# 44th ANNUAL REPORT 1978/1979

## Montreal Neurological Hospital
## Montreal Neurological Institute

# 44th Annual Report

## Montreal Neurological Hospital

## Montreal Neurological Institute

# 1978-1979

# Table of Contents

# Montreal Neurological Hospital

*Stroke, the third most common cause of death in North America, is caused by faulty blood flow to the brain. Overleaf, neuroradiologist Dr. Roméo Ethier and a colleague examine angiograms for evidence of circulatory disorders.*

## Board of the Corporation

*President*
J. Taylor Kennedy, MEng

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

*Members*
Robert Bell, BA, MA, LLD, DSc, PhD, FRS, FRSC*°
Principal and Vice-Chancellor, McGill University (to June 30, 1979)

David Lloyd Johnston, BA, LLB*°
Principal and Vice-Chancellor, McGill University (from July 1, 1979)

Samuel Freedman, BSc, MD, FRCP(C)*°
Dean of Medicine, McGill University

Yves Fortier, QC, BCL, BLitt

Claire Kerrigan, BA, MSW

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

Colin Webster, BA, LLD

* Executive Committee member
° *Ex officio* member

## Board of Directors
**June 1979**

*President*
J. Taylor Kennedy, MEng*
Elected by the Corporation

*Vice-President*
Colin Webster, BA, LLD*
Elected by the Corporation

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

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

Akos de Muszka, QC, LLL
Appointed by the Lieutenant-Governor of Quebec
(Representing Socio-Economic Groups)

Yves Fortier, QC, BCL, BLitt
Elected by the Corporation

Claire Kerrigan, BA, MSW
Elected by the Corporation

Samuel Freedman, BSc, MD, FRCP(C)
Dean of Medicine, McGill University
Appointed by McGill University

Roméo Ethier, BA, MD
Neuroradiologist-in-Chief, Montreal Neurological Hospital
Elected by the Council of Physicians and Dentists

Gordon Selby Francis, MD
Elected by interns and residents

Verna Bound, BA, MSW
Director of Social Work Department, Montreal Neurological Hospital

Lise Cattaert
Elected by support staff

Jill Price
Elected by the patients

Joy Shannon, Dip Bus Admin
Elected by the patients

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

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

*Secretary*
Alphonsine Howlett
Director of Administrative Services, Montreal Neurological Hospital
(to August 31, 1979)
By invitation

Roland Saint-Arnaud, BA, MHA
Director of Administrative Services, Montreal Neurological Hospital
(from October 1, 1979)
By invitation

* Executive Committee member

## Clinical and Laboratory Staff

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

*Honorary Neurosurgeon*
Arthur Elvidge, MD, MSc, PhD, DCL, FRCS(C)

*Honorary Consultant in Neurochemistry*
K. A. C. Elliott, MSc, PhD, ScD, FRSC

*Honorary Consultant in Neurophysiology*
Herbert Jasper, OC, PhD, DèsSc, MD, FRSC, DSc

*Honorary Consultant in Neurosurgery*
Theodore Rasmussen, BS, MB, MD, MS, FRCS(C)

*Senior Consultant in Neurology*
Francis McNaughton, BA, MSc, MD, FRCP(C)

*Senior Consultant in Neuropathology*
Gordon Mathieson, MB, MSc, FRCP(C)*

*Acting Neurologist-in-Chief (to May 31, 1979)*
J. Preston Robb, MSc, MD, FRCP(C)

*Neurologist-in-Chief (from June 1, 1979)*
Donald Baxter, MD, MSc, FRCP(C)

*Neurosurgeon-in-Chief*
Gilles Bertrand, BA, MD, MSc, FRCS(C)

*Neurologists*
Frederick Andermann, BSc, BAC, MD, FRCP(C)
James B. R. Cosgrove, MD, MS, MSc, FRCP(C)
Irving Heller, BSc, MD, MSc, PhD, FRCP(C)
George Karpati, 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)
Serge Gauthier, BA, MD, FRCP(C)

*Assistant Neurologist and Consultant in Pediatrics*
Sergio Pena, MD, PhD, FRCP(C)

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

*Associate Neurosurgeons*
Robert Hansebout, MD, MSc, FRCS(C)**
André Olivier, BA, MD, PhD, FRCS(C)

*Assistant Neurosurgeons*
Elaine Joy Arpin, BSc, MD, FRCS(C)
John Little, MD, MSc, FRCS(C), FACS***
Jean-Guy Villemure, MD, FRCS(C)

*Neuroradiologist*
Roméo Ethier, BA, MD

*Associate Neuroradiologist*
Denis Melançon, BA, MD

*Assistant Neuroradiologist*
Garry Bélanger, BA, MD

*Electroencephalographer and Neurophysiologist*
Pierre Gloor, MD, PhD, FRCP(C)

*Associate Neurophysiologist*
Robert Dykes, BA, PhD

*Assistant Neurophysiologists*
George Kostopoulos, MD, PhD
Luis Felipe Quesney, MD, PhD

*Associate Electroencephalographer*
Frederick Andermann, 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)

*Electromyographer and Assistant Electroencephalographer*
Andrew Eisen, MD, MRCS, LRCP, FRCP(C)

*Biomedical Engineer*
John Ives, MSc

*Assistant Biomedical Engineer*
Jean Gotman, ESE, MEng, PhD

*Computer Systems Engineer*
Christopher Thompson, MSc

*Assistant Computer Systems Engineer*
Terence Peters, BE, PhD

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

*Associate Anesthesiologists*
Mounir Abou-Madi, MB, FRCP(C), FACA
Thomas McCaughey, MB, BAO, FRCP(C)****

*Assistant Anesthesiologists*
Jennifer Barnes, MB
Luis Cuadrado, MD, DABA*
David Thomas, MB, FFARCS
Muriel Yarde, MB, FRCP(C)

*Neurochemist and Medical Research Council Associate*
Leonhard Wolfe, MSc, PhD, MD, FRCP(C), FRSC

*Neurochemist*
Hanna Pappius, MSc, PhD

*Radiochemist*
Mirko Diksic, BSc, MSc, PhD

*Neuropathologist*
Stirling Carpenter, AB, MD

*Assistant Neuropathologists*
Kathleen Meagher-Villemure, BA, MD
Yvon Robitaille, BA, MD, FRCP(C)

*Director, Brain-Scanning Laboratory*
Lucas Yamamoto, BSc, MD, PhD

*Associate Neuroendocrinologist*
Yogesh Patel, MB, PhD, FRACP

*Neuroanatomist*
Donald Lawrence, BSc, MD, FRCP(C)

*Assistant Neuroanatomist*
Barbara Jones, PhD

*Neuro-ophthalmologist*
Trevor Kirkham, MB, FRCS, DO

*Associate Neuro-ophthalmologist*
Daniel Guitton, MEng, PhD

*Neuropsychologist and Medical Research Council Associate*
Brenda Milner, PhD, ScD, FRSC, FRS

*Associate Neuropsychologist*
Laughlin Taylor, BEd, MSc

*Assistant Neuropsychologists*
Marilyn Jones-Gotman, BA, MA, PhD
Michael Petrides, BSc, MSc, PhD

*Clinical Assistants, Neuropsychology*
Mary Kay Ajersch, MA
Gabriel Leonard, BA, DAP
Enda McGovern, BA, DAP

*Clinical Psychologist*
Clara Strauss, BA, MA

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

*Assistant Psychiatrists*
Martine Lalinec-Michaud, MD, FRCP(C)
Joannis Nestoros, MD, FRCP(C)

*Neurophotographer*
Charles Hodge, RBP, FBPA, AIMBI

* Resigned January 1979
** Resigned October 1979
*** Resigned June 1979
**** Resigned September 1979

## Consulting and Adjunct Staff

*Consulting Pathologists*
John Richardson, BSc, MD, PhD, FRCP(C)
Shao-nan Huang, MD, FRCP(C)

*Honorary Consulting Psychiatrist*
Robert Cleghorn, MD, DSc, FRCP(C)

*Consulting Psychiatrists*
Maurice Dongier, MD, FRCP(C)
Heinz Lehmann, MD, FRCP(C), FRSC

*Honorary Consulting Neurologist*
Roma Amyot, BA, MD, FRCP(C)

*Consulting Neurologists*
André Barbeau, BA, BPCB, MD, FRCP(C), LMCC, FACP, FAAN, FRSM, FRSC
Edward Bass, BSc, MD, FRCP(C)
Claude Bélanger, BA, MD, FRCP(C)
Guy Courtois, BA, MD, MSc, FRCP(C)
Jean-Léon Desrochers, BA, MD, FRCP(C)
Norman Giard, BA, MD, FRCP(C)
Raymond Lafontaine, BA, MD
Israel Libman, BA, MD, FRCP(C)
Calvin Melmed, BSc, MD, FRCP(C)
Allan Morton, MD, MSc, PhD, FRCP(C)
Guy Marcel Remillard, BA, MD, FRCP(C)

*Adjunct Neurologists*
Albert Aguayo, MD, FRCP(C)
Sabah Bekhor, MB, FRCP(C)
Garth Bray, BSc, MD, FRCP(C)
Morrison Finlayson, MB, FRCP(C)
Peter Humphreys, BSc, MD, FRCP(C)
Mortimer Lechter, BSc, MD, FRCP(C)
Michael Rasminsky, BA, MD, PhD, FRCP(C)
Leo Renaud, BA, MD, PhD
Bernard Rosenblatt, BSc, MD, FRCP(C)
John Stewart, BSc, MB, BS, MRCP, FRCP(C)
William Tatlow, MD, MRCP, FRCP(C)
Danica Venecek, MD, FRCP(C)
Gordon Watters, BA, MD, FRCP(C)

*Consulting Neurosurgeons*
Claude Bertrand, BA, MD, FRCS(C)
Maurice Héon, BA, MD, FRCS(C), FACS
Gérard Leblanc, MD, FACS, FRCS(C)
Harold Rosen, BSc, MD, FRCS(C), FACS

*Adjunct Neurosurgeons*
John Blundell, BA, MA, MD, MRCP, FRCS

Robert Ford, BA, MD, FRCS(C)
Robert Hollenberg, AB, MD, FRCS(C)
Peter Richardson, BA, MD, FRCS(C)
Joseph Stratford, BSc, MD, MSc, FRCS(C), FRSM

*Honorary Consulting Anesthesiologist*
Harold Griffith, BA, MD, DABA, FACA, FICA, FFARCS, FRCP(C)

*Consulting Anesthesiologists*
Richard Catchlove, MB, MSc, FFARCS
John Sandison, MB, FFARCS

*Adjunct Neurochemist*
Bruce Livett, BSc, PhD

*Adjunct Physiologist (Anesthesia)*
Kresimir Krnjevic, BSc, MB, PhD, FRSC

*Consulting Radiologists*
Jean Gagnon, MD, FRCP(C)
Jean Léger, MD
Lawrence Stein, BSc, MD, FRCP(C)
Jean Vézina, BA, BM, MD, FRCP(C)

*Adjunct Neuro-endocrinologist*
Gloria Tannenbaum, BSc, MSc, PhD

*Consulting Neuro-otolaryngologist*
Athanasios Katsarkas, MD, FRCS(C)

*Consulting Neurophysiatrist*
Dorothy Stillwell, MD, ABPMR, FRCP(C)

*Consulting Radiation Oncologist*
John Webster, MD, FRCP(C)
Joseph Hazel, BSc, MD, FRCP(C)

*Consultant, Employee Health Service*
Rosalind Hutchison, MD, FRCP(C) (to July, 1979)
Eric Ivor Beckett, MB, MRCP (from July 1, 1979)

*Consulting Executive Director*
Steve Herbert, BSc, MHA

*Consultant in Veterinary Medicine*
Richard Latt, DVM

*Consultant Neuropharmacist*
Francois Schubert, BSc (Pharm), DPH

## Resident and Rotator Staff July 1978-June 1979

*Senior Residents*
José-Luis Montes
John Wells

*Residents*
Philip Ades
Douglas Arnold
Gordon Balasi
Barbara Ballermann
William Barkas
Gustav Blomquist
Walter Bloom
John Boice
Alain Brox
James Douglas Cameron
Joseph Carlton
Matthew Chandy
Sirichai Chayasirisobhon
Robert Coté
Francisco Dexeus
Burke Dial
John Ducas
David Dwyer
George Elleker
Peter Ender
Allan Ericksen
Gordon Francis
Serge Gauthier
André Gelly
Arthur Gelston
Robert Gosselin
Michel Grignon
James Gruber
Antoine Hakim
Barbara Hannach
Peter Herscovitch
Richard Holmberg
Lindsey Horenblas
Sandra Horowitz
William Hughson
Paul Hwang
Albert Joern
David Katz
Daniel Keene
Marc Klein
Andrew Koritar
Adrian Langleben
Richard Leblanc
Jacques Leclerc
Eric Leith
Harry Lem
John Lister
Dawood Lockhat
Mohammed Maleki
Allan Cameron Manard
Sharyn Mannix
Herbert Markley
Gary Meller
Henry Milam
Marc Mullie
James Nelson
Kenneth Nudleman
Bruce Patterson
Stanislav Prelevic
Tekle Haimanot Redda
Mary Doris Ruggere
Maurice St. Laurent
Saleh Salehmoghaddam
Sheila Scott
Kenneth Silver
Arthur Sonberg
Daniel Stowens
John Sturman
Hwa-shain Yeh
Benjamin Zifkin

## Clinical and Laboratory Fellows July 1978-June 1979

*Electroencephalography Laboratory*
Dr. Joseph Carlton (Johns Hopkins University)
Dr. Sirichai Chayasirisobhon (Mahidol University, Thailand)
Dr. Kenneth Nudleman (Queen's University)
Dr. Arthur Sonberg (SUNY Downstate Medical Center)
Dr. John Sturman (Indiana University)
Dr. Hwa-shain Yeh (National Defense Medical Centre)
Dr. Benjamin Zifkin (McGill University)

*Electromyography Laboratory*
Dr. Sirichai Chayasirisobhon (Mahidol University, Thailand)
Dr. Herbert Markley (University of Maryland School of Medicine)
Dr. Kayode Odusote (University of Ibadan)
Dr. Leone Ridsdale (McMaster University)

*Neuroanesthesia*
Dr. Mireille Delorme (McGill University)
Dr. Marlene Gauthier (Laval University)
Dr. Marion Gould (University of Saskatchewan)
Dr. Dinh Mui Huang (University of Saigon)
Dr. David Thomas (Welsh National School of Medicine)

*Neuropathology Laboratory*
Dr. Michael Desnoyers (University of Guadalajara)
Dr. George Elleker (University of Alberta)
Dr. Gordon Francis (Queen's University)
Dr. Peter Herscovitch (McGill University)
Dr. José Montes (University of San Luis Potosi)
Dr. Kayode Odusote (University of Ibadan)
Dr. Lothar Resch (Dalhousie University)
Dr. Leone Ridsdale (McMaster University)
Dr. Kenneth Silver (University of Saskatchewan)
Dr. Daniel Stowens (New York State University)

*Neuroradiology*
Dr. Caroline Blane (McGill University)
Dr. Alain Bonafe (CHR Toulouse, Purpan)
Dr. Burke Dial (Medical University of South Carolina)
Dr. Nasir Jaffer (University of British Columbia)
Dr. George Jamaty (University of Beirut)
Dr. Henry Milam (Meharry Medical College)
Dr. David Reich (University of Saskatchewan)
Dr. Tekle Haimanot Redda (Hebrew University)
Dr. Anne Roy (Laval University)
Dr. Robert Warshowski (University of Alberta)
Dr. John Wells (Tulane University)

## Nursing Staff

*Director of Nursing*
Caroline Robertson, N, BN, MScA

*Assistant Directors of Nursing*
Elizabeth Barrowman, N
Irene MacMillan, BA, N, MScA

*Nursing Coordinators*
Anne Carney, N, BN
Annie Johnston, N*
Cecilia Largo, BSc, N
Linda Maruska, N
Lillian McAuley, N
Margaret Smeaton, N

*Assistant Director of Nursing Education*
Helena Kryk, N, BN†
Marilyn Manchen, N, BA, BN

*Coordinator of In-service Education*
Felicia Stretkowicz, N, BN

*Nurse Clinician Teacher*
Geraldine Fitzgerald, N, BN

*Nurse Clinician Lecturer*
Linda Robbins, N, BN

*Operating Room Supervisor*
Norma Isaacs, N, BN

*Consultant in Education*
Florence Mackenzie, N, BN, MScA

*Head Nurses*
Mary Cavanaugh, N
Lucy Dalicandro, N
Marion Everett, N
Kimiko Hinenoya, BA, N
Georgette Jotic, N
Frances Murphy, N
Barbara Petrin, N
Ursula Steiner, N
Winsome Wason, N

*Assistant Head Nurses*
Berta Natucci, N
Lois Gorman, N

* Retired April 1979
† Died January 18, 1979

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

*September 1978-February 1979*
Claire Baillargeon (Hôtel Dieu de Sherbrooke, Sherbrooke, Quebec)
Laura Barry (St. Michael's Hospital, Toronto, Ontario)
Monique Boudreau (Hôtel Dieu Hospital, Campbellton, New Brunswick)
Sandra Bradford (Vanier College, St. Laurent, Quebec)
Gwendolyn Brown (University Hospital of the West Indies, Kingston, Jamaica)
Constance Duclos (Collège Bois de Boulogne, Montreal, Quebec)
Joanne Jarvah (John Abbott College, Ste. Anne de Bellevue, Quebec)
Nancy Krock (St. Lawrence College, Kingston, Ontario)
Della Leng (Southern Islands Hospital, Cebu City, Philippines)
Jane Muoka (Kenyatta National Hospital, Nairobi, Kenya)
Pierrette Roberge (CEGEP Limoilou, Quebec City, Quebec)
Joyce Rose (King's College Hospital, London, England)

*March-August 1979*
Fay Belle (Vanier College, St. Laurent, Quebec)
Bernadine Bryerton (Williamsport Hospital School of Nursing, Williamsport, Pennsylvania)
Helen Chen (Singapore General Hospital School of Nursing, Singapore)
Joanne Curry (St. Martha's Hospital School of Nursing, Antigonish, Nova Scotia)
Jean Hughes (University of Illinois Medical Center, Chicago, Illinois)
Bonnie McFarland (University of Delaware School of Nursing, Newark, Delaware)
Karen Oppedisano (Boston State College, Boston, Massachusetts)
Salome Sansano (De Ocampo Memorial School of Nursing, Manila, Philippines)
Patricia Stackhouse (Saint John School of Nursing, Saint John, New Brunswick)
Meow Huay Tan (Singapore General Hospital School of Nursing, Singapore)

## Administrative Staff

*President*
J. Taylor Kennedy

*Director-General*
William Feindel

*Administrative Consultant*
Charles Gurd

*Director of Administrative Services*
Alphonsine Howlett*

*Director of Nursing*
Caroline Robertson

*Acting Director of Finance*
Gean-Yuan Pwu

*Director of Personnel*
Hector Heavysege*

*Director of Social Work Department*
Verna Bound

*Administrative Assistant*
Winston Rochette

*Registrar*
Bernard Graham

*Assistant Registrar*
Danica Venecek

*Planning Officer*
Harry Marpole

## Supervisory Officers

*Admitting*
Margaret Bernard

*Dietician*
Oresta Podgurny

*Employee Health Service*
Rita Lacombe

*Librarian*
Marina Boski

*Medical Records*
Dorothy Lawson

*Publications*
Rose Slapack*

* Retired September 1979

## Auxiliary of the Royal Victoria Hospital

*President*
Jane Osterland

*Chairman, MNH Coffee Shop Committee*
Frances Riddell

*Treasurer*
Judith Sura

*Director of Volunteers*
Heather McFarland

## 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*
Sister Brenda Halton

*Roman Catholic*
Reverend Father Emilien Messier, SJ

*Roman Catholic*
Father George Novotny, SJ

# Montreal Neurological Institute

*Laboratories at the MNI are involved in patient care as well as scientific research. Overleaf, Hélène Lacroix, chief technician in the Neuropharmacology Laboratory, measures anticonvulsant levels in a blood sample from a patient with epilepsy.*

## Neurosciences Advisory Council

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

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

Marc Colonnier, MD, PhD, FRS
Professor, Neurobiology Laboratories, Laval University

Pierre Gendron, PhD, LLD, 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, MD, BSc
President, University of Florida

Guy Odom, MD
Professor of Neurosurgery, Duke University

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

Donald Tower, AB, MD, MSc, PhD
Director, National Institute of Neurological and Communicative Disorders and Stroke
Department of Health, Education, and Welfare
National Institutes of Health

## 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, LLD
Governor, McGill University

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

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

Claire Kerrigan, BA, MSW
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

Walter Hitschfeld, BASc, PhD, FRSC, FRMetsS
Vice-Principal (Research), McGill University
Appointed by the Principal, McGill University

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

J. Preston Robb, MSc, MD, FRCP(C)°
Acting Chairman, Department of Neurology and Neurosurgery, McGill University
Appointed by the Board of Governors, McGill University

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

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

Member-at-large
Donald Byers, QC, LLD
Trustee, Estate of Dorothy Killam
Elected by the staff of the Montreal Neurological Institute

* Executive Committee member
° *Ex officio* member

## Executive Committee of the Montreal Neurological Institute

*Director*
William Feindel, MD

*Associate Director (Neurosurgery)*
Gilles Bertrand, MD

*Associate Director (Neurosciences)*
Pierre Gloor, MD

*Associate Director (Neurology)*
Donald Baxter, MD

*Associate Director (Finance and Development)*
Norman Bleakley, FCMA

*Chairman, Ethics Committee*
Francis McNaughton, MD

*Director Emeritus*
Theodore Rasmussen, MD

*Executive Secretary*
Sophie Malecka

# MNH/MNI Academic Appointments
# Department of Neurology and Neurosurgery
# McGill University

(Brackets denote joint-appointments.)

*Acting Chairman*
J. Preston Robb (to May 31, 1979)

*Chairman*
Donald Baxter (from June 1, 1979)

**Neurology**
*Emeritus Professor*
Francis McNaughton

*Professors*
Frederick Andermann
Donald Baxter
George Karpati (Pediatrics)
J. Preston Robb
Allan Sherwin

*Associate Professors*
J. B. R. Cosgrove
Andrew Eisen
Bernard Graham
Irving Heller
Donald Lawrence (Anatomy)
Ivan (John) Woods

*Assistant Professors*
Eva Andermann
Michel Aubé
Serge Gauthier
Sergio Pena (Pediatrics)

*Lecturer*
Antoine Hakim

**Neurosurgery**
*William Cone Professor*
William Feindel

*Professors*
Gilles Bertrand
Theodore Rasmussen

*Associate Professors*
Robert Hansebout*
André Olivier

*Assistant Professors*
Elaine Joy Arpin
John Little**
Jean-Guy Villemure

**Neurosurgical Research**
*Associate Professor*
Lucas Yamamoto

**Neurophysiology**
*Professor*
Pierre Gloor

*Associate Professor*
Robert Dykes (Surgery, Physiology)

*Assistant Professors*
Daniel Guitton (Physiology)
George Kostopoulos (Physiology)
Luis Felipe Quesney

**Neurochemistry**
*Emeritus Professor*
K. A. C. Elliott (Biochemistry)

*Professors*
Leonhard Wolfe (Biochemistry)
Hanna Pappius (Biochemistry)

**Radiochemistry**
*Assistant Professor*
Mirko Diksic (Chemistry)

**Neuroradiology**
*Professor*
Roméo Ethier (Radiology)

*Associate Professor*
Denis Melançon (Radiology)

*Assistant Professor*
Garry Bélanger (Radiology)

**Neuroanesthesiology**
*Associate Professors*
Davy Trop (Anesthesia)
Thomas McCaughey (Anesthesia)***

*Assistant Professors*
Mounir Abou-Madi (Anesthesia)
Luis Cuadrado (Anesthesia)****
David Thomas (Anesthesia)

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

**Neuropathology**
*Professor*
Stirling Carpenter (Pathology)

*Associate Professor*
Gordon Mathieson (Pathology)****

*Lecturers*
Kathleen Meagher-Villemure (Pathology)
Yvon Robitaille (Pathology)

**Neuropsychology**
*Professor*
Brenda Milner (Psychology)

*Assistant Professors*
Marilyn Jones-Gotman
Laughlin Taylor
Michael Petrides

**Clinical Psychology**
*Lecturer*
Clara Strauss

**Neuroanatomy**
*Associate Professor*
Donald Lawrence (Anatomy)

*Assistant Professor*
Barbara Jones (Psychology)

**Biomedical Engineering**
*Assistant Professors*
Jean Gotman
John Richard Ives
Christopher Thompson

*Lecturer*
Terence Peters (Radiology)

**Neuro-Ophthalmology**
*Associate Professor*
Trevor Kirkham (Ophthalmology)

**Neuroendocrinology**
*Associate Professor*
Yogesh Patel (Medicine)

**Neuropsychiatry**
*Lecturer*
Louise Demers-Desrosiers (Psychiatry)

* Resigned October 1979
** Resigned June 1979
*** Resigned September 1979
**** Resigned January 1979

## Research Fellows

*Cone Laboratory for Neurosurgical Research*
Dr. Richard Branan (University of Colorado)
Dr. Masayuki Matsunaga (Kyushu University)
Ernst Meyer (University of Montreal)
Dr. Mineo Motomiya (Hokkaido University)
Dr. Hikdeaki Nukui (Gunma University)
Dr. Takashi Shibasaki (Gunma University)
Dr. Victor Smart-Abbey (McGill University)
Dr. John Wells (Tulane University)

*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. George Kostopoulos (Athens National University)
Dr. John Musgrave (Queen's University of Belfast)
Dr. Ioannis Siatitsas (Athens National University)
Deborah Taylor (McGill University)

Dr. Andrew Gabor (visiting scientist, University of California)
Dr. Christian Ménini (visiting scientist, Centre National de la Recherche Scientifique, France)
Dr. Armand Siegel (visiting scientist, Boston University)

*Neuroanatomy Laboratory*
Dr. David Katz (University of Pennsylvania)

*Neurogenetics*
Linda Dansky (McGill University)
Richard Nagy (McGill University)

*Neuromuscular Research Laboratory*
Dr. Robert Coté (University of Montreal)

*Neuropharmacology Laboratory*
Dr. Kayode Odusote (University of Ibadan)

*Neuropsychology*
Dr. Henry Buchtel (McGill University)
Dr. Antonio Incisa della Rocchetta (University of Rome)
Dr. Michael Petrides (Cambridge University)
Dennis Rains (Cornell University)
Donald Read (McGill University)
Dr. Carlos Roldan (University of Stirling)
Mary Louise Smith (St. Francis Xavier)

*Neurosurgical Research*
Dr. Bernard Valle (Centre Hospitalier Universitaire de Rennes)
Dr. Hwa-shain Yeh (National Defense Medical Centre)

# Reports

*Overleaf, some scenes from an eventful year. Above left, MNH/MNI Director Dr William Feindel greets visitor Dr. Deng Jia-dun, vice-president of the Chinese Academy of Medical Sciences. Right, McGill's principal Dr. Robert Bell welcomes his successor, David Lloyd Johnston. Below, city workmen install new signs. In April 1979 McGregor Avenue was renamed Avenue Docteur Penfield.*

# "Pride and Commitment"

## Remarks of Principal David Johnston

Annual Meeting of the Montreal Neurological Institute
October 22, 1979

At Dr. Feindel's suggestion, I am happy to make a few brief observations on the research reports presented here.

First, research is rooted in the work of each individual's imagination, in the relentless curiosity and persistance in taking the ideas there conceived and pursuing them in a rigorous fashion. But as much as one emphasizes the individual components of research, teamwork is also important. Teamwork involves skill, knowledge, and expertise within a particular group, moving from more senior to more junior people, using the creative drives of young people as a regenerating force. It is apparent that the transfer of information and enthusiasm is occurring in a very happy and propitious way here within the institute.

There is also the shared teamwork across sub-disciplines — the ability of people in a particular group organized around a certain disciplinary terminology and set of approaches to share their expertise with others in related sub-disciplines. That kind of sub-disciplinary teamwork is performed in an exemplary fashion here. It could be applied with most beneficial results in other parts of the university.

Finally, there is a sharing of another kind: sharing among the clinical, the teaching, and the research experiences. Medicine leads the way in disciplines represented in our universities in that respect. It is an area where some of our other disciplines have many important lessons to learn.

A second observation has to do with the development of the climate for research within any particular institution. You have been able to make the clinical-research interaction work most successfully here. And in this functioning format the presence of more abstract research endeavours is also very obvious. We in other disciplines are aware of Osler's proposition of many years ago that it is important to root research in clinical work. It is important for the regular clinician to have both the powers of observation, and the imagination to wonder what he is doing and why he is doing it, and what results will ensue. It is important to pass those lessons and inspirations on to others who focus their activities in a more research-oriented mode.

Within the climate you have established here, we are all conscious of the direct and indirect costs of doing research today. How fortunate we all would be if we could have present in this auditorium our decision-makers and representatives of the electorate in our country. This afternoon's experience would help them to recognize how terribly important it is to support the kind of activity that is going on in this institute.

Again, to comment on climate, one is conscious of the time pressures and the great temptations for many of you to spend more time in a clinical mode where the pressures are immediate and direct. Some of you referred to the difficulties in freeing yourself, carving out those precious hours to focus in a more reflective fashion in the laboratory, to take the lessons from clinical

work and travel the next step beyond to a solution of problems as they emerge. Difficult as that task of balancing your time may be, I hope you are successful in doing it.

In respect to the work of other centres, I was heartened to hear of the interaction with China in recent years. I was also heartened to hear time and time again of your work in an interactive fashion with other centres in Canada, the United States, and around the world. Within the past several days, I have been involved in two projects that bear on this interaction. One is the broad question of McGill's interaction with other research centres around the world under the umbrella of McGill International. The other is more specific, an entente that we have recently concluded with Peking University in China. We regard Peking as the premier university in that country. With the entente in place we will be able to examine more specific projects of research and exchange of faculty and students.

Dr. Gilles Bertrand referred to the question of departures. We are all conscious of loss of people to other centres. Permit me to say two things. One is that McGill has always had an important role in staffing research, teaching, and medical centres in other parts of Canada and around the world. I expect that we shall continue to have that role. I do hope, however, that we will not be expected to contribute too much or too quickly. In spite of somewhat stormy political weather that we now experience in the province, I sense a good deal of optimisim. There is a profound sense of the mission to be done by McGill University. McGill's future in Quebec is a prominent one. The future of McGill in Canada is equally strong and I'm very heartened to see more and more signs within Quebec that that is being recognized.

Let me conclude by giving summary observations of the afternoon in two words: pride and commitment. You have both in extraordinary measure. With respect to pride, you have good reason for it. With respect to commitment, McGill is fortunate to have as members of its community the individuals here today.

# Director's Report

From the records presented here by our staff members, it wil be evident that during the past year clinical work in the hospital and scientific research in the institute reached an all-time high. The splendid new resources of the Penfield Pavilion were put into operation without any slackening of pace in the old building. Our knowledge of epilepsy has continued to advance — surgically treated patients, now numbering well over 2,000, make up the largest and most carefully studied series in the world. Our CAT scanning team developed new detailed imaging of the spinal cord and orbit; our positron emission tomography (PET) team completed a successful clinical trial of the MNI-designed high resolution positron imager that "sees" the chemical activity and blood flow of the brain. This year our research grants and scientific publications again increased over those of previous years. The institute's staff were scientific emissaries to many countries; our international connections were more widely extended through the World Health Organization and through our many trainees around the world. Confidence and excitement are in the air.

*Principals*
This summer Dr. Robert Bell resigned from his position as principal of McGill University to return to his career in physics and to take on the presidency of the Royal Society of Canada. As an experienced scientist himself, he was always responsive to our research developments and in particular to our positron-cyclotron project. In the past eight years he often chaired annual meetings of the hospital and institute. It was therefore most fitting that in 1976 he was able to unveil the re-dedication plaque that marked the beginning of our building project. Two years later he presided over the opening ceremonies of the Penfield Pavilion.

This year our annual meeting was chaired by our new principal and vice-chancellor, David Johnston. After earning scholastic and athletic honours at Harvard and Cambridge, he taught law at Queen's, Toronto, and Western, where he was dean of his faculty. His skill as a labour arbitrator with universities and hospitals, and his experience in corporate finances are most appropriate to the present McGill-Quebec scene. We extend a warm welcome to Principal and Mrs. Johnston and to their family of five young ladies.

*Montreal Neurological Institute Advisory Board*
In 1974, after consultation with Dr. Wilder Penfield and Dr. Theodore Rasmussen, I requested of Principal Bell that McGill's Board of Governors authorize an advisory board to assist the director of the institute. This seemed wise in view of the opening of the Penfield Pavilion, the resulting expansion of our research operations and scientific staff, and the broadening role of the institute in world neurology. After discussion with Principal Bell, Vice-Principal Dr. Leo Yaffe, and other senior colleagues, we planned a board of twelve members to represent the university, McGill's Board of Governors, the scientific staff of the MNI, and the community at large. I am grateful to the individuals who have worked to establish this board, to the members who have agreed to serve on it, and to Peter Laing, the university solicitor,

who advised us on regulations by which the board will function.

*Role of the Director*
Since 1934, the director of the Montreal Neurological Institute has also served as chairman of McGill's department of neurology and neurosurgery. In 1977, after some discussion, Principal Bell recommended to the Board of Governors that these two positions had become so onerous they should be divided. Guidelines approved by the board identified the director's continuing responsibilities in administration of the institute's endowment funds, drawing up of its annual research and teaching budget, recruitment of research staff, and allocation of space and resources necessary to the institute's activities. In a larger sense, the director's task was defined as ensuring that our researchers are tackling not only the problems of today, but those of tomorrow as well.

This arrangement will allow the new chairman of the university department of neurology and neurosurgery, Dr. Donald Baxter, to devote his energies to co-ordinating the undergraduate and post-graduate clinical teaching activities among our McGill hospitals. An outstanding neurological teacher, Dr. Baxter will bring strength to our training program. As colleagues and friends from our student days at the Neuro and the "Saskatoon Division" of the MNI, he and I share the common goal of enhancing McGill's world reputation in neurology and neurosurgery. With the full support of Dr. Samuel Freedman, dean of medicine, we have already made useful reviews and upgraded certain aspects of our departmental and hospital programs.

*Staff Kudos*
Many honours have been accorded our staff members. Dr. Brenda Milner was elected a fellow of the Royal Society of London, England — a premier scientific distinction. The Hughlings Jackson lecture she gave in October was a fascinating summary of her views on the duality of the brain.

It has been a busy presidential year for members of our staff. Our neurosurgeon-in-chief, Dr. Gilles Bertrand, was made president of the Canadian Neurosurgical Society, Dr. Pierre Gloor of the American Electro-encephalographic Society, Dr. Denis Melançon of the Quebec Association of Radiologists, and Dr. André Olivier of the Quebec Association of Neurosurgeons.

Dr. Richard Gilbert, for many years our distinguished chief of neuro-anesthesiology and chairman of McGill's department of anesthesia, was named emeritus professor at the fall convocation. Four staff members — Drs. Frederick Andermann, Roméo Ethier, Hanna Pappius, and Allan Sherwin — were promoted to full professorships.

Three of our young neuroscientists — Drs. Jean Gotman, Sergio Pena, and George Kostopoulos — were awarded prestigious five-year MRC Scholarships. Dr. Donald Baxter gave the Allan Bailey Memorial Lecture at the University of Saskatchewan. Dr. Lucas Yamamoto and computer systems

engineer Christopher Thompson, leaders of our positron research team, received outstanding recognition at international meetings for their work in positron emission tomography.

Our scientific staff continues to participate at national and international levels as contributors to symposia and conferences, as members of advisory, examining and editorial boards, and as consultants to other research institutes, universities, and government health agencies.

*Staff Changes*

Last year we reluctantly accepted Dr. Preston Robb's resignation as neurologist-in-chief. We shall miss his steady hand at the helm of the neurological section where he made many valuable contributions over the past thirty-five years. Under the auspices of our World Health Organization program, he is now establishing a model for epilepsy control in Kenya.

On the recommendation of an MNH-McGill selection committee, Dr. Donald Baxter was appointed Dr. Robb's successor. As neurologist-in-chief he will be responsible for clinical neurological services, the neurological residency program at the MNH, and the neurological consultation and outpatient services at the Royal Victoria Hospital. A graduate of Queen's university, Dr. Baxter worked at the MNI with Dr. George Olszewski before taking his neurological training at Harvard with Dr. Derek Denny-Brown. In 1963 he became chief of the division of neurology at the Montreal General Hospital where he gathered about him an able group of young physician-scientists in the best McGill tradition. We welcome him back at the Neuro.

Earlier this year Dr. John Little was lured away to the neurosurgical staff of the Cleveland Clinic. Before his departure he was awarded the surgical prize of the Royal College of Physicians and Surgeons of Canada for his excellent work on vascular bypass operations of the brain. His place will be filled by Dr. Joy Arpin, who completed the McGill neurosurgical residency program and a year in neuroradiological studies at Harvard University.

Other medical staff additions include Dr. Muriel Yarde and Dr. David Thomas, who were appointed to cover teaching and clinical work in neuro-anesthesiology. We record the resignation of Dr. Thomas McCaughey from the same department. Dr. Antoine Hakim joined the neurological staff and is working with Dr. Hanna Pappius in neurochemistry.

Dr. Robert Hansebout resigned recently to take up an appointement at McMaster University. He has been a valued member of the hospital and institute not only as a neurosurgeon but as an investigator of spinal cord injuries and assistant director of professional services.

Four members of our support staff retired in 1979. Alphonsine Howlett, director of administrative services, brought enthusiasm and devotion to her hospital duties and to the heavy administrative activities of our construction program. We appreciate the work she did and the vivacity with which she did it over the past four years.

Father Emilien Messier retired after eighteen years of pastoral service here. He gave comforting and cheerful spirituality to many of our patients, and we wish him well in his new career as hospice organizer.

Hector Heavysege, our director of personnel, retired in August from a position he filled with the greatest faithfulness for many years. We are all grateful to him for his fairness and promptness in dealing with staff problems.

In August Rose Slapack retired as executive secretary to the director. She managed efficiently the many clerical duties related to the boards and committees of the hospital and institute, and was responsible for much of the organization of the Third Foundation celebrations. She has agreed to return from time to time as a consultant; her valuable experience will not be lost to us.

Several newcomers have joined us. Roland Saint-Arnaud was appointed our new director of administrative services. He comes to us after fourteen years' experience in hospital administration, most recently at the Hamilton General Hospital. Paul Dussault, formerly on the staff of the Royal Victoria Hospital, is our new director of personnel. Victoria Lees, who completed a doctorate in English before serving as editor of the *McGill News*, joined us as publications editor.

*Chinese Connections*

The institute has developed unusual international connections through the distinguished scientists and clinicians from around the world who have trained here. In 1938 a young Chinese doctor, Chao Yi-ching, came to study at the Montreal Neurological Institute on a Rockefeller Scholarship. After working here with Wilder Penfield, he returned to Tientsin to establish the first neurosurgical training program in China. When the Peking Institute of Neurosurgery opened in 1957 Chao was appointed its first director. Today, under his successor, Professor Wang Chung-cheng, this institute is the most active in China. This summer, with Dr. Donald Tower, director of the National Institute for Neurological and Communicative Disorders and Stroke, and Dr. Liana Bolis of the WHO secretariat in Geneva, I made a WHO survey visit to China. One of our recommendations was that WHO recognize the Peking Institute as a collaborating centre in its worldwide neurosciences program.

Over the years we have had additonal exchanges with China. Dr. Penfield visited there in 1943 and 1962. In 1964 Dr. K. A. C. Elliott was the first Bethune exchange professor between McGill and Peking University. Several groups of Chinese physicians have visited the MNI in recent years. In October eight delegates from Peking and Shanghai spent a full week here, accompanied on one occasion by our friend, H. E. Wang Tung, the Chinese ambassador to Canada. Recently Dr. Francis McNaughton took part in the fortieth anniversary memorial for Dr. Norman Bethune held by the government of China in Shih-Chia Chung, the site of Bethune's International Peace Hospital. With the blessing of the Bethune Foundation, the MNI will establish two Bethune-Chao fellowships to enable Chinese neurological

and neurosurgical scientists to study here.

*World Health Organization*
At our Third Foundation celebrations in September 1978, Dr. Thomas Adoye Lambo, deputy director-general of the World Health Organization, redesignated the Montreal Neurological Institute one of the eight world collaborating centres in the neurosciences. In October this institute was well represented at the Eleventh International Symposium on Epilepsy, held in Florence partly under WHO sponsorship. We participated in WHO's Sixth Neurosciences Consultation in Geneva, called to review progress of the program and to study results of our survey of neurological centres in China. Dr. Preston Robb initiated his model for epilepsy control in Kenya, a model which could well be applied to other countries too. Dr. George Karpati participated in WHO projects on peripheral neuropathies, and Dr. Allan Sherwin was involved in information programs on the monitoring of anticonvulsant drugs.

*Guest Lecturers*
We are grateful to the many visitors and lecturers who brought us new ideas and information. The Willis Lectures were given by Dr. Henry Barnett, chairman of clinical neurosciences at the University of Western Ontario, who spoke about recent advances in stroke, and by Nobel laureate Dr. Andrew Schally, who reported on his exciting research on brain hormones. The first K. A. C. Elliott Lecture in Neurosciences was given by Dr. Marcus Raichle, of Washington University at St. Louis, who spoke on positron emission tomography.

*Cone Laboratory Anniversary*
October marked the twentieth anniversary of the Cone Laboratory for Neurosurgical Research. Supported by generous donations that established the Cone Memorial Fund in 1959, this laboratory has focussed on the application of radioactive tracers to the study of neurological problems, in particular to the detection of brain tumours and the measurement of brain circulation in experimental and clinical stroke. The Saskatoon contour brain scanner, the original tool of this laboratory, was finally discarded this year. The first automatic brain scanner developed in Canada, it was the forerunner of more sophisticated instruments like the computerized gamma camera. New techniques first introduced in the Cone Laboratory include fluorescein angiography of the brain, regional cortical blood flow measurements, and positron emission tomography for mapping the brain's circulation. The Cone Laboratory has enjoyed the collaboration of McGill's department of chemistry and of its cyclotron team.

*Scanners*
In 1973 we installed an EMI computerized axial tomograph for brain scanning, the first in Canada. This device served not only the MNH, but also patients referred from the teaching hospitals of McGill and the University of Montreal. To date we have completed 25,000 examinations. We maintained close relations with the CAT scanner's inventor, Dr. Godfrey Hounsfield, and his

team at the research centre in England; Hounsfield also travelled here several times to check our developing programs. Our staff members were most gratified to learn that he was awarded the Nobel Prize in medicine for his work on CAT scanning.

In 1975, through the generous support of friends of the MNI, we acquired the first body scanner in Canada. With this device our physicist, Dr. Terence Peters, has developed a superb imaging technique that gives fine details of the spinal cord and the orbit of the eye that were formerly impossible to obtain.

The bismuth germanate positome, the imaging device we use in positron emission tomography, is the first instrument of its kind available for clinical and research work. Developed here by Christopher Thompson and our research team, it was judged so far in advance of other imaging devices that Atomic Energy of Canada Limited (AECL) is now taking over this design for commercial manufacture. Over the past two years we have worked closely with Japan Steel Works in their production and testing of a new miniature cyclotron that will be an integral part of our positron emission tomography project. The skills that our MNI teams have developed in the CAT and PET projects have made the MNI a leader in these remarkable techniques for imaging the brain and for probing the chemical secrets of many neurological diseases.

*Hospital Finances*

In spite of interruptions caused by the *emménagement* into the Penfield Pavilion, the hospital occupancy rate in the past year was 87 per cent. An increase of 15 per cent in the surgical case load was matched by more demands on our clinical and special laboratory services. Changes in the manner of reimbursement of our professional laboratory staff and our residents, as well as numerous negotiated agreements with support staff, have required modifications in our budget operations in the midst of the fiscal year. Nevertheless, the year-end balance for the hospital deviated less than 1.5 per cent from the budget drawn up two years ago. Even this disparity, we hope, will be balanced when the hospital receives the supplementary budget for the Penfield Pavilion requested from the treasury board since July 1975. (A detailed financial statement appears on page 111.)

We recently negotiated a transfer of the budgetary support for the post-basic course in neurological nursing from the Ministry of Social Affairs to the Ministry of Education. We have the full support of government representatives for this change.

*Construction and Renovation*

In these times of tight funding for research we have been engaged in a major expansion program. Since our research units increased from twelve to twenty-five in the past seven years, the opening of the Penfield Pavilion, which increased our total space by 50 per cent, was most welcome. Capital construction and equipment costs amounted to $10 million. The federal and

provincial governments both contributed, supported by private donations from friends who generously expressed their confidence in the work and future of the MNI.

Phase IV of the construction project — modernizing the old building and joining it to the new one — will require a further $4 million. This final stage of development is needed to provide a safe and humane environment for our patients, to upgrade obsolescent research laboratories and teaching areas, and to improve the efficiency of our day-to-day operations. Under a provincial-federal agreement in which our project was declared of national interest, half the money will come from the Health Resources Fund. In order to complete these matching funds, however, the hospital and institute will have to raise $1.6 million.

*Institute Finances*

The Montreal Neurological Institute pays its way from two major sources of funds — external research grants and internal funds (derived from endowments and special donations). In a review of financial operations of the past seven years, several trends are evident.

From 1972 to 1980, total research grants increased by 188 per cent. If we adjust these figures for an inflationary rate of 8 per cent per annum, however, the increase is much less — only 56 per cent. Most of these grants were awarded through the Medical Research Council competitive system. The balance came from the Multiple Sclerosis Society, the Muscular Dystrophy Association, and the Quebec Medical Research Council.

During the years 1974 to 1978, as is well known in the research community, total funds allotted by the federal government to the Medical Research Council barely matched inflation. During these lean years we could, fortunately, fall back on the MNI endowment funds so that our research staff was not forced to abandon projects or to release technical staff. But our endowment funds are not limitless. From 1972 to 1980 their "book" value increased by only 30 per cent. Translated into current dollars, this represents an actual reduction of 30 per cent. In contrast, funds committed to our MNI operating budget derived from our endowments more than doubled.

For many years we have leaned heavily on annual donations earmarked for specific projects. We used these for a wide range of exciting work: research on stroke and epilepsy, positron emission tomography, a neuro-ophthalmology unit, tememetering in the EEG laboratories, a pilot study in home care for multiple sclerosis patients, a survey of patterns of nursing care in our intensive care unit, establishment of a clinical and laboratory unit for neurogenetics. These special donations are life-saving to our current research activities. But for the long run we must augment our endowment funds to assure a stable income for productive, long-term research.

*Research and Development Funds*

In view of our pressing needs, a development campaign for the Neuro

has been approved by hospital, university, and government. The Third Foundation Fund and the Penfield Memorial Research Fund (which has already accumulated a considerable sum through unsolicited contributions) will serve as focal points for donations. We believe the campaign will offer our friends and supporters around the world, but particularly in Canada and the United States, an opportunity to help us continue the life-saving work Dr. Penfield and Dr. Cone started here fifty years ago.

Our urgent needs can be summarized as follows:

1. Funds to match government grants for the modernization of the Rockefeller and McConnell Pavilions.
2. Secure funding for the positron-cyclotron project to ensure that the MNI remains a world leader in this new and exciting field of brain research.
3. Endowment for scholarships and fellowships to maintain the MNI's position as a world centre in training and research in the neurosciences, neurology, neurosurgery, and neurological nursing.
4. Augmentation of the MNI endowment funds to provide long-term stability for ongoing research, and to develop new treatment for epilepsy, stroke, tumours, and other neurological disorders.

*Envoi*

On behalf of the staff, I thank all those who supported this institute and hospital during the past year — our generous donors, our directors, our colleagues in the university, in other teaching hospitals, and in government. Especially, we thank our patients and their families, who are, after all, our *raison d'être.* With their help we strive, as Wilder Penfield expressed it so simply and beautifully, "to make the world a better place in which to live."

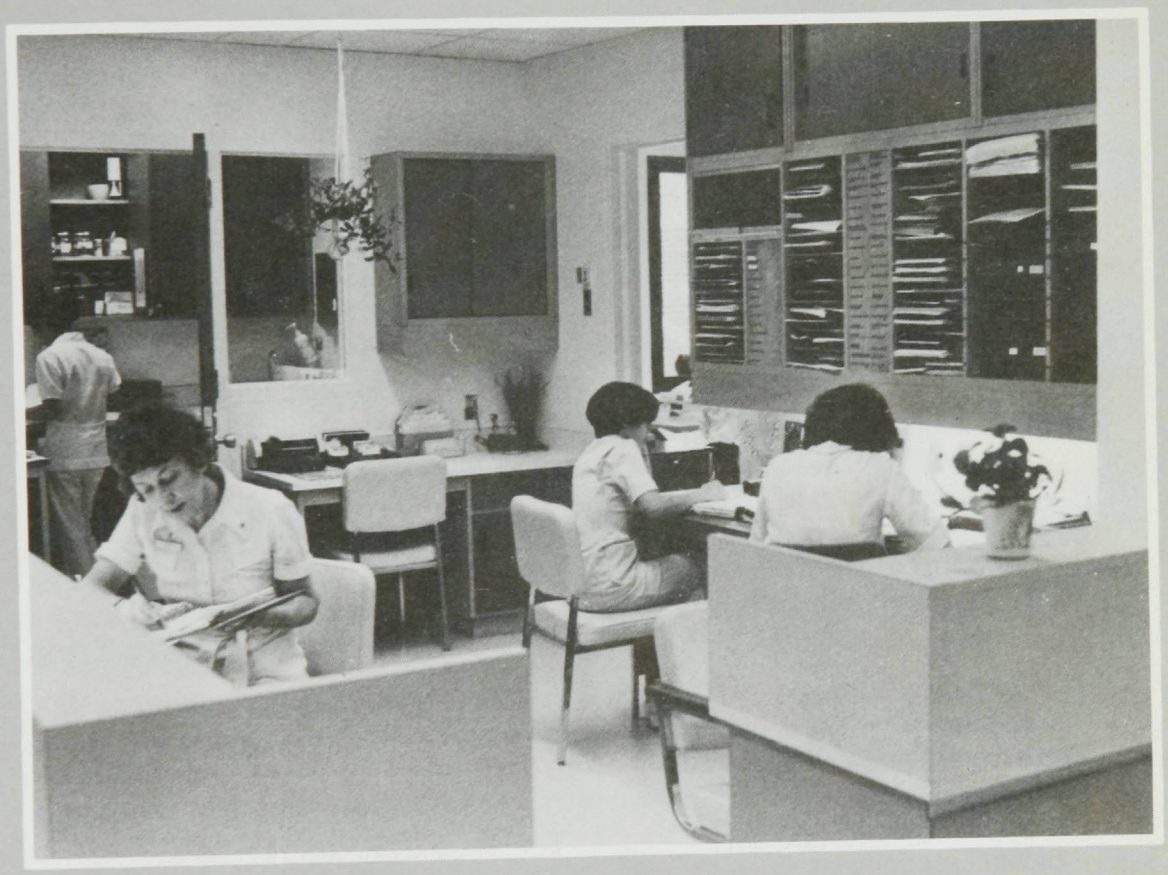
On visits to neurological centres around the world, my colleagues and I cannot help but feel a deep sense of pride at the respect shown this institute. Through the dedicated work of its scientific and clinical staff the MNI remains in a unique position to contribute to man's understanding of brain disorders and behaviour. Other centres around the world have looked to us for leadership. We must continue to provide it.

Never before in the history of science has there been such intense and widespread interest in the brain and its function. Indeed, the study of the human brain, its structure, its action, and its disturbances, represents one of mankind's final intellectual challenges.

We need long-term support to enable us to continue in our vast task. In view of our world-wide connections, our international responsibilities, and our commitment to the continuing quest for knowledge of the brain, it is fitting that we keep in mind the words of the ancient Chinese philosopher Lao-tzu: *"Beyond the ultimately unfathomable lies the gateway to many mysteries."*

— William Feindel, MD

# Hospital Reports



*The opening of the Penfield Pavilion in 1978 added new clinical resources, modern operating rooms, a ten-bed intensive care unit, and a fifteen-bed ward to the MNH. Overleaf, the nursing station on three-south.*

# Neurology

The neurology services have been busy — in the past year there were 1,161 admissions. The three services worked well, each with its own style and special interests. We had an excellent team of residents. The reputation of the Montreal Neurological Hospital has always attracted residents from around the world; we feel we have a responsibility to train neurologists who will return to their home countries. However, the new restrictions placed on us by the government have created severe problems. The 15 per cent limitation on foreign medical graduates in our training program has been a serious blow to our recruiting ability. As a result, we have been short-handed, and the residents deserve a special note of thanks for the extra load they have carried.

We continue to operate the neurology clinics for the Royal Victoria Hospital. In January 1979 we reduced the number of clinics from eleven to six. A general neurology clinic is held every afternoon. There are, as well, specialty clinics: one for multiple sclerosis (run by Dr. J. B. R. Cosgrove and Dr. Yves Lapierre), an epilepsy clinic (Dr. Frederick Andermann), a muscle clinic (Dr. George Karpati), and a motor disorder clinic (Dr. Serge Gauthier).

The active consultation service in the Royal Victoria Hospital is manned by a senior neurology resident, a Royal Victoria Hospital resident in medicine, and (usually) a student, with a staff neurologist supervising. This rotation is popular with our residents. I am impressed by the number of consultations in the emergency department. Ideally, a staff neurologist should be available at all times to handle these emergencies, but we have inadequate staff to make this possible.

As well as doing their work in the hospital and the university, our staff members participated in many outside activities. Dr. George Karpati and Dr. Albert Aguayo headed the International Muscle Conference in Montreal. Dr. Allan Sherwin was active in an international study of anticonvulsant drugs. He also served on a study session of the National Institute of Neurological and Communicable Diseases and Stroke. Dr. Frederick Andermann was on the Policy Committee for Canadian Immigration. Dr. Michel Aubé worked on the Council of the Federation of Medical Specialists.

The year was difficult for everyone because of the move into the new Penfield Pavilion. I have been especially concerned about the temporary decrease in physical space available for residents to interview patients and write reports. The number of examining rooms has decreased, and the second and third floor teaching rooms have succumbed to the pressure for research space. These facilities will be restored as the building is renovated.

The opening of the neurodiagnostic centre will be a challenge to all. Since patients will be seen and investigated on a day-patient basis, all the diagnostic and treatment services — x-ray, EEG, EMG, brain scan — must work together so that these patients will receive the same quality of care as those in hospital. The new grouping of patients according to disease will not only improve

treatment but also provide cohorts of patients for clinical study of new treatments.

We are fortunate in having Dr. Donald Baxter take over the reins as neurologist-in-chief and chairman of McGill's department of neurology and neurosurgery. From him we can expect new ideas, new enthusiasm, and the maintenance of high standards to which we are accustomed.

Dr. Francis McNaughton insists that I always have a Biblical quotation for occasions such as this. Today it would be from Revelation: "I saw a new heaven and a new earth." With new facilities, new staff members, and new leadership, I see a great future for neurology at this hospital. In parting, I would remind you that in Greek the word "farewell" (cherein) is the same as the word "rejoice." To all of you I say rejoice.

— J. Preston Robb, MD
Acting Neurologist-in-Chief

# Neurosurgery

The neurosurgical services have had a busy year; we saw 858 theatre cases, an 8 per cent increase over last year's figures. Major procedures, however, increased by 14 per cent. In general, there has been a shift toward more complex problems, longer operations, more demanding surgical techniques, and more critical post-operative care. These operations, plus 1,020 direct admissions to the neurosurgical services and an undetermined number of transfers from the neurological services and the Royal Victoria Hospital, have kept our dwindling resident staff quite active.

Our hard-working residents have cared for our patients at the cost of many sleepless nights and numerous missed meals, in a way not often surpassed anywhere. They feel the strain of increasingly restrictive quotas and constraints, and of innumerable administrative hurdles which seem designed to break the stride of prospective neurosurgeons. How much more can our resident staff be reduced (all in the name of economy and manpower planning) before quality suffers and very costly consequences occur? An avoidable paraplegia or meningitis can cost the public much more than the salary of a resident!

Because an increased load is shared by fewer and fewer people, paper work has suffered a little, but we are proud to say that the operative infection rate has remained less than 1 per cent — 0.7 per cent, to be exact. Our excellent nurses in the operating room, the recovery room, and the intensive care unit have helped greatly in keeping the infection rate down.

The role of the neurosurgeon is to apply surgical treatment to disorders of the nervous system, in other words, to operate. But he must also assess each patient's problem and establish the necessity for surgical treatment. He must not only keep abreast of new techniques and contributions made by others in his field, but he must also develop some of these techniques himself. He must report his successes (and failures) so that his experience may be useful to other surgeons and ultimately, to other patients. He must teach younger generations — a delicate and sometimes perilous balancing act in which he must exercise a close supervision of the surgical process and at the same time leave his pupils, the residents, a certain amount of freedom. Finally, because of the complex structures in which he works — the service, the department, the hospital, the university, the community — he must also, alas, administer.

Each member of the neurosurgical staff of this institute and hospital has fulfilled these primary functions in various proportions and patterns, weaving, so to speak, his personal tartan from these five primary colours.
Dr. Theodore Rasmussen now devotes his time almost exclusively to the active surgical treatment of epilepsy, and to the study and long-term follow-up of the many cases treated in this institution over the years. Dr. William Feindel, in spite of a heavy administrative load, continues his studies of temporal lobe epilepsy and cerebral arteriovenous malformations. Positron emission tomography, one of his major fields of interest, promises some very exciting developments in these fields. Dr. Robert Hansebout has continued to study the effect of local cooling on experimental spinal cord trauma. Unfortunately

for us, Dr. Hansebout accepted a post as chief of the neurosurgical service and head of the acute spinal injury centre of St. Joseph's Hospital in Hamilton, Ontario, and associate professor of neurosurgery at McMaster University. Dr. Hansebout made many contributions to the life of this institute. We wish him great success in his new position.

Dr. André Olivier, who was elected vice-president of the Association of Neurosurgeons of the Province of Quebec, will now replace Dr. Hansebout as president of that association. He continues the study of patients with bitemporal epileptic foci by means of stereotactically implanted depth electrodes and, with the help of Dr. Hwa-shain Yeh, is developing an experimental animal model to study the "kindling" effect of chronic electrical stimulation by electrodes implanted in the amygdala.

Dr. Jean-Guy Villemure is studying the problem of low pressure hydrocephalus. He monitors the intracranial pressure before, during, and after an infusion of artificial CSF to investigate the compliance of the subarachnoid space and the rate of absorption of the fluid. He is also assessing the significance of silent subdural effusions occuring after low-pressure shunting of hydrocephalus. With his wife, Dr. Kathleen Meagher-Villemure, a neuropathologist, he is also reviewing some of our brain tumors.

My own clinical research focusses on the surgical treatment of pituitary tumors, studied and followed up with members of the department of endocrinology of the Royal Victoria Hospital. I am also studying the management of various anomalies of the craniovertebral junction, for example the Chiari malformation and its common consequence, syringomyelia.

I am happy to welcome to our group Dr. Joy Arpin, who after three years as a resident here spent one year in clinical neuroradiology at the Massachusetts General Hospital in Boston. Her research and clinical interests centre on microvascular surgery, stroke, and aneurysms. She is also engaged in a follow-up study of the efficacy of surgical decompression for ulnar neuropathy at the elbow.

I report with regret the departure of one of the youngest and most active members of our surgical team, Dr. John Little, who left the Neuro to join the Cleveland Clinic. Although he had been here only since 1976, Dr. Little made his mark in cerebral vascular surgery. This year he was awarded the Medal in Surgery from the Royal College of Physicians and Surgeons for his research on this topic. In the name of all my colleagues I should like to thank him for his support and to wish him a successful continuing career.

I hope that next year I will not have to report other departures from our staff. Although this country and this province are facing difficult times financially and politically, I am convinced that there is still opportunity for exciting developments and research at the Neuro.

— Gilles Bertrand, MD
Neurosurgeon-in-Chief

# Nursing

This has been the most active year I have yet encountered in our hospital. Activities preparatory to the Third Foundation caught us up from January to September. We enjoyed the work necessary to make the reunion both happy and educational. The Nursing Day of the Third Foundation is described in a set of papers printed in February. The nurses' theme — *Our Future is Now*— honoured our former directors of nursing for their foresight in planning for the future. Our principal speakers, Joan Gilchrist, director of McGill's School of Nursing, and Dr. Josephine Flaherty, principal nursing officer at Health and Welfare Canada, developed this theme so well that we felt truly committed to the future of Neuro nursing. The presentation of our own staff nurses concerning new dimensions of care for patients with spinal trauma, blood vessel disorders, and increased intracranial pressure, showed how this care has developed over the years. Ward displays took on an added interest — they became centres of reminiscence as well as of learning.

This year, staff nurses revised their own nursing objectives. They shared in the management of procedural changes in this hospital more than ever before. Our nurses are not only willing to implement care but also to devise better ways to do it. In addition, they are trying more than ever before to help patients learn health care and meet their own needs. Part-time nurses also contributed, and the past year has been an extremely active one for them. We could not manage without their help.

Has it been a good year for patients at our hospital? Yes and no. Some have written to thank us for their care, but not all comments have been complimentary. Many complaints are perhaps justified, since we have had to cut corners on comfort items. Although our audits show that we are giving effective bedside care, our nursing staff has a difficult time providing all the services desired. We are thankful we have not had to reduce our numbers. We need every single nurse, and nobody can have felt unwanted in the nursing department this year!

This year we have again put up with old equipment, and have had to fight for every scrap of supplies received. We appreciate the support given us by the other departments; we know that dietary, stores, maintenance, and housekeeping are also under financial pressure. Nevertheless, we have done everything possible to keep patient care as efficient as possible.

We are ready to take parachute jumps into exciting new areas of patient care, but lack of funds grounds us to the every-day task of "keeping it all together." To those nurses who have given the extra effort necessary to get the job done and at the same time to devise ingenious ways of providing care at no additional expense, I wish to say a special thank-you.

Two more of our head nurses started on the road to bilingualism this year. We respect their effort to learn French while also managing their units. In our endeavour to be good citizens of Quebec we have also begun to provide patient learning materials in both languages.

Our nursing department continues to miss the presence of Helena Kryk, our assistant director of nursing education, who died in January. She taught the students of twenty-five classes, but she did much more as well — she helped us all to learn. The nursing library, on which she spent so much time and effort, will be a working memorial to her. Marilyn Manchen has moved into the post of assistant director, nursing education, and Geraldine Fitzgerald is now nurse clinician teacher with the post-basic students. Berta Natucci is assistant head nurse on 4-east. These nurses are welcomed in their new roles and have our best wishes and support.

The nursing department looks forward to a bright and prosperous year. We will enjoy moving into the Penfield Pavilion; Phase IV renovations which we have planned will improve the quality of our service. The theme we chose for the Third Foundation is applicable to this whole year: *Our Future is Now.* We enjoy the benefits of yesterday's planning; we must continue planning so that tomorrow will be even more satisfying.

— Caroline Robertson, BN
Director of Nursing

# Administration

In my last report before retirement I look back with memories of happy associations with the medical staff and department heads on many committees and projects.

This year the director of auxiliary services, Winston Rochette, had the additional responsibility of getting the Penfield Pavilion ready for the Third Foundation celebrations. He also rescheduled staff for the extra work of the new pavilion. Dietitian Oresta Podgurny uses her ingenuity and patience to keep the food services going while we await the Phase IV move to a new central kitchen on 3-south. We appreciate the devoted work of Margaret Bernard and her staff. Bryan Malley, director of purchasing, has done a mammoth job in buying equipment for the Penfield Pavilion, and supervising stores and printing. Director of Personnel Hector Heavysege retired in August. He was always available when the need arose; he will be sorely missed.

A management advisory committee, meeting twice a month, proved an excellent vehicle for exchange of information, settling of mutual problems, and innovation of needed services.

With the approval of the board of directors, Hector Heavysege, Lise Cattaert, and I formed the francization committee of the hospital. Policy and procedures formulated there and later discussed at the management advisory committee are now being implemented.

Fifty-four McGill student volunteers were active this year. The head nurses inform us that their activities were much appreciated by the patients.

My greatest satisfaction as administrator resulted from working with staff members to solve problems confronting us. There are many people I wish to thank: our conscientious librarian, Marina Boski, our director of finance, Gean-Yuan Pwu, planning officer Harry Marpole, administrative consultant Charles Gurd (who planned the move to our own storage of records dispersed in many areas of the city), our health nurse, Rita Lacombe, and my competent secretary, Lise Cattaert. I would like to congratulate Dr. William Feindel on the Third Foundation celebration. It was a masterful piece of organization, attaining the standard of excellence he sets for himself and the Montreal Neurological Hospital and Institute. I am convinced, once the obstacles to the completion of the construction are overcome, that the Montreal Neurological Hospital and Institute will go forward contributing even more to "the relief of sickness and pain, and to the study of neurology."

— Alphonsine Howlett
Director of Administrative Services

# Finance

A total of 2,181 patients were admitted during the year, giving us 43,084 patient days. We treated 2,154 patients; the total stay was 41,121 days, for an average stay of 19 days. Despite the disturbances related to the construction and renovation projects, the hospital was occupied at 87.44 per cent capacity.

We ended the fiscal year with a deficit of 1.36 per cent of the total global budget. We fully expect this to be balanced by a supplementary budget (related to operation of the Penfield Pavilion) which has been accepted by the Ministry of Social Affairs but awaits approval of the Treasury Board. The detailed financial statement and auditors' report will be found at the end of the general reports.

I wish to express my appreciation to the board of directors, especially the members of the audit committee, to department heads, and to all staff members of the business and admitting offices. These are the people who have made our year successful.

— Gean-Yuan Pwu, BCom
Acting Director of Finance

# Social Work

This year the social work staff saw over 2,000 patients and their families. Fifty-six inpatient referrals were seen per month. More than half our time, however, was spent on outpatient activities. Outpatient work is invisible; its importance must be stressed to staff members who expect hospitalized patients to be given priority service.

Meeting the needs of patients with seizures or multiple sclerosis is difficult. This year we introduced an active seizure patient group, and expanded our involvement with the multiple sclerosis clinic. Our research project was the development of a six-month multiple sclerosis home-care plan. A report on this work is being written up for publication.

The Ville Marie Social Service Centre agreed to create a new social work position in the intensive care unit. The new staff member, hired on a one-year basis, will work with families and patients in crisis.

Our participation in both community planning committees and in the Ville Marie Social Service Centre increased. We have been active in the Multiple Sclerosis Association and in the new Quebec Epilepsy Association. We served on both the board of directors and the professional committees. As new social legislation like youth protection and rights of the handicapped comes into effect, we must keep informed in order to give patients the best service possible.

Several improvements were favourably noted by the hospital accreditation team this year, including the increase in psychosocial assessments, recording, high-risk patient profiles, and referral forms, as well as clarification of policies and the commencement of social service dossiers.

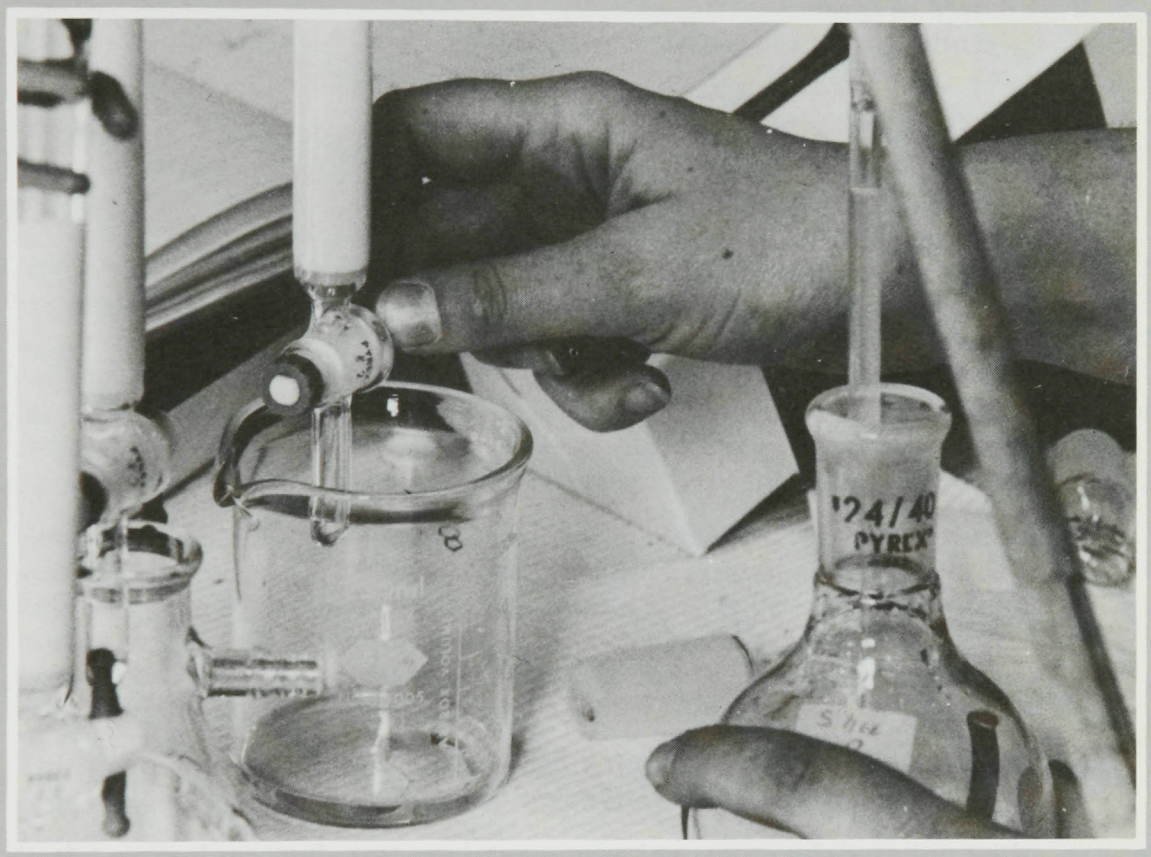
It has been a learning as well as a teaching year for us all. Staff members attended courses and seminars in French, group therapy, and family therapy. They also presented papers at conferences. Although our department is not formally involved with in-hospital teaching, we spend time on an individual basis with residents and students of other disciplines. Our teaching affiliation with the McGill School of Social Work continues — we accept three social work students for field placement annually.

During the university year we had an enthusiastic group of fifty-four McGill students visiting our patients. We hope that the hospital will hire a coordinator to develop a much-needed volunteer service.

I would like to thank all my staff members for their continued support and for the many long hours they spend serving the patients of our department, hospital, and community.

— Verna Bound, PSW
Director, Social Work Department

# Institute Reports



*In twenty-five laboratories at the MNI, brain researchers work on a number of baffling neurological disorders including multiple sclerosis, muscular dystrophy, epilepsy, and stroke.*

# Biochemical Genetics Laboratory

The biochemical genetics laboratory, which began operations in March 1979, studies inherited neuromuscular disorders by means of tissue culture techniques and biochemical analyses.

In basic research, we are carrying out three major studies. First, we are investigating the properties of cultured skin fibroblasts in Duchenne muscular dystrophy. Work is being done on the immunochemical purification of x-linked proteins and on the cytochemistry of surface lectin receptors in dystrophic cells. Projects already completed include immunocytochemical studies of cytoskeletal components, the behaviour of membrane vesicles in aqueous two-phase polymer systems, and the biosynthesis of complex carbohydrates in normal and dystrophic cells. A new technique has been developed to study the cytoskeleton of cultured cells with Coomassie Blue R250. A small study done on the vacuolation of human fibroblasts by xylocaine showed the effect to be due to lysosomotropism of the drug.

Second, we are investigating the properties of dystrophic hamster muscle in culture. We have successfully cultured both normal and dystrophic hamster muscle, and found that dystrophic muscle does not differ from normal in its ability to form contractile myotubes in culture. We are at present exploring techniques for obtaining cultures free of fibroblastic contamination for biochemical studies.

Third, we have also begun to investigate the adhesion properties of cultured cells in avian and human dysmorphogenetic syndromes.

In the clinical research area we have worked in close collaboration with Dr. George Karpati and Dr. Stirling Carpenter. We have established an assay for carnitine-palmityl transferase in muscle. A program of routine explant culturing of human diseased muscle has been started. We plan to set up muscle and plasma carnitine assays. These techniques will be used to study more comprehensively patients with inherited myopathies.

— Sergio Pena, MD

# Electroencephalography and Clinical Neurophysiology

During the fiscal year from April 1, 1978 to March 31, 1979, 3,879 examinations were carried out in the EEG Laboratory. Of these, 2,150 were performed on patients hospitalized in the Montreal Neurological Hospital, and 1,628 on patients referred from the Royal Victoria, the outpatients' department, and physicians' private offices. Fifty-six examinations were electrocorticograms recorded in the operating room during neurosurgical procedures for the relief of medically intractable epilepsy, and 17 were recordings taken during carotid enarterectomy.

As in previous years, highly specialized diagnostic procedures including recordings with stereotaxically implanted chronic interictal electrodes, cable telemetry recordings, and four-channel cassette recordings were carried out on many epileptic patients. EEG recordings made with the sixteen-channel cable telemetry system were often supplemented by simultaneous automatic seizure recording on videotape cassette. We also provided 223 visual evoked potential studies in patients with definite or suspected multiple sclerosis. This service was supervised by Dr. Luis Felipe Quesney, who is also developing a technique to perform brainstem auditory evoked responses as a diagnostic tool in neurology and neurosurgery.

**Clinical Research Activities**

We have continued to put to good use the sophisticated technology that our biomedical and computer engineers, John Ives, Christopher Thompson, and Dr. Jean Gotman, have made available to us. The monitoring systems and computer programs they have put at our disposal have greatly enlarged the range and accuracy of our diagnostic procedures; we can now offer surgical treatment to relieve intractable seizures in a number of patients who otherwise would have faced a dismal future. These technological aids have been particularly important in patients we have studied with Dr. André Olivier by means of stereotaxically implanted intracerebral electrodes. We have accumulated enough clinical and EEG observations on this group of patients to begin a scientific analysis of our results. On the basis of the lateralization of seizure onset recorded with intracerebral electrodes from the depth of the temporal lobes, we have established that bitemporal epilepsy, so-called because EEG discharges appear bilaterally, is, in most cases, unilateral, or nearly so. The results of surgical treatment in patients who previously would have been considered unsuitable for this form of therapy have been highly encouraging. The social rehabilitation of these patients following surgery has, in most cases, also been satisfactory, and in some, nothing short of spectacular.

Another question we have been able to reinvestigate in these patients is whether loss of consciousness (perhaps more prudently labelled "loss of responsiveness") in seizures of temporal origin indeed requires, as has been claimed, bilateral temporal and in particular neo-cortical spread of the seizure discharge. We have found that although such bilateral spread is found in most patients who exhibit ictal unresponsiveness, it is not a prerequisite for the occurrence of loss of responsiveness in temporal lobe seizures,

since unilateral temporal and even unilateral limbic involvement can be associated with the patient's loss of capacity to maintain conscious contact with his environment.

Dr. Jean Gotman has continued his studies on computer analysis of EEG manifestations of epileptic discharge. His main interest has been features characterizing spontaneous seizure discharges. He has developed programs which hold out the hope that the location of the onset of seizure discharges may be identified in cases in which the surface EEG shows only generalized discharge, or in which the scalp EEG is obscured by an abundance of muscle artifacts. Now that we have a computer located in the EEG Laboratory and reserved for EEG work, the application of these techniques to EEG research and diagnosis should receive new impetus.

John Ives continues to analyze the diagnostic results of four-channel cassette recordings of the EEG obtained in ambulatory patients, and has made great progress in defining the diagnostic capabilities of this new monitoring procedure that he developed.

Our clinical laboratory is now adequately equipped for performing pattern reversal visual, as well as brainstem auditory evoked potential studies. These exacting techniques require the establishment of an adequate normative data base, a task which we have almost completed. These methods will not only provide a much-needed new diagnostic service, but will also give us the opportunity to carry out clinical neurophysiological research. We are grateful to Dr. Quesney for taking on the responsibility of developing these new methods.

Drs. Quesney, Frederick Andermann, and Samarthji Lal have investigated, by the use of apomorphine, the possible involvement of dopaminergic mechanisms in generalized photosensitive and non-photosensitive epilepsy in man.

Drs. Quesney, Davy Trop, Allan Sherwin, and I examined the effect of intra-operative phenytoin loading upon residual epileptic abnormality after temporal lobectomy. Drs. Eva Andermann, Frederic Andermann, and collaborators have continued genetic, clinical, and EEG studies on a variety of heredofamilial disorders, including cerebromacular degeneration, Friedreich's ataxia, and familial agenesis of corpus callosum. Drs. John Woods and George Tolis studied neuroendocrine function in patients with various forms of epilepsy.

The clinical and research activities of our laboratory would not have been possible without the dedicated help of our technical and support staff. We offer them our heartfelt thanks.

— Pierre Gloor, MD

# Electromyography

In the year ending May 1, 1979, 1,767 patients were examined, an increase of 40 per cent over the preceding twelve-month period. This substantial increase is chiefly due to the use, now routine, of somatosensory evoked potentials (SEPs).

Research in the clinical field was directed to continuing use of SEPs and single fibre electromyography. In the first part of the year, SEP recording was extended by measuring responses evoked through lower extremity (tibial) nerve stimulation. The lumbar spinal evoked potential was simultaneously recorded allowing assessment of peripheral, central, and overlapping segments of the neuraxis. Using a combination of upper and lower extremity mixed nerve stimulation, the diagnostic yield given by the SEPs is definite; early probable latent and progressive spinal multiple sclerosis were found to approach 90 per cent. The results in MS suspects reach about 40 per cent.

Single fibre electromyography has become routine in a number of centres throughout the world. This useful addition to our laboratory's armamentarium provides us with much additional understanding of the physiology of the motor unit. Quantification of single fibre electromyography is now done by our new automatic analyzer.

With Dr. Kayode Odusote I completed a small study of the amplitude of the F-wave response in spasticity. Contrary to what we had suspected, we found the F-wave is not larger in spasticity but more persistent and therefore easier to elicit. We also completed a further study on the cubital tunnel syndrome. This work, covering the largest group of patients reported in the literature to date, correlates an EMG quantification with clinical severity of the disease. We are, however, no nearer determining if and when surgery should be performed.

In animal research, we have begun a project with Dr. George Karpati on the effect of spermatine on somatosensory pathways in the rat. With Dr. Antoine Hakim, we have also begun a study of the physiological correlates of acetyl ethyl tetramethyl tetralin (AETT). This compound, among other things, may one day prove useful in producing an animal model of anterior horn disease.

— Andrew Eisen, MD

# Experimental Neurophysiology

The main focus of studies in the experimental neurophysiology laboratories has been the mechanism of absence seizures associated with bilaterally synchronous generalized spike and wave discharge in the EEG. For the last few years we have employed generalized penicillin epilepsy in the cat as a model for the human condition. Work undertaken with Deborah Taylor has strongly reinforced our impression that this is indeed a good model of human epilepsy characterized by absence attacks; by using operant conditioning techniques, Taylor has found that the cat indeed appears to be "absent", that is, unresponsive to external stimuli, during generalized spike and wave discharge, just as a human patient is. Thus it appears likely that not only the EEG and the easily observable behavioral manifestations of this form of epilepsy, like eye-blinking, staring, and facial myoclonus, are similar in cat and man, but also the interference with conscious processes.

With Dr. George Kostopoulos, Dr. Ioannis Siatitsas, and Dr. Massimo Avoli, we have looked at the transition from normal to epileptiform activity in this model; we have also gathered further support for our hypothesis that thalamocortical mechanism involved in normal rhythmic cortical activity represented by spindles are the normal physiological substrate of the pathological spike and wave discharge. The latter is a consequence of a state of hyperexcitability of cortical neurons which we have been able to demonstrate by microphysiological techniques. Through the effective recruitment of a presumably recurrent intracortical inhibitory pathway, this increased excitation of cortical neurons leads to an abnormal oscillation between increased excitation and inhibition of cortical nerve cells expressing itself as the spike and wave pattern in the EEG.

Dr. Avoli has shown that during thalamic inactivation by spreading depression, the cortical spike and wave discharges cease; this demonstrates the dependence of the cortical mechanisms upon a thalamic input.

Dr. Siatitsas' work indicates that although the thalamus triggers cortical spike and wave response, the cortex in its turn impresses its abnormal firing pattern on the thalamus. Thus the abnormal type of oscillation of neuronal activity involves both levels of the nervous system once the cortical spike and wave discharge is fully developed.

We now have a fairly accurate knowledge of the mechanism of generalized bilaterally synchronous spike and wave discharge, at least for the cat. In view of the multiple similarities between the experimental model and human absence seizures, the likelihood of a similar fundamental mechanism in man appears to be high.

The next step will be to define in more detail the microphysiological aspects of this form of discharge, especially the nature of one of its most prominent features, the presumably recurrent intracortical inhibition. Also by means of iontophoretic techniques, Dr. Kostopoulos hopes to obtain insight into the transmitted and neuromodulator substances involved in this condition.

Dr. Felipe Quesney has already done some work in this area, in both human patients and the cat model. In some patients suffering from this form of generalized epilepsy, flickering light can precipitate seizures; the same is true for cats in which generalized penicillin epilepsy has been induced. Dr. Quesney has found that in both human patients and cats the dopamine agonist, apomorphine, is capable of blocking photosensitivity, and that this effect cannot be counteracted by naloxone, an opiate antagonist. It seems therefore probable that in some way dopaminergic mechanisms are involved in preventing the development of photosensitivity. The fact that both the human photosensitive epileptic and the cat afflicted with generalized penicillin epilepsy respond in an identical fashion to apomorphine reinforces the validity of this animal model as a facsimile of human generalized corticoreticular epilepsy.

Work in the experimental neurophysiological laboratories is not confined to epilepsy. Dr. Daniel Guitton has started exciting research on the control of eye movements. His work deals with sensorimotor transformations, and is directed at the neural mechanisms underlying the act of orienting the eyes and head toward visual, auditory, and tactile targets. Experiments will involve the recording and analysis of single-cell activity in awake, alert cats trained to orient toward specific targets. The neural activity will be recorded from the superior colliculus, which is thought to play an important role in mediating reflex-like orienting movements involving the eyes, head, and probably the body. The aim of this research is understanding of eye and head movement disorders frequently seen in patients studied in parallel research programs conducted in cooperation with Dr. Trevor Kirkham.

Finally, mention should be made of the work carried out by Dr. Robert Dykes, who is a member of our staff although his laboratory is located at the Royal Victoria Hospital. He is carrying out some very exacting studies on the physiology of the somatosensory system, particularly on the detailed somatotopic organization of this system in the cerebral cortex of the cat.

Three highly respected scientists spent their sabbatical leave in our laboratory during the past year. Dr. Andrew Gabor, a clinical neurologist and clinical neurophysiologist from the University of California at Davis, and Dr. Armand Siegel, a physicist and information scientist from Boston University, each spent half a year here. This summer Dr. Christian Ménini, from the Centre National de la Recherche Scientifique in Gif-sur-Yvette, France, joined us for a year. All three visiting scientists participated in our scientific activities; we benefitted greatly from their experience and from the mutual interchange of ideas that their visits made possible.

Success in our work would not have been possible without the able technical assistance we received from the staff of our neuroelectronics and computer laboratories. We also wish to express our warm thanks to Carmela Corrado, who retired from her duties this fall after more than twenty-five years of loyal service.

— Pierre Gloor, MD

# Library

Once again the Montreal Neurological Institute's library has reached its capacity, not so much in shelf-space as in administrative functioning. Increased demands for service, as well as natural growth, resulted in an overload on the tiny office space. Relief in the form of additional working space is around the corner. In the meantime, the library staff continues in a holding pattern until physical expansion of facilities improves conditions for both staff and library users.

The pause has provided a chance to assess future priorities, service, and space, and to study ways to make the best use of a shrinking, inflation-ridden budget. To eliminate as many duplications as possible, our library will cooperate more closely with McGill's medical library when purchasing. We are also considering whether sending our subscription orders directly to periodical publishers, rather than to an agency, would provide justifiable savings.

Last year the librarian completed courses in medical librarianship and medical bibliography at the McGill Graduate School of Library Science. Krytyna Bisaga is re-cataloguing the nursing education library under the librarian's supervision.

Acquisitions for the past year amounted to 123 purchases and 11 gifts. Departmental acquisitions numbered 102 titles.

— Marina Boski, BLS

# Multiple Sclerosis Clinic and Laboratory

**Multiple Sclerosis Clinic**
During the past year the multiple sclerosis clinics were increased to three half-days per week. A total of 620 patients were seen during the year. The nurse-coordinator, a social worker, and the neurologist were involved in group interviews with patients. The nurse-coordinator made eleven visits to community health centres to discuss problems related to MS with health workers. She also attended ten information sessions with lay people.

The clinic served as an educational centre for medical students, residents, and nurses in the post-graduate course of the Montreal Neurological Hospital, as well as for caretakers and partners of multiple sclerosis patients.

**Clinical Research Activities**
In November 1978 a private donation supported a pilot home care project for ten multiple sclerosis patients. A multidisciplinary team consisting of a social worker, nurse, neurologist, physiotherapist, occupational therapist, and three homemakers visited patients in their homes. The data suggest that quality of life was improved and costs were cut; it is much cheaper to look after relatively simple problems in the home than in hospitals.

We worked closely with other investigators — Dr. Peter Braun (radioimmune assay of myelin basic protein in cerebrospinal fluid), Dr. Gilles Lamoureux (transfer factor study), Dr. Andrew Eisen (sensory evoked potentials), Dr. Trevor Kirkham (eye movements), Dr. Luis Felipe Quesney (visual evoked potentials).

For the past three years the Multiple Sclerosis Society of Canada has financed our clinic and supplied salaries for the nurse coordinator and a secretary. Indications are that this support will continue as long as our clinic is productive of research. We are indeed grateful for this support.

**Multiple Sclerosis Research Laboratory**
Our basic research related to demyelinating diseases continues to develop. Dr. Peter Braun and Dr. Elizabeth Vadas of the department of biochemistry have developed and supervise a radioimmunoassay (RIA) for myelin basic protein. Present interest centres on the finding of a protein component — as yet unidentified — in the CSF of multiple sclerosis patients. This protein component crossreacts with myelin basic protein in the RIA. After examining preliminary data, we think this unidentified component may be unique to multiple sclerosis. If this finding is borne out by further work we will attempt to isolate, purify, and characterize this spinal fluid component.

We have also begun to develop an RIA for the proteolipid, a second major protein component of the myelin membrane whose role is also unknown. This assay will be used in developmental studies of myelin formation.

Preliminary studies have also begun on the protein composition of subcellular fractions of the nerve cell and its axons in amyotrophic lateral sclerosis, or motor neuron disease. When laboratory space becomes available,

Dr. Yves Lapierre hopes to begin to isolate, purify, and identify some of the oligoclonal IGG bands observed in the cerebrospinal fluid of about 90 per cent of MS patients.

The multiple sclerosis laboratory continues to supply clinical services to the Montreal Neurological Hospital. In the past year 1,244 different assays in spinal fluid were carried out. Almost 150 of these assays were requested by other hospitals in the Montreal area — evidence that our laboratory is a well-used community resource.

— J. B. R. Cosgrove, MD

# Neuroanatomy

The laboratory of neuroanatomy has moved into the new facilities on the eighth floor of the Penfield Pavilion, and most of the new equipment is in operation.

Dr. Barbara Jones continues her studies of the anatomical, physiological, and chemical substrates of the sleep-wake cycle. In the six months since she moved into the new quarters she has established a laboratory for recording sleep-wake cycles in cats with chronically implanted electrodes, and with the collaboration of the computer laboratory has developed a microprocessing method for quantitative analysis of these records. In order to study the connections of neurons in the pontine reticular formation which she has found to be involved in the generation of the sleep-wake cycle, she has developed a calibrated pressure injection technique for the intracerebral deposition of small, localized amounts of tritiated amino acids. The projection fields of the axons of neurons labelled in this way are being studied by the radioautographic method. Since her own studies have shown that monoamine neurons modulate the activity of pontine tegmental neurons, Dr. Jones has also established the histofluorescence techniques necessary to study the projections of monoamine neurons. In preliminary studies she is mapping catecholamine pathways in the brainstem and spinal cord of the kitten and rat.

The biochemical laboratory planned by Dr. Serge Gauthier and Dr. Jones is almost in operation and is equipped to assay acetylcholine, monoamines, and adrenal tyrosine hydroxylase. By using the latter enzyme as an index of adrenal activity Dr. Gauthier has shown that each adrenal medulla is under the control of bilateral descending pathways in the spinal cord. The ultimate aim of these studies is to understand the central nervous regulation of the adrenal, particularly in its response to stress. In other studies Dr. Gauthier is measuring the level of transmitters and transmitter metabolites in human CSF in an attempt to provide information concerning the pathophysiology of various neurological and psychiatric disorders.

— Donald Lawrence, MD

# Neuroanesthesiology

In the past year the members of this department have participated in, or independently completed, three major research projects.

With the department of electroencephalography, we engaged in a study of the effect of intraoperative phenytoin loading upon residual epileptic abnormality after temporal lobectomy.

Associate anesthesiologist Dr. Mounir Abou-Madi investigated the etiology and control of the hypertensive episodes observed during transphenoidal resection of pituitary microadenomas. Because these small tumours are extremely difficult to locate, it is essential that the surgeon be given a dry, bloodless surgical field. Hypertension, which results in increased, and often severe bleeding, must be reduced, while anterior pituitary function is maintained. It was shown that 1 per cent concentration of ephedrine-containing lidocaine solution, locally infiltrated, had the best effect on cardiovascular responses during transethmoidal and transsphenoidal resections.

Last year we reported the results of an extensive study assessing post-operative pain relief achieved with a new non-narcotic analgetic compound, Nefopam HCl. Along the same lines, we have just completed a study of another non-narcotic drug, SURGAM RU 15060. The study was conducted in the obstetrics department of St. Mary's Hospital using patients treated for post-episiotomy pain. The statistical analysis of our results has not yet been completed, but we already have good evidence that the compound is effective and safe.

— Davy Trop, MD

# Neurochemistry

**Donner Laboratory of Experimental Neurochemistry**
Our research continues on the biochemical basis of inherited neurological disease. Batten disease, which has a high incidence in Quebec and Newfoundland, is a childhood disorder leading to dementia and death before the age of ten. Dr. N. M. K. Ng Ying Kin and I have isolated highly purified fractions of the autofluorescent storage material from the cerebral cortex of a number of patients who died of this disease. We know that the characteristic curvilinear or finger-print profiles seen under the electron microscope are caused by the association of phospholipids, cholesterol, and polyisoprinols with an insoluble highly fluorescent residue. Dr. Ng Ying Kin and I have shown that the fluorescence is due to compounds derived from the oxidation and isomerization of vitamin A and derivatives of retinoic acid. Thus the characteristic feature of the storage material is the presence of isoprenoid compounds. This suggests that the possible enzymatic defect involves the metabolism of intermediates in the synthesis of membrane glycoproteins. It also suggests possible therapeutic value of a diet low in vitamin A for this condition, and such a regimen has been started in one patient.

Sialidosis is a newly recognized inherited neurological disease. Children suffering from this condition show evidence of a storage disease. They excrete carbohydrate-rich materials in the urine, show a deficiency of $\alpha$-neuraminidase, and have, in some cases, a partially deficient $\beta$-galactosidase activity in leukocytes and fibroblasts. We are investigating linkages of sialic acid in the storage glycopeptides.

Dr. Ng Ying Kin has developed a liquid chromatographic procedure for rapid and accurate analysis of small samples of urine. This test will prove valuable in the diagnosis of known storage disease, and in the discovery and characterization of new, inherited abnormalities of glycoconjugate metabolism.

We are also continuing our research on the biosynthesis of prostaglandins and thromboxanes in brain. Jean Marion and Klara Rostworowski have studied the control of prostaglandin synthesis through the release of the precursor arachidonic acid, and the effects of brain ischemia in activating this release. They have also attempted to trace the synthesis of these biologically active compounds to particular regions of the brain, and to its neuronal and non-neuronal components.

Uwe Goehlert has isolated a highly purified preparation of brain capillaries, and has demonstrated that these microvessels have considerable capacity for synthesis of prostacyclin and several other prostaglandins. Factors activating this synthesis are being investigated. Of great assistance in this work has been a liquid chromatography method for rapid purification and analysis of complex mixtures of prostaglandins developed by Dr. Ng Ying Kin and Uwe Goehlert.

Dr. Richard Branan, Dr. William Feindel, and I have discovered that prostacyclin, topically applied to the cerebral cortex, increases blood flow in the epicerebral circulation. This suggests a possible role of prostacyclin

in autoregulation. Using the deoxyglucose method, Dr. Pappius and I demonstrated an increase in local cerebral glucose utilization throughout the cortical areas to which prostacyclin was applied. The increase in glucose utilization was more marked than the increase in local cerebral blood flow. We believe this means that prostacyclin affects cerebral glucose utilization directly, and not through alteration in cerebral blood flow. The blood flow, presumably, adjusts to meet increased metabolic demand.

Dr. Pappius and her co-workers have begun to reap the benefits of time and effort invested in setting up Sokoloff's quantitative autoradiographic deoxyglucose method. The technique measures local cerebral glucose utilization *in vivo,* and can be used to map functional activity throughout the whole brain. Dr. Antoine Hakim, who recently joined us as a Killam scholar, has begun studies with Dr. Pappius on effects of thiamine deficiency on local cerebral glucose utilization.

Dr. Hakim has also started a neurochemical, neurophysiological, and histological investigation of a compound used in the cosmetics industry for twenty years before its neurotoxic effects were noted. It is hoped that these studies will lead to the development of an experimental model of several neurological diseases.

— Leonhard Wolfe, MD

**Neurochemistry Clinical Laboratories**

In the period April 1978 to March 1979, the seventh floor neurochemistry laboratory performed 31,114 tests, representing a total of 120,851 units. In the third floor ward laboratory, 12,040 hematological determinations, 2,712 urinalyses, and 10,609 miscellaneous tests were carried out. A total of 11,794 blood samples were procured for analysis in other laboratories. The unit total for the third floor laboratory was 319,025, an increase of 25 per cent over the same period in the previous year.

The new Technicon Autoanalyzer has been installed in the clinical neurochemistry laboratory on the seventh floor. The physical conditions of both laboratories, and crowding in the third floor laboratory in particular, reduce our efficiency. We eagerly await the improvements promised under the Phase IV renovation program.

— Hanna Pappius, PhD

# Neurogenetics

**Clinical Activities**
In the past year our department offered genetic consultation, on both an inpatient and outpatient basis, to 300 individuals — patients with hereditary neurological disorders and their relatives. We obtained detailed family and pregnancy histories, performed examinations to confirm diagnoses and detect carriers of disease, and gave genetic counselling regarding risk of recurrence.

**Clinical Research Activities**
In the summer of 1978 our research teams made several field trips to the Chicoutimi-Lac St. Jean area to study further cases of the autosomal recessive syndrome of familial agenesis of the corpus callosum with sensorimotor neuronopathy. This syndrome occurs with high prevalence in the Lac St. Jean area — we have now ascertained over 170 cases. To our knowledge, however, it is not described elsewhere in the world. A program of education and genetic counselling for the families and the population of the area has been initiated. Genealogical studies attempting to trace affected families to common ancestral couples are continuing with Jean Bergeron of the department of demography at the Université de Montréal, aided by a computer print-out of marriages in this area from the department of demography of the Université de Québec à Chicoutimi. The clinical studies are being performed in collaboration with Drs. Denis Bergeron and Jean Larochelle from Chicoutimi, and Dr. Pierre Langevin from Quebec City. Richard Nagy, a graduate student in neurogenetics, has carried out studies of hereditary agenesis of the corpus callosum in a mouse model.

We have identified a new French-Canadian family with Tay-Sachs disease in Temiscouata County near the New Brunswick border. A population screening program is planned for the coming year, supported by the Quebec Network of Genetic Medicine. With Dr. Robert Elston of Chapel Hill, North Carolina, we have carried out linkage studies, and with Jean Bergeron we have continued genealogical studies of all the Tay-Sachs families.

The Canadian Association of Friedreich's Ataxia has designated the Montreal Neurological Hospital and Institute a Centre for Treatment and Research. As part of the Quebec Cooperative Study, we are continuing our work on this disease. We have investigated more than forty patients, and are following over forty families. Since patients as well as unaffected relatives appear to have abnormalities in glucose metabolism combined with increased incidence of cardiomyopathy and arteriosclerotic heart disease, studies consist mainly of endocrine and cardiological examinations. Collaborating with us in this work are Dr. George Tolis of the Royal Victoria Hospital's department of endocrinology, and Dr. André Pasternac of the Institut de Cardiologie de Montréal.

Studies of the teratogenic effects of anticonvulsant medication are continuing. Over forty pregnancies have been monitored in a prospective study by means of monthly measurement of anticonvulsant blood levels during pregnancy, and examination of the offspring at birth and during the first year of life. (A long-term follow-up of these children has also been started.)

Results show a significantly increased frequency of major congenital malformations in offspring of epileptic women taking anticonvulsant medication during pregnancy, despite the fact that the anticonvulsant levels were lower during pregnancy than before. Furthermore, there appears to be a positive correlation between the anticonvulsant level in the plasma and the risk of malformed offspring. We have begun to see epileptic women for pre-pregnancy counselling in order to modify their anticonvulsant regimes, and to counsel them regarding the risk of congenital malformations and epilepsy in their offspring.

We have also studied a number of new neurological syndromes, including an autosomal recessive syndrome of mental retardation, neonatal seizures, and multisystem degeneration. With Drs. Benjamin Zifkin and Trevor Kirkham we have studied two dominantly inherited syndromes — hemiplegic migraine, nystagmus, and tremor, as well as hemiplegic migraine associated with hereditary hemorrhagic telangiectasia. With Dr. Daniel Keene we have carried out research on startle disease or hyperekplexia.

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 planning a more thorough study of myotonic dystrophy in hopes of detecting asymptomatic carriers of the gene and determining a prenatal diagnosis of this condition.

— Eva Andermann, MD

# Neuro-isotope Laboratory

**The William Cone Laboratory for Neurosurgical Research**
Fluorescein angiography and radioactive tracer techniques have been applied to four major research problems.

1. *Protective effects of steroids on the cortico-microcirculation injured by cold.* Freezing of the cortex has been used widely in a model to produce cerebral edema. No previous work was done, however, on what we have now found to be remarkable vascular damage that appears to be the basis of the edema. Fluorescein angiography of the brain in dogs with cold injury of the cortex revealed slowing and arrest of flow in the cerebral circulation, first in the small veins, then in the medium-sized veins, and finally in the arterioles. This was associated with dye leaking from the arterial walls into the extravascular tissue, which provides an explanation for the edema spreading into the subcortical white matter. Blood flow was reduced to 30 per cent of normal within thirty minutes, but after steroids, decreased to only 65 per cent of normal. X-ray projection microangiography confirmed the vascular segments affected by the cold injury.

2. *Effects of hypercapnia with and without mannitol in experimental focal cerebral ischemia.* The dynamic aspects of the development of collateral flow at the microcirculatory level relating to focal ischemia were studied in regard to the effectiveness of carbon dioxide and hyperosmolar mannitol. Up to 55 torr arterial $pCO_2$, CBF in the region of the focal ischemia increased by 75 per cent, and filling of collateral vessels as shown by fluorescein angiography of the brain improved. Above 60 torr $pCO_2$, extravasation of dye was noted from the small veins and capillaries with subpial hemorrhage and steady rise in intracranial pressure. Cortical flow was reduced, but subcortical flow, despite the vascular damage, progressively increased. In this experimental model, 20 per cent mannitol was not observed to benefit flow rates or to prevent vascular damage. These findings are of critical importance in relation to the possible use of carbon dioxide in clinical therapy. A report of these findings at the International Symposium of Cerebral Blood Flow and Metabolism in Tokyo, July 1979, was named the most outstanding paper.

3. *Cerebral blood flow patterns after cerebral revascularization in experimental cerebral ischemia.* Twenty-four hours after intra-orbital occlusion of the middle cerebral artery in dogs, anastomosis between the superficial temporal artery and the occluded artery was studied by combined anatomical and quantitative methods. Improved collateral filling with an increase in cortical blood flow of 180 per cent in the zone of ischemia were observed. Further characterization of this model under hypercapnia and hypertension is now being carried out.

4. *Cerebral vasospasm* We are now resuming earlier studies on the prostaglandin series as potent vasoconstrictors of the micro-vessels of the brain. In collaboration with colleagues in experimental neurochemistry, we found prostacyclin to have an opposite, vasodilatory, effect. This knowledge calls for a different interpretation of the prostaglandin derivates in relation to vasomotive control under normal and abnormal circumstances in the brain.

**Brain Scan Department**

During the past year 3,524 patients were investigated in the brain scan department. We have made substantial progress on our positron emission tomography project. Christopher Thompson and our research team have completed two rings of sixty-four bismuth-germanate detectors which comprise the most highly efficient positron device in existence. We can now obtain simultaneously three horizontal sections of regional hemodynamic information.

The krypton-77 positron emission tomography technique, which was developed through the joint efforts of our research team and the Foster Radiation Laboratory at McGill, is the only technique that gives quantitative and topographical measurement of regional cerebral blood flow at the present time. By means of non-invasive bolus inhalation of krypton-77, we can now obtain three different levels of regional cerebral blood flow at the supratentorial as well as infratentorial levels. We have appraised this technique in over 500 patients and have found it most useful for evaluating cerebrovascular patients, particularly in cases of transcient ischemic attack, mild stroke, and localization of the cerebral steal phenomenon in arteriovenous malformations. We have also used it to evaluate STA-MCA bypass surgery for which other diagnostic techniques may not be helpful.

Positron emission tomography is also capable of measuring the regional metabolic rate using short-lived $^{11}C$ and $^{18}F$ labelled chemical compounds. We are patiently waiting delivery of a mini-cyclotron to produce these compounds. Recently we have been joined by two new staff members, Dr. Mirko Diksic, a radiochemist, and Leo Nikkinen, a cyclotron engineer. We hope to make of the positron technique a strong tool to provide new information on the pathophysiology and evaluation of treatment in various neurological diseases, particularly cerebrovascular disease, epilepsy, dementia, and physiological activation.

— Lucas Yamamoto, MD

# Neuromuscular Research Laboratory

Research in the neuromuscular laboratory progresses on two fronts — clinical studies and animal experiments. A clinical study of muscle biopsies from two infants with Duchenne muscular dystrophy revealed both active destruction of muscle and failure of regeneration. Morphologic features of Duchenne muscles will be further studied by single fibre culture technique.

Investigations were also carried out in several relatively uncommon neuromuscular diseases — a curious form of familial centronuclear myopathy, leimyomatosis of skeletal muscle, a peculiar infantile inflammatory myopathy, and a highly unusual mitochondrial myopathy. Our plasma exchange program for selected myasthenics continued in collaboration with Dr. Max Katz of the Royal Victoria Hospital.

We are setting up an *in vitro* muscle test for the diagnosis of malignant hyperthermia, and we are also participating in a multicentre collaborative study on diabetic neuropathy, conducted under the auspices of the World Health Organization.

By means of animal experiments we are studying the cellular mechanisms responsible for the complex experimental micropuncture lesions of skeletal muscles. Further investigation of the pathophysiology of skeletal muscle necrosis in dystrophic hamsters concentrates on possible defects of sympathetic regulation of skeletal and/or vascular smooth muscles.

Investigation of neutral fat metabolism in skeletal muscle cells continues. We have developed a new cytochemical technique for monitoring the activity of lipase and an autoradiographic method to demonstrate fatty acid uptake to muscle cells. A model for the study of impaired glucose metabolism by skeletal muscle was established by 2-deoxyglucose infusion into limb arteries.

A modern image-analysis system acquired through a major equipment grant given by the Muscular Dystrophy Association of Canada has facilitated our research. The establishment of an active tissue culture laboratory has added a new dimension to our work.

— George Karpati, MD

# Neuro-ophthalmology

We have had a most encouraging year during which we gathered a group of personnel to form a nucleus for neuro-ophthalmological research.

The clinical service and teaching committment have continued to increase. We have had the help of Dr. David Nelson as clinical fellow, a part-time ophthalmology resident from the Royal Victoria Hospital, elective neurology and medicine residents, and two researchers working both in and out of the clinical area. This embryonic department has grown so much that more physical space is required for us to function adequately.

Dr. Daniel Guitton has set up his animal research laboratory. He has also put together his equipment for tracking eye movements, and completed his second doctorate, this time in neurophysiology. A summer research student helped set up facilities for the clinical eye recording laboratory. We still need equipment to record from both eyes together to detect the classical problem of multiple sclerosis, internuclear ophthalmoplegia. Our eye coil system needs further development, but we have completed values for various parameters of normal eye movement in human subjects. Vertical optokinetic responses have been studied in patients with multiple sclerosis. Three studies were completed on eye movement defects in Friedreich's ataxia, the cherry red spot-myoclonus syndrome, and giant axonal neuropathy.

Dr. Stuart Coupland has studied electroretinography and visual evoked potential correlates in neurological disease. He was recently awarded a doctorate in psychology for his work in this field. Research support is being applied for in this most promising area. From electroretinographic findings in multiple sclerosis patients it is already evident that the peripheral retina is important in producing visual problems in these patients. Accordingly, it is necessary to look at the retina and the whole eye before concluding that evoked potential delays can be interpreted simply as conduction problems of optic nerve to cortex. Neuroendocrinologists are describing important changes in retinal function in diseases ranging from diabetes to prolactinoma. It will be useful to study these problems with electroretinographic techniques.

Thus, by a team approach, the study of the visual and ocular motor system can now cover a wide gamut of neurological activity. In the next year we hope to become involved in cerebral circulation studies also, but this will depend on financial help and the acquisition of new personnel.

— Trevor Kirkham, MD

# Neuropathology

This past year has witnessed considerable research activity. Dr. George Karpati and I have been engaged particularly in research on muscle disease. Part of our work involved the exploration of human muscle disease through biopsy study, utilizing the high magnification of electron microscopy to see inside the cells. As much as possible we correlate electron microscope findings with epoxy resin histology, histochemistry, and clinical history; we fit the pieces together to form a picture of what happens in a particular disease. One result has been the demonstration of the loss of plasma membrane which initiates muscle cell necrosis in Duchenne muscular dystrophy. We also set down some morphological criteria for the ultra-structural identification of necrosis in muscle cells. We discovered an abnormal and highly photogenic organelle in muscle cells which we have called a "cylindrical spiral." Unfortunately these organelles appear to be nonspecific — the second case was clinically very unlike the first.

Dr. Karpati and I have also been engaged in a long biopsy study of patients with inflammatory myopathies of unknown cause. Within this group of myopathies we have, in past years, defined a new entity which we have called inclusion body myositis. Despite some controversy about this entity, it appears that cases are now being found at many other medical centres. At present we are trying to define cases of dermatomyositis in adults, and cases of pure polymyositis without rash or signs of collagen vascular disease. Recently we have studied biopsies of two infants who show evidence of inflammatory myopathy, with onset in infancy and marked damage to muscle cell nuclei.

Recently I have also been studying changes that occur in capillaries of denervated human muscle. It appears that as the muscle fibres atrophy, the capillary channels come closer together; eventually some become obliterated through necrosis of the endothelial cells. Though it is evidently a routine occurrence, this type of capillary attrition, secondary to denervation atrophy of the muscle fibres, does not appear to have been previously documented.

In experimental muscle disease, with Dr. Karpati I have been working on the model of hamster dystrophy, hoping to define the initial stages of necrosis in this model. We have also been working on the micropuncture model for muscle cell injury. Cells in the exposed muscle of an anesthetized animal are transfixed with a 10-micron-thick wire. At various intervals after the injury, the lesions are examined by epoxy resin histology and electron microscopy as well as histochemistry. In this way the time sequence of necrosis and/or repair can be closely followed.

In the realm of general neuropathology, Dr. Yvon Robitaille, Dr. George Karpati, and I have compiled a long paper on adult polyglucosan body disease. In this disease a huge accumulation of corpora amylacea-like bodies builds up in axons, dendrites, and astrocytes. In collaboration with Dr. Allan Sherwin and Dr. Somchai Jiaravuthisan, our department is working towards the application of Golgi techniques to the study of seizure foci.

— Stirling Carpenter, MD

# Neuropharmacology

Our laboratory, like many others in the Montreal Neurological Institute, has two separate yet interconnected functions. The first, patient service, involves the analysis of blood and other biological fluids — even milk from nursing mothers — to determine the levels of anticonvulsant drugs in patients with epilepsy. Our data enables us to identify patients with drug toxicity or adverse reactions caused by interactions of one drug with another; most important, it enables us to adjust drug dosage for maximum seizure control. (Our work was greatly facilitated when Dr. Kayode Odusote and his team developed a new and accurate gas-chromatographic assay for valproic acid which halved the time required for testing.) In our laboratory we determine plasma drug levels not only for our own centre but for other Quebec hospitals as well, from the lower St. Lawrence to the Arctic. We also collaborate with several McGill groups studying epilepsy.

Our second function is to carry out basic research. We are interested in the activity of key enzymes regulating putative neurotransmitters in human epileptogenic foci. Surrounding cortex, which did not exhibit spike activity, but which is included in therapeutic excision, serves as the control. As part of a long-term collaborative effort with Dr. Nico van Gelder in the Centre de Recherche en Sciences Neurologiques, we have undertaken a study of enzymes regulating glutamic acid, an excitatory transmitter, and GABA, an inhibitory transmitter. To date we have been able to measure the activities of three of a series of six enzymes involved in glutamic acid metabolism. Preliminary data suggests that the activity of glutamic acid dehydrogenase is greater in the focus than in the surrounding brain. If anticonvulsant drugs were taken before surgery, these are quantitated by gas chromatographic techniques. Dr. Somchai Jiaravuthisan and Dr. Stirling Carpenter have been studying the histopathology of the epileptogenic focus. In collaboration with Dr. Serge Gauthier we are including tyrosine hydroxylase as an indicator of the turnover rate of catacholamines.

Epilepsy, of all diseases of the nervous system, is most likely to involve neurochemical mechanisms. Though many neurochemical studies have been undertaken in the past, more are required as new analytical techniques become available. This approach to the study of epilepsy epitomizes the philosophy of 19th century French neurologist Jean Marie Charcot, who said, "Disease is of antiquity and nothing about it changes. It is we who change as we learn to recognize what was formerly imperceptible."

— Allan Sherwin, MD

# Neurophotography

The acquisition of two new machines in the past year has greatly increased our efficiency. A Kodak Royal Print Processor, which can make a print in just less than a minute, and a Compugraphic Headliner, which produces type in one-tenth the time it took our old machine, have freed our staff for other work.

As well as making up charts and graphs, we have again this year produced many large posters for international conferences. After the meetings these posters are displayed throughout the institute.

After ten years at the Montreal Neurological Institute, Judy Little left and become director of the Still Photographic Division at the University of Texas Hospital. We wish her well.

— Charles Hodge, RBP

# Neuropsychiatry

We conducted 1,000 interviews and therapy sessions this year, focussing our efforts mainly on inpatients. Dr. Joannis Nestoros, a member of the spinal cord team, devotes his time to those patients. Dr. Martine Lalinec-Michaud assists me with the outpatients, and does consultations requested by the neurological and neurosurgical staff.

Our main teaching achievement, besides the weekly supervision of residents, was the preparation, with Dr. Michel Aubé and Dr. Serge Gauthier, of a neuropsychiatry review course for fourth-year residents in psychiatry.

In May 1979 we joined the depth-electrode group. This provides us with the opportunity to do clinical research in a collaborative fashion.

— Louise Demers-Desrosiers, MD

# Neuropsychology

As in the past, the research of the neuropsychology department has focussed on the study of patients undergoing unilateral cortical excisions for the relief of epilepsy. Here a major concern has been the preoperative assessment of speech, memory, and gesture during the temporary inactivation of one cerebral hemisphere by the intracarotid injection of sodium Amytal. This technique is now used as a standard screening procedure, enabling us to determine before surgery the side of speech representation in left-handed subjects, as well as to uncover any possible risk to memory in a planned temporal lobectomy. The latter question arises whenever there is reason to suspect damage to the hippocampal region of the opposite side, and the issue becomes critical for those patients who show sufficient bitemporal electrographic abnormality to require stereotaxic depth-electrode implantation to lateralize the major source of epileptogenic activity. We have recently analyzed the Amytal findings (together with other neuropsychological data) for fourteen such patients who came to operation and, in collaboration with Dr. André Olivier and Dr. Pierre Gloor, we have correlated our results with those from depth-electrode recording. In eleven cases there was complete agreement between the psychological and electrographic findings regarding the probable side and site of the major epileptogenic lesion; in another two cases there was partial agreement, with complete disagreement in one instance only. This degree of concordance between behavioral and EEG measures in such admittedly difficult cases is encouraging, and the cases of disagreement should prove instructive when we have follow-up data on how well the patients' seizures have been controlled by a subsequent temporal lobectomy.

Since 1958 we have carried out Amytal speech tests in over 600 patients, and over this period we have become increasingly aware of the possibility of right-hemisphere speech representation in right-handed patients of right-handed stock. In order to estimate the incidence of such atypical cases, Laughlin Taylor and I had recourse to Dr. Theodore Rasmussen's surgery files, from which we established how many right-handed patients with presumed or proven left-hemisphere speech representation had been examined by us over the same period. (This was necessary because relatively few right-handers undergo Amytal tests.) On the basis of these statistics we concluded that 1.5 per cent of right-handers may have their speech processes lateralised to the right hemisphere, with a further 1 per cent showing some bilateral speech representation.

Other research developments can be but briefly noted. Dr. Henry Buchtel, our new professional assistant, has been studying the effects of frontal eye-field lesions on orientation to brief distracting visual stimuli, as well as trying to assess, by tachistoscopic reaction-time studies, the possible contribution of the left cerebral hemisphere to face recognition. During the past two years Dr. Michael Petrides developed analogues of tasks known to be sensitive indicators of certain frontal-lobe lesions in monkeys; he has used these new measures to elicit differential effects of left and right frontal-lobe lesions in our patient population.

The rest of us continue to explore the subtle memory disorders that follow left or right anterior temporal lobectomy and that vary in kind depending on the side of the lesion. Dr. Marilyn Gotman has modified some of our visual memory tasks in an effort to delineate more clearly the role of the right hippocampus in the recall of visual patterns. An interest in the functions of the right hippocampal region also motivates the work of Dennis Rains on tactile pattern recognition and of Mary Louise Smith on the incidental learning of visual location. Donald Read is investigating the effects of left temporal-lobe lesions on verbal learning and syllogistic reasoning.

It has been suggested that the specific memory disorders of patients with unilateral temporal-lobe lesions may be secondary to an inability to organize and categorize the material to be remembered. Dr. Gina Jaccarino-Hiatt's thesis explored this question, but although she was able to demonstrate some categorization deficits, these were quite insufficient to account for the severity of the memory disorders. This work has been further developed by Dr. Antonio Incisa, who is finding a more consistent impairment of categorization after left frontal-lobe lesions than after temporal-lobe lesions of either hemisphere. We hope that by elucidating some of the mechanisms underlying the specific memory disorders, we shall be better able to counsel our patients regarding the use of appropriate strategies to circumvent these mild but troublesome disabilities.

— Brenda Milner, PhD

# Neuroradiology

We had a busy year in which we performed 14,816 examinations. CT scanning plays an increasingly important role in the detection of neurological diseases; 5,217 CT scans were carried out. Despite a double-shift operation, we still face a three-month backlog of patients waiting for their scan.

High-resolution studies of the spine are becoming the examination of choice for certain diagnostic problems. The addition of a new contrast agent, metrizamide, opens up new diagnostic possibilities, including demonstration of intramedullary cavities. High-resolution techniques have now been applied to the orbits, the sella turcica, and the middle ear, with spectacular results. They will provoke radical changes in the radiological management in those areas.

It has also been a busy year academically. Since most neurology and neurosurgery residents rotate through the department, teaching is an important function here. Dr. Alain Bonafé came to us as a clinical fellow via the France-Quebec exchange. These exchanges should be encouraged — international sharing of medical knowledge inevitably results in improved patient care.

— Roméo Ethier, MD

# Education

*During their post-graduate training, residents in neurology and neurosurgery rotate through the Montreal Neurological Hospital. Overleaf, a familiar hospital sight — morning rounds.*

# Clinical Training Opportunities

## Neurology

The department of neurology and neurosurgery in the Faculty of Medicine of McGill University offers a three-year residency 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 Neurology.

The goal of the residency program is all-round training in clinical neurology for future specialists. The program not only teaches the diagnosis and management of patients with neurological disorders, but also examines one or more of the neurological sciences in depth, with the aim of developing future university research workers and teachers. The strength of the program lies in the wide variety of clinical experience available in addition to superb laboratory and research support.

The program provides two years of clinical training and one year of laboratory training. A third year of clinical training combined with student teaching is available as a teaching fellow at the Montreal Neurological Hospital. A similar third year in clinical training is available as a senior resident in the neurological teaching units at the Montreal General and Montreal Children's hospitals.

The Montreal Neurological Hospital residency program is open to medical graduates who have completed an approved internship and one year of clinical medicine, or, alternatively, an approved clinical clerkship during the final undergraduate year and one year of straight medical or pediatric internship.

Residents are assigned to different clinical services every six months. Although the resident takes on graded responsibility for patient care, visiting staff direct and supervise procedures. Weekly clinical and scientific conferences in each of the McGill teaching hospitals serve as a stimulus to further study. While working on the service, residents may also take part in clinical research projects supervised by members of 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 two-year period of clinical training. In one of the institutions he will spend a full year. (Those in pediatric neurology will spend at least one year at the Montreal Children's Hospital.)

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

> The *Montreal Neurological Hospital* and the *Montreal Neurological Institute,* housed in the same building, have 135 beds for neurology and neurosurgery, and research facilities for the neurosciences. There is close cooperation with the Royal Victoria Hospital for which the MNH provides neurological and neurosurgical services. Twenty-five neurosciences

units focus on epilepsy, cerebrovascular and muscle disease, genetically determined disorders. A modern addition, the Penfield Pavilion, offers splendid new facilities for teaching, research, and clinical activities.

The *Montreal General Hospital* has a neurology teaching unit of fifteen beds in a thirty-bed neurology and neurosurgery ward. Clinical laboratories are adjacent to this unit. Active neuroscientific research programs are carried out in the Montreal General Hospital Research Institute.

The *Montreal Children's Hospital,* a 300-bed institution, has a neurological service as an integral part of the pediatric programs. There is a fifteen-bed neurology unit with specially trained nurses and support staff. Four hundred consultations a year are provided to patients in the medical and surgical wards. 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. In addition, neurological patients overflow to the general medical area. A neurology clinic is held weekly, and a large consultation service provides the resident with wide experience in neurological complications of medical and surgical diseases. The Jewish General Hospital service is available for one year of training for one resident.

Residents are also assigned six- or twelve-month appointments in the research laboratories at the Montreal Neurological Institute. Laboratory training is available in electroencephalography, electromyography, neuropharmacology, neurophysiology, neuropathology, neuroradiology, neurogenetics, and muscle disorders.

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. 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. The length of the program varies depending on the resident's career goals and the qualifying specialty body for which he is preparing. It is also related to the individual's background 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 electro-encephalography 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.

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.

*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, 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. It has the only bismuth germanate positron camera (developed by its own engineering research team) available for clinical research.

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 2B4

# Courses of Instruction

In the Faculty of Graduate Studies and Research, courses are offered leading to the degree of Master of Science and Doctor of Philosophy. (See McGill booklet "Faculty of Graduate Studies and Research.") Through the year the following elective courses are given for graduate students, fellows, and members of the house staff. 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. Mondays 4:30-6:00 p.m. Professors Gloor, Wolfe, Feindel, and other members of the department of neurology and neurosurgery and related McGill departments.

**Neurophysiology**

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

G531-611A Seminars in neurophysiology. Professor Gloor.

**Neuroanatomy**

G531-621A Seminars in neuroanatomy. Professor Lawrence.

**Clinical Conferences**

G531-630H Colloquium on clinical and basic aspects of the nervous system. Mondays 8:30 a.m. during the academic year. Professor Feindel and staff.

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

**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 Conference in neuropathology. Alternate Thursdays 4:30-5:30 p.m.

G531-652A An introduction to neurological histopathology. Ten two-hour sessions. Limited to eight participants. Professor Carpenter.

**Neuroradiology**

G531-660H Practical instruction in techniques and interpretation.

G531-661A Lecture demonstrations. Three months in the fall. Mondays 4:30-5:30 p.m. Professors Ethier and Melançon.

**Electroencephalography and Clinical Neurophysiology**

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

**Neuropsychology**

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

# The 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 1,055 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

*The Fellows' Society and the Montreal Neurological Society offer fellowship and continuing education to Neuro graduates. Overleaf, the dedication stone of the Montreal Neurological Institute, laid in 1934.*

# Fellows' Society

Our major event of the year was the Fellows' Day lecture and dinner. Dr. Charles Branch gave a fascinating lecture on the complications of chymopapain injection for the treatment of lumbar disc disease. His dinner talk on the pitfalls, traps, and other adventures awaiting neophyte neurosurgeons was a delight.

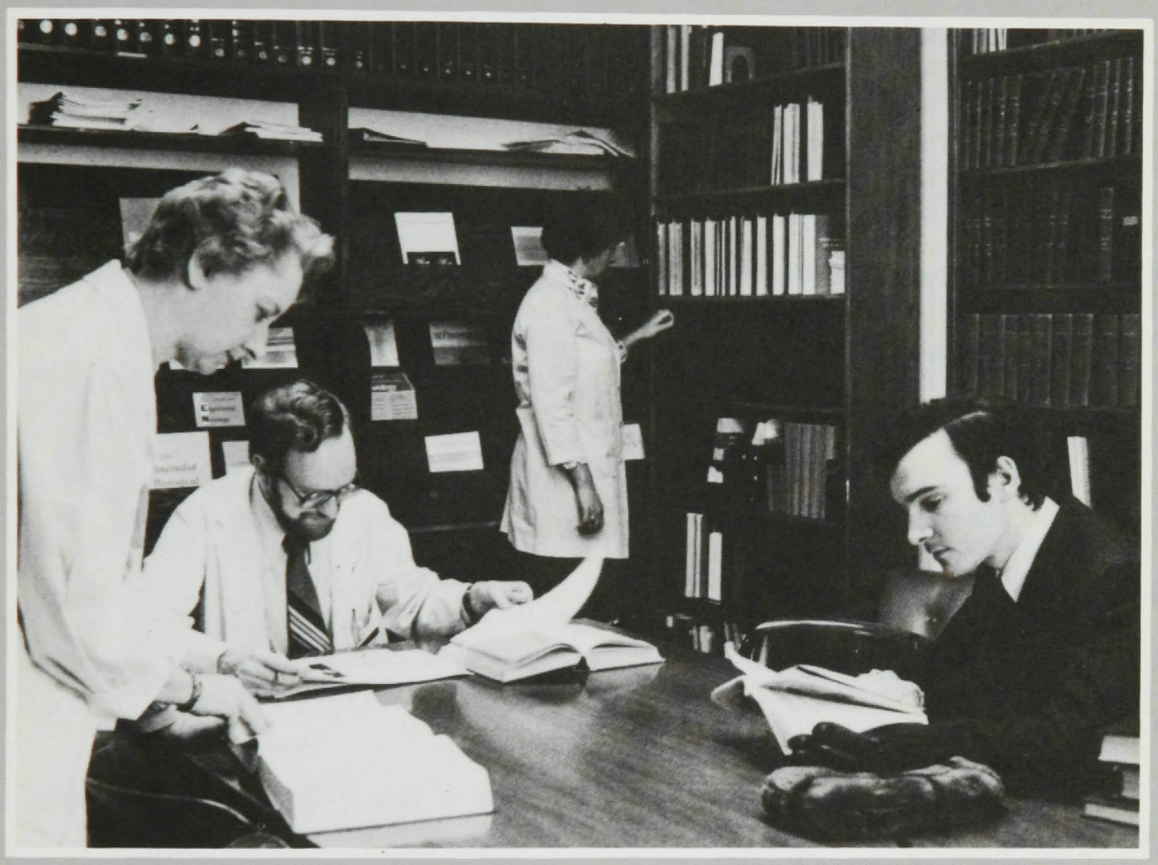
— Burke Dial, MD
President

# Montreal Neurological Society

In 1979 the Montreal Neurological Society enjoyed a heartening revival. Several distinguished visitors — Dr. Richard Tyler from Boston, Dr. Robert Joynt from Rochester, and Dr. Barry Arnason from Chicago — came to address the society and to participate in informal sessions with residents and fellows. In the coming year we look forward to cooperating with other organizations to sponsor visitors of interest to all our members, clinicians and scientists both.

— Ivan Woods, MD
Secretary-Treasurer

# Publications



*"For me no idea or argument is completed until it is written out."*

*— Wilder Penfield, "Rewards and Fairies in Medicine," 1958.*

*Staff members of the Montreal Neurological Hospital and Institute produced over 130 publications in the past year. Overleaf, a well-used research tool — the Neuro library.*

# Publications of the Staff of the Montreal Neurological Hospital and Institute 1978-1979

(Figures indicate Montreal Neurological Institute reprint numbers.)

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# Finances

1507
1313
234

# Montreal Neurological Hospital

## Balance Sheet as at March 31, 1979

### GENERAL FUND

| | 1979 | 1978 |
|---|---|---|
| **Assets** | | |
| Cash | **$ 188,695** | $ — |
| Accounts receivable — less provision for doubtful accounts | **1,126,822** | 656,086 |
| Due from Quebec Department of Social Affairs operating grants | **—** | 853,345 |
| Inventory of supplies at cost | **146,106** | 141,618 |
| | **$1,461,623** | $1,651,049 |
| **Liabilities** | | |
| Bank indebtedness | $ — | $ 261,829 |
| Bank loan | **—** | 211,440 |
| Accounts payable and accrued liabilities | **640,185** | 590,756 |
| Due to Quebec Department of Social Affairs | **358,798** | — |
| Due to plant fund | **28,127** | 8,499 |
| Due to Royal Institution for the Advancement of Learning | | |
| — Current account | **759,873** | 747,217 |
| — Advances to cover prior years' deficit | **10,683** | 10,683 |
| Deficit | **(336,043)** | (179,375) |
| | **$1,461,623** | $1,651,049 |

### PLANT FUND

| | | 1979 | 1978 |
|---|---|---|---|
| **Assets** | | | |
| Cash | | **$ 136,032** | $ 271,520 |
| Short term investments | | **—** | 390,000 |
| Due from general fund | | **28,127** | 8,499 |
| Advance to Royal Institution for the Advancement of Learning — construction project (Note 3) | | **4,709,853** | 4,562,649 |
| Fixed assets, at cost | | | |
| Equipment | $3,288,706 | | |
| Less: accumulated depreciation | 1,241,042 | **2,047,664** | 1,541,030 |
| | | **$6,921,676** | $6,773,698 |
| **Liabilities** | | | |
| Bank loan | | **$1,500,000** | $1,500,000 |
| Unexpended balance of special equipment grant for construction project | | **—** | 382,267 |
| Due to Royal Institution for the Advancement of Learning | | **393,047** | 526,735 |
| Restricted funds — construction project | | **3,189,200** | 3,189,200 |
| **Capital** | | **1,839,429** | 1,175,496 |
| | | **$6,921,676** | $6,773,698 |

## Statement of Operations

| | 1979 | 1978 |
|---|---|---|
| **Income** | | |
| Quebec Department of Social Affairs (Note 1) | **$ 8,072,158** | $7,828,284 |
| Revenue from patients | **2,064,438** | 1,917,203 |
| Other income | **334,088** | 23,802 |
| | **10,470,684** | 9,769,289 |
| **Expenses** | | |
| Salaries and wages | **7,841,921** | 7,120,558 |
| Fringe benefits | **434,723** | 479,939 |
| Drugs, medical and surgical supplies | **454,490** | 330,910 |
| Services and supplies | **1,883,786** | 1,616,421 |
| | **10,614,920** | 9,547,828 |
| Surplus (deficit) for the year (Note 2) | **($ 144,236)** | $ 221,461 |

## Statement of General Fund Capital

| | | |
|---|---|---|
| **Deficit at beginning of the year** | **($ 179,375)** | ($ 79,558) |
| **Deduct** | | |
| Payment from the Quebec Department of Social Affairson account of prior year expenses | — | 107,094 |
| Payment from the Quebec Department of Social Affairs for retroactive salary adjustments | — | 295,749 |
| Adjustment of prior years' deficit | — | 1,114 |
| Surplus for the year | — | 221,461 |
| | **(179,375)** | 545,860 |
| **Add** | | |
| Expenses related to prior year | **7,120** | 107,094 |
| Salary adjustments retroactive to prior years | — | 30,000 |
| Deficit for the year | **144,236** | — |
| Post-budget adjustment | **5,312** | 588,141 |
| **Deficit at end of the year** | **($ 336,043)** | ($ 179,375) |

## Statement of Plant Fund Capital

| | | |
|---|---|---|
| Capital at beginning of the year | **$ 1,175,496** | $1,196,836 |
| Increase in plant capital | **861,659** | 137,072 |
| | **2,037,155** | 1,333,908 |
| Less: Depreciation on equipment | **197,726** | 158,412 |
| Capital at end of the year | **$ 1,839,429** | $1,175,496 |

## Notes to Financial Statements
## March 31, 1979

1. *Quebec Department of Social Affairs*
   Income includes payments from the Government of Quebec to the extent of the amounts approved to March 5, 1979 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 to be subject to reimbursement to the Government. No provision has been made in the accounts for such eventualities.

2. *Deficit*
   The 1978/1979 supplementary budget of $153,000 for operating the new Penfield Pavilion, which was occupied in July 1978 and which was officially opened in September 1978, has been presented to the Budget Committee of the Department of Social Affairs. No approval has been received as yet.

   The additional budget of $950,000 for operating the new Penfield Pavilion for the year ending March 31, 1980 has been submitted by the Department of Social Affairs but has not yet been approved by the Treasury Board.

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. In May 1979, $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 $2,800,000 is pending approval by the 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 $457,122 at March 31, 1979. 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.

## Auditor's Report

To the Board of Directors
Montreal Neurological Hospital

We have examined the balance sheet of the Montreal Neurological Hospital as at March 31, 1979 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.Q. 1971, Chap. 48), 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, 1979 and the results of its operations for the year then ended in accordance with the standards and accounting practices required by the aforementioned Regulation applied on a basis consistent with that of the preceding year.

Montreal, Quebec
June 15, 1979

Touche Ross & Co.
Chartered Accountants

# Montreal Neurological Institute
## Statement of Income and Expenditure

| | | Year Ended March 31, 1979 | | Year Ended March 31, 1978 |
|---|---|---|---|---|
| **Opening Balance** | | **$ 78,423.** | | $ 308,102. |
| **Income** | | | | |
| External grants for research and fellowships | | **979,700.** | | 777,720. |
| Donations | | **840,459.** | | 373,426. |
| Investment | | **1,213,397.** | | 1,045,807. |
| University Funds — | | | | |
| Geographical Full-Time | **$ 264,719.** | | $ 230,855. | |
| General | **49,693.** | **314,412.** | 37,910. | 268,765. |
| | | **3,426,391.** | | 2,773,820. |
| **Expenditure** | | | | |
| Salaries | | | | |
| Teaching and Research Staff | **923,262.** | | 827,669. | |
| Technical and Support Staff | **1,026,343.** | | 814,374. | |
| | **1,949,605.** | | 1,642,043. | |
| Fringe benefits | **144,074.** | **2,093,679.** | 122,591. | 1,764,634. |
| Materials and supplies | | **427,264.** | | 285,830. |
| Services | | **99,288.** | | 94,544. |
| Equipment | | **1,015,615.** | | 550,389. |
| | | **3,635,846.** | | 2,695,397. |
| **Closing Balance (deficit)** | | **$ (209,455 )** | | $ 78,423. |
| Note: Budgeted operating expenditure (included above) | | **777,555.** | | 689,666. |

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

# 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

## 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

**Medical Research Council of Canada Grants**

Dr. Stirling Carpenter
Dr. William Feindel
Dr. Serge Gauthier
Dr. Pierre Gloor
Dr. Daniel Guitton
Dr. Robert Hansebout
Dr. Barbara Jones
Dr. George Karpati
Dr. John Little
Dr. Brenda Milner
Dr. Hanna Pappius
Dr. Sergio Pena
Dr. Allan Sherwin
Dr. Leonhard Wolfe
Dr. Lucas Yamamoto

**Conseil de la Recherche en Santé du Québec Subventions à l'Établissement**

Dr. Serge Gauthier
Dr. Jean Gotman
Dr. Daniel Guitton
Dr. Barbara Jones
Dr. Sergio Pena

**Medical Research Council of Canada Associateships**

Dr. Brenda Milner
Dr. Leonhard Wolfe

**Medical Research Council of Canada Scholarships**

Dr. Jean Gotman
Dr. Barbara Jones
Dr. George Kostopoulos
Dr. Sergio Pena

**Conseil de la Recherche en Santé du Québec Chercheur-Boursier**

Dr. Daniel Guitton

**Muscular Dystrophy Associate Research Grants**

Dr. Stirling Carpenter
Dr. Andrew Eisen
Dr. George Karpati
Dr. Sergio Pena

**Multiple Sclerosis Society of Canada**

Dr. J. B. R. Cosgrove
Dr. Andrew Eisen

**Réseau Provincial de Médecine Génétique**

Dr. Eva Andermann

# Donations to Special Funds 1978-1979

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 Evoked Potential Unit**

| | |
|---|---|
| Savoy Foundation | $30,000. |

**Brain Research Fund**

| | |
|---|---|
| A. Murray Vaughan | 1,000. |
| Mrs. A. Murray Vaughan | 1,000. |

**Cancer Clinical Relief Fund**

**Computer Tomography Research Fund**

| | |
|---|---|
| MNI Radiology Clinic Inc. | 34,475. |

**William Cone Memorial Research Fund**

| | |
|---|---|
| The Harold Crabtree Foundation | 1,000. |
| Edith Dawson | 65. |
| Mildred Flynn | 100. |
| John Langdon | 500. |
| Peter Leggat | 150. |
| Cecilia Oshinsky | 100. |
| Mrs. E. P. Roberts | 15. |
| Rollande Rodrigue | 100. |
| Mr. and Mrs. E. A. Salsberg | 100. |
| Hugh Gordon Seybold | 100. |
| Emilian Strauss | 200. |
| In memory of Robert Burns | 120. |
| In memory of Sophie Kendall | 485. |
| In honour of Edna Schwartz | 430. |
| In memory of Stephen Peter Steinman | 220. |

**Cosgrove Research Fund**

| | |
|---|---|
| Mrs. L. M. Bessner | 1,800. |
| Mr. and Mrs. F. Binda | 20. |
| Dr. Harold Bonner | 100. |
| Champoux et Associés Inc. | 200. |
| Thérèse Décarie | 200. |
| Simone Emard | 130. |
| Irène Fontaine | 75. |
| Mr. and Mrs. A. Galasso | 15. |
| Mrs. D. L. Inwood | 25. |
| Doreen Jurychuk | 65. |
| Brigadier J. A. de Lalanne | 200. |
| Dr. W. Ian McDonald | 35. |
| Claude Menard | 1,000. |
| Morguard Mortgage Investment Company of Canada | 250. |
| Morguard Trust Company | 571. |
| Mr. and Mrs. B. Myers | 10. |
| Mr. and Mrs. G. Ottavi | 25. |
| Penny Lou (1978) Inc. | 25. |
| Mr. and Mrs. Abe Roseman | 25. |
| Salta Benevolent Fund | 1,500. |
| Alain SansRegret | 300. |
| Sheinart Employees | 52. |
| Marielle Vallée | 70. |
| In memory of Alvin Delaney | 173. |
| In memory of Beverly McMillan | 325. |

**Harvey Cushing Clinical Relief Fund**

| | |
|---|---|
| Anonymous | 10. |
| Mrs. C. L. Copland | 25. |
| Sybil Etmekdjian | 5. |
| The Gazette | 2,000. |
| Lillian Sandler | 50. |
| Janet Shapiro | 25. |
| Women's Auxiliary, RVH | 1,162. |

**Eileen C. Flanagan Nursing Bursary Fund**

**Gordon Library Fund**

**Hospital Equipment Fund**

| | |
|---|---|
| Mr. and Mrs. William Stall | 10. |
| Women's Auxiliary, RVH | 3,951. |

**Mary Massabky Foundation Research Fund**

| | |
|---|---|
| Mary Massabky Foundation Inc. | 9,629. |

**Mary Massabky Scholarship Fund**

| | |
|---|---|
| Mary Massabky Foundation Inc. | 4,815. |

**McNaughton Neuroanatomy Research Fund**

**Francis McNaughton Neurological Research Fund**

| | |
|---|---|
| Anonymous | 75. |
| Dr. W. E. Baker | 500. |
| Mrs. M. Buntins | 50. |
| S. M. Duncan | 20. |
| Lafleche Credit Union | 41. |
| Rose Lax | 100. |
| W. G. Lynn | 250. |
| Edward Norsworthy | 325. |
| Sydney Nowa | 1,000. |
| Allan E. Ross | 1,000. |
| John F. Ross | 1,000. |
| Mrs. Reginald E. Simons | 100. |
| J. Clare Wilcox | 100. |
| Mr. and Mrs. Hyman Wisenthal | 150. |
| In memory of Eileen Allen | 140. |

**Montreal Neurological Institute Building Fund**

**Montreal Neurological Institute Neurosurgical Research Fund**

| | |
|---|---|
| Dr. Mark Rayport | 50. |

**Montreal Neurological Institute Nursing Education Fund**

| | |
|---|---|
| Jean Engebretsen | 25. |
| MNI nurses and staff members (in memory of Helena Kryk) | 1,452. |

**Montreal Neurological Institute Staff Loan Fund**

**Multiple Sclerosis Clinical Relief Fund**

| | |
|---|---|
| Joseph Beaudry | 20. |
| Mrs. V. Chrislett | 25. |
| Montreal Association for Multiple Sclerosis | 1,500. |
| Multiple Sclerosis Golf League | 1,755. |

**Multiple Sclerosis Home-Care Program**

**Neurogenetics Research Fund**

| | |
|---|---|
| Association Canadienne de l'Ataxie de Friedreich | 18,000. |

**Neurological Research Fund**

| | |
|---|---|
| Mr. and Mrs. Ronald Annett | 25. |
| Dr. Bartolo Barone | 25. |
| Mr. and Mrs. Gilles Bergeron | 25. |
| Simone Bergeron | 35. |
| Dr. Edwin Boldrey | 10. |
| Canadian Lady-Canadelle Inc. | 25. |
| Fred Carbray | 30. |
| Remi Catafard | 25. |
| Mr. and Mrs. A. C. de Belle | 15. |
| Department of Photography, Montreal Children's Hospital | 20. |
| David Dorfman | 50. |
| Mr. and Mrs. René Dufort | 10. |
| Dr. Kenneth Earle | 20. |
| Dr. Joseph Evans | 50. |
| Dr. Jacques Fortier | 50. |
| Jacques Gariépy | 20. |
| Dr. William Gibson | 50. |
| Mr. and Mrs. C. Headland | 10. |
| George Janna | 17. |
| Heather Mahar | 5. |
| Mr. and Mrs. P. A. Moore | 20. |
| Mrs. Camille Ratt-Drouin | 20. |
| Mr. and Mrs. D. M. Robertson | 25. |
| Mrs. Eric Sutherland | 15. |
| Steyning Foundation | 3,000. |
| Abdulrasul Thaver | 25. |
| Minna Trower | 5. |
| Jill Weedon | 20. |
| In memory of Paul Allard | 110. |
| In honour of the fiftieth anniversary of Mr. and Mrs. Abe Arbess | 35. |

| | |
|---|---|
| In memory of Ann (Val) Cassidy | 625. |
| In memory of Ernest Davis | 125. |
| In memory of Céline Duhamel-Bérard | 205. |
| In memory of Kathleen Hogan | 35. |
| In memory of Jean-Luc Laporte | 500. |
| In memory of Serge Lussier | 60. |
| In memory of G. William Munday | 275. |
| In memory of Serge Pépin | 370. |
| In memory of Yves Petit | 390. |
| In memory of Frank Schiestel | 574. |
| In memory of William Thomas Towes | 110. |
| In memory of Marthe Tremblay-Gendron | 65. |
| In memory of William Tyers | 308. |
| In memory of Dick Watson | 215. |

**Neurophysiology Research Fund**

**Neuroradiology Research and Teaching Fund**

**Penfield Award Fund**

**Wilder Penfield Memorial Research Fund**

| | |
|---|---|
| Barbara Ballard | 100. |
| May Binet | 25. |
| William Chester Jr. | 500. |
| Mr. and Mrs. Thomas Francis | 80. |
| Opal Holst | 75. |
| Janet Kahler | 25. |
| Linda Kaplan | 30. |
| Mildred Kaplan | 25. |
| Madeleine Lemaire | 15. |
| Montreal Council of Hospital Syndicates | 50. |
| Paul Petrow | 100. |
| In memory of Jean-Serge Doray | 354. |
| In memory of Mary Roach | 610. |
| In memory of Barbara Weyman | 940. |

**Zelda and Leo Posman Research Fund**

| | |
|---|---|
| Norman Liben | 200. |
| Mrs. L. Posman | 250. |

**Reuben Rabinovitch Memorial Library Fund**

| | |
|---|---|
| Sunnybrook Hospital | 25. |

**Lewis Reford Fellows' Fund**

**Reitman Research Fund**

**Sherwin Research Fund**

| | |
|---|---|
| Fraid's Inc. | 1,000. |

**Spinal Cord Research Fund**

| | |
|---|---|
| Marshall Jackson | 25. |
| Fred Scotcher | 250. |
| G. Scotcher | 25. |

**Stroke Research**

| | |
|---|---|
| Anonymous | 50,000. |

**H. L. Teuber Neuropsychology Research Fund**

| | |
|---|---|
| S. B. Freed | 250. |
| Steven Levy | 250. |
| Dr. F. L. McNaughton | 100. |
| Dr. Brenda Milner | 750. |
| Sandoz (Canada) Ltd. | 500. |
| Laughlin B. Taylor | 100. |

**Third Foundation Brain Fund**

| | |
|---|---|
| Dr. William Feindel | 400. |
| Mr. and Mrs. Paul Ganz | 1,000. |

**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 thereform 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

# Statistics

# Classification of Operations
April 1, 1978 to March 31, 1979

| | | |
|---|---|---|
| **Craniotomy and Craniectomy** | | |
| and biopsy | 6 | |
| and decompression (debridement) | 3 | |
| and drainage of abscess | 1 | |
| and drainage of subdural haematoma | 12 | |
| and drainage of intracerebral haematoma | 9 | |
| and drainage of extradural haematoma | 4 | |
| and decompression, debridement and repair of dural laceration | 7 | |
| and excision of epileptogenic focus (lobectomy) | 76 | |
| and excision of epileptogenic focus (hemispherectomy) | 1 | |
| and excision, clipping or wrapping of aneurysm | 38 | |
| and removal of arteriovenous malformation | 9 | |
| and cerebral vascular bypass anastomosis | 10 | |
| and plastic repair of skull defect (plate, bone, acrylic) | 3 | |
| and sequestrectomy for osteomyelitis | 1 | |
| and removal of posterior fossa tumour | 21 | |
| and removal of cerebral tumour | 63 | |
| and correction Chiari malformation (plugging of central canal) | 5 | |
| and removal of foreign body | 1 | |
| and removal of tumour of skull | 1 | |
| and trigeminal massage or decompression | 1 | |
| and trigeminal rhizotomy — suboccipital | 4 | |
| and hypophysectomy endocrine control transphenoidal | 2 | |
| and hypophysectomy transphenoidal for pituitary or intrasellar tumour | 40 | |
| and plastic repair of dura, CSF rhinorrhea or fistula | 2 | 320 |
| **Trepanation** | | |
| and biopsy | 1 | |
| and drainage of epidural, intracerebral or subdural space | 20 | |
| and drainage of abscess | 2 | |
| and exploration | 1 | |
| and insertion ventricular catheter or drain | 1 | 25 |
| **Shunt Procedures** | | |
| and ventricular caval (atrial) | 34 | |
| and ventricular peritoneal | 4 | |
| and ventriculoscisternostomy (Torkildsen's) | 1 | |
| and replacement or revision of shunt | 4 | 43 |
| **Stereotaxic Procedures** | | |
| and placement of electrodes | 4 | |
| and ventriculography, PEG, angiography (localization) | 3 | |
| and lesion (mechanical or neurolytic agent, including electrophysiological localization) | 1 | |
| and biopsy or drainage of cyst | 7 | 15 |
| **Laminectomy, Hemilaminectomy** | | |
| anterolateral cordotomy — thoracic | 8 | |
| | | 125 |

| | | |
|---|---|---|
| biopsy | 1 | |
| discoidectomy, lumbar, sacral | 67 | |
| discoidectomy, thoracic | 1 | |
| discoidectomy, cervical | 4 | |
| incision and drainage of intramedullary cyst (syringomyelia) | 2 | |
| removal of tumour, intramedullary | 3 | |
| removal of tumour, extramedullary, intradural | 6 | |
| removal of tumour, extradural, metastatic bone, etc. | 16 | |
| rhizotomy — dorsal | 3 | |
| rhizotomy — torticollis | 1 | |
| implantation dorsal column stimulator unit | 1 | |
| spinal fusion with bone graft — autogenous or bone bank | 15 | |
| spinal fusion with Harrington rods and graft | 4 | |
| spinal fusion with wire, plate or surgical simplex | 2 | |
| spinal fusion, craniocervical | 1 | |
| spinal fusion, anterior approach, spinal trauma | 1 | |
| discoidectomy, anterior approach, cervical (Cloward) | 24 | |
| discoidectomy, anterior approach, cervical without arthrodesis | 4 | |
| decompression or exploration of spinal cord and cauda equina for stenosis or dentate ligament section or spondylosis | 23 | |
| spinal cord cooling and fusion | 1 | 188 |
| **Nerve Exploration** | | |
| anastomosis of suture | 1 | |
| avulsion or section | 8 | |
| excision of neuroma | 1 | |
| excision of nerve tumour | 2 | |
| neurolysis, transplantation, or decompression or exploration | 59 | |
| neurolysis by radiofrequency | 4 | 75 |
| **Artery Exploration** | | |
| shunt or bypass, graft (autogenous, other) | 1 | |
| endarterectomy (Patch graft) | 19 | |
| progressive — occlusion (Selverstone clamp) | 1 | |
| ligation or biopsy superficial temporal artery | 1 | 22 |
| **Wound Reopening** | | |
| drainage of infection | 8 | |
| evacuation of haematoma | 5 | |
| exploration | 1 | |
| repacking | 1 | |
| CSF leak | 1 | 16 |
| **Miscellaneous** | | |
| miscellaneous | 12 | |
| suture of laceration of wound | 2 | |
| radio frequency trigeminal rhizotomy | 14 | |
| radio frequency percutaneous cordotomy | 2 | |
| tracheostomy | 17 | |
| muscle biopsy | 107 | 184 |
| **Radiological Procedures** | | |
| cerebral angiography (venography) percutaneous, carotid, vertebral subclavian | 50 | |
| catheterization — brachial, carotid, femoral | 432 | |
| selective arterial embolization | 1 | |
| pneumograms under anesthesia | 86 | 569 |
| **Total** | | **1427** |

# Classification of Diseases
**April 1, 1978 to March 31, 1979**

| | | |
|---|---|---|
| **General Nervous System** | | |
| Multiple sclerosis | 75 | |
| Motor neuron disease | 9 | |
| Friedreich's ataxia | 6 | |
| Tuberous sclerosis | 1 | |
| Miscellaneous | 6 | 97 |
| **Meninges** | | |
| Meningocele and myelomeningocele | 2 | |
| Subdural hematoma | 26 | |
| Subarachnoid hemorrhage | 46 | |
| Adhesive arachnoiditis | 2 | |
| Spinal arachnoiditis | 2 | |
| CSF rhinorrhea | 2 | |
| Miscellaneous | 23 | 103 |
| **Brain** | | |
| Congenital anomalies | 1 | |
| Hydrocephalus | 36 | |
| Head injury (contusion, laceration, traumatic encephalopathy, concussion, skull fracture) | 55 | |
| Epilepsy | 220 | |
| Parkinsonism | 15 | |
| Intracerebral hemorrhage | 2 | |
| Alzheimer's disease | 7 | |
| Thrombosis, encephalopathy due to arteriosclerosis | 28 | |
| Cysts | 4 | |
| Aneurysm | 13 | |
| Encephalitis | 5 | |
| Sturge-Weber syndrome | 2 | |
| Arteriovenous malformation | 22 | |
| Miscellaneous | 46 | 456 |
| **Tumours** | | |
| Astrocytoma | 23 | |
| Craniopharyngioma | 1 | |
| Schwannoma | 7 | |
| Chromophobe adenoma of pituitary | 42 | |
| Gliomas | 15 | |
| Sarcoma | 3 | |
| Metastatic carcinoma | 34 | |
| Brain tumour suspected | 5 | |
| Hemangioblastoma | 1 | |
| Medulloblastoma | 1 | |
| Glioblastoma multiforme | 22 | |
| Oligodendroglioma | 8 | |
| Lipoma | 5 | |
| Meningioma | 27 | |
| Miscellaneous | 43 | 237 |

| | | |
|---|---|---|
| **Spinal Cord** | | |
| Contusion of spinal cord | 4 | |
| Guillain-Barré syndrome | 7 | |
| Myelopathy | 15 | |
| Syringomyelia | 7 | |
| Hydromyelia | 4 | |
| Spinocerebellar degeneration suspected | 2 | |
| Spinal stenosis | 4 | |
| Miscellaneous | 9 | 53 |
| **Cranial and Peripheral Nerves** | | |
| Cubital tunnel syndrome | 1 | |
| Trigeminal neuralgia | 13 | |
| Optic neuritis | 10 | |
| Ulnar neuropathy | 15 | |
| Other neuralgias | 1 | |
| Peripheral neuropathy | 10 | |
| Neuritis | 10 | |
| Occipital neuralgia | 1 | |
| Hemifacial spasm | 2 | |
| Meralgia paresthetica | 4 | |
| Miscellaneous | 39 | 106 |
| **Muscles** | | |
| Myasthenia gravis | 17 | |
| Muscular dystrophy | 2 | |
| Myopathy | 9 | |
| Muscular atrophy | 6 | |
| Myalgia of undetermined origin | 1 | |
| Charcot-Marie-Tooth disease | 1 | |
| Miscellaneous | 11 | 47 |
| **Mental Disease** | | |
| Mental retardation | 2 | |
| Depression | 7 | |
| Anxiety state | 1 | |
| Conversion hysteria | 2 | |
| Schizophrenia | 6 | |
| Behaviour disorder | 2 | |
| Chronic alcoholism | 20 | |
| Miscellaneous | 12 | 52 |
| **Other Systems** | | |
| Protrusion disc — lumbar | 3 | |
| Protrusion disc — cervical | 2 | |
| Fracture and/or dislocation vertebral column | 22 | |
| Back pain | 21 | |
| Pain miscellaneous | 2 | |
| Gunshot wounds | 5 | |
| Rheumatoid arthritis | 1 | |
| Coronary insufficiency | 1 | |
| Diabetes mellitus | 38 | |
| Hypertension | 74 | |
| Osteoarthritis | 1 | |
| Hypothyroidism | 9 | |
| Miscellaneous | 173 | 352 |

# Causes of Death
**April 1, 1978 to March 31, 1979**

| | |
|---|---|
| Head injury (concussion, contusion, haematoma) | 16 |
| Intracranial aneurysm (haemorrhage, haematoma due to aneurysm) | 29 |
| Cerebrovascular disease (thrombosis, infarction, haemorrhage) | 14 |
| Intracranial tumour, primary | 7 |
| Intracranial tumour, metastatic | 9 |
| Cardiac arrest | 11 |
| Other systems | 10 |
| | **96** |