitative spectral distribution of flow in various tissue compartments of the brain, and has been successfully applied in a number of experimental projects. It is particularly useful for proper assessment of shunting and tissue peaks.

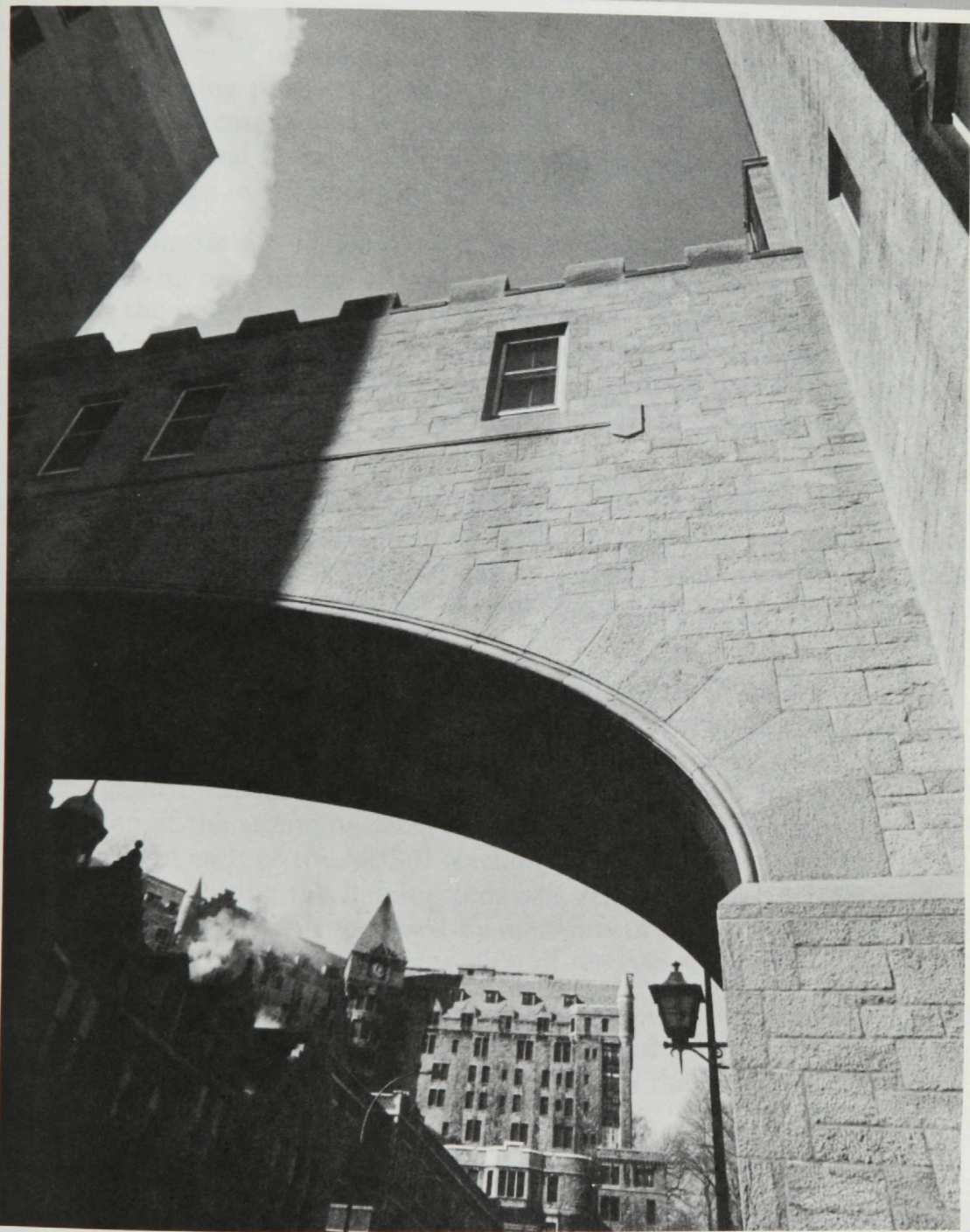
4. *Position Emission Tomography*

The JSW medical cyclotron for production of oxygen-15, carbon-11, nitrogen-13, and fluorine-18 finally arrived at the Montreal Neurological Institute in October, 1980. It should be integrated into our research program by the spring of 1981. Thus, our PET project on cerebrovascular disorders, focal epilepsy, and brain tumors will be expanded to include

metabolic and pharmacokinetic studies. We feel sure these will contribute to both our basic understanding of the pathophysiological mechanism and to the logical evaluation of their therapeutic agents in the coming year.

— William Feindel, MD
— Lucas Yamamoto, MD

Education



*Doctors and nurses studying at the
Montreal Neurological Hospital and
Institute benefit from its close
association with both McGill University
and the Royal Victoria Hospital.
Overleaf, the bridge linking the Neuro
to its sister hospital.*

Clinical Training Opportunities

Neurology

The department of neurology and neurosurgery at McGill offers a three-year residency training program in adult and pediatric neurology designed to meet the requirements of the Professional Corporation of Physicians of Quebec, the Royal College of Physicians and Surgeons of Canada, and the American Board of Psychiatry and Neurology.

The program has two major goals. The first is to develop highly skilled clinicians who have had an above-average exposure to the neurosciences. To this end the program provides a wide variety of clinical and laboratory experiences. The program is also designed to train academic physician-investigators and teachers, and with this goal in mind graduating residents are encouraged to seek further training in one of the neuroscientific disciplines.

The McGill neurology residency program is available to medical graduates who have completed an approved internship and one year of training in internal medicine, or, alternatively, an approved clinical clerkship during the final undergraduate year and one year of straight medical or pediatric internship.

The program provides two years of clinical training and one year of laboratory training. Residents are assigned to different clinical or laboratory services every three to six months. While on clinical services, the residents assume graded responsibility for patient investigation and care under the supervision of the attending staff. Weekly clinical and neuroscientific conferences in each of the McGill teaching hospitals serve as a stimulus for further study. During the training program, residents may also take part in clinical research projects supervised by members of the staff. Every resident is expected to participate in the teaching of medical students and nurses.

It is usual for each resident to rotate to three hospitals in the course of his training. In one of these institutions, he will spend a full year. Those in pediatric neurology will spend at least one year in the Montreal Children's Hospital.

The McGill neurology program is university-based, and includes the neurological services of four McGill teaching hospitals:

The Montreal Neurological Hospital, housed in the same building as the Montreal Neurological Institute, has one hundred and forty-five beds for neurology and neurosurgery. It has excellent support facilities in neuroradiology and clinical electrophysiology. There are extensive facilities for research in neurosciences available within the institute. The MNH also

provides neurological and neurosurgical services for the Royal Victoria Hospital.

The Montreal General Hospital has a neurology teaching unit of fifteen beds in a thirty-bed neurology and neurosurgery ward. A large consultation service provides the residents with experience in diagnosing and managing the neurological problems which develop on general and specialty medical and surgical services. An active neuroscience unit is located in the MGH Research Institute.

The Montreal Children's Hospital, a 300-bed institution, houses a fifteen-bed neurology unit with specially trained nurses and support staff. In addition, there is an active consultation service, and general neurology and specialty clinics are held weekly.

The Jewish General Hospital, a large general hospital with 650 beds, has a twenty-three-bed neurology unit, a large consultation service, and neurology clinics.

In the laboratory year, residents are assigned to one or more of the many diagnostic or research laboratories of the teaching hospitals or research institutes. The laboratory options include, among other, electro-encephalography, electromyography, neuropathology, neuroradiology, neuro-ophthalmology and neuro-otology.

Fellowships in the basic sciences and clinical laboratories offer opportunities for training and research lasting one year or more. Such research, additional to the clinical residency training program, may lead to an MSc or PhD degree awarded by the Faculty of Graduate Studies and Research of McGill University.

All inquiries should be addressed to:

Chairman
Department of Neurology and Neurosurgery
McGill University
Montreal Neurological Institute
3801 University Street
Montreal, Quebec H3A 2B4

Neurosurgery

The residency training program in neurosurgery is directed by the staff of the department of neurology and neurosurgery of McGill University. While residents spend most of their time at the Montreal Neurological Hospital and the Montreal Neurological Institute, for six months to one year of their training they also rotate through the neurosurgical services at the Montreal General and the Montreal Children's hospitals, each with twenty active beds and out-patient services. The length of the program varies depending on the resident's career goals and the qualifying specialty experience in medical and surgical disciplines. Residents with one year of internship and one year of general surgery should plan a minimum of four years of neurosurgical training. Additional time is usually needed for the resident to develop competence in a basic or clinical subject in preparation for an academic career in neurosurgery. Most trainees will spend six to twelve months in one of the laboratory units of the institute working on basic studies. They will also spend thirty months rotating through the various neurosurgical services. Neuropathology, neuroradiology, and electroencephalography are considered important parts of the resident's training program, but not every resident will be able to include all three in his training period. All residents are expected to share in the teaching of medical students, nurses, and technicians.

Three residents are accepted each year.

Board Examination Requirements

The resident is expected to take the written examination of the American Board of Neurological Surgery — for self-assessment, at any time during his training program, and for credit, as soon as he becomes eligible.

Research

Twenty-five research laboratories at the Montreal Neurological Institute and several at the Montreal General Hospital Research Institute provide ample opportunity for residents to participate in research projects under the supervision of the neurosurgical and neuroscientific staff. Research can lead to an MSc or PhD degree in the Faculty of Graduate Studies and Research at McGill University.

Special Features

Wilder Penfield and William Cone started the neurosurgical training program at McGill University in 1928. Six years later the Montreal Neurological Institute, a combined hospital and research centre, was opened with fifty beds. In 1954 the hospital expanded to 135 beds for neurology and neurosurgery, and in 1978 a major addition to the institute and hospital, the Penfield Pavilion, was opened with enlarged research, teaching

and clinical areas. From the beginning the neurosurgical program had an international flavour, with MNI trainees coming from, and returning to, many countries. The first modern neurosurgical units in Norway, India, and China, to name only a few, were initiated by former residents of the Montreal Neurological Institute.

A vigorous neurosciences research community at the Montreal Neurological Institute reinforces the academic excellence of the residency program. The surgical treatment of epilepsy is an area of particular interest and expertise; a follow-up series of more than 2,000 surgical cases represents the largest group study of its kind. Computerized stereotactic surgery, advanced vascular surgery, and procedures using microneurosurgical methods are well developed.

The Montreal Neurological Institute has a reputation for innovation — it was the first neurological centre in Canada and one of the first three in North America to acquire the EMI head scanner. It was one of the first to acquire a body scanner, with which a high resolution spinal scanning program has recently been developed. It is the only medical centre in Canada, and one of a half-dozen in the world, to exploit positron emission tomography. The first bismuth germanate positron camera available for clinical research, developed by the MNI's research team, has been in use since 1978.

A knowledge of French is important for the resident, and many opportunities are provided to learn the language. French-speaking patients and staff members mix daily with the English-speaking staff. McGill's Faculty of Medicine, under whose auspices the residency program is run, is the oldest, the most widely recognized, and the most international of all Canadian medical schools. Montreal is a cosmopolitan city of two million people, and a wide variety of cultural activities gives the city a continental flavour. The nearby countryside is one of North America's most highly developed winter sports areas.

All inquiries should be addressed to:

The Director
Montreal Neurological Institute
McGill University
3801 University Street
Montreal
Quebec H3A 2B-

Courses of Instruction

In the Faculty of Graduate Studies and Research, courses are offered leading to the Master of Science and Doctor of Philosophy degrees. (See McGill booklet, "Faculty of Graduate Studies and Research.") Through the year the following elective courses are given for graduate students, fellows, and residents. They are open to undergraduates by arrangement.

Neurosciences Seminar

G531-602H This is a course of weekly seminars given during the academic year and designed to present over a two-year period a concise, up-to-date review of the basic neurological disciplines. Members of the Montreal Neurological Institute, related McGill departments, and visiting neuroscientists. Mondays 4:30-6:30 p.m. MNI.

Neurophysiology

G531-610A Lecture together with undergraduate neurology and neurosurgery 2A, "Anatomy and Physiology of the Central Nervous System."

G531-611A Seminars in neurophysiology. Professor Gloor and staff.

Neuroanatomy

G531-621A Seminars in neuroanatomy. Professor Lawrence and staff.

Clinical Conferences

G531-630H Colloquium on clinical and basic aspects of the nervous system. Professor Feindel and staff. Mondays 9:00 a.m. MNI.

G531-631H Seizure and EEG conference. Professors Gloor, Andermann, Feindel; Olivier, Milner, and Ethier. Alternate Thursdays 4:30 p.m. MNI.

Neurochemistry

G531-640H Neurochemistry seminars additional to those provided in Course G531-602H. By special arrangement. Professors Wolfe and Pappius.

Neuropathology

G531-650H Six or twelve months of laboratory work in neuropathology.

G531-651H Clinicopathological conference. One Monday per month, 9:00 a.m. MNI. Professor Carpenter and staff.

Undergraduate Course. Basic science option in neuropathology. Professor Carpenter.

Neuroradiology

G531-660H Practical instruction in techniques and interpretation.

G531-661A Lecture demonstrations. Professor Ethier and staff. Fall term, Tuesdays 4:30 p.m.

Electroencephalography and Clinical Neurophysiology

G531-670H Laboratory work in electroencephalography with active participation, seminars, and clinical conferences. Professor Gloor and staff.

Neuropsychology

G531-680H Training in research methods for selected graduate students. Professor Milner and staff.

Post-Basic Course in Neurological-Neurosurgical Nursing

This course is designed to enhance the knowledge gained in basic nursing education. Its objective is improved nursing care of patients with a variety of neurological and neurosurgical conditions. The nurse is taught to apply new knowledge to total patient care, which involves not only attending to the patient's physical needs but also teaching him about his condition and helping him adapt to the changes his disorder brings.

Classes are accepted in March and September, and are limited to sixteen students. Learning experiences include actual patient care, lectures, demonstrations, laboratory visits, seminars, multidisciplinary discussions, self-teaching projects, and preparation of small studies. A new library facilitates the program. On completion of the course requirements a certificate is granted.

Eileen Flanagan began the post-basic course in neurological-neurosurgical nursing soon after the hospital opened in 1934. Since then the Montreal Neurological Hospital has had 1,073 graduates from thirty-four countries. To become a "Neuro nurse" is to enter a colleague relationship with other nurses who can share their experience and acquired knowledge to the benefit of patient care.

Societies



“Children of the Brain,” a sculpture by Hortense Cantlie which decorates the outer wall of the institute, is an artistic rendering of cerebral localization.

Fellows' Society

The Fellows' Society of the Montreal Neurological Institute once again sponsored the annual Fellows' Dinner in June, 1980. Invited guest was Dr. H.D. Garretson, who lectured on arteriovenous malformations.

This year the Fellows' Society presented its Penfield Award to Dr. José Montes, resident in neurosurgery, and Dr. James Nelson, resident in neurology. The society also made its traditional three awards for teaching. The award in neurosurgery was given to Dr. Theodore Rasmussen, the award in neurology to Dr. Irving Heller, and the ancillary award to medical librarian, Marina Boski.

— Sandra Horowitz, MD
President

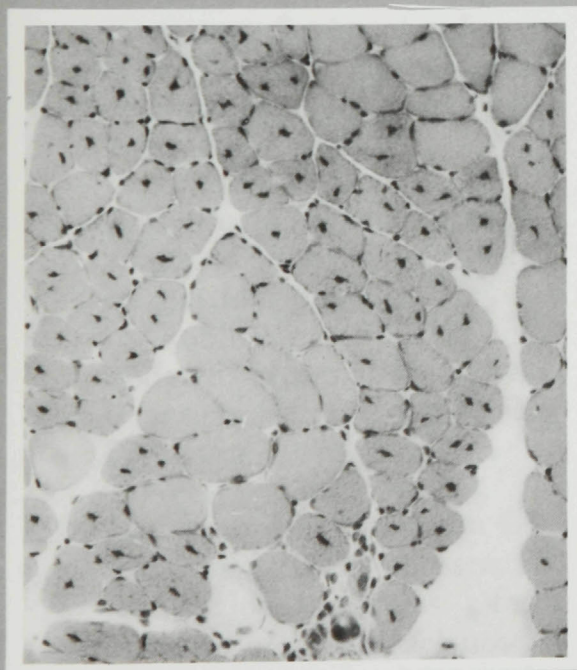
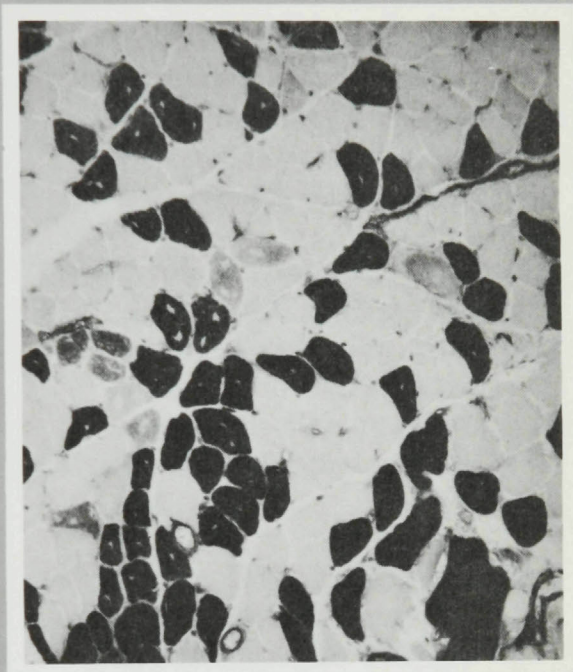
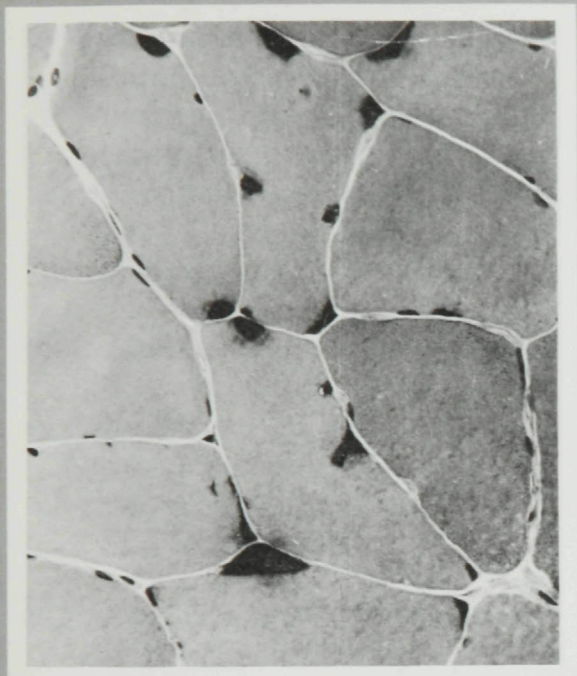
Montreal Neurological Society

Officers of the Society for 1979-1980 were Dr. Albert Aguayo, president, Dr. Jean-Marie Peyronnard, vice-president, and Dr. Ivan Woods, secretary-treasurer.

§/ The society invited four distinguished scientists to Montreal during the year. In addition to addressing the society, the visitors met with residents and staff at various hospitals. The speakers and their topics were:

- September: Dr. H. Richard Tyler
Professor of Neurology
Peter Bent Brigham Hospital
Harvard Medical School
“Motor Neurone Disease — Past, Present, and Future”
- October: Dr. Robert Joynt
Professor and Chairman of Neurology
University of Rochester, New York
“Strokes and Their Effects on Other Systems”
- November: Dr. Barry Arnason
Professor and Chairman of Neurology
Pritviker School of Medicine
University of Chicago
“Immune Regulation in Neurological Diseases”
- December: Dr. Peter Janetta
Professor and Chairman of Neurosurgery
Presbyterian Hospital
Pittsburgh, Pennsylvania
“Neurovascular Compression of Cranial Nerves and the Brain Stem: A Concept of Disease”
- January: Dr. Anders Bjorklund
Department of Histology
University of Lund, Sweden
“Experimental Studies of Regeneration in the Central Nervous System”
- Ivan Woods, MD
Secretary

Publications



Overleaf, electronmicrographs showing (upper left) abnormal deposits in muscle of a patient with a myopathy, and regenerated muscle fibres in dystrophic hamster.

Photographs: Dr. George Karpati.

Publications of the Staff of the Montreal Neurological Hospital and Institute 1979-1980

(Figures indicate Montreal Neurological Institute reprint numbers.)

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neurohypophysis. *Biochem
Biophys Res Commun*
90(2):466-472, 1979

Finances

Montreal Neurological Hospital

Balance Sheet as at March 31, 1980

GENERAL FUND

Assets

Cash	\$ —	\$ 188,695
Accounts receivable, less provision for doubtful accounts	796,377	1,126,822
Due from Quebec Department of Social Affairs	850,203	—
Inventory of supplies at cost	176,747	146,106

\$ 1,823,327

\$ 1,461,623

Liabilities

Bank indebtedness	\$ 539,995	\$ —
Accounts payable and accrued liabilities	989,966	640,185
Due to Quebec Department of Social Affairs	—	358,798
Due to plant fund	16,727	28,127
Due to Royal Institution for the Advancement of Learning		
Current account	811,336	759,873
Advances to cover prior years' deficit	10,683	10,683
Deficit	(545,380)	(366,043)

\$ 1,823,327

\$ 1,461,623

PLANT FUND

Assets

Cash	\$ 328,931	\$ 136,032
Short-term investments	400,000	—
Due from general fund	16,727	28,127
Advance to Royal Institution for the Advancement of Learning, construction project (Note 3)	4,696,469	4,709,853
Fixed assets, at cost	2,876,890	2,047,664

Equipment \$4,145,798

Less accumulated depreciation (1,268,908)

\$ 8,319,017

\$ 6,921,676

Liabilities

Bank Loan

Due to Royal Institution for the Advancement of Learning		
Restricted funds, construction project		

Capital

\$ —

\$ 1,500,000

348,153

393,047

5,189,200

3,189,200

2,781,664

1,839,429

\$ 8,319,017

\$ 6,921,676

Statement of Operations

	1980	1979
Income		
Quebec Department of Social Affairs (Note 1)	\$7,948,305	\$8,072,158
Revenue from patients	2,477,747	2,064,438
Other income	558,250	334,088
	<u>10,984,302</u>	<u>10,470,684</u>
Expenses		
Salaries and wages	7,993,810	7,841,921
Fringe benefits	486,163	434,723
Drugs, medical and surgical supplies	511,073	454,490
Services and supplies	2,284,600	1,883,786
	<u>11,275,646</u>	<u>10,614,920</u>
Deficit for the year	<u>(\$ 291,344)</u>	<u>(\$ 144,236)</u>

Statement of General Fund Capital

	1980	1979
Deficit at beginning of the year	(\$ 336,043)	(\$ 179,375)
Deduct		
Payment from the Quebec Department of Social Affairs on account of prior year expenses	82,007	—
Contribution from the Quebec Department of Social Affairs related to prior year retroactive salary adjustments	183,306	—
	<u>(70,730)</u>	<u>(179,375)</u>
Add		
Expenses related to prior year	—	7,120
Salary adjustments related to prior year	183,306	—
Deficit for the year	291,344	144,236
Post-budget adjustment	—	5,312
	<u>—</u>	<u>5,312</u>
Deficit at end of the year	<u>(\$ 545,380)</u>	<u>(\$ 336,043)</u>

Statement of Plant Fund Capital

Capital at beginning		\$1,175,496
Increase in plant capital		861,659
	<u>3,040,776</u>	<u>2,037,155</u>
Less depreciation on equipment	259,112	197,726
Capital at end of the year	<u>\$2,781,664</u>	<u>\$1,839,429</u>

Notes to Financial Statements March 31, 1980

1. *Quebec Department of Social Affairs*

Income includes payments from the Government of Quebec to the extent of the amounts approved to March 20, 1980 by the Department of Social Affairs. The Department may, subsequent to a review of the accounts of the Hospital, modify amounts previously approved which would either give rise to additional amounts becoming due to the hospital or cause amounts to be subject to reimbursement to the Government. No provision has been made in the accounts for such eventualities.

2. *Deficit*

The supplementary budgets of \$153,000 for 1978/1979 and \$250,000 for 1979/1980 for operating the new Penfield Pavilion, which was officially opened in September 1978 and in partial operation since July 1978, have been presented to the Budget Committee of the Department of Social Affairs. No approval has been received as yet.

The additional budget for the full operation of the new Penfield Pavilion for the year ending March 31, 1981 has not yet been approved by the Department of Social Affairs.

3. *Construction project*

The construction project has been authorized by Order-in-Council no. 3415-75 dated July 23, 1975 of the Province of Quebec for an amount up to \$8,500,000 of which \$3,250,000 is the responsibility of the Montreal Neurological Institute. The amount of \$2,952,000 was paid by the Institute as its share of the work completed.

The final phase of the project which involves the renovations of the original building together with its integration with the new Penfield Pavilion for a cost of \$3,825,966 was approved April 2, 1980 by Decree No. 966-80 of Quebec Department of Social Affairs.

4. *Contingent liabilities*

Employees' accumulated sickness benefits, which are recoverable from the Department of Social Affairs when paid, amounted to \$451,960 at March 31, 1980. These sickness benefits are payable when an employee terminates his services and are expensed at that time.

An action has been instituted against the Hospital for \$375,000. In the opinion of management and legal counsel, the action is unfounded.

Auditors' Report
The Board of Directors,
Montreal Neurological Hospital

We have examined the balance sheet of the Montreal Neurological Hospital as at March 31, 1980 and the statements of operations, general fund capital and plant fund capital for the year then ended. Our examination was made in accordance with the mandate outlined in Schedule II of the Regulation adopted under the Act respecting health services and social services (L.R.Q. 1977, c. S-5), and with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Hospital as at March 31, 1980 and the results of its operations for the year then ended in accordance with the standards and accounting practices required by the aforementioned Regulation.

Montreal, Quebec
June 20, 1980

Charette Fortier, Hawey Co.
Touche Ross Co.
Chartered Accountants

Montreal Neurological Institute

Statement of Income and Expenditure

	Year Ended March 31 1980	Year Ended March 31 1979
Opening Balance (Deficit)	(209,455)	78,423
Income		
External grants for research and fellowships	1,119,857	979,700
Donations	324,177	714,259
Decapitalizations of previous donations	397,565	126,200
Endowment Income	1,246,777	1,213,397
University Funds:		
Ministry of Education funds for GFT clinical staff of the MNH/MNI	217,377	207,474
Other salary support for teaching	114,253	84,563
	<u>3,210,551</u>	<u>3,404,016</u>

Expenditure**Salaries**

University Funds

Ministry of Education

funds for GFT

clinical staff,

MNI/MNH

217,377

207,474

Other salary
support for
teaching

114,253

84,563

331,630292,037

MNI Funds

Staff

GFT clinical

386,910

289,401

Other teaching

304,432

182,629

Research

500,540

478,782

Technical-external
grants

429,790

343,897

Technical-MNI
funds

203,646

160,434

Support

263,362

184,050

2,088,680

1,639,193

Fringe benefits

248,481

2,668,791

144,074

2,075,304

Materials and
supplies

420,396

423,264

Services

120,509

99,288

Equipment

302,385

1,015,615

3,512,0813,613,471**Closing Balance (Deficit)***(301,530)(209,455)

Note:

The closing deficits for 1979 and 1980 include an encumbrance for the purchase of a mini-cyclotron for the MNI/McGill research project on positron emission tomography.

(Prepared by Norman Bleakley, Associate Director (Finance))

Endowments

- 1934 Rockefeller Endowment
- 1951 Donner Canadian Foundation Grant
- 1954 Lily Griffith McConnell Endowment
- 1957 Hobart Anderdon Springle Memorial Endowment
- 1958 Rupert Bruce Memorial Endowment
- 1959 Percy R. Walters Memorial Endowment
- 1960 William Cone Memorial Endowment
- 1963 Walter Chamblet Adams Memorial Endowment
- 1964 MNI Research Endowment Fund
- 1966 Izaak Walton Killam Memorial Endowment
- 1969 Sophie M.C. Letang Memorial Endowment
- 1972 Senator and Mrs. Lorne Webster Memorial Endowment
- 1973 G. Maxwell Bell Memorial Endowment
- 1974 Flora Campbell Memorial Endowment
- 1975 Cosgrove Multiple Sclerosis Research Fund
- 1976 Wilder Penfield Memorial Endowment
- 1978 William D. Munro Memorial Endowment
- 1980 Clive Baxter Memorial Endowment Research Fund

Fellowship Endowments

- 1948 Duggan Fellowship
- 1950 Lewis L. Reford Fellowship
- 1956 Dr. and Mrs. Charles F. Martin Fellowship
- 1966 Izaak Walton Killam Memorial Fund for Advanced Studies

Grants for Special Projects

September 1, 1979 – August 31, 1980

Conseil de la Recherche en Santé du Québec Bourse de Stagiaire de Recher
Linda Dansky

Conseil de la Recherche en Santé du Québec Chercheur-Boursier
Dr. Daniel Guitton (*until June 30/80*)

Conseil de la Recherche en Santé du Québec Subventions à l'Établissement
Dr. Alain Beaudet Dr. Antoine Hakim

E.A. Baker Foundation for the Prevention of Blindness, CNIB
Dr. Trevor Kirkham

Medical Research Council of Canada Career Investigators
Dr. Brenda Milner Dr. Leonhard Wolfe

Medical Research Council of Canada Grants

Dr. Alain Beaudet	Dr. George Kostopoulos
Dr. Stirling Carpenter	Dr. Brenda Milner
Dr. William Feindel	Dr. Hanna Pappius
Dr. Serge Gauthier	Dr. Sergio Pena
Dr. Pierre Gloor	Dr. Luis Quesney
Dr. Jean Gotman	Dr. Allan Sherwin
Dr. Daniel Guitton	Dr. Leonhard Wolfe
Dr. Barbara Jones	Dr. Lucas Yamamoto
Dr. George Karpati	

Medical Research Council of Canada Scholarships

Dr. Alain Beaudet (<i>since July 1/80</i>)	Dr. Barbara Jones
Dr. Jean Gotman	Dr. George Kostopoulos
Dr. Daniel Guitton (<i>since July 1/80</i>)	Dr. Sergio Pena

Multiple Sclerosis Society of Canada Fellowship

Dr. Stuart Coupland

Multiple Sclerosis Society of Canada Research Grants

Dr. J.B.R. Cosgrove	Dr. Daniel Guitton
Dr. Andrew Eisen	Dr. Trevor Kirkham

Multiple Dystrophy Association of Canada Research Grants

Dr. Stirling Carpenter

Dr. George Karpati

Dr. Andrew Eisen

Dr. Sergio Pena

Réseau Provincial de Médecine Génétique

Dr. Eva Andermann

Montreal Neurological Institute Grants

Killam Fellow

Antonio Incisa della Rocchetta

Killam Scholars

Elaine Joy Arpin

Alain Beaudet

Mirko Diksic

Robert Dykes

Serge Gauthier

Jean Gotman

Antoine Hakim

Barbara Jones

George Karpati

Donald Lawrence

Ernest Meyer

Luis Felipe Quesney

Ivan (John) Woods

Donations to Special Funds 1979-80

Donations to the Montreal Neurological Institute may be made to any of the following funds, or for other purposes as specified by the donor. Receipts for such contributions are valid for income tax purposes in Canada. Donations from the United States will also qualify for income tax purposes if cheques are made out to The Friends of McGill University Inc. and sent to PO Box 441, Elizabethtown, New York 12932 with the notation that they are for the Montreal Neurological Institute.

Anesthesia Research Fund

Brain Research Fund

Mr. and Mrs. A. Murray Vaughan

Cancer Clinical Relief Fund

Computer Tomography Research Fund

MNI Radiology Clinic Inc.

William Cone Memorial Research Fund

The Harold Crabtree Foundation

Mildred Flynn

John Langdon

Mr. and Mrs. Welton G. Mehlow

José Mourelo

Hyman Pantel

In honour of Dr. Gilles Bertrand

In honour of Jean Cohen

In honour of Lily Glazer

In memory of Robert Burns

In memory of Wendy Grace and
Gail Budd

In memory of Maurice Samson

Cosgrove Research Fund

Brigadier J.A. de Lalanne

Julie di Maulo

Antonio Doucet

Doreen Jurychuk

La Rencontre —

Section St-Jean

Claude Ménard

Abbé Pierre Ménard

In memory of S.W. Little

In memory of Beverly McMillan

In memory of Delcie Sickles

Harvey Cushing Clinical Relief Fund

Anonymous

Dorothy Copland

Lillian Sandler

Mrs. Joseph Shapiro

Mrs. Marjorie White

Women's Auxiliary, RVH

Gordon Library Fund

Hospital Equipment Fund

Dr. Andrew Eisen

Women's Auxiliary, RVH

Mary Massabky Foundation Research Fund

Mary Massabky Foundation Inc.

Mary Massabky Scholarship Fund

Mary Massabky Foundation Inc.

McNaughton Neuroanatomy Research Fund

Francis McNaughton Neurological Research Fund

Anonymous

Martha Buntins

Madeleine de Grandpré

S.M. Duncan

Henry Johnson

W.G. Lynn

Edward Norsworthy

Allan E. Ross

John F. Ross

J. Clare Wilcox

In memory of Prudence Baxter

In memory of Gordon Riddell

In memory of Evelyn Sulmistras

In memory of Paul Vauthier

In memory of Jack Yaung

Montreal Neurological Institute Building Fund

**Montreal Neurological Institute
Neurosurgical Research Fund**

**Montreal Neurological Institute Staff
Loan Fund**

**Multiple Sclerosis Clinical Relief
Fund**

Multiple Sclerosis Golf League

Muscular Dystrophy Research Fund

In memory of Mildred Brothwell
In memory of Marguerite K.
Cornell

Neurogenetics Research Fund

Association canadienne de l'ataxie
de Friedreich

Neurological Research Fund

Mr. and Mrs. Ronald J. Annett
Gordon R. Bailey
Dr. Harold C. Bonner
P. Rémi Catafard
Comité Social, École Tournesol
Compagnie Price Ltée
Dr. Joseph P. Evans
H. George Hampson
Gilles Lépine
Dr. Frank Morrell
John Muth
J. W. McConnell Foundation
Dr. R.H. Pudenz
C.T. Rapp
Dr. Mark Rayport
Steyning Foundation
Mrs. E.S. Sutherland
Danielle Tessier
Woodriver Donors' Choice
In honour of Dr. Irving Heller
In memory of Marie-Ange
Aussant

In memory of Aline Bergeron
In memory of Louise Cohen
In memory of Juliette de
Costa-Rainville

In memory of Mrs. Fisher
In memory of Edward Forzley
In memory of Peter Freygood
In memory of Gerald Gausden
In memory of Henri Giroux
In memory of William Max Katz
In memory of France Lecavalier
In memory of Jessie McCallum
In memory of Harold McGregor
In memory of Albert E. Miller
In memory of John Moran
In memory of Brian Edwin
Mullally

In memory of Francine Paquet
In memory of Spyros Paravalos
In memory of Robert Payette
In memory of Marjorie Rankin
In memory of Adolphe Routhier
In memory of Kenneth Roxburgh
In memory of Thérèse St-Arnaud
In memory of Wallace Stevens
In memory of Linda R. St-Onge
In memory of Mrs. H.H. Stuit
In memory of Dr. Jack
Teitelbaum
In memory of Thérèse Tessier
In memory of Jules Tremblay

Neuro-ophthalmology Research Fund

Henri Gratton
Mr. and Mrs. Mirko Kohn
Smith Printing Inc.
Town of Mount Royal Executive
Hockey League
In memory of Mrs. F.C. Mannix

Neurophysiology Research Fund

Neuroradiology Research and Teaching Fund

Nursing Funds

Eileen C. Flanagan Nursing Bursary Fund
Montreal Neurological Institute Nursing Education Fund
Anonymous
Nursing Coordinators, MNH

Penfield Award Fund

Wilder Penfield Memorial Research Fund

Barbara Ballard
May S. Binet
Dr. Chao J. Chen
Dr. Jerome A. Davis
Estate of the late Gabrielle Papineau
Opal Holst
Linda Kaplan
Mildred Kaplan
Mr. and Mrs. William Kaplan
Alexander Nicholson
Cecelia Oshinsky
In memory of Patricia Budden
In memory of Ann Cassidy
In memory of Trevor Charles Cooper
In memory of Thérèse Fenech
In memory of Dr. John Kershman
In memory of Dr. W. Penfield

Zelda and Leo Posman Research Fund

Reuben Rabinovitch Memorial Library Fund

Laughlin B. Taylor
Dr. Robert S. Yufe

Lewis Reford Fellows' Fund

Reitman Research Fund

Sherwin Research Fund

Special Project Funds

Epilepsy Follow-up and Research Projects
Savoy Foundation Inc.
Mr. and Mrs. Leonard Freeman
Stroke Research

Spinal Cord Research Fund

In memory of Dorothy Scotcher

H.L. Teuber Neuropsychology Research Fund

Dr. Brenda Milner
Psychology Group, MNH
Laughlin Taylor
H.L. Teuber

Third Foundation Brain Fund

Anonymous
Mary Burton
Stuart M. Finlayson
Howard Richer
In memory of Clive Baxter
In memory of Lucien Blouin
In memory of Marjorie Finlayson
In memory of Mme Louis-Blanche Giguère
In memory of Ailsie Harper
In memory of T.R. McBride
In memory of Donald Richer

Thomas Willis Fund

Suggested Forms for Bequests to the Montreal Neurological Institute

Unrestricted

I give and bequeath the sum of _____ dollars (or designated property or portion of estate) to the Montreal Neurological Institute, McGill University, both the principal and income to be derived therefrom to be used in such manner as the Board of Governors of the said University shall from time to time determine.

Restricted only as to principal

I give and bequeath the sum of _____ dollars (or designated property or portion of estate) to the Montreal Neurological Institute, McGill University, to constitute part of its general endowment funds, the income to be derived therefrom to be used in such manner as the Board of Governors of the said University shall from time to time determine.

Restricted as to purpose

I give and bequeath the sum of _____ dollars to the Montreal Neurological Institute, McGill University, both the principal and the income to be derived therefrom to be used for the purpose of (stating purpose) in such manner as the Board of Governors of the said University shall from time to time determine.

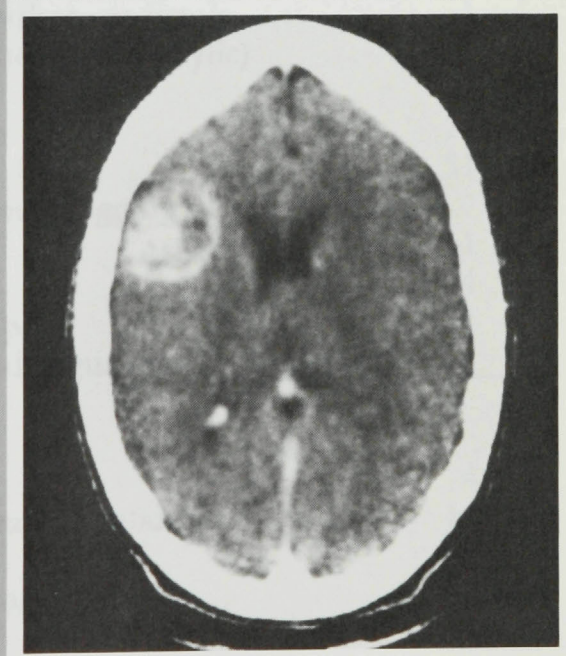
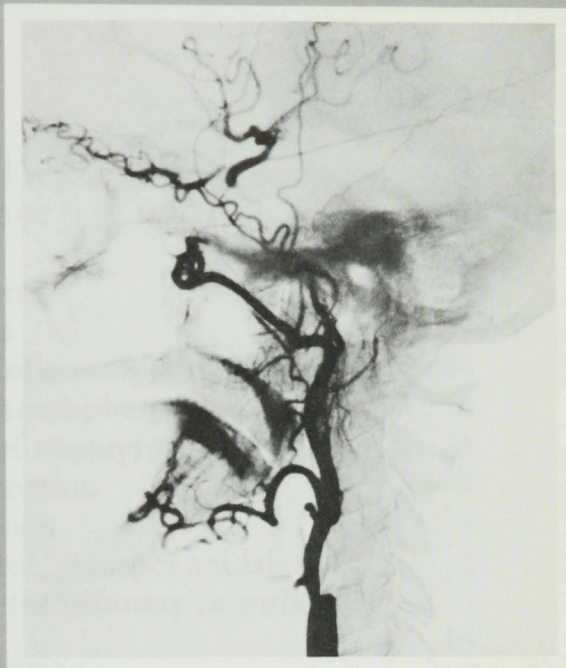
For founding fellowships and student aid

I give and bequeath the sum of _____ dollars (or designated property or portion of estate) to the Montreal Neurological Institute, McGill University, for the purpose of founding in the said University one or more fellowships or bursaries to be known as “_____ Fellowship or Bursary,” the net annual income from this fund to be awarded annually in such amounts, under such conditions and to such recipients as may be determined from time to time in accordance with the directions of the Board of Governors of the said University.

For information and suggestions, contact:

The Director
Montreal Neurological Institute
3801 University St.
Montreal H3A 2B4
Quebec
Telephone: (514)

Statistics



Overleaf, x-ray procedures showing (clockwise, from upper left) giant aneurysm, occlusive vascular disease, veinous angioma, and chronic subdural hematoma.

Classification of Operations

April 1, 1979 to March 31, 1980

Craniotomy and Craniectomy

and biopsy	2
and decompression (debridement)	1
and decompression, debridement and repair of dural laceration	3
and elevation of depressed skull fracture	1
and drainage of subdural hematoma	19
and drainage of intracerebral hematoma	6
and drainage of extradural hematoma	7
and excision of epileptogenic focus (lobectomy)	78
and excision of epileptogenic focus (hemispherectomy)	4
and excision, clipping, or wrapping of aneurysm	23
and removal of arteriovenous malformation	1
and cerebral vascular bypass anastomosis	3
and hypophysectomy endocrine control, transphenoidal	2
and hypophysectomy transphenoidal for pituitary or intrasellar tumor	14
and incision, drainage, or removal of cyst	1
and plastic repair of dura, CSF rhinorrhea, or fistula	1
and plastic repair of skull defect (plate, bone, acrylic)	5
and sequestrectomy for osteomyelitis	2
and removal of posterior fossa tumor	21
and removal of cerebral tumor	51
and correction of Chiari malformation (plugging of central canal)	7
and removal of foreign body	1
and removal of tumor of skull	4
and trigeminal rhizotomy — suboccipital	1
and suboccipital glossopharyngeal and vagus nerves rhizotomy	<u>1 259</u>

Trepanation

and biopsy	4
and drainage of epidural, intracerebral, or subdural space	14
and drainage of abscess (infection)	3
and insertion of ventricular catheter or drain	2
and ventriculography	<u>1 24</u>

Shunt Procedures

	20
	8
and ventriculocisternostomy (Torkildsen's)	1
and replacement or revision of shunt	<u>20 49</u>

Stereotaxic procedures	
and placement of electrodes	4
and ventriculography, PEG, angiography (localization)	5
and introduction of depth electrodes	1
and biopsy or drainage of cyst	<u>1</u> <u>11</u>
Laminectomy, Hemilaminectomy	
and antero-lateral cordotomy — cervical	1
and antero-lateral cordotomy — thoracic	2
and biopsy	1
and decompression or exploration of spinal cord, tumor, or vascular malformation	4
and decompression or exploration of spinal cord or cauda equina for stenosis or dentate ligament section, or spondylosis	25
and discectomy, lumbar, sacral	89
and discectomy, cervical	3
and incision and drainage of intramedullary cyst (syringomyelia)	2
and removal of hematoma	1
and removal of tumor, intramedullary	1
and removal of tumor, extramedullary, intradural	10
and removal of tumor, extradural, metastatic bone, etc.	17
and rhizotomy — dorsal	3
and removal or revision of dorsal column stimulator implant	1
and spinal fusion with bone graft — autogenous or bone bank	15
and spinal fusion with Harrington rods, and autogenous or other graft	4
and spinal fusion with wire, plate, or surgical simplex	3
and spinal fusion, cranio-cervical and traction of vertebral body fracture or dislocation	2
and discectomy, anterior approach, cervical (Cloward)	27
and discectomy, anterior approach, cervical without arthrodesis	<u>2</u> <u>213</u>
Nerve Exploration	
and anastomosis or suture	1
and avulsion or section	7
and excision of neuroma	1
and neurolysis, transplantation, or decompression or exploration	54
and neurolysis, by radiofrequency	<u>2</u> <u>65</u>

Artery Exploration		
and endarterectomy (patch graft)	7	
and ligation	1	
and progressive occlusion (Selverstone clamp)	1	9
		<hr/>
Wound Reopening		
and drainage of infection	2	
and evacuation of hematoma	3	
and removal of bone flap, tantalum plate, or wire mesh or acrylic	1	6
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Miscellaneous		
miscellaneous	12	
and radio-frequency trigeminal rhizotomy	13	
and radio-frequency percutaneous cordotomy	2	
tracheostomy	11	
and muscle biopsy	99	137
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Radiological Procedures		
cerebral angiography (venography) percutaneous, carotid, vertebral, subclavian	53	
catheterization — brachial, carotid, femoral	340	
pneumograms under anesthesia	58	451
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Classification of Diseases

April 1, 1979 to March 31, 1980

Nervous system generally		
Multiple sclerosis	83	
Motor neurone disease	23	
Friedreich's ataxia	4	
Tuberous sclerosis	6	
Subarachnoid hemorrhage	30	
Miscellaneous	8	154
		<hr/>
Meninges		
Meningocele and myelomenigocele	3	
Acute purulent meningitis	3	
Subdural hematoma	27	
Subarachnoid hemorrhage	30	
Adhesive arachnoiditis	1	
CSF rhinorrhea	2	
Miscellaneous	21	57
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Brain		
Congenital anomalies	1	
Hydrocephalus	29	
Abscess	6	
Head injury (contusion, laceration, traumatic encephalopathy, concussion, skull fracture)	184	
Epilepsy	291	
Arnold-Chiari deformity	7	
Parkinsonism	29	
Intracerebral hemorrhage	10	
Intracerebral hematoma	15	
Alzheimer's disease	14	
Vascular encephalopathy	22	
Cysts	10	
Encephalitis	2	
Arteriovenous malformation	8	
Miscellaneous	30	468
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Tumors		
Astrocytoma	13	
Craniopharyngioma	1	
Schwannoma	6	
Chromophobe adenoma of pituitary	15	
Gliomas	12	
Metastatic carcinoma	40	
Brain tumor suspected	9	
Angioma	3	
Glioblastoma multiforme	29	
Meningioma	25	
Chordoma	2	
Miscellaneous	27	182

Spinal cord		
Myelopathy	26	
Syringomyelia	12	
Spinal stenosis	14	
Miscellaneous	92	144

Cranial and peripheral nerves		
Trigeminal neuralgia	7	
Optic neuritis	1	
Ulnar neuropathy	13	
Median neuropathy	13	
Other neuralgias	4	
Peripheral neuropathy	18	
Hemifacial spasm	2	
Miscellaneous	32	155

Muscles		
Myasthenia gravis	15	
Muscular dystrophy	1	
Myopathy	3	
Spasmodic torticollis	1	
Muscular atrophy	2	
Myalgia of undetermined origin	4	
Miscellaneous	5	31

Mental disease		
Mental retardation	7	
Depression	23	
Anxiety state	7	
Conversion hysteria	1	
Schizophrenia	3	
Behavior disorder	2	
Learning disorder	1	
Chronic alcoholism	15	
Miscellaneous	15	74
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Other Systems		
Protrusion disc — lumbar	5	
Protrusion disc — cervical	13	
Fracture and/or dislocation vertebral column	17	
Back pain	21	
Miscellaneous pain	2	
Gunshot wounds	7	
Rheumatoid arthritis	2	
Coronary insufficiency	2	
Diabetes mellitus	57	
Hypertension	55	
Osteoarthritis	4	
Hypothyroidism	6	
Miscellaneous	60	252
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Causes of Death

April 1, 1979 to March 31, 1980

Craniocerebral head injuries	13	
Intracranial aneurysm	10	
Cerebrovascular disease	20	
Intracranial tumor, primary	13	
Intracranial tumor, metastatic	12	
Other systems	12	80
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