

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

1964-65



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# THE INSTITUTE AND HOSPITAL

## REPORT OF THE DIRECTOR

DR. THEODORE RASMUSSEN

This is our thirtieth annual report, but the year just finished constitutes the first full calendar year of our hospital activities since these were incorporated as a separate legal entity in July 1963. Thus the various reports of the hospital side of our year's work are directed this year to the Board of Management of this new legal entity, the Montreal Neurological Hospital. The reports of the research and teaching activities, which constitute the substance of the Montreal Neurological Institute, however, continue, as in the past, to be directed to the Principal and Board of Governors of McGill University, and concern the 1964-65 academic year. At the same time, this combined series of reports is directed, as in the past, to the community we serve and to our friends and supporters, medical and non-medical, around the world.

The capsule reports you have just heard give a quick over-all glimpse of our varied activities during the past year, but of course can only hint at the drama, the triumphs and successes, and the occasional, but still too frequent, tragedies and failures that constitute the day-to-day record on the wards and in the laboratories.

Among the year's statistics, the one that caught my eye this year was the over-all death rate, 3.6%, the lowest yet recorded in the Institute's history. This prompted me to look up this figure in past years and follow its course since the Institute was opened in 1934. During the first 10 years the rate averaged 7%. During the next decade the rate averaged 4.7% and during the most recent decade, 1955 through 1964, the average is 4.35%. This includes our new low record figure of 3.6%.

Although this is only one of a host of criteria of progress and advancement, it is a gratifying record and gives some measurable evidence of our over-all effectiveness in the clinical sphere.

We must continue to force this line steadily downward in the years to come, and to do so the needs of the Institute and Hospital must be clearly stated. These can be broadly summarized under the obvious three headings, (1) staff, (2) equipment and facilities, and (3) adequate and stable financial support. Each of these three items is closely intertwined with the other two, and each alone has multiple facets.

Our staff encompasses a wide variety of individual ability, skills and interests, each with a role to play and each with a responsibility. Our non-professional staff must be as competent in their posts as the professional staff in theirs, since a chain is only as strong as its weakest link. The nurses

and non-professional workers have in the past been notoriously underpaid. One of the important and gratifying aspects of the Quebec Hospital Insurance Service to date has been the gradual raising of these salary scales to bring them closer to comparable scales in other aspects of the community. As a result, this has been one of the principal factors in the steady climb of hospitalization costs, which will inevitably continue, although at a slower rate we hope, as long as salary scales continue to go up generally throughout the spectrum of Canadian and American life. The financial policies of the Q.H.I.S. must enable us to recognize particularly valuable and long term service even if this means occasionally exceeding arbitrarily established category limits.

Our ability to attract professional staff members with outstanding skills, ability and knowledge depends on a number of factors, some of which are germane to the whole health field. The scientifically oriented young people of today have many rapidly expanding and fascinating fields beckoning before them. The public and our political leaders must recognize that if regulatory or economic strictures in the health field become too binding, many of these potential contributors to improvement of future medical care will turn to other non-medical scientific fields. If this tide is too great, the onrush of medical and biological knowledge will stagnate and our children and our children's children will pay the price of second rate health protection regardless of how palatial, elaborate and expensive the hospital buildings and facilities of the future become.

If we are to continue to attract professional staff with the unique abilities, background and training we require to stay in the front ranks in advancement of medical care and knowledge in our special field, there must be increased recognition on the part of the government of the roles and the needs of research and cognizance of the fact that the teaching hospitals of Quebec have both financial and administrative requirements that set them apart, in certain respects, from the Province's non-teaching hospitals.

The second category, facilities and equipment, covers a wide variety of "hardware", as the space and military experts describe their armamentarium. These range from housekeeping items that contribute to the patient's comfort and safety or make the nurses' work more effective, or more efficient, to the clinical tools such as X-ray, operating room, EEG and anaesthesia equipment that extend both diagnostic and therapeutic horizons and make these various procedures safer, to the scientific laboratory equipment of ever increasing complexity, such as electron microscopes, computers and other electronic and radio-isotope tools for garnering and analyzing data, that are increasingly important today in advancing the frontiers of knowledge of the nervous system. The equipment depreciation allowance set up by the Q.H.I.S. has to-date been adequate for the routine replacement of our ordinary obsolete equipment but additional funds must be available for some of the major equipment items, both clinical and scientific, one or two of which in any one year could well pre-empt our entire equipment budget allowance.

With regard to the third category, financial support, the Hospital's needs can be easily stated, (1) further increase in our per-diem rate to bring it closer to our actual cost per patient-day, (2) more prompt and complete final payment of our deficit at the end of the year, and (3) help in retiring our cumulative indebtedness built up over the past decade as a result of the woefully inadequate coverage by the City and the Province of the hospitalization costs of the medically indigent patients who have been sent here from all over the Province for specialized diagnostic and therapeutic services.

The teaching and research needs of the Institute under this category also have a familiar ring, increased long-range financial support that only endowments can bring. It is a pleasure to report that the capital of the Wm. Cone Memorial Endowment Fund has continued to grow this year and amounts to \$470,000. and thus about half the present annual cost of the Cone Laboratory for Neurosurgical Research is solidly supported for the long pull. We are most grateful to the benefactors who have contributed to this and to our other special funds during the past year, and we hope that many others in the years ahead will want to invest in the advancement of nervous-system research and in this way become partners in the exciting developments unfolding before us.

During the past year definite progress has been made in our plans to add an electron microscopic unit in the Laboratory of Neuropathology. Dr. Stirling Carpenter, formerly a Fellow in Neuropathology here in 1960 and '61 and now completing his training in Pathology at the University of California in Los Angeles, will be returning this summer to take direct charge of this programme, under Dr. Gordon Mathieson's supervision. Preliminary plans have been drawn for the new unit, which will be constructed as an addition to the 6th floor over the X-ray storage area, and we hope that the final planning and construction will be under way before long.

The EEG Laboratory, a key department of both the Hospital and the Institute, has been retitled the "Laboratory of Electroencephalography and Clinical Neurophysiology" to describe more accurately its functions and activities which have broadened steadily, first under Dr. Herbert Jasper's leadership and for the past five years under that of Dr. Peter Gloor. Dr. Frederick Andermann has been appointed Assistant Neurologist and Assistant Electroencephalographer, bringing help to cope with the steadily expanding work-load in this Laboratory and also strengthening our liaison in Paediatric Neurology with the Montreal Children's Hospital. Additional impetus and dimensions will be added by Dr. Roger Broughton, presently Medical Research Council Fellow in the EEG Laboratory, who will come on the Staff this summer bringing his special skills in polygraphic and evoked potential recording techniques to both the clinical and research spheres, along with new viewpoints from Dr. Henri Gastaut's laboratory in Marseille.

All is not gain as far as the Staff is concerned, however. The gay, bristling energy of Mrs. Von Nida no longer radiates from the Registrar's

Office. Her contributions to the Institute were many, and Staff and Fellows alike will long remember her with affection and admiration. Two days before her death, which she knew was not far off, she told me with her usual vivacity and charm how well she was feeling as a result of a recent change in her treatment, and of her conviction she would win yet another reprieve.

Dr. John McGrath, Assistant Anaesthetist, returns this summer to his home territory of Newfoundland to take up an appointment at the General Hospital in St. John's. Our best wishes and our thanks and appreciation for his excellent work during the past four years go along with him.

Dr. K. A. C. Elliott's gradual transfer of his activities to the McGill Department of Biochemistry is about completed and Dr. Leonhard Wolfe becomes officially Neurochemist-in-Charge, which has been the situation, unofficially, during the past year or more. Dr. Elliott will continue as Consultant to the Neurochemistry Laboratory and we hope his path between our 7th floor and the new McIntyre Medical Sciences Building will be well travelled.

It is with keen regret that we record in this report Dr. Herbert Jasper's move this spring to the other side of the mountain to accept a research professorship in the Department of Physiology at the University of Montreal, where he hopes the blandishments of clinical neurophysiology will not interfere so much with his increasing involvement in the more basic aspects of experimental neurophysiology. It is not necessary to remind this audience of his outstanding contributions to electroencephalography and to clinical and experimental neurophysiology here and on the international scene as well. We are happy he will stay on our Staff as Consultant in Neurophysiology and hope he will provide a stout link between the growing Neurological Sciences Department of the University of Montreal and the M.N.I. and McGill.

As we shift our gaze forward, we find the quadrennial Congress summer just ahead. We hope to be well represented at the two big Vienna meetings, the 8th International Congress of Neurology and the 6th International Congress of Electroencephalography and Clinical Neurophysiology and at the 3rd International Congress of Neurosurgery in Copenhagen, as well as at some of the smaller related meetings and symposia. We anticipate that the panoramic view of recent scientific and clinical progress and the stimulus of new viewpoints, that will be provided by these meetings, will give new impetus and momentum to our continuing quest for more effective therapy for our patients, and expansion of our knowledge of the nervous system in health and disease.



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REUBEN RABINOVITCH, B.A., M.D., M.Sc.

### *Assistant Neurologists*

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IRVING HELLER, M.D., C.M., M.Sc., Ph.D.

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C.M., D.Sc., (Acadia), F.R.C.S., (C), F.A.C.S.

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THEODORE RASMUSSEN

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R.C.P., F.F.A.R.C.S., F.A.C.A.

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ANIBAL GALINDO, M.D.

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<i>Assistant Professor, Neurological Radiology</i> .....	ROMÉO ETHIER
<i>Professor of Anaesthesiology</i> .....	RICHARD GILBERT
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<i>Associate Professor</i> .....	PIERRE GLOOR
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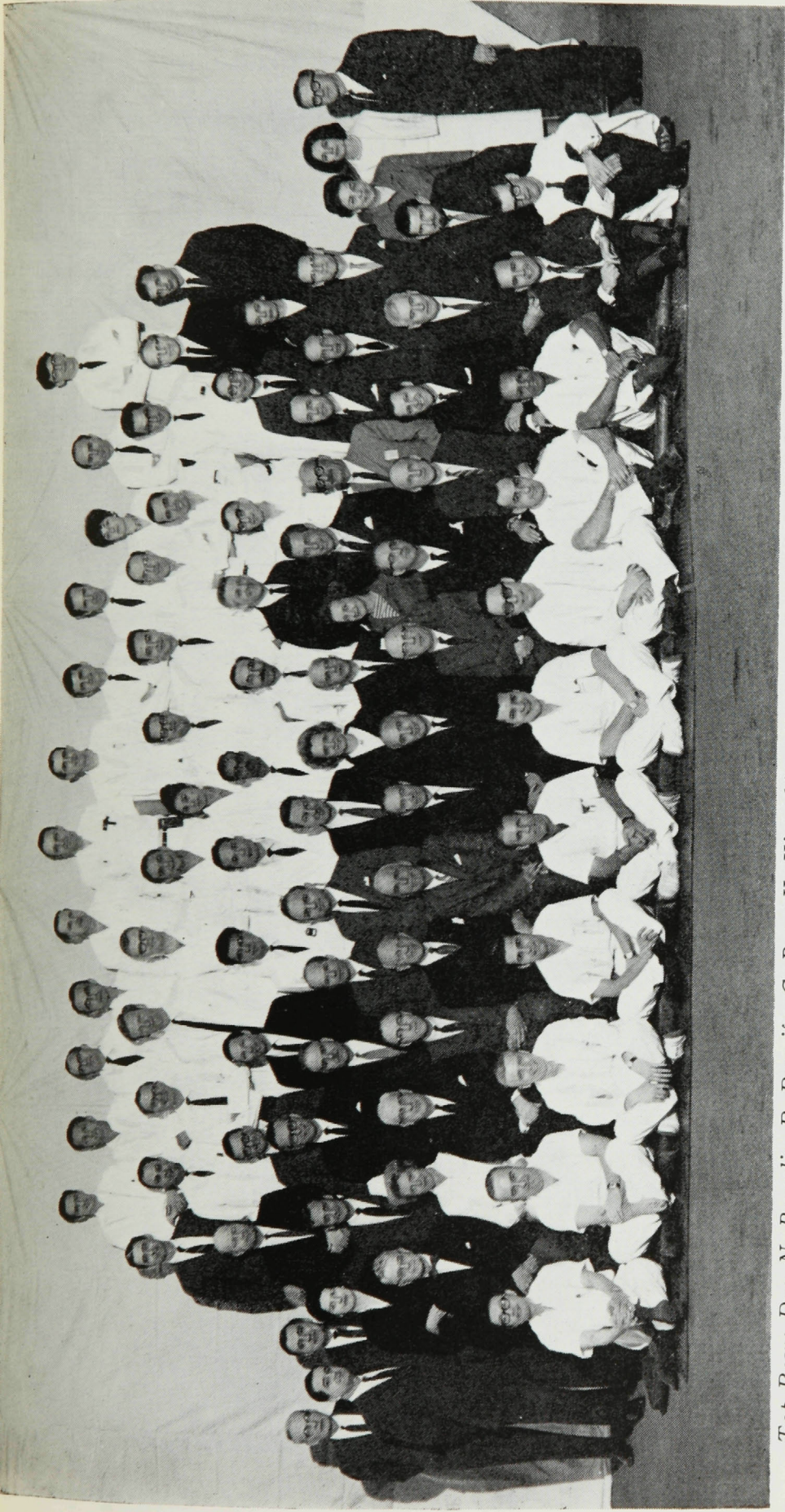
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\* Six months on this service.

## NURSING STAFF

<i>Director of Nursing</i> .....	MISS BERTHA I. CAMERON R.N.
<i>Assistant Director of Nursing</i> .....	MISS IRENE MACMILLAN B.A., R.N.
<i>Administrative Assistant</i> .....	MRS. ELEANOR CARMAN R.N.
<i>Supervisor Dressing Rooms</i> .....	MISS ANNIE JOHNSON R.N.
<i>Assistant Director of Education</i> .....	MISS JEAN MACMILLAN B.N., R.N.
<i>Clinical Co-ordinator</i> .....	MISS CAROLINE ROBERTSON B.N., R.N.
<i>Clinical Instructor</i> .....	MISS AUDREY KIMBERLEY R.N.
<i>Acting Supervisor Auxiliary Nursing</i> .....	MRS. RUBY PARKES R.N.
<i>Night Supervisor</i> .....	MISS ELISABETH BARROWMAN R.N.
<i>Assistant Night Supervisors</i> .....	MISS LILLIAN MCAULEY R.N. MISS MARILYN MANCHEN R.N. MISS AUDREY MCILVEEN R.N.
<i>Operating Room Supervisor and Instructor</i> .....	MISS PATRICIA MURRAY B.N., R.N.

## HEAD NURSES

MISS MARY AGNEW R.N.

MRS. ALMA HAM R.N.

MISS ALICE M. CAMERON R.N.

MISS DELTA MACDONALD R.N.

MISS MARY CAVANAUGH R.N.

MISS URSULA STEINER R.N.

MISS MARION EVERETT R.N.





*Top Row: J. Percy, V. Moroz, B. Petrin, G. Hart, L. Dalicandro, J. Henry, H. Rose, B. Cameron, Y. Hanaoka, L. Munoz, D. Rivest, B. Holmes.*  
*Second Row: L. Gorman, N. Siddons-Grey, M. Cavanaugh, L. Fletcher, M. Everett, G. Chisholm, E. Clarke, S. Davis, A. Gauvreau, W. Seaton, E. Pries.*  
*Third Row: M. Blackburn, J. Mallory, A. Cameron, P. Rattray, R. Boyer, Y. Okamoto, M. Agnew, D. Hood, H. Zatylny, J. MacDonald.*  
*Fourth Row: D. MacDonald, C. Robertson, A. Kimberley, A. Johnson, I. MacMillan, R. Parkes, J. MacMillan, E. Carman, A. McIlveen.*  
*Front Row: R. Tang, M. Spencer, C. Largo, L. Dagenais, C. Dixon, N. McGuire.*

## GRADUATE STUDIES AND RESEARCH

DR. PIERRE GLOOR

A review of the research carried out in our Institute during the past year shows that there has been no slackening of the effort to advance the frontiers of neurological sciences.

It will obviously be impossible to review in detail all the research activities of the past year, and a rapid and necessarily incomplete survey will have to suffice. Much of the research work has been carried out in the various laboratory departments. Clinical work too, however, has been closely related to research and many studies carried out on patients, undergoing treatment, have made it possible to gain some new or deeper insight into the functions of the nervous system and the causes and nature of their derangement in various diseases. This Institute represents unique opportunities for engaging in clinically oriented research making use of basic science techniques. Although much of our research has been carried out along these lines, there is still room for further strengthening of this kind of investigative effort.

How fruitful such an approach can be is best illustrated by the micro-electrode studies of single thalamic cells in patients undergoing stereotaxic surgery for extrapyramidal movement disorders, which were carried out jointly by Dr. Gilles Bertrand and Dr. Herbert Jasper. The highly specialized skill of a neurosurgeon and a neurophysiologist have been perfectly matched to yield a rich harvest of valuable data, which are of fundamental importance for the understanding of human thalamic physiology and of the genesis and treatment of abnormal involuntary movements.

A similar team effort has been in evidence in the studies, making use of the various applications of intracarotid Sodium Amytal injections. Here too co-operative studies carried out by neurosurgeons, Dr. Theodore Rasmussen, Dr. Charles Branch and Dr. Henry Garretson, with psychologists or electroencephalographers, have extended our knowledge of cerebral hemispherical dominance, speech and memory function and have helped us to understand better the mechanisms of some of the complex seizure discharges in the human brain, as they present themselves in some of our patients. Carefully controlled experimental observations in animals, carried out in the neurophysiology laboratory have supported and clarified some of the data obtained in these clinical studies.

Our productive team of psychologists under the expert guidance of Dr. Brenda Milner has further investigated in many of our patients important aspects of highly integrated functions of the human brain. Various important aspects of auditory and somato-sensory mechanisms have received close attention, as well as disturbances in cognitive functions that are found in patients with centrencephalic epilepsy.

In the department of neuropathology, after a very prolonged period of gestation, a laboratory of tissue culture has finally been established and is now in operation. Thus, one of Dr. Gordon Mathieson's most cherished

dreams has at last been realized. This new and exciting development should greatly strengthen the research capabilities of our neuropathology laboratories.

The department of neurochemistry has again been very active in many aspects of fundamental biochemical research. In spite of Dr. K. A. C. Elliott's increasing involvement in the direction and work of the biochemistry department of McGill University, he has been able to continue his important studies on brain amino-acids. Dr. Leonhard Wolfe in collaboration with several fellows has carried on his research program on brain lipids with special emphasis on gangliosides, which may well turn out to be some of the most important constituents of nerve cell membranes. This work is therefore of great potential importance for many fields of neurology. Dr. Hanna Pappius has extended her biochemical studies on cerebral oedema, a subject of great clinical importance, on which she has become an internationally known authority.

Cerebral circulation and possible ways to measure and study it reliably in man has been one of the aims towards which work has been directed, both in the neuroisotope and the neuroradiological departments. The importance of a better understanding of cerebral circulation for many problems of clinical neurology and neurosurgery can hardly be exaggerated.

In the laboratory for research in chronic neurological diseases, the work on multiple sclerosis has been continued and Dr. Allan Sherwin, in spite of a prolonged scientific tour of Europe and the United States, has succeeded in writing up his very exciting immuno-chemical studies of the nervous system in the form of a Ph.D. thesis. Work of this kind may be crucial for the comprehension of what causes a variety of crippling neurological disorders.

In the department of anaesthesia, Dr. Anibal Galindo has been very productive in his research on various aspects of hemodynamics as influenced by various surgical and anaesthetic procedures.

Various projects, related to cortical physiology, thalamocortical relationships, the visual system, the role of acetylcholine in cortical physiology, and the topical specificity of the epileptogenic action of Penicillin have been under investigation in the laboratories of neurophysiology by a very active group of fellows.

In the EEG department the setting up of a computerized unit for the analysis of evoked potentials in man has added a new dimension to our method of clinical neurophysiological investigations. We are glad that Dr. Roger Broughton, who is taking charge of this work will soon officially join our staff as an Associate Electroencephalographer and Clinical Neurophysiologist.

The report on our research activities would be incomplete without a word of farewell to Dr. Herbert Jasper, who after more than 25 years of dedicated service to this Institute has left us at the end of 1964, to take up a position as a research professor of neurophysiology at the University of Montreal. His departure is a great loss to this Institute, for few have contributed more than he did to its scientific activities and fame; all of us who worked with him will never cease to remember how much we owe him and how rich his contributions in research and teaching have been. We all wish him success and satisfaction in his new career.

As in any university department, our research is closely tied to our post-graduate teaching activities. Various conferences, lectures and seminars have been conducted to fulfill this purpose. Graduate teaching in many fields of medical research today has become a very difficult problem and we at the Neurological Institute are feeling the impact of modern development just as much as anybody else. Basic science techniques as applicable to medicine, which were comparatively simple as early as 15 years ago, when many of us underwent our post-graduate training, have become increasingly difficult, varied and complex. The frontiers of neurological research today have expanded beyond the limits traditionally regarded as the proper realm of medicine; not only chemistry and physics at a very fundamental and sophisticated level, but even such relatively alien fields as engineering, cybernetics and mathematics have all become almost frighteningly relevant to scientific studies of the nervous system in health and disease. It is obviously impossible for any institute in the latter half of the 20th century to stay scientifically in the forefront of all these developments. Our traditional approach to post-graduate teaching is no longer sufficient for equipping a young graduate student with all the necessary knowledge and skills that will enable him to engage in creative research throughout the next two or three decades, a period that should span the peak of his scientific productivity. Increasingly some of the skills such a young man needs to acquire are being developed outside the confines of medical institutions, and it is therefore unrealistic to hope that we can continue to be entirely self-sufficient in providing all types of post-graduate instructions, which a young researcher in the neurological sciences might want to receive. We should therefore in our graduate teaching program increasingly reach out beyond the confines of our Institute. A closer collaboration with various basic science departments of McGill University may well become more and more desirable and necessary as time goes on.

In closing this report it is fitting to thank all those who have given generously of their time and effort by contributing to our research activities. Much of the success of this work would have been impossible without the enthusiasm and dedication of our fellows, to whom therefore much credit is due. The technical assistance received from a great number of laboratory technicians, our photographers, and last but not least from Miss Mary Roach is herewith also gratefully acknowledged. Without the assistance provided by all these collaborators, our research work could not have been performed.

## NEUROLOGY

DR. FRANCIS L. McNAUGHTON

If annual meetings are to serve a useful function, they must be times for confession and soul searching, for patting on the back — that is, other people's backs — where success has been achieved; for beating of the breast — one's own breast — for short-comings and for things left undone which ought to have been done. Above all, annual meetings should be occasions for hopeful planning and cheerful resolutions. May the Thirtieth Annual Meeting of the M.N.I. be such an occasion! If a certain amount of perseveration creeps into Annual Reports, one hopes that it will not be interpreted as a clinical sign of institutional or personal sclerosis.

There are no striking changes to report on the organization of our clinical services. This does not mean that we are satisfied, and our staff has been considering for some time how we might improve the neurological services. The appointment of Dr. Fred Andermann to the clinical staff has added new strength. As in the past, we thank our Residents and Assistant Residents who continue to maintain a high standard of patient care, though there will always be room for improvement. With the gradual development of Departments of Neurology and Neurosurgery elsewhere in Canada, this Institute becomes more and more a consultation centre for difficult clinical problems, already investigated by neurologists elsewhere.

As Miss Griffin will tell in her report, there is increasing delay in the placement of our patients with long-term illnesses, because of the shortage of beds of this type in the community. This can be demoralizing for the patients, and at the same time is very wasteful of expensive and highly specialized hospital facilities, which are much in demand. Surely the Teaching Hospitals of Montreal, and the Medical Schools should be collaborating actively in the development of new institutions designed for treatment and research in chronic diseases.

Next to good patient-care, our major preoccupation has been with good teaching at both Undergraduate and Graduate levels. In addition to the regular teaching of Medical Students, we accept an increasing number of students for an elective month in Clinical Neurology during their Junior year of Medicine, and each summer we appoint three or four students from Canadian and American schools as Externes in Neurology. Dr. Robb and I feel that this is an admirable way to recruit new people who will tackle the many unsolved problems of Neurology.

In addition to providing full residency training in Neurology to the limit of our capacity, we now accept each year for two-month periods of training, twelve Assistant Residents in Medicine who rotate from the Royal Victoria Hospital, and six from the Montreal General Hospital. The Graduate Teaching is strengthened by the financial support we continue to receive from the U.S.P.H. Neurological Training Grant and for which we are most grateful. Our own Residents rotate at present to the Montreal General Hospital (with Doctors Baxter and Tatlow) and the Montreal

Children's Hospital (with Doctors Robb and Andermann) for three-month periods during their senior year and thereby obtain valuable experience in other areas of Clinical Neurology. I should point out here that all our Residents share in the teaching of Undergraduate Students, and this is an integral part of their own training.

We have a duty to provide neurological training for Psychiatrists and Physiatriests and other Specialty groups, which we cannot fulfil until more teaching beds become available within the McGill Group of Teaching Hospitals. We would like, for example, to see further development of post-graduate teaching in Neurology at the Queen Mary Veterans' Hospital.

Acting as the Department of Neurology of the Royal Victoria Hospital, we provide a Consultation Service to many hundreds of patients annually. I would like to give special commendation to our Teaching Fellow, Dr. Jean Chabot, who has carried a heavy responsibility as Consultant on the Wards of the R.V.H. during the past twelve months, in addition to supervising Student Teaching. Beginning in July 1965, we are establishing two Teaching Fellowships for young Neurologists who have completed Resident Training. These will combine opportunities for teaching Medical Students and Residents, clinical research, and consultation work, and will, we hope, bring a closer link between Medicine and Neurology in the Royal Victoria Hospital.

In the Out-patient Services I regret that Dr. Cosgrove's Multiple Sclerosis Clinic still lacks the support which it needs so urgently, and which was emphasized in last year's Annual Report.

The Federal and Provincial Governments continue their support of the Epilepsy Clinic through our Rehabilitation Grant. Spurred on by the enthusiasm and drive which Dr. Robb has brought us from his survey of Research in Epilepsy with the National Institutes of Health last year, we hope to expand the study of special types of epilepsy, and the trial of new anti-epileptic drugs during the coming year. This will be aided by the close collaboration which exists between our Department and Dr. Katherine Metrakos at the Epilepsy Clinic of the Montreal Children's Hospital. A number of our staff members are taking an active part in the work of the new Quebec Association for Epileptics, which is making good progress in this community.

Dr. Allan Sherwin, Markle Fellow in Neurology, has returned from an intensive period of work and study in Great Britain and France, and is continuing his important researches in Immunology, as it affects Brain, Nerve and Muscle. Dr. Irving Heller has started a long-term study of the Neurological Complications of Diabetes in association with Dr. Martin Hoffman of the Department of Medicine. Dr. Cosgrove continues a number of Clinical and Laboratory projects in the Demyelinating Diseases.

One of the great advantages of the M.N.I. from its very beginnings has been its organization, which has brought into one independent Department and under one roof, Neurologists, Neurosurgeons, and Laboratory Workers, as a closely-knit team. It is now widely acknowledged that this is the only

satisfactory way in which Neurology can be organized if progress is to be made in the understanding of the Nervous System and its Diseases. To achieve the right balance between individual and team effort is not an easy thing, but the constant challenge helps to keep this Institute a stimulating and interesting place. The day is part when the Neurologist or Neurosurgeon can work alone, and I would hope that all those who go out from this Institute to the far corners of the earth will carry with them this concept of team work in Neurology.

It is therefore with particular pleasure that we welcome as our Guest of Honour to-day a man whose distinguished career represents an almost ideal combination of the best in Neurology and Neurosurgery. Dr. Paul Bucy is a Man for all Seasons, a man of thought and of action, a world figure in Neurology and Neurosurgery. We welcome him very warmly into the M.N.I. family.

## NEUROSURGERY

DR. WILLIAM FEINDEL

Since 1953, when the McConnell Wing was added, the capacity of this building has not changed and the number of beds and operating rooms has remained the same. But at every Annual Meeting since then we have continued to record a steady and substantial increase in the activities of this Institution and this is true also of the neurosurgical activities. An analysis of the figures in the annual reports over the past ten years or so, makes it evident that this increase has come about mainly from the introduction of useful new methods of diagnosis and treatment. These could hardly have been foreseen 15 years ago. We can take as an obvious example the method of radioactive brain scanning started here in 1960. This technique, which subjects the patient to very little discomfort, or hazard, has now been established as a valuable diagnostic aid. In 1964, 500 patients were scanned, an increase of 70% over the previous year and very near the saturation point for our present set-up. Examples of other new methods include the development of stereotaxic surgery under the direction of Dr. Gilles Bertrand, the use of special carotid artery catheter studies by Dr. Henry Garretson, both for defining the cerebral circulation using radioactive isotopes and in a project with Dr. Rasmussen and Dr. Gloor for the analysis of electrographic abnormality in seizure patients. The use of the echoencephalogram for the determination of shift of midline intracranial structures, especially in patients with head injuries has also continued with Dr. Gindin and Dr. Girvin aiding Dr. McRae in the application of this method. These new procedures have been accommodated somehow by a process of internal compression aided at times I suspect by some sort of minor miracle on the part of the Resident, Nursing and Technical staff.

The number of operating room procedures has also increased. According to statistics prepared by Miss Murray, our Operating Room Supervisor, these reached a new high last year of 1,215. There were over 500 major cranial and spinal operations. Of 672 theatre cases, at least 25% were emergencies: these obviously tax the resources of the staff and the facilities of the operating room, of anaesthesia, of radiology, of the laboratories, and particularly of the nursing wards. Emergencies also cause a degree of disruption of the timetable for elective surgical cases, which in a teaching institution often require careful planning with a highly skilled scientific team and elaborate instrumentation. Although these complex operative procedures have long been familiar here for the surgical treatment of seizure patients, stereotaxic surgery, and many operations for aneurysms and other vascular lesions of the brain also require now an equally elaborate pattern of team support to give the best assurance of success for the patient.

It must be emphasized too that not all the emergency cases are reflected in the operating room statistics. Many patients with closed head injuries, for instance, may not require surgery. But their condition demands immediate investigation at any time of the day or night and requires subsequent surgical and nursing care which is often more intensive and of longer duration on the ward than that needed by the usual post-operative patient.

During 1964, there was only one post-operative infection and fortunately this proved to be of a minor nature. These yearly statistics are an index in themselves of the skill and devotion of all the members of the staff throughout the Institute. The neurosurgeons have had the unstinting help and support not only of the anaesthesiologists and radiologists but also of the staff in the laboratories, in psychology, in Social Service and in the clerical offices. We appreciate more than anyone the significance of the high level of patient care provided by the Nursing and Resident staff.

From these comments you might imagine that the neurosurgeons were so concerned during 1964 with clinical problems that they had no time to set aside for research and teaching. However, their names appeared on almost half of the scientific publications coming from the Institute during that year. In addition, each of the neurosurgeons, thanks partly to the pattern of full-time University appointments, was able to pursue or develop a special field of interest in either clinical or laboratory investigation. The details of these projects were reviewed last year but certain additional items may be cited. Dr. Marius Heuff under a Medical Research Council Fellowship has been working on the application of electromagnetic flowmeters for cerebral circulation studies in the Cone Laboratory. Dr. Lloyd Dayes, Resident on the Second Neurosurgical service, completed a study with Dr. Dossetor and Dr. Pappius on cerebral oedema. Dr. Barone and Dr. Solis have continued work with Dr. Elvidge on the brain tumour registry material. Dr. Bryce Weir completed a series of studies on the neurophysiology of the reticular formation. Dr. Branch has continued his studies on speech localization with Dr. Milner. Dr. Perot has been engaged in a careful analysis of the role of the lower cranial nerves in torticollis. Dr. Gilles Bertrand has supervised



the Surgical Neuropathology Laboratory and has continued a study with Dr. Barone of special stains for neoplastic cells. Dr. Silfvenius took part in this program and before returning to the University of Lund, Sweden, also reviewed a series of epileptic patients with cortical discharge from the insula and completed an experimental study on the effects of cooling on cortical activity.

In the Cone Laboratory for Neurosurgical Research studies have continued on the application of radioactive tracers for the investigation of the blood supply to the brain. Brain scanning has given some indication of the localization of the area of brain damaged by a "stroke" and also information on the degree and rate of recovery which the patient may undergo. For the first time it has been possible to get consistent quantitative information on the speed and volume of blood flow through local regions of the brain during operation. Mr. Hodge in the Photographic Department has devised a new approach involving rapid colour photography to record the fast transit of tracer amounts of dye through the surface vessels of the brain. These studies have been correlated with elegant anatomical displays of the capillary vessels of the brain produced by Professor Richard Saunders at Dalhousie Medical School with the use of the X-ray microscope. Professor Saunders spent two months of his sabbatical leave here and this collaborative "atomic-anatomic" project will be continued.

Dr. Elvidge continued to supervise the brain tumour registry and has been active on the neurosurgical service. One of his achievements was to come through 1964 — a leap year — with singular success!

As many of you will have noted, Dr. Penfield was recently elected President of the newly-chartered Vanier Institute of the Family. We wish Dr. and Mrs. Penfield all success in this exciting new venture which has been very close to their hearts and to which they have already brought so much of their apparently limitless and enthusiastic interest.

Last year Dr. Rasmussen completed his term as President of the American Academy of Neurological Surgery. Tomorrow with Mrs. Rasmussen he takes off for Beirut, Lebanon, to give the Fifth Annual Wilder Penfield Lecture, established through the initiative of a former Fellow, Dr. Fuad Haddad. Dr. and Mrs. Rasmussen will also be visiting Jordan, the Hacettepe Medical School at Ankara, Turkey and Istanbul. We wish them a pleasant journey, a safe return and ask them to give our warmest greetings to the increasing band of M.N.I. Fellows and wives and friends in the Middle East.

Sir Geoffrey Jefferson that warm-hearted, philosophic and scholarly neurosurgeon, in a delightful essay entitled "On being Happy and Liking It", wrote that happiness "derives from being surrounded by people that you like and in having work to do that absorbs you". On both these counts I can certainly say that the neurosurgeons have enjoyed a very happy year.

## HOSPITALIZATION

DR. PRESTON ROBB

The Montreal Neurological Hospital has continued its hectic pace of admissions, discharges, and the search for empty beds. Each year one or other type of service increases, we search desperately for hidden rooms that can be used, or how existing space can be reorganized to provide greater efficiency without impairing quality. In 1964 there were 2,312 admissions and 44,263 patient days. The number of patient days increased by 543 from the 1963 figure, and the level of occupancy rose to 89.6%. The average stay per patient was 19.5 days. This is an increase of 0.8 days, something we look on with concern, and due in large part to our inability to find suitable placement for the patient who requires convalescent care or permanent placement.

There were 83 deaths and an autopsy rate of 86.7%. The operating room staff was extremely busy. There was a total of 1215 cases done, of whom 672 were done in the theatres. There were 274 major craniotomies and 228 laminectomies.

There was a total of 5134 visits to the neurology and neurosurgery Outpatient Clinics of the Royal Victoria Hospital. This total was made up of 4277 visits to the Neurology Clinics and 857 visits to the Neurosurgery Clinics.

Hospital operating expenditure rose by approximately 6% to \$2,288,425. This figure includes an amount of \$1,455,759 for salaries, an increase of 8.5% over 1963. Capital expenditure for the procurement of equipment was \$74,002.

The net shareable cost per patient day during 1964 was \$44.21. The Quebec Hospital Insurance service reimbursed our expenditure during the year at a rate of \$39.10 per patient day. Although this left a gap of \$5.11 per patient day, the improvement over previous years was substantial.

During 1964 a final settlement for 1962 was received. This final settlement left an amount of \$16,502 outstanding for that year. Further representations are being made to the Hospital Insurance Service concerning this. An interim settlement for the year 1963, amounting to \$128,000 was also received, leaving a balance of \$129,080 outstanding for 1963. Last week a further \$64,000 was received, leaving an outstanding balance of \$65,080 for 1963. Our claim for reimbursement of shareable expenditure for 1964 amounting to \$220,284 was forwarded to the Service three weeks ago. Since then we have received an interim payment of \$112,000 leaving an amount of \$108,284 still outstanding for 1964.

The Hospital deficit for 1964 was \$178,675; \$41,525 less than for 1963 and the accumulated deficit at December 31st 1964 was \$650,683. To date the Province has not given an indication that we will receive assistance in retiring the portion of our deficit accumulated prior to 1961.

These are the cold statistics of the operation of the hospital. They do not tell the story of miraculous recoveries and the return of patients from a state of complete dependence to useful active lives, or the tragedies that stagger the imagination. This hospital is a place of great happiness and of great sorrow. Many relatives have come to me to tell of the kind and sympathetic care that they or their relatives have received from our staff. We are indebted to all the members of staff for what they have done to lighten the burden on our patients and their families.

It is with regret that I report on the death of Mrs. Marie von Nida. There was no one who exemplified the loyalty and devotion to the hospital as did Mrs. von Nida. Her courage in the face of pain and adversity was an example we shall long remember. Donations which were made to the hospital in lieu of flowers are being used to purchase special books for the library. Mrs. von Nida's special project was the fellow and interns and we felt the library would be the place she would be remembered.

What problems do we face? The major one is lack of space. With the increase in medical technology more and more space is needed for auxiliary services and relatively less for beds. This is our major problem. The EEG Department is working under cramped conditions. The X-Ray Department must limit their outpatient work. The Psychology Department is spread all over the place. The coffee shop is too small. The business office needs more space. Indeed, almost everybody is working under cramped conditions.

We have outgrown our system of diagnostic classification-storage and retrieval. On May 1st a Keydex system was started which, we expect, will provide for much better storage and retrieval, requiring less work and less space. The preparation necessary for this project has been considerable, and I am grateful to Miss Arlene Urquhart for her understanding and help in the preparation of the dictionary of terms.

In the past I have referred to building maintenance and the problem related to an old building. This continues, however, there is presently under way a program to lighten up the corridors, nurses' stations and generally improve the decor of the hospital.

We are indebted to the Women's Auxiliary for operating the all too small coffee shop. This shop plays a very important part in the life of the Institute. As well the profits provide help to indigent patients through our Social Service Department and for other things that are not available through the Q.H.I.S.

The main purpose of the MNH as opposed to the MNI has been to provide the best in Medical and Nursing Care of our patients in the tradition of Dr. Cone. A second responsibility is to provide leadership in the care of the neurologically ill. May we continue to be "Dedicated to the Relief of Sickness and Pain, and to the Study of Neurology".

## NURSING DEPARTMENT

MISS BERTHA I. CAMERON

The Department of Nursing of the Montreal Neurological Hospital has experienced a most active and stimulating year.

The challenge which the nursing care of our patients presents has been met with gratifying response. A renewed stimulus has been given to the area of In-Service Education under the direction of our newly appointed Clinical Co-ordinator; Miss Caroline Robertson.

We are pleased to announce the appointment of Miss Jean MacMillan as Assistant Director of Education; Miss Patricia Murray as Supervisor and Instructor in the Operating Room; Miss Audrey Kimberley as Nursing Instructor; Miss Audrey McIlveen as Junior Night Supervisor and Miss Ursula Steiner and Miss Marion Everett as Head Nurses.

Certificates have been presented to 41 students in our Post-Graduate Group. It is of interest to note that since 1934 approximately 700 certificates have been awarded to Post-Graduate Students from 28 different countries.

During the present year 151 R.V.H. students have gained experience in a revised intensive program and students from The McGill School for Graduate Nurses (at all levels) have sought experience in the various clinical areas.

The Eileen C. Flanagan Prize which is awarded to the most outstanding nurse in each Post-Graduate Group was presented to Miss Barbara Jean McCulloch and Miss Stewart-Mary Arbuckle. The St. George's Lodge #10 Bursary in honor of Dr. Reuben Rabinovitch was granted to Miss Anne Carney and Miss Helena Kryk, while Mrs. Sam Reitman's Bursary in memory of Dr. William V. Cone was awarded to Miss Phoebe Stanley.

The M.N.H. Prize to the outstanding affiliating R.V.H. student from the class of 1964 was awarded to Miss Ann Brothers.

We are pleased to report that the Eileen C. Flanagan Scholarship Fund has now reached the \$4,000.00 mark. Our goal is \$10,000.00 in order that this fund may begin to operate.

May we again express our appreciation to all members of the Women's Auxiliary of the Royal Victoria Hospital for their generous support and continued interest. Our association with you is most heartening.

I would like to pay a personal tribute to *all* members of the Nursing Staff for their loyalty and co-operation. The *maintenance* of a high standard of patient care over the entire twenty-four hour period is our aim. Without the full participation of each one of us, this ideal could not be realized. We appreciate particularly the constancy shown by the many members of the Nursing Staff who have been with us for 10 years and upwards.

May I also take this opportunity to thank all members of the Medical Staff and each department of the Institute for their continued interest and support throughout the past year.

## SOCIAL SERVICE

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

*Social Workers:*

MRS. HILDA FEINER, B.A., Dip.S.W.   MISS KATHLEEN MACDONALD, B.A., B.S.W.  
MRS. IRENA LIEBICH, B.A., M.S.W.   MISS NOELLA VAILLANCOURT, B.A., M.S.W.

*Social Service Assistant:*

MISS YOLANDA SABETTA, B.A.

Social Service staff members suggested that a major portion of this report should be devoted to the extension of our services into the community. In our department-reports throughout the past twenty-five years the topics "community resources" and "the relationship between the hospital and the community" have been given prominence; and the theme, lack of resources for the chronically ill, has appeared like an oft-repeated refrain. The mood varied according to the availability of resources. In some years, mentioned only incidentally, in others with a sense of urgency, in the past year, this theme, this problem, seemed to over-shadow all others. We have felt gentle, but ever-increasing pressures both from within the hospital (from medical staff, admitting office, etc.), and from outside the hospital (from families strained almost beyond endurance, and from chronic care institutions having no social workers, which means most health facilities except the acute care hospitals). From all sides they turn to the social workers of the referring institution where, throughout the years of the patient's chronic illness, medical responsibility will lie whenever acute episodes occur. When patients and their families can be helped with recurring medical and nursing needs and the related social and psychological problems as they arise, future problems can be reduced; if help is unavailable, the needs multiply and the patients come earlier and more frequently to clinic, to emergency or as readmissions to this hospital.

We realize that the community (both governmental and voluntary) is aware of, concerned about and working on the "placement" problem and the companion one of providing home care services. But must we accept the current unfortunate shortage of resources for the immediate future? Perhaps in part, but at the same time, through doctor-nurse-social worker joint planning, we may find ways to reduce the problems; we can also serve actively on community committees and continue to make our needs known and to help with long-range solutions.

The foregoing was somewhat negative, but the year has also been marked by positive factors:

- 1) After a year of handling referrals to our department through a pool, we were happy to be able to return to the assignment of social workers to specific services both in the hospital and in the clinics.
- 2) In direct service to patients and to their families, the department has continued to give help on a wide variety of problems related to illness and medical care. These ran the gamut from inability to pay for transportation to family disintegration.
- 3) For eight successful months, we have experimented with the services of what we call a "Social Service Assistant" to whom specific tasks have

- been relegated, e.g. helping patients and families with community resources for financial assistance or "placement". We wish she were at least twins.
- 4) Social service activity on the Seizure Program has continued unabated. The problems encountered most frequently were: among children, the school authorities' fears; among adults, finding employment and the associated need for a sheltered workshop in the community. Reports from the one-year old Association for Epileptics of Quebec corroborate our findings.
  - 5) For the second year the McGill School of Social Work student unit under Miss MacLean's supervision has stimulated us through individual contacts, through their participation in our staff meetings, and for one department member, through serving as observer and critic at student conferences; we have also valued our association with the Post-Graduate School of Nursing.
  - 6) The blue smocks of the RVH Volunteers are welcome reminders of their many hours of devoted service in the clinics, in our office pin-pointing hospitals and nursing homes on a Montreal resource map, and in an embryo program of visits to chronically ill patients in the community.
  - 7) Last, but high in importance, is our acknowledgment of the generous donations to help patients with financial needs related to medical care such as transportation, essential medication, wheelchairs and emergency attendant service. To the RVH Women's Auxiliary and to community service organizations such as the Dalse Club, In His Name Society, MS Associations, Easter Seals and Rotary Club go the grateful thanks of our department and of the patients and their families.

## 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 Anaesthetist</i> .....	J. J. McGRATH, B.Sc., M.B., B.Ch., B.A.O.
<i>Clinical Fellow</i> .....	D. A. SHEPHARD, M.B., B.S. (Lond.), D.A., R.C.S.
<i>Residents:</i>	
ELISABETH ALLEN, M.D. (London, Eng.)*	ZOENA JORDAN, M.D. (Dalhousie)**
JOHN EMMETT, M.D. (Australia)*	BENOIT LABRECQUE, M.D. (Univ. of Mont.)**
ERHAN ERDEM, M.D. (Turkey)**	GUY LEFEBVRE, M.D. (Univ. of Mont.)*
ANGELA JACKSON, M.D. (London, Eng.)**	ALBERT PACE-FLORIDIA, M.D. (Malta)* ANDRÉE PINEAULT, M.D. (Univ. of Mont.)*

\* Six months on this service.  
\*\* Three months on this service.

The number of anaesthetics given during 1964 (1,042) exceeded the one-thousand mark for the second time in the Institute's history. Nitrous

oxide, oxygen and Fluothane, following Pentothal, with or without curare, continue to be the mainstay, and was administered in 765 operations. Controlled ventilation continues to be an almost standard procedure for operations carried out under general anaesthesia, and was utilized in 418 operations. The neurolept-analgesia regime has proven to be a valuable addition in procedures carried out under local anaesthesia and has contributed both to patients' comfort during the procedure and to increased smoothness of postoperative course. It was also used in nearly half the number of patients undergoing cerebral angiography and was used in a total of 214 procedures. No deaths occurred in the operating room due to anaesthesia.

Investigative work during the year, largely carried out by Dr. Galindo and Dr. Brindle, has been concerned with blood gas studies during surgery and anaesthesia, relationship between postural changes and circulatory homeostasis, interference with liver hemodynamics incident to surgery and anaesthesia and possible renal effects of a new anaesthetic agent "Teflurane".

Teaching activities have followed the pattern of previous years, both in relation to staff-nurses, the nursing postgraduate courses, undergraduate teaching to the medical students and graduate instruction in connection with the McGill Diploma Course.

Dr. Gilbert spent a week as Guest Professor at the Yeshiva University, and was also Visiting Professor at the Columbia-Presbyterian Medical Center and the San Francisco Medical Center of the University of California.

Dr. Roy Schofer resigned his appointment to accept a post on the staff of the Vancouver General Hospital and was replaced by Dr. David Shephard who served as Clinical Fellow.

## RADIOLOGY

*Radiologist*.....DONALD McRAE, M.D.

*Associate Radiologist*.....ROMÉO ETHIER, M.D.

### *Residents:*

PIERRE ARCHAMBAULT, M.D.\*  
(U. of Mont.)

FRANÇOIS LAROCHE, M.D. (Laval)\*

DAVID BRATTMAN, M.D.\*  
(Ireland)

JAMES RONALD STANDEN, M.D. (U. of Toronto)\*

MILTON JOSEPH HERBA, M.D.\*  
(U. of Man.)

GIACOMO VESSA, M.D. (Italy)\*

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

\* Six months on this service.

1964 was the busiest year in the history of this Department. Ten thousand, six hundred and seven-eight examinations were performed, an increase of 5.8% over last year. There was a disproportionate increase in some of the more complicated, more time-consuming examinations. For

example, arterial catheterizations increased three-fold from 34 in 1963 to 102 in 1964. Other types of arteriography increased 29%, i.e. from 575 in 1963 to 737 in 1964. In 1964, we began performing intravenous pyelograms in this Department and did 26 of these procedures, most of them in the last six months of the year. In all, 2007 major, time-consuming examinations were performed during 1964 compared to 1673 in 1963, an increase of 20%.

The above figures are presented not only to record a busy year but to lead up to some remarks concerning the future of radiology in this Institute and in this Province.

There are certain analogies between medical work on the one hand and industry on the other hand which must be explained to industry, to labor, to insurance companies and to government health insurance commissions. An annual increment of 5% means that the work doubles in 14 years. Such increments are reported from most hospitals and have been so reported since 1946. Hospital boards and government hospital insurance commissions have not allowed for this increase, either in their annual budgets or in their building plans. Budgets have been held to a 2% or 3% annual increase. This goes to salary increases and increased cost of supplies and repairs, leaving little or none for replacements or expansion and modernization of plant or equipment. Building plans usually make no allowance for expansion of these departments. In some programs of hospital expansion, x-ray departments have been cut down in order to get the maximum number of beds for the minimum amount of money. This results in increased bed occupancy because patients must wait several days for diagnostic procedures before therapy, particularly operative therapy, can be instituted. If the diagnostic departments were full-sized and fully manned, it could reduce the hospital stay for each patient by two or three days.

Technological advances in the past ten to fifteen years have been so great that the technical aspects of radiology have changed greatly. The invention of automatic x-ray film processing machines has completely changed the role of the x-ray dark room and dark room technicians. The development of image amplifiers with the display of information on television monitors or on cinefilm has changed many of the examinations almost completely. The development of three-phase x-ray generators, ultra high speed rotating anode tubes and high-voltage techniques greatly change the physical factors used in making radiographs and at the same time has reduced the dose of radiation to the patient. It is possible to incorporate some new equipment and some new advances in a department designed for 1950 methods but there comes a time when nothing will do except a complete remodelling of the department. When our x-ray department was designed in the early 1950s, it was considered to be ultramodern. Today it is behind most newly constructed departments and would be considered about average for a general hospital. We need a complete overhaul and modernization, extending from the transformer room in the basement of the Institute to



the entire department as it now exists on the fifth floor. Even this will only bring us up to 1965. It will not allow for the expected annual increment of 5% per annum or for future developments in equipment and technique.

Patterns of medicine change. In 1953, when the new wing opened, we carried out 715 air studies and 124 arteriograms. In 1964, we did 621 air studies and 782 arteriograms of various types, an increase of 600% in arteriography with only a slight reduction in air studies. We urgently need to double our space for arteriograms. In 1953, we did no x-ray examinations in the operating room but in 1964, there were 23 stereotaxic procedures done in the operating room with x-ray assistance and 20 other procedures requiring x-ray assistance in the operating room. This was done with a low-power, mobile x-ray unit purchased from War Assets Corporation. It is necessary that we install permanent, high-power x-ray equipment in one operating room, best in operating room number four. The tube stand and mounting will have to be custom made in order to obtain great flexibility combined with great strength.

New methods of medical examination are being developed. The newest is ultrasonics. Ultrasonic examination of the brain is in its infancy. The usefulness and accuracy of the procedure depends in large part on the amount of time devoted to each patient and to the ease with which each patient can be examined. At the present time, our ultrasound machine is wheeled from bed to bed in the ward where the conditions for examination are not entirely satisfactory. A separate room for ultrasound examinations would be most useful not only for increased speed and accuracy of the present type of examination but also for the development of improved techniques.

Departmental teaching continued as before. In 1964, Drs. McLeese, Van Alstyne, Standen and Herba, from the McGill Diploma Course in Radiology, spent six month periods in this Department. Dr. Françoise Laroche, of Laval University, spent one year in post-graduate training with us.

The regular Monday afternoon seminar in Neuroradiology was given in the Fall for four months. The regular Monday morning colloquia in Neuroradiology continued. Some lectures to the medical students were given during their Neuroanatomy course and the introductory course in General Radiology was given to the second year medical students in their third term.

In closing, I must thank the members of the other departments of the Institute and particularly the members of the nursing staff for their support and cooperation during the year. Without it, we would have been unable to do so much.

## NEUROCHEMISTRY

<i>Consultant</i> .....	K. A. C. ELLIOTT, M.Sc. (S. Africa), Ph.D., Sc.D. (Cantab.), F.R.S.C.
<i>Neurochemist &amp; Medical Research Council Associate</i> .....	LEONHARD S. WOLFE, M.Sc. (N.Z.), Ph.D. (Cantab.), M.D.
<i>Associate Neurochemist</i> .....	HANNA PAPIIUS, M.Sc., Ph.D.
<i>Assistant Neurochemist, Clinical</i> .....	IRVING HELLER, M.Sc., Ph.D., M.D., C.M.
<i>Visiting Scientist</i> ,.....	IKUKO KOYAMA, Ph.D. (Keio, Japan)
<i>Fellows:</i>	
PAULA BERGER, B.Sc. (Montreal) National Research Council (Canadian) Studentship	DAVID DERRY, M.D. (British Columbia)* MATTHEW SPENCE, M.D. (Alberta) Medical Research Council Fellow
FLAVIO COCEANI, M.D. (Bologna)* Post-Doctoral Fellow	

Six months on this service.

### *Transition*

This will be the last report for which I shall be responsible. As of 1st January, 1965, the direction of the Donner Laboratory of Experimental Neurochemistry passed to Dr. Leonhard Wolfe and administrative responsibility for the Clinical Laboratories passed officially to Dr. Irving Heller. Actually these responsibilities had been effectively exercised by Drs. Heller and Wolfe for years. Dr. Hanna Pappius remains an independent research worker in the Donner Laboratory and responsible for the technical aspects of the Clinical Laboratories. For the past few months I have been vaguely 'Chairman of Neurochemistry' but as of the 1st June 1965, I shall be occupied full time in the McGill Biochemistry Department and will become Consultant in Neurochemistry to the M.N.I. The latter connection will remain strong on my part, at least sentimentally and probably in more tangible ways. I believe that, in the many happy years that I have belonged to the Institute, my most important achievement consists in the fact that I leave dynamic departments that have no more need for me.

K.A.C.E.

### *Clinical Laboratories*

The total number of procedures done in the 7th floor laboratory on spinal fluid, blood and urine during 1964 was 13,159 (10,371). (Figures for 1963 are given in parentheses). The increase was largely due to the use of the Auto-Analyser since July of 1963 for a number of determinations on blood, which were previously done at the Royal Victoria Hospital. In addition 3198 (5600) liters of irrigation solution were prepared for the operating rooms, continuing the decrease in this figure which has been evident for the past two years. The clinical services were provided with 217 (194) liters of Nupercaine solution.

The work of the 3rd floor ward laboratory was maintained at the busy pace of the past few years. Separate blood determinations amounted to 15,690 (16,801) and 5375 (5433) complete urinalyses were done. Also 3633 (3686) samples of blood were drawn for biochemical analysis at the R.V.H., maintaining the reduced amounts of outside work required since the introduction of our Auto-Analyser two years ago. In addition our technicians have always been responsible for the procurement and handling of several thousand blood specimens for biochemical analysis in our 7th floor laboratory.

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*

A dominating feature of electron microscopists' pictures of the central nervous system of man and in fact all vertebrates is the profusion of membrane structures whether they be elaborations of the cell surface of nerve cells, neuroglial cells or of intracellular organelles. The molecular architecture of the surface membrane of nerve cells is at the basis of brain function. The electrical activity of nerve cells, transmitted in complex but highly organized fashion to other nerve cells, depends on small changes in permeability of the surface membrane to small ions such as sodium, potassium and chloride. This permeability change is affected by a number of highly specific molecules synthesized within the brain. The electrical activity can also be modified by drug molecules administered for specific clinical effects but again the ultimate site of action is on the surface membrane. Knowledge of the way in which the surface membrane governs permeability processes in molecular terms is very fragmentary but it is one of the most challenging aspects of contemporary medicine.

For a number of years one research project carried on by Dr. Wolfe with Dr. Spence and Dr. Derry with the technical assistance of Mrs. A. Kurnicki has been the study of a group of complex, acidic, sugar-containing lipids specifically located in the nerve cell membrane. A number of our findings indicate that these lipids are involved in the maintenance of the excitable state in brain by acting as a receptor site for other basic molecules which produce a change in membrane permeability to small ions. Investigations of the appearance of these lipids during development of the nervous system and microchemical analyses of thin sections through specific areas of the brain indicates that these lipids are located chiefly on the process of nerve cells which make contacts with and receive processes from other nerve cells. By modern biochemical techniques a nerve-ending particle fraction has been isolated from the brain tissue of new born rats which is enriched in these acidic lipids. Furthermore a specific membrane element from this fraction was isolated and its composition determined. Preparation of these membranes will enable small ions and neurotransmitter

molecules in the brain. Changes in the composition of these lipids have been found in pathological conditions such as hypoxia, respiratory acidosis and in areas around brain tumours in which the blood supply is affected. Methods are being studied to provide protection of membrane integrity in these conditions.

A basic feature of mental retardation is the failure of nerve cells to grow and make proper contacts with other nerve cells. One group of diseases, in which mental retardation is a predominant feature, shows a specific abnormality in the formation of these acidic lipids. An important aspect of our work is the study of the way in which these lipids are synthesized in the brain from simple precursors such as glucose and amino acids and incorporated into the active nerve cell membranes.

The nature of chemical substances which excite or inhibit other nerve cells in the central nervous system is in many instances unknown. In the functioning brain *in vivo* a number of substances with powerful biological activity are released onto the surface of the brain. In the last year we have succeeded in characterizing a new substance released in this manner. The substance is a water soluble acidic fatty acid belonging to the group of prostaglandins recently characterized at the Karolinska Institute in Sweden. These substances are derived from unsaturated fatty acids that are essential in the diet. Thus this finding has opened up a whole new area of the role of essential dietary fatty acids in brain function.

Our earlier studies showed that cerebral edema produced in cats by a freezing lesion affects primarily white matter underlying the lesion area, with only small changes in water and electrolyte content of cerebral cortex tissue. More recent studies by Dr. Pappius and Dr. L. A. Dayes and Mrs. H. Szylinger have shown that hypertonic urea, an agent used to dehydrate cerebral tissues, affects the potassium content of cerebral tissues in animals with cerebral edema strikingly differently than tissue from normal animals. This indicates that edema, or damage in general, may result in other generalized changes in the brain which warrant close study.

Another type of cerebral swelling, associated occasionally with the use of the artificial kidney, has been investigated in collaboration with Dr. J. B. Dossetor and Dr. J. Oh of the Renal Unit of the Royal Victoria Hospital. We have shown that such osmotically induced swelling is not as common an occurrence as was believed, but that increased CSF pressure was always observed during hemodialysis. It was concluded that osmotic effects on CSF volume play an important role in neurological complications associated occasionally with rapid hemodialysis. In a few instances where osmotically induced cerebral swelling occurred studies showed clearly that this type of swelling is quite different from that induced by trauma.

Mr. R. Tariq Khan completed studies on the different forms of binding of  $\gamma$ -aminobutyric acid (GABA) in brain. Dr. Ikuko Koyama and

Miss Paula Berger are continuing studies on amino acids in brain with Dr. Elliott. Dr. Koyama has established methods for determining a variety of free and bound amino acids in brain. Miss Berger, using radio-active GABA, has shown that one of the two forms of bound GABA is separated by a normally impermeable barrier from free GABA and the other form of bound GABA.

Dr. Irving Heller and Mr Sigurd Hesse have completed their studies of the thiamine content of rat sciatic nerve. They have identified thiamine as the substance which allows the nerve respiration to respond to stimulation. The stability of thiamine proosphate compounds in nerve is essential for the normal metabolic response to added substrates and to electrical stimulation and this stability requires the presence of glucose or of bicarbonate and carbon dioxide.

The generosity of the Donner (Canadian) Foundation this year enabled us to purchase an automatic scintillation spectrometer to enable us to pursue tracer techniques with radioisotopes. Already this fine instrument is being used almost daily. It will enable us to study the way in which gangliosides are synthesized in the brain and to pinpoint the metabolic abnormalities which lead to the degradation of gangliosides in asphyxia. It is also giving us clearer ideas of the nature of different forms of binding of amino acids and the way they are produced.

Dr. M. W. Spence has been granted a renewal of his Medical Research Council Fellowship. Dr. J. A. Lowden received his Ph.D. in June, 1963 and is now at the Research Institute, Hospital for Sick Children, Toronto. Tariq Khan will shortly be granted his M.Sc. from McGill.

Dr. Wolfe was invited to participate in a panel on the mode of action of local anaesthetics, at the Third World Congress of Anaesthesiology, at Sao Paulo in September, 1964. He was elected to membership in the American Association of Biological Chemists, is president of the Montreal Biochemical Circle, and is a member of the Permanent Committee on Undergraduate Medical Education of McGill.

# ELECTROENCEPHALOGRAPHY & CLINICAL NEUROPHYSIOLOGY

<i>Consultant</i> .....	HERBERT JASPER, Ph.D., D.ès Sci., M.D., C.M.
<i>Electroencephalographer</i> .....	PIERRE GLOOR, M.D., Ph.D.
<i>Assistant Electroencephalographers</i> .....	FREDERICK ANDERMANN, B.Sc., M.D. DONALD LLOYD-SMITH, B.Sc., M.D., C.M., F.R.C.P. (C)
<i>Fellows:</i>	
ROGER BROUGHTON, M.D. (Queen's) M.R.C. Fellow	WILLIAM McCANN, M.D. (Georgetown Univ.)* AHMET SATOGLU, M.D. (Izmir, Turkey)
JEROME DAVIS, M.D. (N.Y.)*	KEITH SEAMANS, M.D. (New Brunswick)*
PHILIP GRISHAM, M.D. (Seattle)*	TOSHIKIYO SHOHMORI, M.D. (Japan)*
DANILO GUZMAN, M.D. (McGill)*	G. M. TAORI, M.D. (India)
KAZUO KINOSHITA, M.D. (Japan)*	ANDREW WONG, M.D. (Queen's Univ.)*
<i>Chief Technician</i> .....	LEWIS HENDERSON
* Six months on this service	

The year 1964 has again been very busy. The steady increase in work load has shown no sign of levelling off. A total number of 3,516 electroencephalograms were taken, of which many represented complex and time-consuming special procedures. The number of these seems to show even a higher rate of increase than that of the overall number of examinations. The break-down of the examinations, according to the referral diagnosis is shown in the following table :

Epilepsies .....	1,470
Cerebral tumours (proven or suspected) .....	501
Head injuries .....	325
Headaches .....	249
Cerebral vascular disease .....	203
Behavior problems and mental retardation ....	45
Multiple sclerosis .....	35
Parkinsonism .....	35
Syncopes .....	27
Aneurysms .....	18
Miscellaneous .....	608
TOTAL	3,516

Of all the patients examined in this laboratory 1,783 came from the Montreal Neurological Hospital, 586 from the Royal Victoria Hospital, 378 from the out-patient departments of the Royal Victoria Hospital and 769 patients were referred from private offices and other hospitals.

In the operating room 53 electrocorticograms were recorded from the exposed brain in patients undergoing surgical treatment for focal cerebral seizures.

From January to May 1964, 185 electromyograms were carried out. Unfortunately, this important diagnostic service had to be suspended for the remainder of the year. It is probable that this laboratory service will have to remain dormant until the help of a fully qualified electromyographer can be enlisted.

During the past year, Dr. Frederick Andermann has joined our staff as Assistant Electroencephalographer and we are pleased to welcome him among us. His special interest and experience in paediatric EEGs will be of great value in enhancing the stature of our laboratory.

It is with regret that we record the departure of Dr. Herbert Jasper from the Montreal Neurological Institute and Hospital, which brings to an end a close association with the work of our laboratory, which he had founded and chaired for so many years, developing it from beginnings to one of the leading laboratories of the world. We are conscious of his legacy and determined to maintain the high standard he has set for us.

The following young physicians have been in training in our laboratory during 1964 :

Dr. Guy Geoffroy from Montreal; Dr. Jean-Louis Lalonde from Montreal; Dr. Manoucher Gueramy from Iran; Dr. Ahmet Satoglu from Turkey; Dr. Girdharilal Taori from India; Dr. Andrew Wong from China; Dr. William P. McCann from the United States; Dr. Jerome Davis from the United States and Dr. Philip Grisham from the United States.

In the autumn of 1964 we acquired a computer of average transients, a very versatile instrument which, among others, will allow us to record and study evoked potentials in man. Dr. Roger Broughton, a young Canadian physician, who obtained his training under Dr. Henri Gastaut in Marseille, has taken charge of this work, and we are pleased that he will join our staff as Associate Electroencephalographer and Clinical Neurophysiologist.

The research activities of the department have mainly been directed towards the study of complex seizure mechanisms by using the method of intracarotid Sodium Amytal and Metrazol injections, a project carried out in conjunction with Drs. T. Rasmussen and H. Garretson. The technique of these procedures has been further refined, resulting in a greater reliability of the results thereby obtained.

Teaching facilities for fellows and technicians in training consisted of weekly conferences and lectures held over a period of four months. They have been supplemented by evening seminar sessions held every three weeks for the fellows in training. Many important aspects of clinical neurophysiology and electroencephalography were reviewed during these seminars, which required the active participation of the fellows in training.

We would like to conclude this report by expressing our appreciation to our technicians and all the other laboratory personnel, whose conscientious and diligent efforts have made it possible to carry out our work competently and efficiently.

## EXPERIMENTAL NEUROPHYSIOLOGY

<i>Consultant</i> .....	HERBERT JASPER, Ph.D., D.ès Sci., M.D., C.M.
<i>Acting Neurophysiologist</i> .....	PIERRE GLOOR, M.D., Ph.D.
<i>Fellows:</i>	
THEODORE BAIZ, M.D. (Washington)*	ALAIN GODON, M.D. (U. de Mont.) M.R.C. Fellow
GASTONE CELESIA, M.D. (Genoa, Italy)* M.R.C. Fellow	ANTHONY GORMAN, M.D. (Rochester, N.Y.) U.S.P.H. Fellow
FLAVIO COCEANI, M.D. (Bologna, Italy)*	ROY STEINBERG, M.D. (New York) U.S.P.H. Fellow
<i>Nurse in Charge of Neurophysiology Laboratories and Animal Quarters</i> .....	
MARY ROACH, A.R.R.C., R.N.	

\* Six months on this service

In the neurophysiology laboratory during the past year a very active group of fellows was engaged in a variety of projects, making use of a great number of laboratory techniques.

Changes in retinal activity and in the functional state of other parts of the visual system within the brain in response to light and dark adaptation and to various levels of arousal were studied by Dr. Roy Steinberg. The results obtained provided the material for a doctoral thesis, submitted to the Faculty of Graduate Studies and Research.

Dr. Anthony Gorman investigated the action of polarizing currents upon cortical neuronal elements, with intra and extra-cellular recordings, demonstrating the importance of presynaptic terminals in the mechanism of the observed changes in cortical activity.

Drs. Herbert Silfvenius and Bartolo Barone studied the effect of local cooling upon cortical activity, especially evoked potentials.

An electrophysiological study of the role of efferent motor cortex fibers to the VL-nucleus of the thalamus was undertaken by Dr. Alain Godon.

A group of fellows, Mr. R. Tariq Khan, Dr. Gastone Celesia, Dr. Flavio Coceani, was engaged in investigating the local production of some biologically active substances by the cerebral and cerebellar cortex, using a perfusion chamber technique. This work was carried out in conjunction with the neurochemistry laboratory. It was shown that various physiological states of cortical activity are associated with a different pattern of release of substances. The observations made contributed to a further understanding of chemical and neurophysiological mechanisms involved in the regulation of arousal and sleep.

The effects of intracarotid injection of Sodium Amytal upon Penicillin-induced cortical epileptogenic foci was investigated by Drs. Flavio Coceani and Israel Libman. Dr. Theodore Baiz, in another series of experiments, studied the response of such foci to the intracarotid injection of Xylocaine.

The topical specificity of the epileptogenic action of locally applied Penicillin in monkeys and cats was the object of a study carried out by Mr. Gordon Hall with the help of Dr. Flavio Coceani.



The supervision of these numerous projects and the teaching and guidance of the fellows engaged in them was no mean task. Most of the projects were under the direction of Dr. Herbert Jasper, a smaller number under that of Dr. Pierre Gloor. Dr. Jasper's departure at the end of 1964 will be sorely felt. We hope that it will soon be possible to find a highly qualified neurophysiologist, who will take over the direction of the experimental neurophysiological research activities at the Institute.

The facilities of the laboratory were also used in part by experimental workers from the neurochemistry, neuropathology and neuroisotope laboratories. A total of 550 experimental procedures were carried out in 1964. It should therefore come as no surprise that this has been a very busy year for Miss Mary Roach and her two assistants, who have succeeded in keeping the laboratory efficient, well equipped and in a state of spotless cleanliness.

Our electronic engineer, Mr. Ralph Jell and his technicians, Mr. Eddie Puodziunas and Mr. Claude Gagnier, deserve equal credit for the expert assistance they have given to all the investigators, who used a variety of electronic equipment.

## NEUROPATHOLOGY

<i>Neuropathologist</i> .....	GORDON MATHIESON, M.B., Ch.B., M.Sc.
<i>Assistant Neuropathologist</i> .....	GILLES BERTRAND, B.A., M.D., M.Sc., F.R.C.S. (C)
<i>Fellows:</i>	
G. Th. A.M. BOTS, M.D. (Leiden)	ARTHUR SCHWARTZ, M.D. (Queen's)
AMADO ESPINA, M.D. (Venezuela)*	
PHILIP GRISHAM, M.D. (Seattle)	MARIO SCULCO, M.D. (Boston)*
GEORGE KARPATI, M.D. (Newfoundland)*	
KAZUO KINOSHITA, M.D. (Kyushu Univ. Japan)*	ORLANDO SOLIS, M.D. (Mexico)*
FALAH MAROUN, M.D. (Lebanon)*	
RICARDO RENGIFO, M.D. (Colombia via Vermont)	
<i>Chief Technicians:</i>	
JOHN GILBERT, R.T.	BARBARA NUTTALL, B.A., A.R.T.

\* Six months on this service

During the calendar year 1964 a total of 469 surgical specimens were examined and reported by the laboratory. Drs. Falah Maroun and Orlando Solis partook in this work. Of the 83 patients dying in the Institute, autopsy examination was carried out on 72, an autopsy rate of 86.7%. We are again much indebted to the Medico-Legal Institute of the Attorney General's Department for the opportunity to collaborate in the study of some 17 cases in which death was attributed to injury. All fatal cases dying in the Institute were reviewed at death rounds conducted by this department. In addition

selected cases were the subject of detailed clinicopathological analysis. Drs. Kinoshita, Sculco, Karpati and Rengifo were responsible for carrying out this phase of the service function of the department.

In the fall of 1964 we welcomed to the department Dr. G. Th. A. M. Bots of the Pathological Laboratory of the University of Leiden, Holland to spend a year with us. Dr. Bots has been reviewing our muscle biopsy material and is carrying out a follow-up survey with a view to assessing the value and limitations of this technique as it has been practised in the Institute over the years. He has also set up a technique for the cytological examination of the cerebrospinal fluid based on the method devised by Johannes Sayk, which is clearly a great advance on our previous methods. About the same time Dr. Arthur Schwartz joined us from Cleveland and is currently active in the tissue culture laboratory using both animal (chick embryo) and human tumour source material.

Structural modifications have been made in two of our smaller laboratories to provide a light-trapped darkroom suitably equipped for radioautography, a facility which we share with the Isotope Laboratory.

We look forward to the arrival of Dr. Stirling Carpenter from California to join the permanent staff of the Department. Dr. Carpenter's wide experience in neuropathology, electron microscopy and clinical neurology will add much strength to the department and help bring to fruition present plans to construct an electron microscopy laboratory in the Institute. With these developments in our capacity for investigation with modern techniques we look forward to the future with confidence.

## 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> .....	HENRY GARRETSON, M.D., (Harvard). MARIUS HEUFF, M.D. (Utrecht, Holland).
<i>Physicist</i> .....	CHRISTOPHER HASLAM, B.Sc., M.Eng., Eng.
<i>Visiting Scientist</i> .....	PROFESSOR R. L. de C.H. SAUNDERS, F.R.C.S. (E), F.R.S. (E). PROFESSOR of ANATOMY, Dalhousie Medical School.
<i>Visiting Technician</i> .....	MR. VICTOR CARVALHO, B.Sc.

### 1. *Brain Scanning and Cerebral Circulation Laboratory.*

There was an increase in the work of this Laboratory during 1964, with 1,137 scans on 518 patients as compared to 761 scans on 304 patients in 1963. This represents a 50% increase in the number of scans and a 70%

increase in the patient load. In addition, 117 cerebral circulation studies were made, using intravenous or intracarotid injection of radioactive tracers. Additional studies were also continued with Dr. Cosgrove, utilizing radioactive substances for investigation of the cerebral spinal fluid dynamics in patients with various demyelinating diseases.

The new quarters of this Laboratory on the third floor have allowed for more efficient, comfortable management of patients and for safer handling and storage of radioactive materials.

During 1964, three reports were published from this Laboratory summarizing our experiences with various radio-isotopes for brain scanning. These results indicate that Mercury<sup>203</sup> and <sup>197</sup> tagged onto a mercurial diuretic gave detection and localization in almost 90% of a series of patients with verified brain tumours. Failure of detection of some intracranial lesions in the 10% negative group were attributed to limitations of the instrument or lack of uptake of the radioactive tracer in small midline tumours or low grade gliomas and in a few cases to lesions which were distributed almost symmetrically on either side of the midline.

Some refinement of detection with brain scanning may be expected with the development of more selective radio-isotope tracers and with the use of larger detection crystals or multi-detection systems of the gamma-camera type. These latter approaches, though now on a research basis, can be expected shortly to be valuable enough to be applied to every day clinical diagnosis and investigation in this rapidly moving field.

We have completed a review of 50 patients with brain "strokes", produced by closure or narrowing of the arteries supplying the brain, and have correlated the findings from the brain scan and circulation studies with neurological findings and results of arteriography. Using Neohydrin Mercury<sup>197</sup>, a high percentage of patients with verified closure or abnormality of intracerebral arterial vessels showed a positive brain scan. Further studies are being done to define the time after a stroke when brain scanning may be expected to give the most useful information.

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

Closely related to the clinical uses of radioactive tracers in diagnosis and investigation, a program of research has been concentrated in this Laboratory on problems of the cerebral circulation. This main area of study has been selected for several reasons, including first of all the prominent role of cerebral vascular disease among the leading causes of death (third in the list) and of neurological disability. Secondly, surgical treatment is now available for patients who have narrow or closed arteries. It is essential that some objective means of assessing the level of blood supply to different parts of the brain be made available to evaluate surgical and other possible methods of treatment. The application of radioactive tracers for measuring the cerebral circulation promises to provide such a method.

In addition to the support from the Cone Memorial Research Fund, research projects have been aided from grants from private donors and from the National Cancer Institute and Medical Research Council of Canada. The work of Dr. Cosgrove has been supported in part by a grant from the Multiple Sclerosis Society of Canada.

During 1964 further studies have been made by the method which we have developed for measuring the cerebral blood flow directly on the exposed cortex of the brain at operation. This M.N.I. brain circulation technique depends upon the use of miniature radiation detectors placed on selected areas of the exposed brain and the rapid injection of the radioactive tracers by means of a tiny catheter placed in the internal carotid artery. This provides the surgeon with information which guides him in the more precise removal or closure of abnormal blood vessels in the brain and also yields new quantitative data of regional blood flow. This new method also employs the use of coloured dyes to give a striking visual picture of the blood flowing through the surface of the brain which has been recorded with a special rapid colour-photographic technique developed by Mr. Charles Hodge.

Towards the end of 1964, the pilot instrumental system which had proved satisfactory over the past two years in this method was extended by the purchase of new and more flexible recording equipment. Improved types of miniature detectors based on solid-state materials have shown considerable promise.

Reports of research projects were made to several neurosurgical societies and at the International Symposium on Regional Cerebral Blood Flow at Lund University, Sweden.

During the last three months of 1964, Professor Richard Saunders of the Department of Anatomy of Dalhousie University was a Visiting Scientist in the Cone Laboratory. This provided opportunity to review his fascinating work on the anatomical display of the small blood vessels of the brain using a new X-ray projection microscopic method. This anatomical information has a direct bearing on the problem of cerebral circulation studies by our radio-isotopic methods. A review with Dr. Saunders and Mr. Victor Carvalho of anatomical findings obtained on brain material prepared at the M.N.I. was prepared for publication.

A Radio-autography Laboratory for the Institute, planned in collaboration with Dr. Mathieson's Department, provides a much needed feature.

A beginning was made on the use of electromagnetic blood flow meter with Dr. Marius Heuff taking this as his main project under a grant from the Medical Research Council. Dr. Yamamoto has continued the study of how labelled isotopes build up a concentration in brain tumours and other lesions. Dr. Henry Garretson has played an active role in the operating room circulation studies, and has also continued work on the transplantation of gliomas into the anterior chamber of the eye in guinea pigs with the purpose of studying the time course of the mitotic cycles. Mr. Christopher Haslam, physicist-engineer and Mr. George Lootus, electronic technician, have worked

very effectively to keep the elaborate recording equipment and scanning equipment in satisfactory running order.

With increase in personnel and apparatus the laboratory was physically re-organized during the year to make more efficient use of space although the limit has now been reached. An apt summary of the activities in the Cone Laboratory for 1964 was expressed by one of the patients who said "time and space seem occupied".

## 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 year 1964 the work of this laboratory has continued the same pattern of relating basic research to the problems which arise from the study of patients with chronic neurological diseases.

Dr. Sherwin studied for a six-month period in Europe and was fortunate to visit several major centres there during his sojourn. Since his return he has continued and extended his previous studies on experimental allergic neuritis. These include a long term study on experimental neuritis in rabbits employing special techniques to study individual nerve fibres. Important antigenic differences were found between central and peripheral nervous tissue and studies on the antigenic composition of peripheral nerve are in progress. Dr. Sherwin has also begun a new series of investigations on the enzymatic and antigenic composition of brain tumors and focal epileptogenic tissues removed at surgery. Preliminary results indicate that there are significant variations in different brain tumors which are of theoretical interest and may aid in the clinical management of these patients.

During the summer Mr. Milton Owens, a third year medical student assisted in special studies on the sera of patients with various forms of muscle disease. Mr. John Armstrong, a fourth year medical student developed a technique for the three dimensional study of the plaques in Multiple Sclerosis. In addition he assisted with the blood-CSF permeability studies in patients with various neurological diseases.

Clinical investigations have continued on the natural history of Multiple Sclerosis and the correlation of this history with the alterations of protein fractions in the cerebrospinal fluid. New methods of microzone electrophoresis have been added and the technique of immunoelectrophoresis has been developed in order to study further the changes in the cerebrospinal fluid in various neurological illnesses.

The laboratory continues to supply the clinical services of the hospital with electrophoretic protein determinations of CSF. Last year 784 separate determinations were carried out.

## PSYCHOLOGY

<i>Clinical Research Psychologist and Medical Research Council Associate</i> .....	BRENDA MILNER, B.A., M.A., Ph.D.
<i>Assistant Psychologist</i> .....	LAUGHLIN B. TAYLOR, B.Ed., M.Sc.
<i>Research Associates</i> .....	ANTHONY W. H. BUFFERY, Ph.D. (Cantab.) ETIENNE PERRET, Ph.D. (Neuchâtel)
<i>Research and Clinical Assistant</i> .....	RUTH RADBILL, M.A.

This year has seen some changes of personnel in the psychology department, although its main orientation remains the same. Dr. Etienne Perret comes to us from Zürich for two years research on motor skills and problems of vigilance. He has developed a battery of tests of motor function which he will apply not only to patients with cerebral seizures but also to the patients with Parkinson's disease who are operated upon by Dr. Gilles Bertrand. It is hoped that these new tests will fill a long-felt gap in our research programme.

A fresh approach is also provided by Dr. Anthony Buffery, who comes here from Cambridge University, where he has just completed a Ph.D. thesis on the behavioral effects of frontal and temporal-lobe lesions in baboons. He hopes to adapt some of the techniques which have proved fruitful with lower primates to the study of temporal and frontal-lobe function in man.

During the past year Mrs. Suzanne Corkin completed her research on cortical representation in somesthesia, obtaining her Ph.D. degree. Dr. Corkin is now working as a Research Associate in Dr. Teuber's laboratory at M.I.T. We wish her continued success in her new research setting.

Dr. Donald Shankweiler has also left us, to take up a research appointment at the Haskins Laboratories in New York. His studies of auditory function in patients with temporal-lobe lesions yielded interesting data on the discrimination of both music and speech.

In addition to these more specialized research projects, the regular clinical work of assessment of patients with focal cerebral seizures continues to increase steadily from year to year. Mr. Taylor bears the brunt of this considerable work load, and is ably assisted by Miss Ruth Radbill, whose contribution to the examination of French-speaking patients is of particular value.

As in the past, we are greatly indebted to the nursing and technical staff, many of whom have acted as volunteer subjects for the standardization of new tests. Their continued cooperation makes possible the development of new and valid research tools.

## 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.)
<i>Visiting Research Fellow in Neuroanatomy</i> .....	OTTO R. HOMMES, M.D. (Amsterdam), Ph.D. (Utrecht).

This department can report a significant expansion of its activities over the past year.

The undergraduate neuroanatomy laboratory course under Dr. Morton's direction has undergone extensive revision during the 1964-65 academic period. New study materials, both gross and microscopic, have been introduced into the course; a new laboratory manual has been written; and a Neuroanatomy Laboratory Atlas for student use has been developed for the purpose of supplementing traditional study specimens, the supply and quality of which are not always reliable. Initial experiences with the Laboratory Atlas attest its value as a teaching technique.

The teaching program has benefited greatly by the support and cooperation of Professors LeBlond and Banfill and other members of the Department of Anatomy at McGill. We are particularly happy to learn that the histology laboratory will soon become the scene of major structural alterations which have been planned with a view to better adapting this area to neuroanatomy teaching.

Dr. Hommes has assisted actively in all aspects of undergraduate neuroanatomy teaching as well as in the series of review lecture-demonstrations given during the autumn for graduate students and Fellows.

Dr. Morton has resumed his quantitative histological studies of the human hypothalamus, with particular reference to the anatomical correlates of diabetes insipidus.

With the collaboration of Dr. Hommes a study has also been undertaken of the neuron density of the tuberal infundibular nucleus in both the normal hypothalamus and following hypophysectomy.

Dr. Walle J. H. Nauta of the Department of Psychology at the Massachusetts Institute of Technology delivered the Annual Neuroanatomical Lecture on the subject of "Connections of the Corpus Striatum".

The year ahead is anticipated as one of continued increasing activity in the areas of neuroanatomy teaching and research.

## NEUROPHOTOGRAPHY

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

Again this department has had a busy year in all sections.

The chart and graph section has been very active and completed over 1,000 charts during the past year.

The photographic section has been kept busy on both the clinical and research departments of the Institute.

In new work we have been taking up to four colour pictures a second in the operating room during dye injection studies. These photographs have proved extremely useful and more work will be carried out in this field during the next year.

Some progress has been made in the preparation of a teaching movie but this has been limited by the pressure of other work.

Mr. Hodge attended the Annual Meeting of the Biological Photographers Association in New York City in August.

## TUMOUR REGISTRY

DR. ARTHUR R. ELVIDGE

The incidence of patients treated for tumour of the Nervous System showed a slight increase in 1964. The records of 236 patients were processed by the Tumour Registry and 138 of these were cases of verified tumour. There were 111 surgical operations and 72 patients were treated by Roentgen-therapy with or without surgery. There were 114 visits to the clinics. Other patients were followed in private offices and by the Tumour Registry directly.

As indicated on previous occasions the purpose of the Tumour Registry is to record historical data and follow-up information in regard to patients who suffer from suspected or verified tumour of the Nervous System. This material is gathered from the clinics, offices and referring doctors. When necessary patients are traced through the Department of Demography at Quebec and at Ottawa. They are encouraged to report to clinic or to their doctor for follow-up and when necessary may obtain advice from the social agencies of the hospital. The records serve as source material for physiological and pathological investigations and clinical research into tumour growth under various forms of treatment.



The secretary of the local Tumour Registry in 1964 was Mrs. G. Guthro, who succeeded Miss E. McCarthy. They are thanked for their interest and conscientious endeavour. The Fellow of the Tumour Registry in 1964, Dr. O. Solis, attended clinics and took part in investigative work.

The Registry of the Montreal Neurological Hospital is a branch of the Central Tumour Registry of the Royal Victoria Hospital, which, at present, is under the direction of Dr. E. J. Tabah. Returns are made via the Central Tumour Registry to the Tumour Registry of the Province of Quebec, which published its first annual report in 1962. In the future this will be a valuable source of basic statistics regarding tumourous disease within the Province of Quebec. The Registry received a welcome visit from Dr. Edgar A. Bering Jr., of the Department of Health, Education and Welfare, National Institutes of Health, Washington. He was impressed by the number of brain tumours treated, the clinical and pathological data available, and looked forward to further reports, particularly on the intermediate group of gliomas. Methods of filing were discussed.

During 1964 clinical research has continued in association with several present and former Fellows. Dr. Solis commenced a clinical and pathological study of a large group of unclassified gliomas with specific reference to the results of surgery and roentgen therapy in the dominant and non-dominant hemispheres. On the pathological side an attempt was made to classify these tumours as accurately as possible and to correlate the clinical and histo-pathological findings in terms of malignancy. Dr. Barone conducted a study of long term survival in patients with cerebral glioma and a brief report has been accepted for publication. He continued with an extensive clinical and pathological analysis of the ependymomas. The review of carcinoma metastasis to the central nervous system, reported at the annual meeting of the Canadian Neurological Society 1963, is being completed by Dr. E. Berger for publication. The report by Dr. Rosario Musella regarding a Parkinsonion-like syndrome caused by a subarachnoid cyst situated above the vermis of the cerebellum was published. A similar study of an unusual frontal cyst, and a general review of the subject has been made by Dr. Prakash Tandon, now of Lucknow, India. He also made a brief study of the results and effects of surgery for neoplasm of the dominant hemisphere. A long term follow-up of a series of patients treated by interventriculostomy for stenosis of the aqueduct of Sylvius and neoplasm of the brain stem was read at the Canadian Neurological Society, and has been submitted, in part, for publication.

## FELLOWS' LIBRARY

DR. DONALD McRAE

The library in a hospital and a research institute is apt to be taken for granted. In that sense, it is a quiet service but otherwise it is far from quiet. Our library has 164 registered users and an average daily attendance of between 20 and 25. In addition, about 6 books and journals per day are borrowed for use outside of the library. The librarian supplies personal services such as aid in searching the literature and compiling bibliographies, identifying obscure references and journal abbreviations, locating material in our library and other McGill libraries and answering telephone reference questions. In addition, she arranges for inter-library loans to and from libraries outside of McGill and outside of Montreal.

The library is an essential tool for patient care and should be supported in part by hospital insurance grants. It is also an essential tool for research and should receive a proportion of research grants from outside sources as well as a proportion of the Montreal Neurological Institute endowment income for research. It is also an essential tool for teaching and should receive some income from university sources.

The library is currently receiving 171 journals, some weekly, some monthly and some quarterly. Of these, we bind and keep 35. We keep 55 unbound titles and pass the remainder to McGill or some other library to keep or to dispose of as they see fit. In 1964, we purchased 148 monographs and textbooks. We received 39 books as gifts from members of the staff and from the Osler Library of McGill, the Canadian Medical Association and the Ciba Company.

During the year, Mrs. A. Melzak resigned as Librarian to take up a position in the Department of French at McGill University. We are all grateful for her pioneering efforts over the previous two years in re-organizing the library, in bringing the catalogue up to date and in instituting the valuable personal services mentioned above. We wish her well in her new endeavor. Her place has been taken by Miss Sandra Duchow, B.A., B.L.S., who has continued the fine work with no break in the continuity.

## MONTREAL NEUROLOGICAL SOCIETY

*President* ..... DR. J. B. R. COSGROVE  
*Vice-President* ..... DR. CLAUDE GAUTHIER  
*Secretary-Treasurer* ..... DR. PHANOR PEROT

Twenty-eight meetings of the Section of Neurology of the Montreal Medico-Chirurgical Society were held from September 16th, 1964 to May 5th, 1965.

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

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

- DR. JAN JIROUT, Prague, Czechoslovakia: "The Roentgen Anatomy of the Spinal Cord and its Meninges as Shown by Pneumomyelography as well as the Diagnostic Uses of Pneumomyelography."
- PROFESSOR D. DILENCE, Radiologist, Neurosurgical Clinic of Dr. David, Paris: "Some Results with Ophthalmic Arteriography."
- DR. K. KRNJEVIC, Visiting Professor from Cambridge University via McGill Department of Physiology: "Cholinergic Pathways in the Cerebral Cortex."
- DR. T. H. WILLIAMS, Lecturer in Experimental Neuroanatomy, Manchester University: "Some Aspects of Cardiac Innervation."
- DR. SEAN MULLAN, Division of Neurological Surgery, University of Chicago: "An Experimental Approach to the Problem of Cerebral Aneurysms."
- DR. H. FERNANDEZ-MORAN, Professor of Biophysics, University of Chicago: "Molecular Organization of Nerve Cell Membranes."
- DR. CLAUDE FORTIER, Chairman, Department of Physiology, Laval University: "Neurohumoral Control of ACTH Secretion."
- DR. R. M. P. DONAGHY, Division of Neurosurgery, University of Vermont: "Use of Magnification in Neurosurgery."
- DR. RICHARD L. ROVIG, Division of Neurosurgery, Jefferson Medical College: "Cushing's Disease and Pituitary Tumours; the role of the hypophysis in hyperadrenalism."
- DR. JEAN BOUCHARD, Department of Radiology, Royal Victoria Hospital: "Radiation Therapy of Brain Tumours in Children; long-term results."
- DR. W. JAMES GARDNER, Department of Neurosurgery, Cleveland Clinic: "Syringomyelia, its Relationship to Myelomeningocele."
- DR. HOLLIE E. McHUGH, Otolaryngologist-in-Chief, Royal Victoria Hospital: "Hearing Tests in Otologic Diagnosis."
- DR. J. A. SIMPSON, Professor of Neurology, Glasgow University: "Polyneuropathy."

- DR. WALLE J. H. NAUTA, Department of Psychology, M.I.T.: "Annual Neuroanatomy Lecture — Connections of Corpus Striatum."
- DR. JOHN B. DOSSETOR, Director of Renal and Urological Research, Royal Victoria Hospital: "The Acid-Base Disturbance with Neurogenic Hyperventilation; Hyperlactatemia."
- DR. E. S. GURDJIAN, Professor of Neurological Surgery, Wayne State University: "Mechanism of Head Injury Studied by Various Techniques including High-Speed Cinephotography."
- DR. DOMINICK P. PURPURA, Neurophysiologist, Columbia University: "Intrathalamic and Thalamocortical Synaptic Organizations in Regulation of Motor Cortex Activity."
- DR. HANS-LUKAS TEUBER, Chairman, Department of Psychology, M.I.T.: "Alterations in Perception after Penetrating Brain Wounds in Man."
- DR. D. F. PARSONS, Assistant Professor of Medical Biophysics, University of Toronto: "Correlation of Structure and Function in Mitochondrial Membrane."
- DR. PAUL C. BUCY, Professor of Surgery (in charge of Neurological Surgery), Northwestern University Medical School, and Head of the Section on Neurological Surgery at the Chicago Wesley Memorial Hospital: "Annual Hughlings Jackson Lecture of the M.N.I. — The Delusion of the Obvious."

The Annual Dinner of the Society was held on May 12th, 1965 at Hélène de Champlain restaurant.

To honor their contribution to Canadian Neurology the following were given life membership in the Society: Ramon Amyot, Arthur Elvidge, Wilder Penfield, Jean Saucier, Norman Viner and Arthur Young.

## FELLOWS' SOCIETY

<i>President</i> .....	DR. GASTONE CELESIA
<i>Vice-President</i> .....	DR. MATTHEW SPENCE
<i>Secretary-Treasurer</i> .....	DR. NORMAN LUSH

The Fellows' Society in 1965 again has had a very active scientific and social year. There were a total of sixty-five fellows in training at the Montreal Neurological Institute and Hospital. Approximately 30 fellows are here for their full training, either in basic or clinical sciences, the remaining thirty-five on a shorter time basis to complete some facet of their training.

Throughout the year the Fellows' Society was addressed by a number of distinguished guest speakers. These were as follows:

Professor Jan Jirout, Neurological Clinic, Prague, Czechoslovakia — Roentgen Diagnosis of Incipient Disc Disease.

Dr. Benoy G. Chakravorty, Calcutta, India — Arterial Supply of the Cervical Spinal Cord and its Role in the Pathogenesis and Treatment of Cervical Spondylotic Myelopathy.

Dr. Sean Mullan, Division of Neurological Surgery, University of Chicago — Percutaneous Cordotomy.

Dr. D. Elmquist, Farmakologiska Institutionen, Lunds Universitat, Lunds, Sweden — Electrophysiological Studies on Myasthenia Gravis.

Dr. R. M. Peardon Donaghy, Division of Neurosurgery, University of Vermont, Burlington, Vermont — Interesting Aspects of Intravascular Fat.

Dr. W. James Gardner, Cleveland, Ohio — Hemifacial Spasm and Trigeminal Neuralgia.

Dr. J. Simpson, Division of Neurology, Glasgow University, Scotland — Electromyography.

Dr. C. Branch, McGill University and Montreal Neurological Institute — Neurosurgical Techniques.

Dr. D. Brewerton, Westminster Hospital, London, United Kingdom — Treatment of Cervical Disc Syndrome.

The social events included the Annual Spring Picnic, the Christmas Party and the Annual Winter Dance sponsored by the Abbott Laboratories.

The academic year closed on May 28th, 1965, with the Ninth Annual Fellows' Society Lecture given by Dr. Igor Klatzo of the National Institutes of Neurological Diseases and Blindness,, Bethesda, Maryland, who spoke on "The Experimental Studies on Blood-Brain Barrier and Brain Edema".

Officers for the coming academic year are:

President: Dr. Danilo Guzman

Vice-President: Dr. Keith Seamans

Secretary-Treasurer: Dr. Frank LeBlanc

## 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.
603. Advanced Neuroanatomy for selected group; times to be arranged.  
Professor McNaughton and Staff

#### 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 Gloor and Wolfe
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 LOCALISATION: Clinical Electroencephalographic and Roentgenographic Conference.  
M.N.I. 1 hour weekly (9 months). Tuesdays, 4:00 — 5:00 p.m.  
Professors Rasmussen, 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 Wolfe

#### NEUROPATHOLOGY

650. Six months laboratory work in Neuropathology.  
Professors Mathieson and Bertrand
651. Conference in Neuropathology, Thursdays, 4:00 — 5:00 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 and Lloyd-Smith

# MONTREAL NEUROLOGICAL INSTITUTE

## PUBLICATIONS

1964-65

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MONTREAL NEUROLOGICAL HOSPITAL  
BALANCE SHEET — DECEMBER 31, 1964

ASSETS

GENERAL FUND

Cash on hand .....			\$ 880
Accounts receivable —			
Hospital Insurance Service .....		\$ 14,842	
Patients' accounts prior to commencement of Provincial Insurance Plan .....	\$ 78,536		
Less: Allowance for uncollectible accounts .....	<u>78,535</u>	1	
Patients' accounts after commencement of Provincial Insurance Plan .....	112,819		
Less: Allowance for uncollectible accounts .....	<u>10,000</u>	<u>102,819</u>	117,662
Inventory of supplies — at cost .....			22,859
Deficit account (statement attached) .....			<u>650,683</u>
			<u>\$ 792,084</u>

PLANT FUND

Buildings — non-depreciable .....			\$2,825,588
Equipment — depreciable .....	\$1,453,207		
Less: Accumulated depreciation .....	<u>777,011</u>	<u>676,196</u>	\$3,501,784
Equipment Depreciation Fund —			
Unexpended balance .....			29,133
			<u>\$3,530,917</u>

LIABILITIES

GENERAL FUND

Due to the Royal Institution for the Advancement of Learning .....			
Current account .....			\$ 141,401
Advances to cover deficit .....			650,683
			<u>\$ 792,084</u>

PLANT FUND

Plant capital account .....			\$3,530,917
			<u><u>                    </u></u>

A U D I T O R S ' R E P O R T

The Board of Management,  
Montreal Neurological Hospital,  
Montreal, Que.

We have examined the balance sheet of the Montreal Neurological Hospital as at December 31, 1964, and the related statements of revenue and expenditure and deficit for the year ended on that date and have obtained all the information and explanations we have required. Our examination included a general review of the accounting procedures and such tests of accounting records and other supporting evidence as we considered necessary in the circumstances.

In our opinion, and according to the best of our information and the explanations given to us shown by the books of the Hospital, the accompanying balance sheet and related statements of revenue and expenditure and deficit present fairly the financial position of the Hospital as at December 31, 1964 and the results of its operations of the year ended on that date, in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Montreal, Que.  
MARCH 26, 1965

Touche, Ross, Bailey, Smart  
Chartered Accountants.

# MONTREAL NEUROLOGICAL HOSPITAL

## STATEMENT OF DEFICIT ACCOUNT FOR THE YEAR ENDED DECEMBER 31, 1964

	Shareable	Non Shareable	Total
Accumulated deficit at December 31, 1963	\$ 367,953	\$ 335,373	\$ 703,326
<i>Deduct:</i>			
Prior years' adjustment	670	8,947	9,617
Quebec Hospital Insurance Service —			
Final payment in settlement of			
1962 deficit	93,701	—	93,701
Interim payment on account of			
1963 deficit	128,000	—	128,000
Transfer of unrecoverable portion of			
1962 deficit on shareable operations	16,502	(16,502)	—
	129,080	342,928	472,008
Deficit for the year — statement attached	220,284	(41,609)	178,675
Accumulated deficit at December 31, 1964	\$ 349,364	\$ 301,319	\$ 650,683

# MONTREAL NEUROLOGICAL HOSPITAL

## STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDED DECEMBER 31, 1964

	Shareable	Non Shareable	Total
<i>Expenditure:</i>			
Salaries and wages	\$1,455,759	—	\$1,455,759
Medical and surgical supplies			
and drugs	122,156	—	122,156
Depreciation on requirement	90,825	—	90,825
Miscellaneous supplies, services			
and expense	613,500	\$ 6,185	619,685
	2,282,240	6,185	2,288,425
<i>Revenue:</i>			
In-patients			
Quebec Hospital Insurance Service —			
Interim payments received or			
receivable in accordance with			
the contract (Note 1)	1,173,516	—	1,173,516
Equipment depreciation fund payments	90,825	—	90,825
Patients	541,264	49,237	590,501
Out-patients	84,750	—	84,750
Province of Quebec grant	90,000	—	90,000
City of Montreal grant	67,500	—	67,500
Miscellaneous revenue	14,143	—	14,143
Allowances	(42)	(1,443)	(1,485)
	2,061,956	47,794	2,109,750
Deficit for the year (Note 1)	\$ 220,284	(\$41,609)	\$ 178,675

Note 1. Interim payments under the Quebec Hospital Insurance Act are based on the budget for 1964 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 Act.

# MONTREAL NEUROLOGICAL INSTITUTE

## RESEARCH AND TEACHING EXPENDITURE SUMMARY FOR THE YEAR ENDING DECEMBER 31, 1964

from Major MNI Endowment Funds .....	\$160,991.00
from MNI Special Funds .....	113,126.00
from General University Funds .....	9,200.00
from Medical Research Council Block Term Grant .....	75,000.00
from Various Annual Research and Fellowship Grants .....	290,570.00
TOTAL EXPENDITURE .....	<u>\$648,887.00</u>

### *ENDOWMENTS*

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

### *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. Public Health Grants — Dr. Milner
- National Cancer Institute of Canada Grants — Dr. Feindel  
— Dr. Garretson  
— Dr. Rasmussen
- 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. Milner  
— Dr. Wolfe

## DONATIONS TO SPECIAL FUNDS — 1964-65

<b>ANAESTHESIA RESEARCH FUND:</b>	
Anonymous .....	\$15,000.00
McNeil Laboratories .....	7,000.00
<b>BRAIN RESEARCH FUND:</b>	
Mr. A. Murray Vaughan .....	500.00
Mrs. A. Murray Vaughan .....	500.00
Mrs. Howard Pillow .....	4,000.00
<b>BORDEN COMPANY FOUNDATION FELLOWSHIP FUND:</b>	
Borden Company Foundation .....	4,800.00
<b>WILLIAM CONE MEMORIAL RESEARCH FUND:</b>	
Mr. B. A. Usheroff .....	250.00
Miss Rita Breitman .....	15.00
Dr. David Berger .....	25.00
Col. K. B. Jenckes .....	75.00
Mr. John Langdon .....	200.00
The Harold Crabtree Foundation .....	1,000.00
Mr. C. Edward Disher .....	1,000.00
Dr. Frank W. Morse .....	500.00
The Oaklawn Foundation — for fellowship .....	1,000.00
Mrs. Howard Pillow and Mr. & Mrs. A. Murray Vaughan .....	2,000.00
In Memory of the late Mr. John Conrad .....	2,342.00
Mrs. Edna Roberts in memory of Mr. E. Percy Roberts .....	100.00
<b>COSGROVE RESEARCH FUND:</b>	
Anonymous .....	200.00
Mrs. Treva Troutman .....	25.00
Mrs. Dorothy Owens .....	10.00
<b>DICK EPILEPSY FUND:</b>	
<b>GORDON LIBRARY FUND:</b>	
Anonymous .....	500.00
Dr. Edward Spudis .....	50.00
<b>HARVEY CUSHING CLINICAL RELIEF FUND:</b>	
Miss Mary Dey .....	50.00
Miss Lillian Sandler .....	10.00
Mr. Maurice Gabes .....	10.00
Mrs. F. Stott .....	10.00
Mr. J. Clare Wilcox .....	100.00
Miss Suzanne Cohen in memory of the late Mr. George Cohen .....	30.00
Miss Betty Whitman .....	50.00
Women's Auxiliary of the R.V.H. ....	3,000.00
Rotary Club .....	71.25
Dalse Welfare Club .....	100.00
In His Name Society .....	68.50
<b>HOSPITAL EQUIPMENT FUND:</b>	
Mrs. Anna Singer .....	100.00
Mr. William Stall .....	25.00
<b>MADISON WALTER MEMORIAL FUND:</b>	
<b>MARY MASSABKY FOUNDATION RESEARCH FUND:</b>	
Mary Massabky Foundation .....	192.67

M.N.I. NEUROSURGICAL RESEARCH FUND:

M.N.I. STAFF LOAN FUND:

MISCELLANEOUS SPECIAL FUNDS:

In Memory of the late Mr. G. A. Gaherty .....	190.00
In Memory of the late Master John Cartmel .....	80.00
In Memory of the late Mr. John W. Robinson .....	290.00
In Memory of the late Mrs. Maria von Nida .....	311.50

MULTIPLE SCLEROSIS CLINICAL RELIEF FUND:

Multiple Sclerosis Golf League .....	450.00
Montreal Association for Multiple Sclerosis .....	500.00

MULTIPLE SCEROSIS RESEARCH FUND:

MCNAUGHTON NEUROANATOMY RESEARCH FUND:

Anonymous .....	500.00
Mrs. Anna Aaron .....	50.00

NEUROLOGICAL RESEARCH FUND:

Estate of the late Mrs. Jean Stone .....	500.00
J. W. McConnell Foundation .....	3,000.00
Mrs. Peter Laing .....	1,000.00
Lady Pilditch .....	100.00
In memory of the late Mr. Myer Malcoff .....	75.00

NEUROPHYSIOLOGY RESEARCH FUND:

NEURORADIOLOGY RESEARCH AND TEACHING FUND:

NURSING FUND:

MACDOUGALL NURSING SCHOLARSHIP:

M.N.I. NURSING EDUCATION FUND:

Mrs. Sam Reitman in memory of Dr. W. V. Cone .....	300.00
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EILEEN C. FLANAGAN NURSING BURSARY FUND:

Miss B. Cameron .....	40.00
Mr. B. A. Usheroff .....	50.00
Mrs. Robert Hampson .....	50.00

OAKLAWN FOUNDATION FELLOWSHIP FUND:

Oaklawn Foundation .....	2,000.00
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PENFIELD RESEARCH FUND:

LEWIS REFORD FELLOWS FUND:

ROBINS RESEARCH FUND FOR VASCULAR DISEASES:

WOMEN'S AUXILIARY FUND:

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 .....	145
Motor Neurone Disease .....	14
Miscellaneous .....	12

### *Meninges:*

Meningocele & Myelomeningocele .....	8
Acute Purulent Meningitis .....	9
Headache .....	61
Subdural Haematoma .....	22
Intracerebral Haematoma .....	10
Epidural Haematoma .....	11
Extradural Haematoma .....	4
Subdural Hygroma .....	1
Subarachnoid Haemorrhage .....	49
Miscellaneous .....	11

### *Brain:*

Congenital Anomalies .....	11
Hydrocephalus .....	14
Abscess .....	9
Concussion .....	204
Contusion, Laceration, Traumatic Encephalopathy .....	86
Syncope .....	18
Epilepsy .....	375
Migraine .....	33
Parkinsonism .....	25
Thrombosis, Encephalopathy due to Arteriosclerosis .....	180
Intracranial Aneurysm .....	26
Encephalitis .....	14
Gunshot Wound .....	3
Miscellaneous .....	7

### *Tumours:*

Gliomas .....	23
Perineurial Fibroblastoma .....	4
Meningeal Fibroblastoma .....	27
Craniopharyngioma .....	3
Angioma .....	2
Glioblastoma Multiforme .....	28
Metastatic Carcinoma .....	33
Astrocytoma .....	16
Medulloblastoma .....	4
Ependymoma 4th Ventricle .....	5
Neurofibroma .....	2

Stenosis Aqueduct of Sylvius .....	8
Chromophobe Adenoma Pituitary .....	10
Sacral Radiculopathy due to Metastases .....	6
Tumours — Miscellaneous .....	10

*Spinal Cord:*

Compression of the Spinal Cord .....	16
Guillain-Barré Syndrome .....	3
Myelopathy .....	15
Syringomyelia .....	7
Poliomyelitis .....	1
Diastematomyelia .....	2
Cervical Spondylosis .....	13
Miscellaneous .....	6

*Cranial and Peripheral Nerves:*

Optic Neuritis .....	6
Trigeminal Neuralgia .....	50
Menière's Syndrome .....	14
Compression Ulnar Nerve .....	7
Compression Peroneal Nerve .....	3
Other Neuralgias .....	24
Neuropathy .....	20
Carpal Tunnel Syndrome .....	15
Paresis — Rt. Nerves .....	10
Miscellaneous .....	2

*Muscles:*

Myasthenia Gravis .....	6
Muscular Atrophy .....	4
Polymyositis .....	3
Spasmodic Torticollis .....	8
Miscellaneous .....	7

*Mental Diseases:*

Mental Retardation .....	14
Depression .....	19
Anxiety State .....	24
Conversion Hysteria .....	25
Alzheimer's Disease .....	7
Alcoholism .....	6
Schizophrenia .....	4
Miscellaneous .....	6

*Other Systems:*

Protrusion Disc — Lumbar .....	226
— Cervical .....	33
Fracture and/or Dislocation of Vertebral Column .....	42
Fracture Skull .....	54
Pain in Back .....	35
Pain — Miscellaneous .....	15
Traumatic Lesions & Infections .....	19
Miscellaneous .....	4

## CLASSIFICATION OF OPERATIONS

### *Craniotomy or Craniectomy:*

and Biopsy .....	4
and Decompression .....	4
and Drainage of Sub-Dural Haematoma .....	12
and Drainage of Intra-Cerebral Haematoma .....	11
and Drainage of Extra-Dural Haematoma .....	3
and Elevation of Depressed Skull Fracture .....	31
and Excision of Epileptogenic Focus (Lobectomy) (Hemispherectomy) .....	46
and Excision, Clipping or Wrapping of Aneurysm .....	29
and Exploration .....	5
and Hypophysectomy for Endocrine Control .....	4
and Hypophysectomy for Pituitary or Intra-Sellar Tumour .....	4
and Incision, Drainage or Removal of Cyst .....	2
and Plastic Repair of Dura (C.S.F. Rhinorrhea or Fistula) .....	1
and Plastic Repair of Skull Defect (Plate, Bone or Plastic) .....	11
and Removal of Arterio-Venous Malformation .....	2
and Removal of Cerebral Tumour .....	82
and Removal of Posterior-Fossa Tumour .....	13
and Trigeminal Massage or Decompression .....	2
and Trigeminal Rhizotomy .....	6
and Ventriculocisternostomy (Torkildsen's) .....	2
<b>274</b>	

### *Trepanation:*

and Biopsy .....	4
and Drainage of Sub-Dural Space .....	8
and Leucotomy (Lobotomy) .....	3
for Stereotactic Procedures .....	36
Ventriculography .....	9

### *Shunt Procedure:*

Ventriculo-Caval .....	20
Ventriculo-Peritoneal .....	4
<b>85</b>	

### *Laminectomy and Hemilaminectomy:*

and Anterolateral Cordotomy — Cervical .....	1
and Anterolateral Cordotomy — Thoracic .....	2
and Biopsy .....	3
and Decompression or Exploration of Spinal Cord for Spondylosis (Dentate Ligament Section) .....	25
and Decompression or Exploration of Spinal Cord (Trauma) .....	5
and Decompression or Exploration of Spinal Cord Tumour or Vascular Malformation .....	7
and Disceidectomy — Lumbo-Sacral .....	92
and Disceidectomy — Cervical .....	3
and Incision and Drainage of Intra-Medullary Cyst (Syringomyelia) .....	2
and Removal of Tumour — Intra-Medullary .....	3
and Removal of Tumour — Extra-Medullary, Intra-Dural .....	1
and Removal of Extradural Tumour — Metastatic, Bone tumours, etc. ....	2
and Rhizotomy .....	12

and Spinal Fusion with Bone Graft—Autogenous or Bone Bank .....	56
and Spinal Fusion with Wire or Plate .....	1
and Spinal Fusion—Cervical-Occipital .....	4
Discoidectomy—Anterior Approach—Lumbar .....	1
Plastic Repair of Cranium Bifida .....	1
Plastic Repair of Spina Bifida .....	2

*Nerve Explorations:*

and Anastomosis or Suture .....	1
and Avulsion or Section .....	17
and Excision of Neuroma .....	1
and Neurolysis, Transplantation or Decompression .....	13

*Artery Exploration:*

and Endarterectomy (Patch-Graft) .....	2
and Progressive Occlusion (Selverstone Clamp) .....	2
and Temporary Occlusion .....	5

*Wound Re-Opening:*

and Evacuation of Haematoma .....	3
and Exploration .....	2
and Further Removal of Brain Tissue .....	2
and Further Removal of Tumour .....	2
and Removal of Bone Flap, Tantalum Plate or Wire Mesh .....	1
and Repacking .....	1
Miscellaneous .....	33

*Radiological Procedures:*

Cerebral Angiography, Percutaneous (Carotid, Vertebral or Subclavian) .....	382
Cerebral Angiography by Catheter (Brachial, Femoral or Carotid) .....	108
Pneumograms under Anaesthesia .....	51
	<u>541</u>
TOTAL .....	121

CAUSES OF DEATH

Head Injury (concussion, contusion, haematomata, etc.) .....	13
Intracranial Tumour, Primary .....	16
Intracranial Tumour, Metastatic .....	8
Carcinoma (Generalized) .....	3
Miscellaneous Neurological Diseases .....	2
Multiple Injuries .....	3
Other Systems .....	3
Cerebro-vascular Disease (thrombosis, infarction, haemorrhage) .....	16
Intracranial Aneurysm (haemorrhage and haematomata due to aneurysm) .....	19
TOTAL .....	<u>88</u>