

Twenty-Ninth Annual Report  
of the  
MONTREAL NEUROLOGICAL  
INSTITUTE  
and  
MONTREAL NEUROLOGICAL  
HOSPITAL  
and the  
DEPARTMENT OF NEUROLOGY  
AND NEUROSURGERY  
of  
McGILL UNIVERSITY

1963-64



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# THE INSTITUTE AND HOSPITAL

## REPORT OF THE DIRECTOR

DR. THEODORE RASMUSSEN

This report, like all of our previous reports, is a combined one, covering our clinical, scientific, and teaching activities of the past year. Like its predecessors, it is made not only to the Principal and the Board of Governors of McGill, but also to the community, individual and corporate, local and provincial, national and international. Thus we take this opportunity to report directly to the public we serve and upon whom we must depend, in the long run, for our support.

It was wisely provided at the very beginning of the Institute's history that the financial aspects of the clinical side of the Institute be completely separate from the scientific side, and the two budgets have always been completely independent. This has now been formalized by the incorporation, in July 1963, of the hospital functions of the Institute as required by the 1962 Quebec Hospital Act, Bill 44. With the Board of Management of this new legal entity, the Montreal Neurological Hospital, now established and organized, future reports of our clinical activities will be formally directed to this Board, while the reports on teaching and research will continue to be made to the Principal and Board of Governors of McGill, since we continue to be both a hospital and an educational and research institute, a department of McGill.

This combined form of report may not be tidy from the legal standpoint, but is essential to give a true picture of the close integration that exists and must continue to exist in all levels of our clinical, teaching and research activities. Easy transgression of arbitrary organizational boundaries becomes increasingly important as burgeoning medical knowledge calls for progressively narrow specialization on the one hand and the synthesis provided by more elaborate team efforts on the other. Constant vigilance must be maintained against insidious effects of budgetary or organizational pressures, or habits of thought that tend to hinder patterns of collaboration and integration in our daily hospital and laboratory work.

The costs of hospitalization continue to rise, but so do the benefits to the community. The costs must be measured not only in dollars, and against those of previous years, but also against the real costs, now and future, of anything less than the best medical care. The benefits of such care are still less easily evaluated. They are measured in better relief of suffering, reduced mortality and morbidity, safer and more accurate methods of investigation and treatment, quicker and more complete return of the patient to productive life, etc. True medical-care economy lies in providing the best facilities and staff that can be economically utilized. Continuing improvement in medical care must always be the guiding star for all who have responsibilities in this area, whether they be political, professional, non-professional, or educational in nature.

The increase in our per-diem rate during the past year by the Quebec Hospital Insurance Service, reported by Mr. Noel, has reduced our 1963 year-end deficit significantly as compared with the previous two years, but the interim year-end payment just received still leaves a sizeable sum in red ink, and more prompt final settlement of the year-end adjustments is urgently needed. Again this year we must report that no progress has been made by the Province in regard to help in retiring our cumulative indebtedness built up over the past decade as a result of inadequate coverage, by the City and the Province, of the hospitalization costs of the medically indigent patients who have required the specialized services available here.

The major changes in the senior staff this past year concern the Department of Anaesthesia. Dr. Douglas Crowell, Assistant Anaesthetist, resigned early this spring to take charge of the anaesthesia department of St. Joseph's Hospital in Toronto, and takes with him our best wishes for success and happiness in his new post.

We welcome in his place Dr. Roy Schofer, a graduate of the University of British Columbia, with experience in Alabama, Australia, the Vancouver General Hospital and the Queen Elizabeth Hospital here in Montreal.

We welcome also Dr. Anibal Galindo, originally from Bogota, Colombia, who has been appointed Associate Anaesthetist and Assistant Professor in the Department of Anaesthesiology. He has come from a four-year stint at the National Institute of Neurological Diseases and Blindness in Bethesda to add strength to both the research and clinical aspects of the Anaesthesia Department.

Dr. K. A. C. Elliott has returned from his sabbatical leave in England and from his assignment as the first Norman Bethune Exchange Professor to the Chinese Medical College in Peking, China. Dr. Preston Robb will return at the end of June from his sabbatical year in the U.S., during which he has surveyed research programs in the field of epilepsy for the National Institute of Neurological Diseases and Blindness.

Dr. Arthur Elvidge assumed responsibility for the Neurosurgical Service at the Queen Mary Veterans' Hospital last summer in lieu of his former teaching commitments, but continues in charge of our Tumour Registry and with his private clinical responsibilities here.

Dr. Brenda Milner's research contributions in psychology were recognized this spring by the award of a Medical Research Council Associateship, and it is a pleasure to record our gratitude to the M.R.C. for this award.

Dr. Herbert Jasper delivered the first William G. Lennox Memorial Lecture of the American Epilepsy Society at its annual New York meeting last December, and is President of Sigma Xi of McGill for the coming year.

Dr. Wilder Penfield received an honorary D.Sc. degree from the University of New Brunswick, delivered the Horowitz Lectures of the New York University and was awarded the 50th Anniversary Gold Medal Award of the Peter Bent Brigham Hospital.

I express with deep appreciation the thanks of the entire Staff to the many individuals and organizations who throughout the year have made donations, large and small, to our Special Funds. Those earmarked for clinical use have provided a wide variety of comforts, aids and services, not covered by the Q.H.I.S., to many patients. Special mention under this heading should be made of the bequest of approximately \$120,000.00, from the estate of Mrs. Theodora Adams, establishing the Walter Chamblet Adams Memorial Endowment. The income from this endowment will be available for clinical activities not considered shareable by the Q.H.I.S.

Those donations to the Institute's various research and fellowship funds have been even more vitally needed to help compensate for the steady and persistent shrinkage of the buying power of the "hard" money income from our endowment funds.

Again this year a disturbingly high proportion of our scientific and departmental budget consisted of yearly or limited-project grants, and the need for increased endowment support for the scientific program remains acute. Additional stable financial support is required to permit urgently needed expansion of the research potential in the Laboratories of Neuropathology, Neuroanatomy and the Department of Electroencephalography and Electromyography. The rapidly rising tide of basic biological research, one aspect of which will be discussed by Dr. Murray Barr this evening, is providing an explosive expansion in opportunities for increasing our knowledge of the nervous system in both health and disease. It is in institutions such as this, where patients' clinical problems in their infinite variety are in constant contact with research-oriented clinicians and with specialized laboratory research teams, that these horizons are most apt to be approached. The public by private philanthropy can actively participate in this promising and exciting adventure.

Increased knowledge of the nervous system, its functions and dysfunctions, has implications for surpassing the immediate and pressing problems of treatment of patients with neurological diseases. Increased understanding of the human brain must certainly lead in time to better understanding of the human mind, and, ultimately, of human society which may point the way to harmony among men that is so badly needed throughout the world today.

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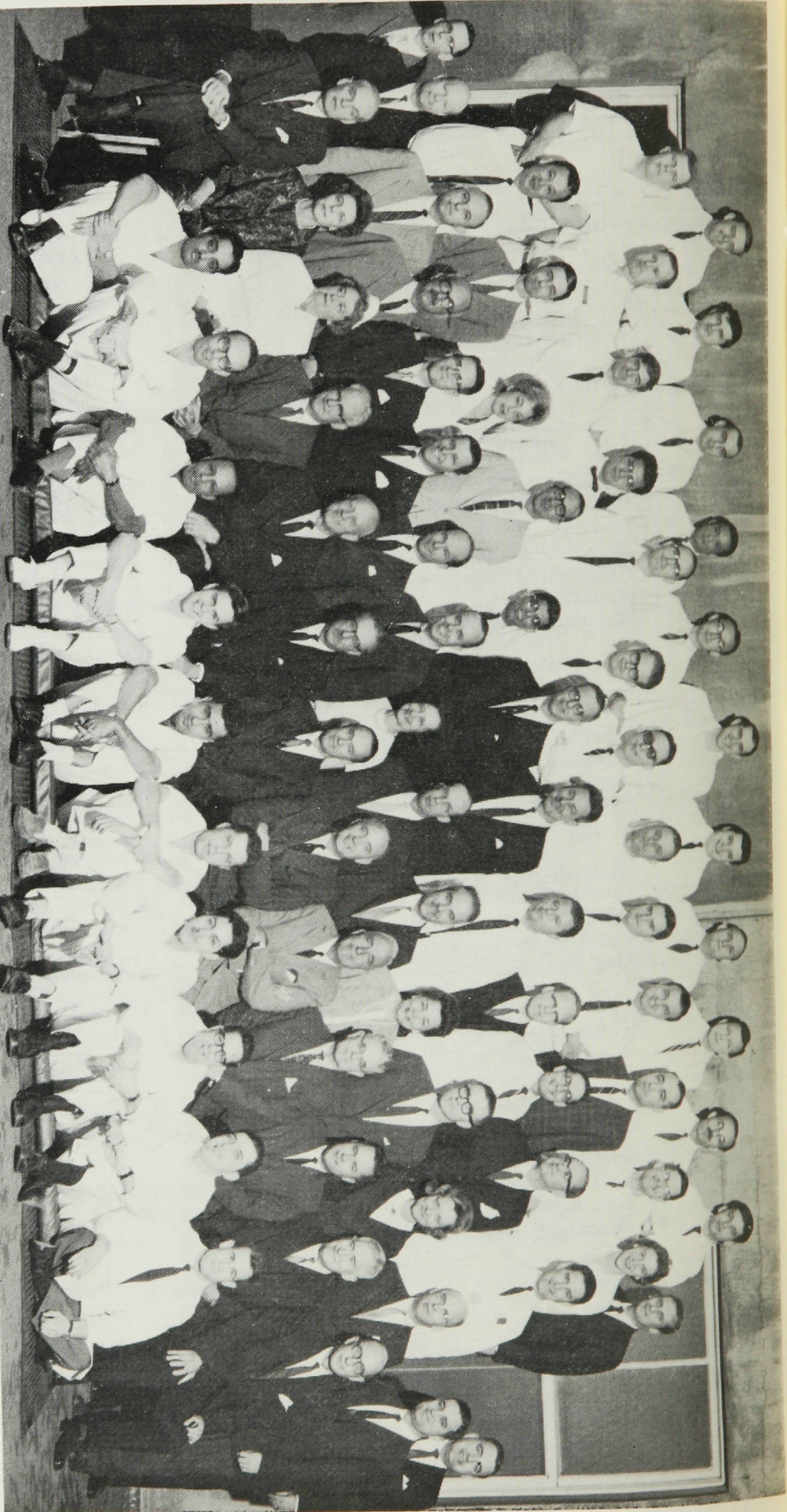
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\* Six months on this service

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*Third Row:* Miss N. Siddons-Gray, Mrs. J. Mallory, Miss D. MacDonald, Miss A. Cameron, Mrs. A. Ham, Mrs. L. Fletcher, Miss M. Cavanaugh, Miss P. Robertson.

*Fourth Row:* Miss P. Murray, Miss B. Holmes, Mrs. R. Boyer, Miss A. Gauvreau, Mrs. O. Yacovitch, Miss L. Dalcandro, Mrs. L. Law, Miss E. Mitchell.

*Back Row:* Mrs. L. Gorman, Miss K. Boucaud, Miss C. Dixon, Miss E. Clark, Mrs. E. Griffith, Miss N. Issacs, Miss R. Dharmicarak.



## GRADUATE STUDIES AND RESEARCH

DR. HERBERT H. JASPER

This annual report on Research is made relatively easy by the series of weekly research conferences held throughout the year. At these informal meetings research in progress in all departments, clinical and laboratory, is presented by fellows and staff for critical review. Presentation of published or entirely completed work is discouraged so that the worker may benefit from the discussion and suggestions given for the improvement of his continuing study. The fact that all departments and clinical staff are supposed to be represented at these meetings should 1) facilitate inter-departmental collaboration so essential to the objectives of our Institute, 2) permit critical evaluation by staff and fellows with different basic and clinical training and experience, and 3) facilitate the increasingly difficult task of fostering active collaboration between clinical and laboratory workers in the neurosciences.

The first two of the above objectives have been realized to a degree during the past year, but the third objective has been more difficult. With a few notable exceptions, in the research conferences, as well as in graduate seminars, participation of senior clinical staff has not been sufficiently active, for one reason or another, to make possible the close coordination of basic and clinical work which has been hitherto the hallmark of our Institute.

During the past year there have been 51 graduate fellows working at the Institute, if we include a few borrowed from departments of psychology and biochemistry at McGill. They come from 20 different countries. About one out of every four (25%) are from Canada, and one out of five (20%) from the United States. The remainder, over half the total, are from other countries around the globe; Dominican Republic, Egypt, Finland, Great Britain, Hong Kong, Indonesia, India, Iran, Italy, Jamaica, Japan, Lebanon, Mexico, Pakistan, the Phillipines, Poland, Spain, and the Soviet Union. This respectable representation of the United Nations serves to emphasize the broader significance of the work of this Canadian International Institute, though it might be advisable for the future to encourage a larger proportion of fellows from Canada itself. These fellows are at the same time our greatest strength and our greatest responsibility.

Twenty-six, or about one-half of these fellows were engaged for at least a part of the year in laboratory research. An additional 11 worked part time in the laboratory and part time on the wards. This makes a total of 37, or about 73% engaged in some form of research during the past year.

The Fellow (actually a Visiting Scientist) from the Soviet Union, Dr. R. Durinian, provides a good example of the broader significance of

our work in the fostering of international collaboration in science. It took Dr. Durinian three years to obtain a fellowship from the World Health Organization to work in our neurophysiology laboratories. He was well prepared, with excellent basic training and considerable experience in one of the leading Institutes of the Academy of Medical Sciences in Moscow. His warm genial Armenian personality and quick mind won our hearts and respect immediately. On his return home to Moscow the entire laboratory turned out at Dorval Airport to see him off. A letter since received from the President of the Academy of Medical Sciences of the USSR speaks for itself:

“Dear Sir,

Dr. Durinian returned happily in our Institute. He told me much about his working in your laboratories and expressed his utmost gratitude to you for the excellent research possibilities you gave him.

May I thank you most cordially for your scientific and human hospitality. It is especially great pleasure for me because we all in our Institute love Dr. Durinian very much as a really competent and skillful experimenter.

I am very glad that the experience of our first scientific collaboration was not only mutually useful but also pleasant.

Very sincerely yours,

(Signed) V. Parin, President

The Academy of Medical Sciences, Moscow.”

The participation of Dr. Rasmussen in the annual meeting of the Japanese Medical Association, and the most successful mission of Dr. Elliott as the first Norman Bethune Exchange Professor to the Chinese Medical College at Peking, and the active participation of other staff members in international medical or neurosciences meetings is another major factor giving far broader significance to our work. Such activities must be viewed in the perspective of improved international relationships in all fields of endeavour to assess their full importance which is by no means restricted to our clinical or scientific specialties.

At the risk of being repetitious for those who have read previous annual reports, we can still report little progress in our attempts to establish up to date laboratories of neuroanatomy and neuropathology at the Institute. The Research Advisory Committee is giving active serious study to this problem.

It is not possible to review the many interesting research developments in the Institute during the past year. They will be found (in part) in the separate laboratory reports. In fact the number of separate laboratories has increased to an alarming degree during recent years (about 12 in all).

## NEUROLOGY

DR. FRANCIS McNAUGHTON

The volume of neurological work, in terms of the numbers of patients, has remained at about the same level as in 1963, and the teaching program has not changed essentially. As mentioned in previous annual reports, each and every member of our staff, including all the residents, has some share in the undergraduate teaching. Dr. Foster Redding has served as Teaching Fellow during the Academic Session 1963-64.

The Epilepsy Clinic of the Royal Victoria Hospital, supported by a Federal-Provincial Rehabilitation Grant, continues to function well, due to the able assistance of Dr. Fred Andermann. There is great need for wider public understanding of epilepsy, and more social aid for those people of all ages who suffer from it. We are therefore pleased to note that "L'Association pour les Epileptiques de Québec" (The Quebec Association for Epileptics) has now begun its work in Montreal with Madame Marguerite de Lom as Director, and with the support of the French and English social agencies and the medical profession. Its function will be to co-ordinate and give leadership to all the community forces for the rehabilitation of persons with epilepsy. We expect much from this new Association and must be ready, as an Institute and Hospital, to give it our full support.

Dr. Cosgrove's Multiple Sclerosis Clinic now supervises over five hundred patients, and the load is an ever-increasing one. In addition to detailed follow-up studies, Dr. Cosgrove is testing new forms of treatment for the spasticity and decubitus ulcers, encountered in the more severe forms of this disease, and the serious bladder problems are being studied in close association with the Department of Urology of the Royal Victoria Hospital. There is an urgent need for public funds and more medical personnel to strengthen this important Clinic, and to develop a home-care program.

Some mention should be made of the research carried on in the special laboratories associated with the Department of Neurology. Dr. Allan Sherwin has an active program of basic immunochemical studies under way, related to neurological and muscle disease. In addition to studies of experimental encephalitis and neuritis in animals, Dr. Sherwin is developing enzyme assays in muscle disease, and new testing methods for auto-antibodies. These tests will soon be in every-day use on the wards, as aids in neurological diagnosis.

Dr. Irving Heller has continued his fundamental researches in the metabolism of peripheral nerve in the Laboratory of Neurochemistry, with support from the Multiple Sclerosis Society of Canada.

Dr. Cosgrove's laboratory continues its studies of CSF protein in various neurological diseases, with particular attention to multiple sclerosis. A follow-up study of retro-bulbar neuritis has also been started.

We are happy to "pipe" surgeon-commander Robb aboard ship again, and welcome his return after an active year with the National Institutes of Health at Bethesda, devoted to the study of epilepsy. We are also very pleased to welcome Dr. Donald Baxter, who has recently joined the neurological staff of the Montreal General Hospital and the M.N.I. He brings new strength to both Institutions.

In the Annual Report of 1962 we mentioned the important Brief on the Future of Neurology in Canada, submitted by Dr. Robb to the Royal Commission on Health Services in Canada, on behalf of the Canadian Neurological Society. He pointed out the need for the development of strong academic departments of neurology in all the university medical centres across Canada. While the Commission has still to complete its massive report, one can detect the signs of slow but steady expansion of university departments with more and better-trained staff members, more adequate hospital and laboratory space and increased funds for research and training. Each year, more university departments are being accredited as centres for graduate training in Clinical Neurology, in Canada by the Royal College, and this is another sign of healthy progress. In 1963, four of our recent graduates obtained their Fellowship in Neurology, and we expect more in 1964. In this, and in many other ways, we trust that the Institute is contributing to the growth and expansion of Canadian neurology.

## NEUROSURGERY

DR. WILLIAM FEINDEL

Once a year we slow down the clinical and academic treadmills of this Institute and Hospital to examine the previous year's activities. The brief glimpse which each of us in turn is privileged to give will have to be brought into proper prospective by the concluding report of our Director, Dr. Rasmussen.

One of the problems now facing this combined clinical and research institution stems from its present large size. During the past three decades of its existence it has tripled in almost all its facilities and is among the largest units of its kind. Size and excellence do not necessarily go hand-in-hand. But because of the results already achieved here over the past 30 years under Dr. Penfield's wise direction, this Institute now enjoys a world-wide reputation in the treatment, research and teaching related to disorders of the nervous system.

But there remain enough unsolved problems of the brain and its diseases to keep us humble and to keep this Institute occupied for many future generations. Past achievements, however, do emphasize to you, its loyal and devoted staff, to the great family of brain children who have trained here and gone out to all parts of the world, and to our generous friends everywhere, that this Institution, regardless of its dollar accounts, has been operating at a very satisfactory therapeutic and scientific profit. It will continue to do so as long as we retain the point of view expressed on the stone

plaque outside the original building, "Dedicated to the relief of pain and suffering and to the study of neurology". No apology need be made for the sequence of that dedication. For the scientist, there are far more luxurious ivory towers than this Institute can provide, and for the clinician far more profitable medical market places than this Hospital can afford. But there are few places where the unique catalytic combination of clinic and laboratory can be so fully enjoyed in the intellectual setting of a great university and amidst a generous cosmopolitan community.

During 1963, the neurosurgical activities here continued to expand steadily. The number of major cranial and spinal operations increased from 482 in 1962 to 508 in 1963. 1,183 patients were admitted to the three neurosurgical services (51% of the total admissions) and an additional 107 patients transferred from other departments. These figures are an index of the increasing load carried by the Nursing, Anesthetic, and Resident staff and of the enormous support which the neurosurgeons receive from the radiological, laboratory, technical and clerical staffs.

There were no surgical infections in 1963 out of a total of over 1,000 operations. During the past ten years there has been no year with more than 4 infections and there were none at all in the good "vintage" years of '59, '61 and '63. We are grateful to Professor Roger Reed, Dr. Constandina Butas and our old friend, Professor E. G. D. Murray,\* for their continued help and contribution to this record.

In addition to their clinical duties, the neurosurgeons of the attending and resident staff have pursued a widely diversified range of research activities many of which are concerned with fundamental problems. Dr. Elvidge continues to work, we are happy to say, on the Second Neurosurgical service, adding his wise and honest comments. He continues to produce with Dr. Barone and other Fellows careful follow-up reports on the results of brain tumour treatment. Dr. Henry Garretson, from Arizona and Harvard, has joined us. His work on brain tumour transplants brings additional strength to the active neurosurgical basic research program. He has also joined the team in the Isotope Laboratory developing techniques for studying the cerebral circulation. Dr. Robert Ford, despite his busy role as Neurosurgical Resident, has managed in the past few months to study over 100 patients with the new technique of ultra-sound encephalography which he introduced here from England. This method provides a rapid indication of a space-occupying lesion and has proved particularly valuable in the early handling of patients with head injuries.

Dr. Gilles Bertrand, who took over supervision of the Third Neurosurgical service upon Dr. Elvidge's retirement from the McGill teaching staff, has continued his work on the surgical treatment of Parkinsonism. In collaboration with Dr. Jasper and co-workers, Dr. Bertrand has been able to obtain electrical recordings from the deep parts of the brain which not only guide the surgeon to correct placement of a therapeutic lesion but

\* We were saddened since the presentation of this report to hear of Professor Murray's death in July, 1964. As recently as this year he had visited the Institute, and reviewed many problems of aseptic technique with the operating room staff. His zest and interest will be much missed.

which provide a unique opportunity to obtain fundamental information on the physiology and pathology of involuntary movements which cannot be duplicated in the laboratory. Dr. Phanor Perot, working with Dr. Bertrand, is to be congratulated for receiving his Ph.D. from McGill for his experimental work on petit mal epilepsy and his diploma from the American Board of Neurological Surgery. He has also completed with Dr. Feindel a report on the circulation in brain tumours and brain scars, a work which stems from observations made some 30 years ago by Dr. Penfield.

Dr. Rasmussen heads the First service and despite his many responsibilities as Director, has kept up the critical and meticulous analysis of the follow-up results of patients treated surgically for epilepsy. Dr. Charles Branch with Dr. Milner and Dr. Rasmussen published a report on the testing of speech lateralization by the injection of amytal into the carotid artery. He has also concluded with Dr. Robert Hansbout an important experimental study in monkeys on chemical agents which may be useful for treating brain tumours.

The environment of this Institute makes it possible for the neurosurgeon not only to carry out effective treatment for the patient but also to fulfill the important role of contributing toward our knowledge of many important basic problems which still require solution. It is obvious that some of these problems can only be solved at the clinical level and this is particularly true of the analysis of speech mechanisms, the effect of disease on movement and sensation or the study of memory mechanisms. The expertise of the laboratory scientist and the clinical skill of the neurosurgeon with a research training can be combined to bring insight to some of these urgent neurological problems.

It has given all of us at the Institute great satisfaction that Dr. Ronald Christie will be the new Dean of Medicine. Dr. Christie took his Medical degree at Edinburgh but acquired his early clinical training at the Royal Victoria Hospital under Dr. Jonathan Meakins. This perhaps goes to prove the comment of Dr. Samuel Johnson, that "much may be made of a Scotchman if he be caught young".

Finally, on behalf of the Neurosurgical staff, I wish to express our appreciation to everyone who has made it possible for me to report, both from the point of view of clinical and research activities, such a satisfactory year.

## HOSPITAL SERVICES

MR. CHARLES NOEL

Once again the Hospital Services have had an extremely busy year. During 1963 there were 2,329 admissions and 43,720 patient days. Although the number of patient days dropped by 942 from the 1962 figure, largely due to various staffing problems, the level of occupancy remained high at 88.7%. The average stay per patient was 18.7 days, close to the average of the past decade.

The distribution of patient days by type of accommodation was: Standard, 59%; Semi-private, 28%; and Private, 13%. In comparison with 1962 this indicates a slight shift from standard to semi-private with no change in the proportion of private accommodation. The analysis of patient days by responsibility for payment remained virtually unchanged as follows: Quebec Hospital Insurance Service, 71%; Federal Government, 1%; Workmen's Compensation Commissions, 3%; Canadians residing outside of the Province of Quebec, 14%; and foreign patients 11%.

There were a total of 5072 visits to the Outpatient Clinics held in the Royal Victoria Hospital by our staff members and residents. This total was made up of 4,217 visits to the Neurology Clinics and 855 visits to the Neurosurgery Clinics.

At December 31st, 1963 the Hospital had 346 full time employees and 52 part time employees, 29 less than what is considered to be the ideal staffing situation. The fact that standards and efficiency have been maintained under these adverse conditions is a tribute to all of the individuals engaged in the provision of Hospital Services.

Expenditure for Hospital Services rose by approximately 7% to \$2,158,552. This figure includes an amount of \$1,341,157. for salaries, an increase of 8.6% over 1962. Capital expenditure for the procurement of equipment was \$140,366.

The actual shareable cost per patient day during 1963 was \$42.00. The Quebec Hospital Insurance Service reimbursed our expenditure during the year initially at a rate of \$29.85 per patient day and subsequently at a rate of \$35.05 per patient day. This single increase in the rate of reimbursement was greater than the total of all other increases since the submission of our 1961 budget to the Service at its inception.

During 1963 a final settlement for 1961 was received. This final settlement left an amount of \$7,020. outstanding for 1961. Although we were not in complete agreement with this treatment, the interpretation of the regulations by the Provincial authorities appeared to be reasonable, and we did not make further representations regarding the settlement. An interim settlement for the year 1962, amounting to \$200,000., was also received during 1963 leaving a balance of \$110,873. outstanding for 1962. This has not been adjusted to date. Our claim for reimbursement of shareable expenditure, for 1963, amounting to \$257,080. was forwarded to the Service less than three weeks ago and I am happy to report that an interim settlement of \$128,000. was received yesterday.

The Hospital deficit for 1963 was \$220,200. and the accumulated deficit at December 31st 1963 was \$703,326. Over one half of the accumulated deficit is the result of 1962 and 1963 operations and all of this is recoverable from the Hospital Insurance Service. It is hoped that in the future the Provincial authorities will take some action to retire Hospital debts and deficits incurred prior to 1961 but there has been no definite indication that this will be done.

Now that the Quebec Hospital Insurance Service has been in existence for a full three years it appears that we can look forward to the future with confidence. With reimbursement rates being increased to realistic levels we hope that claims for final settlement will decrease in size and importance and that these will then be processed without long delays. If this is achieved most of our major financial problems will cease to exist.

## NURSING DEPARTMENT

MISS BERTHA I. CAMERON

The past year has been a very active one for the Nursing Department of the Montreal Neurological Hospital. We have endeavoured to meet our responsibilities in spite of the growing demands on the nursing personnel.

The individual nurse must have and maintain a genuine interest in recognizing and meeting the overall needs of her patient. In order to help her do this, it is becoming more evident in the nursing profession as in all other disciplines that one of the greatest challenges lies in the field of education.

We are pleased to welcome back to the staff following graduate studies at the School for Graduate Nurses McGill University, Miss Caroline Robertson as Assistant Director of Nursing Education; Miss Patricia Murray, Assistant Supervisor and Instructor Operating Room; Miss Helena Kryk, Supervisor Night Staff and Miss Anne Carney, Supervisor of Auxiliary Nursing.

The Teaching Department was particularly active under the capable leadership of Mrs. Maureen McIntosh, Miss Caroline Robertson and Miss Marion Everett together with the valuable help of the personnel of each unit. A formal orientation program was established for new staff members; the Hand Book of Nursing Care and the revised manual of Dressing Room procedures are proving most valuable. Our objective is to co-ordinate the various teaching programs so that all staff members may benefit by the opportunities available.

I mentioned in a previous report the need for a planned program for our nursing assistants. Well, I'm happy to say that Miss Anne Carney, Supervisor of Auxiliary Nursing has planned an excellent program which is going on at the present time. These classes have stimulated interest and the good effect has already manifested itself.

Certificates were awarded to 20 Post Graduate nurses. The Eileen C. Flanagan Prize presented to the most outstanding student in each class was awarded to Miss Teresa Mraz and Miss Doreen Kennedy.

We had 128 undergraduate students from the Royal Victoria Hospital School of Nursing and an increasing number of students from the School for Graduate Nurses McGill University for experience in neurological and neurosurgical nursing, teaching and supervision.



Miss Ann Brothers was awarded the prize given by the Montreal Neurological Hospital to the Royal Victoria Hospital student showing aptitude and interest in neurological and neurosurgical nursing while affiliating here.

We are very proud of our Nurses' Library and grateful to all those who have contributed to it, most especially members of the medical staff and the Graduate Nurses' Society.

The Graduate Nurses' Society under the capable leadership of Miss Lucy Dalicandro continues to play an increasingly important part of life at the Hospital.

We are privileged to thank Mrs. Samuel Reitman for the nursing bursary donated in the memory of Dr. William V. Cone which was awarded to Miss Audrey Kimberley, and Dr. Arthur Elvidge for the nursing bursary which was awarded to Miss Ursula Steiner. A gift of money which was donated by a member of the medical staff (who wishes to remain anonymous) was added to the Eileen C. Flanagan Fund which has reached well over the \$4,000. mark. We hope this fund will soon grow to an amount sufficient to endow perpetual scholarships.

We are grateful to all members of the Women's Auxiliary of the Royal Victoria Hospital for their interest and help so generously given throughout the year. The Coffee Shop continues to be much appreciated by the relatives of patients and staff members alike.

I would like to express my gratitude and appreciation to all members of the nursing staff for their co-operation and loyalty. The *maintenance* of a high standard of nursing over the whole of the twenty-four hour period is essential in the achievement of the goal of total patient care.

May I also thank each member of the medical staff and of all other departments for their understanding and assistance given in so many ways.

## SOCIAL SERVICE

*Director*.....MISS CYNTHIA GRIFFIN, B.A., M.S.W.

### *Social Workers:*

MRS. HILDA FEINER, B.A., B.S.W.

MISS KATHLEEN MACDONALD, B.A., B.S.W.

MRS. SALLY GOLD, B.A., M.S.W.

MISS NOELLA VAILLANCOURT, B.A., M.S.W.

I could concentrate on familiar, melancholy topics such as shortages of staff, money and space, and I could, with equal validity, outline goals, achievements and plans of our department in words varying only slightly from those of previous annual reports. I prefer to assume that most of you know all this, and to comment more fully on two items: one of special interest, the expanding program for social work students; the other of special concern, the expanding problem of what is frequently called 'placement', i.e. making appropriate arrangements for patients not needing the services of this acute care hospital.

The department has, for at least ten years, had one or two students per year from the McGill or University of Montreal School of Social Work. This year a bright note was the assignment here of a student unit from the McGill School of Social Work. This included the field supervisor, Miss Mary MacLean and ten students, six from first year, four from second. They occupied rather cramped quarters in our department, drew cases for practical experience from both this hospital and from the Royal Victoria Hospital and shared with post-graduate student nurses and others in valuable multi-discipline case conferences.

The interest of the schools of social work in Epilepsy and its problems represented a further development. The University of Montreal School of Social Work, for the second consecutive year, assigned a student to lead the group of French-speaking Young Adult Seizure Patients. In addition, four McGill social work students are working on Masters theses or special papers, including studies of problems of employment and of payment for medication for seizure patients.

We look forward to a continuation of the stimulating relationships with the two schools of social work.

Placement, the item of concern, has been mentioned with increasing emphasis in each annual report since the establishment of Quebec Hospitalization Insurance. Patients referred to us ranged from those for whom our service was simply giving advice regarding resources in the community, to those for whom plans were dependent upon help from outside themselves and families. For the latter, we combed the countryside for beds and sent out applications and reports, but we also helped apprehensive patients and anxious families make appropriate decisions regarding plans. As well as arranging placements at the point of discharge from this hospital, help was given to patients from the following three groups: — those considered to be ready for discharge from convalescent or rehabilitation services in the hospitals to which they had been transferred from here; those who for medical and/or social reasons needed to be transferred from one nursing home or chronic care facility to another; and those in their own homes who became increasingly incapacitated, with concomitant increase in social stress.

Placement this year was stated or implied in over three-quarters of the in-patient referrals. Although far fewer out-patients were referred specifically for placement, many referred for other reasons or as in-patients have remained in need of service of this type not only for one but for many years — for example, the large group of multiple sclerosis patients and their families who, whether in their own homes or in chronic care institutions, continue to seek help in adjusting and readjusting and look to this department indefinitely for assistance with their problems. This is reflected in the department's yearly figures. Of the patients active in 1963, nearly one-half were either carried over from 1962 or had been known in previous years and were referred again because of recurring or new problems.

Our concern regarding placement is related to: 1) the lack of adequate chronic care facilities which in spite of the community's efforts are still

lagging behind the demand, and 2) the increasing volume of our patients outside the walls of this hospital, who are in need of chronic care services offered under Quebec Hospitalization Insurance.

We are faced with a question — how far should our responsibilities extend for such patients? We know that there is a dearth of social service departments in this area in other than the major active treatment hospitals. If we do not continue to assume this responsibility — who will?

An annual report would be incomplete if we failed to record the invaluable voluntary contributions in the form of hundreds of hours of service in the clinics and in our department by Royal Victoria Hospital volunteers, and of the generous donations to our clinical relief funds from the RVH Womens' Auxiliary and from voluntary health associations in the community.

To all within and outside the hospital who have helped in innumerable ways, our sincere thanks.

### ANAESTHESIA

<i>Anaesthetist</i> .....	RICHARD G. B. GILBERT, M.B., B.S., F.R.C.P. (C), D.A., R.C.S. & R.C.P., F.F.A.R.C.S., F.A.C.A.
<i>Associate Anaesthetists</i> .....	G. F. BRINDLE, B.A., M.D., C.M., F.R.C.P. (C). ANIBAL GALINDO, M.D.
<i>Assistant Anaesthetists</i> .....	DOUGLAS CROWELL, B.A., M.D., C.M. J. J. McGRATH, B.Sc., M.B., B.Ch., B.A.O. ROY C. SCHOFER, B.A., M.D.

#### *Residents:*

LUIS CUADRADO, M.D. (Spain)*	HASAN ORGE, M.D. (Turkey)*
GORDON FOX, M.D. (Toronto)*	RALPH PRIME, M.D. (New Brunswick)*
CLAUDE LEPAGE, M.D. (Montreal)*	OTTO SCHULTE, M.D. (Germany)*
KAMAL MUKHERJEE, M.D. (Calcutta, India)*	DAVID TROP, M.D. (Belgium)*

\* Six months on this service

The senior staff remains unaltered but changes have taken place at the assistant level. Dr. D. Crowell, who replaced Dr. Mary Morris, subsequently left to become Director of the Department of Anaesthesia at St. Joseph Hospital, Toronto. Dr. Crowell was replaced by Dr. Roy Schofer of Vancouver.

The major change in the permanent staff has been the addition of Dr. Anibal Galindo. Dr. Galindo hails from Colombia where he had the position of Professor of Anaesthesia. For the four years prior to his advent here, he had been on the research staff of Dr. Maitland Baldwin of Bethesda. This most encouraging development in our department was made possible through an anonymous gift. The members of our department are most grateful for this generous contribution which has permitted us once again to undertake worthwhile studies in the research field.

The clinical work has followed the pattern set in previous years. More cases are being studied with laboratory aids and new monitoring equipment both during and after anaesthesia. Clinical studies have been undertaken with

Fentanyl and Droperidol to determine the place for neuroleptanalgesia in neurosurgery.

Laboratory work has recommenced and after initial problems were ironed out, assumed a major activity. Pilot studies have been made with a view to the correlation of hepatic artery and portal vein blood flow and blood gases with liver function. The importance of this study may be understood when the gravity of postoperative hepatonecrosis is considered. A new non-flammable agent — Teflurane — has been studied with special reference to possible renal effects. It appears so far that this agent may have the potential to replace cyclopropane.

Our interest in ward care and the postgraduate nursing programme continues unabated. The enthusiasm and industry of Mr. W. Garneau is greatly appreciated. A new nurse has joined our department in the Anaesthesia room, Miss Tracz, whose work is excellent.

As in previous years, Drs. Brindle and Gilbert have undertaken a not inconsiderable consignment for the McGill postgraduate teaching programme as well as the third year undergraduate periods allotted for the instruction of anaesthesia.

During the year, Dr. R. G. B. Gilbert had the privilege of being a visiting professor at the Albert Einstein Medical School and the University of California Medical Centre, San Francisco.

## RADIOLOGY

<i>Radiologist</i> .....	DONALD McRAE, M.D.
<i>Associate Radiologist</i> .....	ROMÉO ETHIER, M.D.
<i>Residents:</i>	
MARTHA ROSE GRIMALOSKI, M.D. (Saskatchewan)*	HECTOR MA, M.D. (Hong Kong)*
FRANCOIS LAROCHE, M.D. (Laval)*	RUTH McLEESE, M.D. (Dalhousie)*
	WM. VAN ALSTYNE, M.D., C.M. (McGill)*
<i>Chief Technician</i> .....	JOAN BROADLEY, R.T.

\* Six months on this service

During 1963, 10,093 radiological examinations were carried out in this department. This is the greatest number we have ever performed in a single year. There were 601 angiograms of various types, 34 of which were carried out by way of percutaneous catheterization of the femoral or axillary artery. There were 527 pneumoencephalograms, 102 ventriculograms and 443 myelograms and/or discograms. The special procedures, 1673 in all, are major procedures each taking one or more hours to carry out and requiring the services of two or more members of the department. There were 43 procedures in the operating room of which 23 were stereotaxic procedures. We are in the process of increasing our radiographic facilities at the expense of the isotope laboratory and isotope counting room and hope to be able to better handle the work next year.

During the year we carried out 978 emergency examinations. These examinations were carried out at night or Saturday afternoon or Sunday. They have always been carried out by the regular members of the department because emergency patients are usually very ill and difficult to examine. I believe such patients should be handled by the most skilled and experienced personnel and I take this opportunity of praising and thanking the members of our staff who have cheerfully and willingly carried out these difficult and demanding procedures. At this time I wish to emphasize that the quality of radiology in any department is in large part dependent on the quality of the films made by the technicians. I must pay tribute to the skill and understanding of our technical staff led by Miss Joan Broadley.

In 1963 four doctors from the McGill Diploma Course in Radiology spent six month periods studying neuroradiology in our department. They were Drs. Grymaloski, Ma, Macpherson and Smith.

Work on anatomical variations of the corpus callosum and septum pellucidum and on the radiological findings in temporal lobe epilepsy of non-tumoral origin was finished. Work is continuing on craniolacunia, diastematomyelia, the habenular commissure and on ultrasonic diagnosis in neurology and neurosurgery.

The neuroradiological seminar for the neurological and neurosurgical residents was given each Monday afternoon for four months in the fall as in past years. The regular Monday morning colloquia in neuroradiology were held again. The introductory course in general radiology was given to the medical students in the third term of their second year and other lectures to the medical students were given during the neuroanatomy course. Refresher courses in cerebral angiography and on diseases of the spine were given at the 64th Annual Meeting of the American Roentgen Ray Society in Montreal in October, 1963 and a scientific exhibit on reversed blood flow in the vertebral artery was presented at the same meeting.

In closing, I take pleasure in again thanking the members of the medical and nursing staff of the Institute for their cooperation, cooperation that is always cheerfully and willingly given.

## NEUROCHEMISTRY

<i>Neurochemist and Donner Fellow</i> .....	K. A. C. ELLIOTT, M.Sc., Ph.D., Sc.D., F.R.S.C.
<i>Associate Neurochemist</i> .....	HANNA PAPIIUS, M.Sc., Ph.D.
<i>Associate Neurochemist &amp; Medical Research Council Associate</i> .....	LEONHARD S. WOLFE, M.Sc. (N.Z.), Ph.D. (Cantab.), M.D.
<i>Assistant Neurochemist, Clinical</i> .....	IRVING HELLER, M.Sc., Ph.D., M.D., C.M.
<i>Visiting Scientist</i> .....	RASHID TARIQ KHAN, M.Sc. (Lahore, West Pakistan)
<i>Fellows:</i>	
PAULA BERGER, B.Sc. (Montreal) National Research Council (Canadian) Studentship	MATTHEW SPENCE, M.D. (Alberta) Medical Research Council Fellowship
J. A. LOWDEN, M.D. (Toronto) Helen Hay Whitney Research Fellow	

### *Clinical Laboratories*

With the acquisition of a Technicon Auto Analyser the 7th Floor Clinical Neurochemistry Laboratory was reorganized and completely

renovated. These improvements represent a major change in the scope of the services of this laboratory. The amount of work done increased considerably when, in July 1963, the Auto Analyser was put into operation for sugar and blood urea nitrogen determinations. The volume of other procedures was the same as in 1962. The total number of procedures done on spinal fluid, blood and urine was 10,371 (9683). (Figures for 1962 are in parentheses). In addition 5,600 (6,114) liters of irrigation solution were prepared for the operating rooms and 194 (203) liters of Nupercaine solution for the clinical services.

The work of the 3rd floor ward laboratory was maintained at about the same level as in the previous year. Separate determinations done on blood amounted to 16,801 (17,308) and 5,433 (5,240) complete urinalyses were done. Also 3,686 (4,694) samples of blood were drawn for analysis in other hospital departments. The latter figure is 1008 less than for 1962. This decrease is accounted for partly by the increase in procedures now done in the 7th floor laboratory but previously done at the Royal Victoria Hospital, and partly by the fact that the new arrangement allowed more determinations to be done on a single sample of blood.

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

#### *Donner Laboratory of Experimental Neurochemistry*

During the greater part of the year Dr. Elliott was absent on leave. On his return he found that the productivity of the department, its reputation and its influence on fellows and others in the Institute had markedly increased.

Dr. Hanna Pappius and Miss Paula Berger, with the technical assistance of Mrs. H. Szyllinger, studied the early stages of development of cerebral edema induced in cast by freezing lesions. In general no qualitative differences from results reported previously for fully developed edema by Pappius and Gulati were observed in water and electrolyte changes. Further studies on the uptake of thiocyanate by cerebral tissue *in vivo* have shown that in the cortex, when the blood-brain barrier is broken down around freezing lesions, equilibration with thiocyanate in the plasma is reached after 4 hours. At equilibrium the thiocyanate 'space' in the cerebral cortex is equivalent to approximately 50 per cent of the total tissue water. This finding is compatible with the hypothesis that the thiocyanate 'space', like the chloride space, is a rough measure of glial 'space'. The joint study with Dr. J. B. Dossetor of the Royal Victoria Hospital on the cerebral swelling associated with hemodialysis of uremic subjects was continued. It was shown that both cerebral cortex and white matter swell when the brain-blood urea gradient develops during dialysis of uremic dogs. The osmotically-induced swelling is not accompanied by changes in Na/K ratio in the tissue. This is in striking contrast to traumatically-induced edema, which is restricted to white matter and characterized by a sharp increase in Na/K ratio.

Dr. Leonhard Wolfe with Dr. J. A. Lowden, Dr. M. W. Spence and their assistant Miss Ania Morawska have continued studies on gangliosides, a group of complex acidic glycolipids in brain which contain N-acetylneuraminic acid. A new ganglioside containing 3 moles of N-acetylneuraminic acid per mole of sphingosine — a trisialoganglioside — has been characterized and the conversion of the various ganglioside types to monosialoganglioside by the action of mild acid, the enzyme neuraminidase and brain glycosidases has been observed. Gangliosides have been found to occur predominantly in grey matter. They are present in minimal amounts in white matter and absent in glial cells. Chronic hypoxia and hypoglycemia, conditions characterized by neuronal fall-out, have been found to be associated with markedly reduced tissue ganglioside. Thus a dendritic or neuronal cell body location for gangliosides appears likely. Studies of sub-cellular fractions have indicated that gangliosides are membrane constituents and occur in considerable amounts in fractions containing the nerve-ending particles. A light membrane fraction greatly enriched in ganglioside and unassociated with myelin has been found in brains of new-born rats.

A study of the chemical composition of gangliosides extracted and from a large number of human brains obtained at autopsy revealed that, in circumstances in which the patient had been in prolonged respiratory distress before death, clear-cut alterations in the composition of the purified gangliosides occur. Studies with cats showed that asphyxia led to the same type of alteration, namely, a loss of N-acetylneuraminic acid and N-acetylgalactosamine from the gangliosides. Extensive studies were carried out with cats in which the respiration was controlled and known gas mixtures used. Blood pH, pCO<sub>2</sub>, bicarbonate and oxygen were determined. It was found that the alteration of cerebral cortex gangliosides was not related to pure hypoxia but rather to hypercapnia. It appears that intracellular acidosis in some way activates the alteration of gangliosides *in vivo*. These studies could have important implications to the cause of certain types of mental retardation.

A study of gangliosides obtained from tissue made available at craniotomy during the surgical removal of glioblastoma multiforme, epileptic scar tissue and a number of other intracerebral lesions showed that, in the zone of cerebral tissue immediately adjacent to the lesion in which there was maximum disturbance of blood supply, the same type of alteration in tissue ganglioside was found as in the experiments mentioned above. Uninvolved tissue removed during the course of surgical resection did not show these changes. Thus local as well as general asphyxia produced the same alterations to gangliosides.

A detailed study of the development of gangliosides from the 15 mm embryo to the adult rat clearly indicates that the major amounts of gangliosides in the nervous system are formed before active myelination commences. It seems probable that gangliosides are added during the period of rapid expansion of dendritic processes in development. Pathological processes that affect the deposition of gangliosides would thus be expected to lead to alterations in the neuronal function. Such processes might well underlie

mental retardation and the whole group of little understood diseases associated with defective maturation of the nervous system.

Dr. Irving Heller with Mr. Sigurd Hesse have found that, during incubation of nerves in phosphate-buffered medium, a free thiamine derivative diffuses out of the nerve. This was prevented by the presence of thiamine or of glucose in the medium or by the bicarbonate-CO<sub>2</sub> buffer system. Deactivation, loss of responsiveness of a nerve to the metabolism-stimulating substance obtainable from nerve, occurs, when more than a critical amount of the thiamine derivative has diffused out.

Mr. R. Tariq Khan, under the guidance of Dr. Elliott by correspondence, has shown that besides  $\gamma$ -aminobutyric acid (GABA) other amino acids related to the Krebs metabolism cycle are stored in a bound or occluded form in brain. As was shown for GABA the amounts of these amino acids increase suddenly post-mortem in brains not frozen at the moment of death. This suggests that a protease and glutamic decarboxylase become suddenly active at death and may be closely concerned in function. The total amounts and the proportions in the bound form are affected by a variety of conditions and it is apparent that there are two distinct forms of bound GABA one of which is released by high potassium or lack of sodium.

With Dr. Jasper and Dr. P. G. Sie, Mr. Khan has shown that amino acids can leak from the cerebral cortex of cats, through punctures in the pia-arachnoid. When the EEG shows an 'aroused' pattern, after cervical section, the amount of glutamate is increased and that of GABA decreased. The converse occurs when a 'sleep' record is obtained by mid-brain section. Mr. Khan has also contributed to the work of Drs. Jasper and Sie on the release of acetylcholine from the cortex of animals in the 'aroused' and 'sleep' states.

Dr. Lowden was awarded a Helen Hay Whitney Foundation Fellowship, Dr. Spence a Medical Research Council Fellowship and Miss Berger a National Research Council of Canada Student Bursary. Dr. Pappius participated in a Symposium on Biology of Neuroglia which was held in conjunction with the Tenth Latin American Congress of Neurosurgery in Buenos Aires in October 1963. She also discussed her work on cerebral edema at the University of Sao Paulo and at the Neurological Institutes at Montevideo and Santiago de Chile and presented a paper at the Pan-American Congress of Neurology in Lima. Dr. Wolfe was Chairman of the session on Lipid Metabolism at the First Pan-American Congress of Neurology at Lima, Peru, in October. He has been a member of the Dean's Committee on Undergraduate Medical Education and of a sub-committee on teaching resources in the Faculty of Medicine. Dr. Elliott spent a sabbatical eight months, partly savouring the British National Health Service in one of London's most ancient and famous landmarks and partly, more happily, working with his own hands on the metabolism of physiologically active amino acids in the living brain at the Neuropsychiatric Research Unit of the Medical Research Council in Surrey. Before returning he and his wife spent a most interesting, enjoyable and hard-working month in the People's Republic of China where he was Norman Bethune Exchange Professor.



## ELECTROENCEPHALOGRAPHY & ELECTROMYOGRAPHY

*Electroencephalographer*.....PIERRE GLOOR, M.D., Ph.D.  
*Consultant in Electroencephalography*.....HERBERT JASPER, Ph.D., D.ès Sci., M.D.,  
 C.M.  
*Assistant Electroencephalographer*.....DONALD LLOYD-SMITH, B.Sc., M.D., C.M.,  
 F.R.C.P. (C)

### *Electroencephalographic Fellows:*

TADEUSZ BACIA, M.D. (Warsaw, Poland) Rockfeller Fellow*	MANOUCHER GUERAMY, M.D. (Shiraz, Iran)*
FLAVIO COCEANI, M.D. (Bologna, Italy)*	J. C. JACOB, M.D. (Vellore, India)*
ANDREW EISEN, M.D. (Leeds, Eng.)*	JEAN-LOUIS LALONDE, M.D. (Montreal)*
OSAMAH ELWAN, M.D. (Cairo, Egypt)*	IRWIN LEWIS, M.D. (Montreal)*
GUY GEOFFROY, M.D. (Montreal)*	FELIPE VALLE, M.D. (Mexico)*

### *Electromyography Fellow:*

CHONG-BUN YAP, M.D. (Philippines, via Kentucky)  
*Chief Technician*.....LEWIS HENDERSON

\* Six months on this service

In 1963 we recorded 3555 electroencephalograms, 379 electromyograms, and 59 operating room electrocorticograms. These figures represent increases in the number of examinations of 5.3%, 11% and 28.2% respectively. Small as they may appear, these yearly increments add to the steadily progressive expansion of the work-load this department had to carry over the past years. Since 1954 the number of examinations has almost doubled, without any proportionate increase in staff. If one adds to this the greater use of special examination procedures that are carried out with increasing frequency, the problem can be appreciated in its true magnitude. It should come as no surprise that this situation causes us a considerable amount of anxiety. We have to be forever watchful that under such conditions our traditionally high standards of EEG practice are uncompromisingly maintained and that teaching and research are not caused to suffer. The individualistic approach to each patient's particular clinical problem that should characterize good EEG practice everywhere has been maintained and further improved and no concessions have been made to mere numerical efficiency by adopting a stereotyped and routinized approach. However, if the work-load should increase still further, as the current year's figures up to the present date, lead us to expect, it will be necessary to add further personnel, both to the professional and technical staff. For the good quality of work done in the laboratory we owe a debt of gratitude to our technicians ably led by Mr. Lewis Henderson.

The rough breakdown of our referrals, as to source of origin and diagnostic categories has been similar to that of other years, except that there has been an increase in referrals from sources outside of the M.N.I. Thus, during 1963, 1775, i.e., slightly over 50% of our patients were referred from outside our own hospital. Referrals from the Royal Victoria hospital accounted for 565 of these patients, an increase of 133 patients or 13.3% over the figure for 1962. The remaining outside referrals came from the out-patient department, from other hospitals of the city and from private offices.

Teaching and training of technicians and Fellows has been an ever-growing concern of our department. Too few young neurologists, who later are taking care of the interpretation of EEG'S and the direction of laboratories, can claim to have undergone adequate training in this field. It is impossible to turn out an experienced electroencephalographer in six months. We therefore encourage our Fellows to stay with us for at least a full year, although our attempts at persuasion are not always successful. It is to be expected that our efforts in this direction will fall short of success, as long as adequate training requirements for electroencephalography are not officially recognized and enforced.

Fellows in training in our laboratory during 1963 were Dr. T. Bacia, from Warsaw (Poland), Dr. F. Cocceani, from Bologna (Italy), Dr. A. Eisen from Leeds (England), Dr. O. Elwan from Cairo (Egypt), Dr. J. C. Jacob from Vellore (India), Dr. I. Lewis from Montreal, Dr. F. Maroun from Beirut (Lebanon), Dr. H. Silfvenius from Helsinki (Finland) and Dr. F. Valle from San Luis Potosi (Mexico). Dr. C. B. Yap from Louisville (Kentucky) was fellow in electromyography.

Weekly seminars and EEG pathological conferences were again held during the winter months. They were attended by both fellows and technicians and continued to provide valuable teaching sessions.

We are grateful to the nursing department of the Institute for allowing our technician trainees to attend the lectures given within the postgraduate nursing program. This, undoubtedly, has improved the quality of training of our technicians. We have the pleasure to announce that Miss Alice Craib successfully passed the Canadian registration examination for EEG Technicians in 1963.

Research in the department has proceeded along various lines :

Dr. T. Bacia, together with Mr. K. Reid and Mr. R. Jell, under the supervision of Dr. H. Jasper, studied the changes in averaged sensory evoked responses in epileptic patients, using modern computer techniques.

Drs. J. C. Jacob and O. Elwan, under the supervision of Dr. Gloor and in collaboration with Drs. J. Dossetor and B. Pateras of the renal unit of the Royal Victoria Hospital, investigated the EEG changes in uremia and the influence of hemodialysis upon these changes.

Dr. O. Elwan analyzed the changes in EEG background activity, associated with various histological types of supratentorial brain tumours.

Dr. H. Silfvenius, in collaboration with Drs. T. Rasmussen and P. Gloor undertook a clinical follow-up study on epileptic patients who had undergone temporal lobectomy and in whom the electrocorticogram had shown persistent epileptiform abnormality, arising from the insula.

Dr. C. B. Yap, under supervision of Dr. H. Jasper continued the studies on the H-reflex and the changes in extrapyramidal movement disorders, using electromyographic techniques.

Investigative work on the use of intracarotid Sodium-Amytal and Metrazol injections in epileptic patients is continuing in collaboration with Dr. H. Garretson. This work has been supplemented by an experimental approach in laboratory animals, carried out in the neurophysiology laboratories by Drs. F. Cocceani and I. Libman, under the supervision of Dr. P. Gloor.

## NEUROPHYSIOLOGY

<i>Neurophysiologist</i> .....	HERBERT JASPER, Ph.D., D.ès Sci., M.D., C.M.
<i>Assistant Neurophysiologist</i> .....	PIERRE GLOOR, M.D., Ph.D.
<i>Visiting Scientist</i> .....	ROUBEN DURINIAN, M.D. (USSR)**

*Fellows:*

THEODORE BAIZ, M.D. (Washington)*	LUIS MARCO, M.D. (Valencia, Spain)*
BARTOLO BARONE, M.D. (Washington)	KENNETH REID, M.Sc. (Montreal) Research Associate
GASTONE CELESIA, M.D. (Genoa, Italy)*	PEK GIOK SIE, M.D. (Djakarta, Indonesia) Colombo Plan Fellow*
FLAVIO COCEANI, M.D. (Bologna, Italy)*	HERBERT SILFVENIUS, M.D. (Helsinki, Finland via Lund, Sweden)
ANTHONY GORMAN, M.D. (Rochester, N.Y.)	ROY STEINBERG, M.D. (New York)

*Nurse in Charge of Neurophysiology*

<i>Laboratories and Animal Quarters</i> .....	MARY ROACH, A.R.R.C., R.N.
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\* Six months on this service

\*\* Four months on this service

In this department there have been 15 graduate fellows working on a variety of neurophysiological problems during the past year (for variable periods of time). This does not include staff and fellows making use of the facilities of this department for work being done largely in other departments of the Institute. At the time of this report there were nine fellows carrying out research in neurophysiology alone. Some of the work in neurophysiology is done in the operating rooms where exceptionally fine opportunities are provided for electrophysiological studies of the human brain and central nervous system.

With the continuing assistance of a grant from the National Science Foundation of the United States we have been able to make considerable progress with studies of some aspects of the neurophysiological basis of learning. For these studies we have built up a computer data processing laboratory for the analysis of the firing patterns of single brain cells in relation to states of consciousness and throughout various stages of the learning process.

The effects produced by stimulation of the hippocampus have received particular attention, and were the subject of a Ph.D. thesis by Dr. Redding. The effect of dendritic polarization upon firing patterns of single cortical cells is also receiving detailed analysis since it has been shown that important changes in D.C. polarization of the cortical surface occurs in certain forms of learning situation in experimental animals.

We have continued our intracellular microelectrode studies of pyramidal tract neurones showing that axon collateral inhibition plays a major role in their functional organization, sharpening the control of cell assemblies concerned with fine movements by "surround" inhibition. Defects in this inhibitory process may cause motor incoordination and lead to certain forms of epileptic discharge.

Neurochemical studies of the perfusate from the cortical surface in relation to afferent systems of the brain stem, and to certain forms of

epileptic discharge are shedding much light on the chemical basis of cortical synaptic transmission as well as factors regulating states of sleep and alertness and the excessive excitatory states of epileptic discharge.

Controlled studies of the effect of temperature upon cortical activity have shown that inhibitory systems are probably more sensitive to decreased temperature than are excitatory systems, so that an initial heightened excitability occurs before all cortical activity is depressed by decreasing surface temperatures. In these studies we are trying to perfect a method for the reversible blockade of cortical activity for use in neurosurgery.

Stereotaxic studies of brain stem and thalamic relationships to the cerebral cortex have been continued both in man and in experimental animals. The inhibitory nature of experimental wave and spike ("petit mal") cortical activity generated by circuits in the mid-brain and thalamus has served to clarify the pathophysiology of petit mal seizures.

In the operating rooms, with Dr. Gilles Bertrand, we have perfected a method for microelectrode recording from the human thalamus and basal ganglia during stereotaxic operations for various types of dyskinesia. This has made possible precise mapping of sensory cells in the human thalamus, as well as the discovery of a local group of cells which participate actively in the generation of certain forms of involuntary movement. This technique has made possible the guidance of stereotaxic neurosurgery by the sound of the firing of cells and fibres in subcortical structures, as heard in the loudspeaker, providing a new dimension to scientific neurosurgical methods.

Dr. Gloor has succeeded in completing the writing up of his classical studies of mechanisms of epileptic discharge in the hippocampus, as well as carrying out additional studies of the effects of the injection of intracarotid Sodium Amytal upon experimental epileptic foci in animals with particular reference to "mirror foci" and mechanisms of bilaterally synchronous epileptic discharge.

Mr. Kenneth Reid, computer mathematician who has been with us for several years in neurophysiology has been largely responsible for the development of our computer data processing equipment, so important to modern neurophysiological laboratories. His splendid work over the years has been a major contribution. We wish to take this opportunity to express our appreciation and to extend best wishes to him when he leaves in the Fall to take a position in the Department of Biophysics at the University of Washington in Seattle.

We all owe much to Miss Mary Roach and her staff for their splendid and tireless assistance, and to Mr. Eddy Puodziunas and his assistant Mr. George Lootus in the Neuroelectronics laboratories upon whom we depend very heavily for the apparatus which makes possible all of this experimental work. The appointment of Mr. Ralph Jell, graduate electronics engineer, to take charge of neuroelectronics has been of great value to neurophysiology as well as to other departments of the Institute during the past year.

## NEUROPATHOLOGY

*Neuropathologist*..... GORDON MATHIESON, M.B., Ch.B., M.Sc.  
*Assistant Neuropathologist*..... GILLES BERTRAND, B.A., M.D., M.Sc.,  
F.R.C.S. (C)

### *Fellows:*

SANTIAGO CRISOSTOMO, M.D. (Philippines) GUSTAVO LAZOS, M.D. (Mexico)\*  
ROBERT FORD, M.D. (London, Ont.)\* NORMAN LUSH, M.D. (Newfoundland)\*  
ARTHUR GINDIN, M.D. (Virginia) JAIME ZAMUCO, M.D. (Philippines)  
KAZUO KINOSHITA, M.D. (Kyushu Univ., Japan)\*

### *Chief Technicians:*

JOHN GILBERT BARBARA NUTTALL

\* Six months on this service

The year under review has seen little change in the pattern of activities of the department, its major energies being committed to histopathological studies and teaching both undergraduate and graduate. The experimental and investigative potentialities of the department remain under-developed.

During the calendar year 1963, a total of 494 surgical specimens were examined and reported by Drs. Crisostomo and Gindin under the supervision of Dr. Bertrand. There were 104 deaths in the Institute and of these 84 were the subject of detailed autopsy study, an autopsy rate of 80.8%; the autopsy rate in 1962 was 75.8%. This material, derived from the clinical services of the Institute, has formed the subject matter of our twice monthly pathological conferences throughout the academic year. We have also studied 339 brains from several local hospitals for whom the Pathological Institute of McGill University provides general pathological services. Some 28 specimens from other sources were referred for opinion.

Some of the fine structural studies of the cerebellum carried out by Dr. Robert Herndon in association with Dr. Sheldon of the electron microscopy laboratory of the Pathological Institute have now been published in the *Journal of Cell Biology* and Dr. Gluszczy's histochemical work on glial tumours has appeared in *Acta Neuro-pathologica*. Dr. Hansebout is continuing a histopathological analysis of the effects of intrathecal phenol in man and correlating them with clinical changes. Dr. Robin Barr spent three months with us during the spring of 1964 on leave from the department of Pathology of Ottawa Civic Hospital with whom we have been developing an informal relationship on neuropathological problems.

The challenge of the new and rapidly developing tools of morphological investigation, and their application to the nervous system and its manifold diseases still confront us. Our response to this challenge must be both vigorous and realistic; our planning for the staffing and organization of the department of the future must take into account the growing complexity of both techniques and the results of their application. Only then will we be able to reap the rich harvest which they promise.

## NEURO-ISOTOPE LABORATORY

<i>Director</i> .....	WILLIAM H. FEINDEL, B.A., M.Sc., D.Phil. (Oxon.), M.D., C.M., D.Sc. (Acadia), F.R.C.S. (C), F.A.C.S.
<i>Research Associate</i> .....	LUCAS YAMAMOTO, M.D., Ph.D. (Hokkaido)
<i>Research Assistants</i> .....	JOAN ZANELLI, M.S.R. HENRY GARRETSON, M.D., (Arizona).
<i>Consulting Physicist</i> .....	NICHOLAS RUMIN, B.Eng., M.Sc.
<i>Physicist</i> .....	CHRISTOPHER HASLAM, B.Eng., M.Sc.
<i>Research Fellow</i> .....	MANOUCHER GUERAMY, M.D., (Shiraz, Iran).

### 1. *Brain Scanning Laboratory.*

This laboratory was moved from the fifth to the third floor, facilitating the transport of patients, increasing their comfort as well as providing more adequate room and better facilities for the handling of radio-active tracers. It is also worth noting that this extra space has been a premium because of the very low surgical infection rate since this room had previously been set aside as a special dressing room for cases with infection.

The work of the scanning laboratory increased again in 1963 with 761 scans in 304 patients as compared to 711 scans in 254 patients in 1962. In addition, there was an increase in the number of special circulation studies. Ninety patients were included in an investigation of the blood brain barrier by radio-active tracers in collaboration with Dr. Cosgrove, to contribute to our understanding of cerebral spinal fluid dynamics in certain neurological disorders.

An important study completed in the past year indicated that a new radio-isotope Mercury<sup>197</sup>, can be substituted for the Mercury<sup>203</sup> in brain scanning. This eliminates the radiation dosage to the kidney and ensures the complete safety of this tracer technique. For this reason, it has been possible for the first time to carry out without hazard repeat scans in patients with brain "strokes". The brain scans continue to show uptake of the tracer which indicates the location and extent of the tumour or other intracranial lesion. In certain locations this is more precise than either angiography or pneumoencephalography although the three techniques are of course complementary.

### 2. *The Cone Laboratory for Neurosurgical Research.*

The research activities have again been supported by the Cone Memorial Research Fund which has continued to grow from recent generous contributions. A detailed list of these is provided at the end of this year's report. Other grants from the National Cancer Institute and the Medical Research Council have supported specific projects. The work in collaboration with Dr. Cosgrove has been partly supported by the Multiple Sclerosis Society of Canada.

The work on investigation of the cerebral circulation by radio-active tracers has picked up pace during the past year and was reported at the Harvey Cushing Neurosurgical Society. It has been possible for the first

time to identify activity curves of blood circulating through the three components of the vascular bed of the brain, — arteries, veins and capillaries. Precise timing of the passage of the radio-active tracer has been accomplished and changes in this timing in certain disease states have been recorded. These studies have been carried out in over 30 cases, usually with external radiation detectors outside the head and in a smaller number of cases with miniature detectors placed directly on the surface of the brain during operation. New types of radiation detectors utilizing solid state physics are being investigated by Dr. Yamamoto and Mr. Haslam in conjunction with the R.C.A. Research Laboratories. Dr. Gueramy successfully completed his Master's thesis on an experimental study of subdural hematomas. He was able to show that radio-active tracers are absorbed directly into the blood stream and not by way of the subarachnoid space. The anatomical studies being planned in collaboration with Professor Richard Saunders of Dalhousie Medical School continue. Dr. Yamamoto and the technical staff have been joined recently by Mr. Christopher Haslam, an electrical engineer formerly with the McGill project in Barbados shooting the upper atmosphere. During the coming year with this able staff and new apparatus which has been developed over the past few years we look forward to a few exciting "brain shots".

## LABORATORY FOR RESEARCH IN CHRONIC NEUROLOGICAL DISEASES

*Director*..... J. B. R. COSGROVE, M.D., M.Sc.,  
M.Sc. (Cantab).  
*Research Associate*..... ALLAN SHERWIN, B.Sc., M.D., C.M.,  
F.R.C.P., MARKLE SCHOLAR

During the past year the work of this laboratory continues to emphasize the policy of correlation and integration of clinical investigation with basic science research. Efforts have been orientated towards the application of various techniques to the study of neurological and muscle disease in experimental animals and patients.

The clinical study of the natural history of Multiple Sclerosis continues. There are now over 500 patients in this study and extra medical and social service coverage is required to cope with the accompanying work load. Follow-up is now extending into nursing homes and a home care program is becoming urgent to obtain the maximum value for the long-term follow-up which is now in its tenth year. The patients from this group have supplied the material for the laboratory studies of electrophoretic changes in serum and cerebrospinal fluid during the course of their illness. These patients also form a control group for Dr. Roy Swank's low animal-fat diet study and include those which form a long term follow-up study of retrobulbar neuritis.

During the year studies have been made on the effect of administration of intra-theal prednisolone on the electrophoretic protein pattern of cerebrospinal fluid. In cooperation with the Dept. of Urology, Royal Victoria Hospital, a clinical study of the neurogenic bladder has also been commenced. Data continues to be collected on the value of the electrophoretic protein

pattern of CSF in the diagnosis of neurological disorders. A major project this year has been the study of permeability of radioactive proteins into the CSF of patients with M.S. This has been possible through the cooperation of Dr. Feindel's isotope laboratory. This clinical study has been correlated with studies in the laboratory of the blood-CSF barrier to antibodies in normal animals and in those suffering from allergic encephalomyelitis.

Dr. Sherwin has applied immunochemical techniques to diseases such as experimental allergic encephalitis, allergic neuritis, myasthenia gravis and muscular dystrophy as part of an investigation of the role of immune reactions in neurological disorders. He has employed the "tanned red cell" technique for the detection of auto-antibodies to muscle and thymus in the serum of patients with myasthenia gravis and has begun to study the significance of these antibodies in relation to the thymus and the effect of thymectomy. He has also used this technique to study the blood-CSF barrier in various stages of experimental encephalomyelitis. In addition, Dr. Sherwin has set up laboratory procedures for the assay of serum creatine kinase and aldolase in order to evaluate their usefulness in the diagnosis and management of patients with muscular dystrophy and polymyositis.

As in the past this laboratory has provided training facilities for one or two medical students during the summer, and during the academic year several neurology residents have assisted in part-time projects. It now appears possible for the laboratory to provide facilities for a full year of training in neurological research for suitable candidates.

The laboratory continues to supply the clinical services of the hospital with electrophoretic protein determinations of CSF. This service has also been extended to other hospitals in the Montreal area. Last year 848 separate determinations were performed, of which 90 were from outside hospitals.

## PSYCHOLOGY

<i>Clinical Research Psychologist</i> .....	BRENDA MILNER, B.A., M.A., Ph.D.
<i>Assistant Psychologist</i> .....	LAUGHLIN B. TAYLOR, B.Sc., B.Ed., M.Sc.
<i>Research Associate</i> .....	DONALD SHANKWEILER, A.B. (Oberlin), M.A., Ph.D. (Univ. Iowa), Post-doctoral Fellow, (Cambridge)
<i>Graduate Students in Psychology</i> .....	SUZANNE H. CORKIN, B.A. (Smith), M.Sc. Appl. (McGill). RUTH RADBILL, B.A. (George William's)

The principal effort of this department continues to be employed in devising and evaluating tests which will aid in differentiating the functions of areas of the human cortex and subcortex. Patients with focal cerebral seizures are tested for diagnostic purposes before unilateral cortical excisions, and their progress is then followed by testing after operation and in long-term follow-up. We are grateful to the groups of nurses and university students who have served as control subjects in this research.

The growing usefulness of psychological tests in locating cerebral dysfunction has led to an increased number of referrals from neurosurgical and neurological services. With the number of testing hours per patient



also mounting it has been necessary to add to the clinical staff. We are pleased that Miss Ruth Radbill served her clinical internship with us during the past summer months, and that she will be able to help us again this summer in meeting the growing demands on the department. Miss Radbill has also been giving visual tests to patients as part of the requirement for her Master's degree at McGill.

Work on the relation between auditory perception and cerebral dominance is being continued by Dr. Donald Shankweiler. He is also exploring musical perception and expression in persons with focal cerebral lesions, and the effects of noise on auditory perception. The use of facilities in the Department of Otolaryngology at the Royal Victoria Hospital has been of considerable assistance in performing these studies, and is greatly appreciated.

In addition to the usual number of patients seen in follow-up study, a group of patients with unilateral parietal-lobe removals was brought back for intensive study this year. Mrs. Suzanne Corkin, a Ph.D. student at McGill, investigated somesthetic function in this group as a part of her research in this area. Other major research problems which have concerned the department include: the differentiation of frontal-lobe from subcortical functioning, verbal and nonverbal memory functions associated with the temporal lobes, learning tasks associated with the frontal and temporal lobes, the assessment of patients with Parkinson's disease, the diagnosis and study of learning difficulties in children, and the study of speech and memory in association with Dr. Rasmussen and Dr. Branch.

Among the numerous visitors to the department during the year, we were particularly pleased to have Mrs. Freda Newcombe from Oxford University with us for three weeks. Mrs. Newcombe is currently engaged in a systematic study of Dr. Ritchie Russell's patients who sustained head injuries during military service.

## NEUROANATOMY

<i>Neuroanatomist</i> .....	FRANCIS L. McNAUGHTON, B.A., M.Sc., M.D., C.M., F.R.C.P. (C)
<i>Teaching Assistants</i> .....	ALLAN MORTON, M.D., C.M., M.Sc. JOHN BLUNDELL, M.A., M.D., M.R.C.P. (Lond.), F.R.C.S. (Eng.)

The activities of this Department have again been concentrated on the teaching of Neuroanatomy for undergraduates in Medicine, and for the Fellows of the M. N. I.

The undergraduate laboratory course was directed by Dr. Morton, while Dr. Blundell gave the formal lectures in the Second Year. Drs. Barone, Celesia, Gindin and Hanaway assisted as Demonstrators. We are grateful for the close collaboration of Professors Leblond and Langman of the Department of Anatomy at McGill. A series of Review Lecture-Demonstrations was again organized for the Fellows.

The annual Neuroanatomical Lecture was given on February 26th by Dr. Malcolm Carpenter, Professor of Anatomy at the College of Physicians and Surgeons, Columbia University, on the subject of "The Vestibular System and its Relationship to Conjugate Horizontal Eye Movements".

By the time of the next Annual Report, we hope to report a significant expansion of the activities of this Department.

## NEUROPHOTOGRAPHY

*Supervisor*.....GILLES BERTRAND, B.A., M.D., M.Sc.,  
F.R.C.S. (C)  
*Photographer*.....CHARLES HODGE, F.B.P.A.  
*Assistant Photographer*.....MICHAEL SMITH.

The Department has completed another very active year supplying Audio-visual aids to all departments of the hospital.

It was found this year that by re-arranging the department and moving the chart and graph section up to the entrance, the chart maker was able to assist in taking in new requests for visual aids. This has helped considerably in giving more time to the photographic staff.

The chart section has been extremely busy making over 900 charts and graphs during the year. The addition of a Vari-typer has helped greatly in completing this number of charts. We are very sorry to lose Mrs. O. Kalabay who has run this section of Neurophotography so well. Mrs. Kalabay has returned to her home in Turkey.

We are pleased to say that Dr. Cosgrove has volunteered to help edit some of the many thousand feet of exposed 16 mm film in our files.

A start has been made and many hours have been spent reviewing every foot of this film as well as films made elsewhere. The next step will be to complete a few short teaching films from some of the footage in our files.

Mr. Hodge attended the Annual Meeting of the Biological Photographic Association held in Atlanta, Ga.

## TUMOUR REGISTRY

DR. ARTHUR R. ELVIDGE

During 1963 the records of 230 patients were processed through the Tumour Registry. Of these, 128 were verified cases of tumour requiring 116 surgical operations. Sixty patients were treated with Roentgentherapy, with or without surgery. Clinic visits totaled 102. The remainder were followed in private offices and by the Tumour Registry.

The function of the Tumour Registry is to record information of patients suffering from suspected and verified tumour of the nervous system. This information is gathered from clinics, offices, referring doctors and the Department of Demography at Ottawa, and the Registry maintains a close liaison with the Tumour Registry of the Province of Quebec. Patients are encouraged to return for follow-up and, where necessary, may obtain advice and help from the social agencies of the hospital. This benefits both patient and doctor and ensures completion of treatment. The records serve as source material for physiological and pathological investigations and clinical research in tumour growth under various types of treatment.

The efficient secretary of the Tumour Registry is Miss E. McCarthy. During the year fellows serving in the Tumour Registry have been Dr. R. Musella and Dr. O. Solis. They attend the follow-up clinics and take part in research. The Registry is a branch of the Royal Victoria Hospital Tumour Registry which, at present, is under the general direction of Dr. E. J. Tabah. Cooperation with the Tumour Registry of the Province of Quebec is close and appreciated.

Clinical research has been carried on in association with several present and former fellows: The extensive analysis with Dr. Emile Berger of the medulloblastomas and the sarcomas of the cerebellum appeared in the *Journal of Neurosurgery* in 1963. He also spoke on carcinoma metastasis to the central nervous system at the meeting of the Canadian Neurological Society in 1963. The report with Dr. H. D. Garretson of a case of glossopharyngeal neuralgia with cerebral and cardiovascular symptoms was published in 1963 and has received wide attention. The report with Dr. R. Musella regarding a cyst of the posterior fossa causing a Parkinson-like syndrome was accepted for publication. The long-term survival of glioma patients is under study by Dr. B. Barone. He has also commenced a survey of the ependymomas. A sampling of the mixed gliomas and a study of gliomas of the dominant hemisphere is being undertaken by Dr. O. Solis.

## FELLOWS' LIBRARY

DR. PIERRE GLOOR

The work in the Fellows' Library in 1963 proceeded much in the same way as the year before. Our Librarian, Mrs. A. Melzak, has given efficient and expert help to Staff and Fellows in many ways. To many newcomers and even to some of its old "habitués" the outward calm of the library deceptively hides the great amount of detailed work that goes on below the quiet surface. Much work is involved to turn a book collection into an active library which may justifiably claim to be an efficient research tool.

Work on improving our cataloguing system has been continued. In addition to cataloguing of new titles, we have started to list all the material available in various departmental libraries, scattered throughout the building. This will make it possible to integrate more fully the library resources of the entire Institute.

In order to make the material of our Library more accessible and useful an index of the following items has been set up: Chapters of books, written by M.N.I. staff members or other significant authors, articles of interest in journals, not usually used by M.N.I. personnel or not covered by published indexes, and articles of obvious interest to Staff and Fellows before they have been covered in published sources.

The librarian has also provided services to readers individually. Such services included the following activities:

(1) Drawing attention to material of interest to clinicians and researchers in publications not normally consulted by them (the volume of these references has increased substantially since the library started subscribing to "Current Contents").

(2) Tracking down and identifying obscure or incomplete references to the literature and checking journal abbreviations.

(3) Translating foreign (French, Russian, Spanish) papers into English, as well as editorial assistance in English to foreign fellows.

(4) Literature researches and compiling of bibliographies.

(5) Assisting fellows in setting up their personal literature file.

(6) Advice on purchases of books, subscription agents, library equipment, etc.

(7) Compilation and analyses of book reviews pertaining to publications considered for purchase by the Library Committee.

In its purchasing and subscription policy the Library Committee has endeavoured to select those books and journals that would satisfy as adequately as possible the very diversified needs of our Institute. We still fall short of this goal. Of all the items which have received a top priority rating by the members of our Library Committee, only a fraction can be acquired. This means that with every year an increasing number of books fail to be added to our collection, because of inadequate funds. This problem is not one that is peculiar to our Library only, but seems to affect the library situation at McGill University as a whole. Thus, Dean S. B. Frost, in the McGill University Bulletin No. 2, 1963/1964 writes "the University Library Committee has submitted to Senate and Governors guide line figures for the next five years, showing how steeply bookfunds must rise within that period". It is thus anticipated that McGill is going to buy many more books in the near future. This will certainly also affect the collection of medical books, and more specifically should include those in the neurological field. It is obvious that our budgetary resources and available space are insufficient to accommodate this needed increase. The problem will have to be faced, whether the neurological collection of McGill University should be housed entirely within the Fellows Library of the M.N.I., or whether the Medical Library should take care of supplementing the neurological collection for those items not included in our own subscriptions and purchases. The solution of this problem will require close consultation with the Medical Library and other University authorities.

In concluding this report, the members of the Library Committee wish to express their sincere thanks to our Librarian, Mrs. A. Melzak, for her splendid work, as well as to the numerous benefactors among, and outside our Staff, who have contributed gifts in the form of books and subscriptions to our Library. These represent valuable additions to our collection and may help us to fill, at least partially, the gaps in our purchase and subscription lists.

## MONTREAL NEUROLOGICAL SOCIETY

<i>President</i> .....	DR. GUY COURTOIS
<i>Vice-President</i> .....	DR. PIERRE GLOOR
<i>Secretary-Treasurer</i> .....	DR. CHARLES BRANCH

Twenty-eight meetings of the Section of Neurology of the Montreal Medico-Chirurgical Society were held from September 25th, 1963 to May 13th, 1964.

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

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

- DR. BERNARD DROZ, University of Paris: "Axonal Migration of Proteins."
- PROFESSOR R. C. OLDFIELD, Director, Institute of Experimental Psychology, Oxford: "Some Aspects of the Naming Task in Normals and Dysphasics."
- PROFESSOR ERIC MOBERG, Sahlgrenska Sjukhuset Goteborg, Sweden: "Peripheral Nerve Regeneration in the Light of New Methods of Examination."
- DR. GÉRARD GUIOT, Hôpital Foch, Suresnes, France: "Electro-physiology and Stereotaxy."
- DR. THEODORE SOURKES, McGill University and Allan Memorial Institute: "Biochemistry of Basal Ganglia Disease."
- DR. PIERRE GLOOR, McGill University and Montreal Neurological Institute: "Mechanism of Cerebral Seizures; Concepts Old and New."
- DR. B. B. RAGINSKY, Psychiatrist, Montreal: "Hypnosis and the Central Nervous System."
- DR. V. G. LONGO, Istituto Superiore di Sanita, Rome: "Neuropharmacological Investigations of Hallucinogenic Drugs; laboratory results vs. clinical trials."
- DR. DAVID H. HUBEL, Department of Neurophysiology, Harvard Medical School: "Physiological Effects of Visual Deprivation in Kittens."
- DR. CHARLES DRAKE, Chief of Neurosurgery, University of Western Ontario: "Ruptured Intracranial Aneurysms — some thought on management, including experience with eleven basilar aneurysms."

- DR. MALCOLM CARPENTER, Department of Anatomy, Columbia University College of Physicians and Surgeons: "Annual Neuroanatomy Lecture — The Vestibular System and its Relationship to Conjugate Horizontal Eye Movements."
- DR. ALLAN MIRSKY, Professor of Neuropsychology, Boston University School of Medicine: "Psychophysiological Studies of the Nature of the 'Absence' in Centrencephalic Epilepsy."
- DR. JOHN F. SULLIVAN, New England Center Hospital: "A Review of Amyotrophic Lateral Sclerosis and of Cervical Spondylosis and their Relationships to Abnormal Carbohydrate Metabolism."
- DR. DONALD G. BATES, Institute of the History of Medicine, Johns Hopkins University: "Thomas Willis and the Epidemic of 1661."
- DR. HANNA PAPIIUS, McGill University and Montreal Neurological Institute: "Experimental Studies in Cerebral Edema."
- DR. BRONSON S. RAY, Professor of Neurological Surgery, Cornell University: "Hypophysectomy in the Treatment of Diabetic Retinopathy."
- DR. K. A. C. ELLIOT, McGill University and Montreal Neurological Institute: "Report on Recent Trip to China."
- DR. MURRAY L. BARR, Professor of Microscopic Anatomy, University of Western Ontario: "Annual Hughlings Jackson Lecture of the M.N.I. — Some Principles and Examples in the New Field of Human Cytogenetics."

The annual Dinner of the Society was held on May 20, 1964 at the National Film Board with M. Claude Jutras, film director, as guest speaker. M. Jutras spoke on his recent creation of the film "A TOUT PRENDRE".

#### FELLOWS' SOCIETY

<i>President</i> .....	DR. BARTOLO M. BARONE
<i>Vice-President</i> .....	DR. ALEXANDER LOWDEN
<i>Secretary-Treasurer</i> .....	DR. ORLANDO SOLIS QUIROGA

The Fellows' Society again had an active scientific and social year. There were a total of 64 fellows in training at the Institute and Hospital. Approximately 25 fellows are here for their full training, either in the basic or clinical sciences, the remaining 39 on a short time basis to complete one or another facet of their training. We were saddened to learn of the untimely deaths of Dr. Alec Barnum and Dr. Jerzy Olszewski. We all remember vividly the deep feeling and sense of responsibility Dr. Olszewski felt towards his students. In tribute to him the Society has commemorated Dr. Olszewski's death by naming the Eighth Annual Fellows' Society Lecture in his honour. This lecture was given by Dr. Kristian Kristiansen of Oslo, Norway on "Studies of the Vasomotor Control of Cerebral Circulation".

Throughout the year we were most fortunate in having an illustrious series of guest speakers who delivered talks on the rather broad subject of neurological sciences.

Speakers were as follows:

Dr. David Kendall, Neurologist, Atkinson Morley Hospital, London. — Cerebral Venous Thrombosis.

Dr. Albe-Fessard, Neurophysiologist, Neurophysiological Institute, College de France, Paris — Organization of Sensory System in the Monkey.

Dr. Gérard Guiot, Neurosurgeon, Hôpital Foch, Paris — Ventriculoscopy.

Dr. M. Pocidalo, Respiratory Physiologist, Claude Bernard Hospital, Paris — Present Basis for Treatment of Barbiturate Poisoning.

Dr. Charles Drake, Neurosurgeon, University of Western Ontario, London — Diagnosis and Treatment of Lesions of the Brachial Plexus and Adjacent Structures.

Dr. Allan Mirsky, Psychologist, Boston University School of Medicine, Boston — The Dissimilar Effects of Drugs on the Digit Symbol Substitution and Continuous Performance Tests.

Dr. Brenda Milner, Psychologist, M.N.I. — The Psychological Examination of Patients with Cerebral Lesions.

Part I. Temporal Lobes, Memory and Cerebral Dominance.

Part II. Frontal, Parietal and Subcortical.

Dr. John Sullivan, Neurologist, Tufts-New England Medical Center, Boston — Cerebrovascular Disease — Discussion of the Experience of the Tufts-New England Medical Center.

Dr. Bronson Ray, Neurosurgeon, Cornell Medical Center, New York — The Pituitary Tumor and its Management.

Dr. Murray Barr, Anatomist, University of Western Ontario, London — The Zaragoza Period of Cajal's Life.

Mr. Murray Falconer, Neurosurgeon, Guy's Maudsley Neurosurgical Unit, London — Some Observations on the Pathogeneses of Temporal Lobe Epilepsy.

Officers for the coming academic year are:

President: Dr. Gastone Celesia.

Vice-President: Dr. Matthew Spence.

Secretary-Treasurer: Dr. Norman Lush.

## CLINICAL APPOINTMENTS AND FELLOWSHIPS\*

Appointments to the Resident Staff in Neurology or Neurosurgery are made for January 1st or July 1st. An internship in an approved hospital is required.

The posts of Resident in Neurosurgery and Resident in Neurology are available only to men who have had previous clinical service in the Institute. Assistant Resident in Neurosurgery — one year's duration — available January 1st and July 1st.

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

Appointments for periods of research and training in the laboratories are made by the Director for the Chief of the laboratory in question. A limited number of research stipends are available for these laboratory appointments.

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

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

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

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

## COURSES OF INSTRUCTION

### UNDERGRADUATE

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

### GRADUATE

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



## NEUROANATOMY

600. This course is given in combination with Undergraduate Course Neurology and Neurosurgery 2A "Anatomy and Physiology of the Central Nervous System."
601. Graduate seminars in coordination with Course 611.
602. Preparation of a term paper on a neuroanatomical subject as arranged.  
Professor McNaughton
603. Advanced Neuroanatomy for selected group; times to be arranged.  
Professor McNaughton

## NEUROPHYSIOLOGY

610. Lectures and examination together with undergraduate Neurology and Neurosurgery course 2A "Anatomy and Physiology of the Central Nervous System".
611. Weekly seminars and demonstrations co-ordinated with Course 2A (4 months, beginning in December). Mondays, 4:30 to 6:00 P.M.)
612. Under exceptional circumstances, a paper on a neurophysiological subject may be written by special arrangement as a substitute for 610.  
Professors Jasper, Elliott, and Gloor
620. COLLOQUIUM IN CLINICAL NEUROLOGY: 1 hour weekly, clinics and lectures, Wednesdays, 5:00 p.m. M.N.I. (9 months).  
Staff and Visiting Lecturers
630. SEIZURE MECHANISM AND CEREBRAL LOCALIZATION: Clinical Electroencephalographic and Roentgenographic Conference.  
M.N.I. 1 hour weekly (9 months). Tuesdays, 4:00 to 5:00 p.m.  
Professors Rasmussen, Jasper, Gloor, McRae, and Milner
640. OUTLINE OF NEUROCHEMISTRY: Instruction in Neurochemistry in addition to that provided in course 611 may be obtained by special arrangement.  
Professor Elliott

## NEUROPATHOLOGY

650. Six months laboratory work in Neuropathology.  
Professors Mathieson and Bertrand
651. Conference in Neuropathology, Thursdays, 4-5 p.m.  
Professors Mathieson and Bertrand
652. Introduction to Histopathology of the Nervous System. A short basic course for a limited number. By special arrangement with Professor Mathieson.

For graduate credit, courses 650 and 651 are required. Under special circumstances written and/or oral examinations may be substituted for 650 and 652.

## NEUROLOGICAL RADIOLOGY

660. Lecture demonstrations (3 months beginning in September). Mondays 4:30 to 6:00 p.m.
661. Colloquium, 1 hour weekly (9 months) Mondays, 9:00 a.m.  
Professor McRae

## ELECTROENCEPHALOGRAPHY

670. Laboratory work in Electroencephalography (minimum 6 months with active participation in seminars and clinical conferences).
671. Seminar in Electroencephalography (including clinical EEG Conferences) Fridays 4:30 — 6:00 P.M., October and November, January and February.

Professors Gloor, Jasper and Lloyd-Smith

# MONTREAL NEUROLOGICAL INSTITUTE

## PUBLICATIONS

1963-64

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MONTREAL NEUROLOGICAL INSTITUTE  
(HOSPITAL OPERATIONS)

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDING  
DECEMBER 31, 1963

	Shareable	Non Shareable	Total
<b>EXPENDITURE:</b>			
Salaries and wages .....	\$1,339,657	\$ 1,500	\$1,341,157
Medical and surgical supplies and drugs .....	133,002	—	133,002
Depreciation on equipment .....	86,158	—	86,158
Miscellaneous supplies, services and expense .....	594,303	3,932	598,235
	<u>2,153,120</u>	<u>5,432</u>	<u>2,158,552</u>
 <b>REVENUE:</b>			
In-patients			
Quebec Hospital Insurance Service —			
Interim payments received or receivable in accordance with the contract * .....	1,091,982	—	1,091,982
Equipment depreciation fund payments .....	86,158	—	86,158
Patients .....	467,861	48,152	516,013
Out-patients .....	79,262	—	79,262
Miscellaneous revenue .....	13,390	—	13,390
	<u>1,738,653</u>	<u>48,152</u>	<u>1,786,805</u>
 <i>Deduct:</i>			
Provision for doubtful accounts, courtesy allowan- ces, rebates and free work .....	113	5,840	5,953
Net revenue from patient services .....	<u>1,738,540</u>	<u>42,312</u>	<u>1,780,852</u>
Excess of expenditure over revenue from patient services .....	<u>414,580</u>	<u>(36,880)</u>	<u>377,700</u>
 <i>Supplementary revenue:</i>			
Province of Quebec grant .....	90,000	—	90,000
City of Montreal grant .....	67,500	—	67,500
	<u>157,500</u>	<u>—</u>	<u>157,500</u>
Deficit for the year * .....	<u>\$ 257,080</u>	<u>(\$36,880)</u>	<u>\$ 220,200</u>

\* Interim payments under the Quebec Hospital Insurance Act are based on the budget for 1963 approved by the Provincial Department of Health and are subject to adjustment following a review of expenditures by the Minister of Health as provided for in the Acts.

MONTREAL NEUROLOGICAL INSTITUTE

EXPENDITURE SUMMARY FOR THE YEAR ENDING DECEMBER 31, 1963	
from Major MNI Endowment Funds .....	\$160,029
from MNI Special Funds .....	\$ 66,946
from General University Funds .....	\$ 8,400
from Medical Research Council Block Term Grant .....	\$ 71,250
from Various Annual Research and Fellowship Grants .....	<u>\$249,720</u>
TOTAL EXPENDITURE .....	<u>\$556,345</u>

## *ENDOWMENTS*

- 1934 — Rockefeller Foundation Endowment
- 1951 — Donner Canadian Foundation Grant
- 1954 — Lily Griffith McConnell Endowment
- 1957 — Hobart Anderson Springle Memorial Endowment
- 1958 — Rupert Bruce Memorial Endowment
- 1959 — Percy R. Walters Memorial Endowment
- 1960 — William Cone Memorial Endowment
- 1963 — Walter Chamblet Adams Endowment

## *FELLOWSHIP ENDOWMENTS*

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

## *RECURRING ANNUAL GRANTS*

- 1947 — Federal Government Block Term Grant

## *GRANTS FOR SPECIAL PROJECTS*

- Federal-Provincial Health Grants — Dr. McNaughton  
— Dr. Rasmussen
- U.S. Public Health Neurological Training Grant — Dr. McNaughton
- U. S. National Science Grant — Dr. Jasper
- U. S. Public Health Grants — Dr. Milner
- National Cancer Institute of Canada Grants — Dr. Rasmussen  
— Dr. Feindel
- John and Mary Markle Foundation Fellowship — Dr. Sherwin
- Medical Research Council of Canada Grants — Dr. Sherwin  
— Dr. Wolfe
- Medical Research Council of Canada Associateships — Dr. Wolfe  
— Dr. Milner

## DONATIONS TO SPECIAL FUNDS — 1963-64

### ANAESTHESIA RESEARCH FUND:

*Anonymous* ..... \$15,000.00

### CLARENCE BERNSTEIN MEMORIAL RESEARCH FUND:

### BRAIN TUMOUR RESEARCH FUND:

### BORDEN COMPANY FOUNDATION FELLOWSHIP FUND:

### CANCER CLINICAL RELIEF FUND:

*Cancer Aid League* ..... 1,500.00

### WILLIAM CONE MEMORIAL RESEARCH FUND:

*Dr. David Berger* ..... 25.00  
*Mrs. W. V. Cone* ..... 14.00  
*The Harold Crabtree Foundation* ..... 1,000.00  
*Mrs. A. D. Crews* ..... 200.00  
*Mr. K. B. Jenckes* ..... 75.00  
*Mr. John Langdon* ..... 875.00  
*The Oaklawn Foundation — for fellowship* ..... 1,000.00  
*Mrs. Howard Pillow* ..... 3,000.00  
*Mrs. Edna J. Roberts* ..... 100.00  
*Mrs. H. Y. Russel* ..... 5.00  
*Mr. Benjamin Usheroff* ..... 250.00  
*Mr. Murray Vaughan* ..... 500.00  
*Mrs. Murray Vaughan* ..... 500.00

### COSGROVE RESEARCH FUND:

*Anonymous* ..... 200.00  
*Mr. George Dr. Troutman* ..... 100.00  
*Mr. Kenneth Campbell* ..... 50.00

### DICK EPILEPSY FUND:

*Anonymous* ..... 546.86

### GORDON LIBRARY FUND:

*Anonymous* ..... 500.00

### HARVEY CUSHING CLINICAL RELIEF FUND:

*Employees of Suitmaker, Ltd.* ..... 19.00  
*Miss Lillian Sandler* ..... 15.00  
*Miss Evelyn Gabes* ..... 5.00  
*Mr. J. Clare Wilcox* ..... 100.00  
*Dalse Welfare Club* ..... 50.00  
*Mrs. F. Stott* ..... 10.00  
*Miss Suzanne Cohen* ..... 40.00  
*Miss Carol Craft* ..... 10.00  
*Women's Auxiliary of the R.V.H.* ..... 1,500.00

### HOSPITAL EQUIPMENT FUND:

*Mr. J. K. Field* ..... 225.00

### MADISON WALTER MEMORIAL FUND:

MARY MASSABKY FOUNDATION RESEARCH FUND: ..... 95.76

### M.N.I. NEUROSURGICAL RESEARCH FUND:

### M.N.I. STAFF LOAN FUND:



MISCELLANEOUS SPECIAL FUNDS :

<i>Anonymous</i> .....	20,000.00
<i>In Memory of the late Mrs. Muriel Chisholm</i> .....	20.00
<i>In Memory of the late Mr. Charles Rowson</i> .....	7.50
<i>In Memory of the late Mrs. E. Cartmel</i> .....	20.00

MULTIPLE SCLEROSIS CLINICAL RELIEF FUND :

<i>Multiple Sclerosis Golf League</i> .....	300.00
<i>Montreal Association for Multiple Sclerosis</i> .....	500.00

MULTIPLE SCLEROSIS RESEARCH FUNDS :

<i>Multiple Sclerosis Society of Canada</i> .....	12,500.00
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McNAUGHTON NEUROANATOMY RESEARCH FUND :

<i>Anonymous</i> .....	500.00
<i>Mrs. Anna Aron</i> .....	50.00

NEUROLOGICAL RESEARCH FUND :

<i>Mrs. Peter Laing</i> .....	1,000.00
<i>Estate of the late Mr. Hyman Steinberg</i> .....	500.00

NEUROPHYSIOLOGY RESEARCH FUNDS :

NEURORADIOLOGY RESEARCH AND TEACHING FUND :

NURSING FUNDS :

MACDOUGALL NURSING SCHOLARSHIP :

M.N.I. NURSING EDUCATION FUND :

<i>Mrs. Sam Reitman in memory of Dr. W. V. Cone</i> .....	300.00
<i>St. George's Lodge No. 10</i> .....	500.00

EILEEN C. FLANAGAN NURSING BURSARY FUND :

<i>Mr. William Labow</i> .....	500.00
<i>Mr. Benjamin Usheroff</i> .....	50.00
<i>Mrs. Robert Hampson</i> .....	35.00
<i>Anonymous</i> .....	20.00
<i>Dr. Henry Garretson</i> .....	80.00
<i>M.N.I. Graduate Nurses Society</i> .....	500.00

OAKLAWN FOUNDATION FELLOWSHIP FUND: .....	2,000.00
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PENFIELD RESEARCH FUND :

LEWIS REFORD FELLOWS FUND :

ROBINS MEMORIAL RESEARCH FUND FOR VASCULAR DISEASES :

WOMEN'S AUXILIARY FUND :

<i>Women's Auxiliary of the Royal Victoria Hospital</i> .....	500.00
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Donations to the Montreal Neurological Institute may be made to any of the above funds or for other purposes as specified by the donor. Receipts for such contributions are valid for income tax purposes in Canada. 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 the Secretary, Mrs. Ernest Rossiter, Jr., Box 533, Hempsted, N.Y., with the notation that they are for the Montreal Neurological Institute.

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

## STATISTICS

### CLASSIFICATION OF DISEASES

#### *Nervous System Generally:*

Multiple Sclerosis .....	135
Motor Neurone Disease .....	22
Neurosyphilis .....	1
Miscellaneous .....	3

#### *Meninges:*

Meningocele & Myelomeningocele .....	14
Acute Purulent Meningitis .....	6
Tuberculous Meningitis .....	4
Headache .....	55
Subdural Haematoma .....	27
Intracerebral Haematoma .....	11
Epidural Haematoma .....	12
Extradural Haematoma .....	2
Subdural Hygroma .....	1
Subarachnoid Haemorrhage .....	31
CSF Rhinorrhoea .....	6
Miscellaneous .....	4

#### *Brain:*

Congenital Anomalies .....	11
Hydrocephalus .....	18
Abscess .....	3
Concussion .....	222
Contusion, Laceration, Traumatic Encephalopathy .....	96
Syncope .....	6
Epilepsy .....	362
Migraine .....	25
Parkinsonism .....	21
Thrombosis, Encephalopathy due to Arteriosclerosis .....	171
Haemorrhage .....	19
Intracranial Aneurysm .....	21
Encephalitis .....	14
Gunshot Wound .....	3
Miscellaneous .....	7

#### *Tumours:*

Gliomas .....	21
Perineurial Fibroblastoma .....	6
Meningeal Fibroblastoma .....	13
Craniopharyngioma .....	5
Angioma .....	1
Glioblastoma Multiforme .....	18
Metastatic Carcinoma .....	38
Astrocytoma .....	19
Medulloblastoma .....	11
Ependymoma 4th Ventricle .....	2
Neuroblastoma — Rt. Thoracic .....	1
Neurofibroma .....	6
Stenosis Aqueduct of Sylvius .....	5

Chromophobe Adenoma Pituitary .....	7
Granuloma — Eosinophilic .....	1
Sacral Radiculopathy due to Metastases .....	4
Tumour — 3rd ventricle susp. ....	2
Tumours — Miscellaneous .....	7

*Spinal cord:*

Compression of the Spinal Cord .....	20
Transverse Acute Myelitis .....	1
Guillain-Barré Syndrome .....	6
Myelopathy .....	14
Syringomyelia .....	4
Poliomyelitis .....	1
Diastatomyelia .....	2
Cervical Spondylosis .....	5
Miscellaneous .....	4

*Cranial and Peripheral nerves:*

Optic Neuritis .....	5
Trigeminal Neuralgia .....	45
Meniere's Syndrome .....	9
Compression Ulnar Nerve .....	4
Compression Peroneal Nerve .....	2
Other Neuralgias .....	6
Neuropathy .....	20
Carpal Tunnel Syndrome .....	9
Paresis Rt. 6th Nerve .....	8
Miscellaneous .....	7

*Muscles:*

Myasthenia Gravis .....	11
Muscular Atrophy .....	5
Polymyositis .....	4
Myotonic Dystrophy .....	11
Miscellaneous .....	14

*Mental Diseases:*

Mental Retardation .....	10
Depression .....	19
Anxiety State .....	33
Conversion Hysteria .....	21
Alzheimer's Disease .....	5
Schizophrenia .....	4
Miscellaneous .....	6

*Other Systems:*

Protrusion Disc — Lumbar .....	220
— Cervical .....	45
Fracture and/or Dislocation of Vertebral Column .....	34
Fracture Skull .....	40
Pain in Back .....	25
Pain — Miscellaneous .....	16
Traumatic Lesions & Infections .....	10
Miscellaneous .....	11

## CLASSIFICATION OF OPERATIONS

### *Craniotomy (Osteoplastic, etc.) and Craniectomy*

and Biopsy .....	3
and Drainage of Abscess .....	2
and Drainage Sub-Dural Haematoma .....	15
and Drainage of Intra-Cerebral Haematoma .....	8
and Drainage of Extra-Dural Haematoma .....	7
and Elevation of Depressed Skull Fracture .....	37
and Excision of Epileptogenic Focus (Lobectomy) .....	48
and Excision, Clipping or Wrapping of Aneurysm .....	15
and Exploration .....	1
and Hypophysectomy for Endocrine Control .....	4
and Hypophysectomy for Pituitary or Intra-Sellar Tumour .....	7
and Incision, Drainage or Removal of Cyst .....	4
and Plastic Repair of Dura (C.S.F. Rhinorrhoea or Fistula) .....	6
and Plastic Repair of Skull Defect (Plate, Bone or Plastic) .....	5
and Removal of Adhesions .....	2
and Removal of Arterio-Venous Malformation .....	4
and Removal of Cerebral Tumour .....	64
and Removal of Posterior-Fossa Tumour .....	18
and Removal of Tumour of Skull .....	2
and Trigeminal Massage or Decompression .....	1
and Trigeminal Rhizotomy .....	8
and Ventriculocisternostomy (Torkildsen's) .....	5

### *Trepanation*

and Artificial Suture for Craniostenosis .....	1
and Biopsy .....	3
and Drainage of Sub-Dural Space .....	9
and Exploration .....	3
and Leucotomy .....	1
for Stereotactic Procedures .....	29
and Ventricular Puncture .....	1
and Ventriculography .....	5
Suture of Lacerated Wound of Scalp .....	8

### *Shunt Procedure*

Ventriculo-Caval .....	19
Ventriculo-Peritoneal .....	2

### *Laminectomy and Hemilaminectomy*

and Anterolateral Cordotomy — Cervical .....	5
and Anterolateral Cordotomy — Thoracic .....	2
and Biopsy .....	1
and Decompression or Exploration of Spinal Cord for Spondylosis (Dentate Ligament Section) .....	17
and Decompression or Exploration of Spinal Cord (Trauma) .....	2
and Decompression or Exploration of Spinal Cord (Tumour or Vascular Malformation) .....	4
and Discoidectomy — Lumbo-Sacral .....	120
and Discoidectomy — Cervical .....	8

and Removal of Tumour — Intra-Medullary .....	2
and Removal of Tumour — Extra-Medullary and Intra-dural .....	3
and Removal of Extradural Tumour (Metastatic, Bone Tumours, etc.) .....	1
and Rhizotomy .....	7
and Spinal Fusion with Bone Graft — Autogenous or Bone Bank .....	68
and Spinal Fusion with Wire or Plate .....	3
Discoidectomy — Anterior Approach — Cervical .....	3
Dermoid Cyst — Exploration and Repair — Sacral .....	1
Plastic Repair of Spina Bifida .....	6
 <i>Nerve Explorations</i>	
and Anastomosis or Suture .....	1
and Avulsion .....	4
and Excision of Neuroma .....	4
and Neurolysis, Transplantation or Decompression .....	11
 <i>Artery Exploration</i>	
and Endarterectomy (Patch-Graft) .....	3
and Ligation .....	2
and Progressive Occlusion (Selverstone Clamp) .....	3
and Temporary Occlusion (Ligature or Selverstone) .....	4
 <i>Wound Re-opening</i>	
and Evacuation of Haematoma .....	1
and Exploration .....	2
and Further Removal of Tumour .....	2
and Removal of Bone Flap, Tantalum Plate or Wire Mesh .....	1
and Resuturing .....	1
Miscellaneous .....	51
Radiological Procedures .....	438
TOTAL .....	1128

## CAUSES OF DEATH

Cerebro-vascular Disease (thrombosis, infarction, haemorrhage) .....	26
Intracranial Aneurysm (haemorrhage and Haematomata due to aneurysm) .....	17
Head Injury (concussion, contusion, haematomata, etc.) .....	25
Gun Shot Wound of Brain .....	1
Intracranial Tumour, Primary .....	7
Intracranial Tumour, Metastatic .....	10
Carcinoma (Generalized) .....	8
Miscellaneous Neurological Diseases .....	3
Other Systems .....	7
TOTAL .....	104





