History 7 – Brawer to Present

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70. James Brawer (McGill: 1979-2013)

James Brawer came to McGill in 1975 as an Assistant Professor in our department as well as in the Department of Obstetrics and Gynecology. He had obtained a B.Sc. in Biology in 1966 from Tufts University, and then a Ph. D. in Neuroscience from Harvard in 1971. This was followed by a year as a NIH research Fellow at Harvard. From 1972-1975, he was an Assistant Professor of Anatomy at Tufts University School of Medicine.

After coming to McGill, Brawer became Associate Professor of Anatomy and Cell Biology and Obstetrics and Gynecology in 1977. In 1981, he became Professor of Obstetrics and Gynecology, and in 1983,
Professor of Anatomy and Cell Biology. In 2001, Brawer became a Core Member of the McGill Centre for Medical Education.

In his research career, Brawer focused on the neuroendocrinology of the arcuate nucleus of the hypothalamus, on binding sites for insulin and prolactin in the brain, on the polycystic ovarian condition, and on the stress response in mitochondria of astrocytes.

In later years, Brawer focused his interest on Medical Education. He analyzed the impact of medical dichotomies on congruent physician-patient relationships, the philosophical foundations of clinical practice, and the impact of peer review on lecturing. He published 90 peer-reviewed publications. An excellent teacher, Brawer gave for many years the very popular B.Sc. course on the Circuitry of the Human Brain. In the Basis of Medicine curriculum he was Chair of Unit 1 (Molecules, Cells and Tissues) and also taught Neuroanatomy in Unit 6 (Nervous System and Special Senses). In recognition of his excellent teaching, he won the Teacher of the Year Award from the McGill Medical Student Society in 2002, as well as the Certificate of Merit Award of the Canadian Association for Medical Education in 2004.

In 2013, Jim Brawer retired from McGill University as Emeritus Professor.

71. The 1981 Departmental Review

In 1981, McGill, urged by the Ministry of Education, had instituted five-yearly cyclical reviews of all university Departments. These were run by the Departments themselves, but with a strong external component. In 1991, Michael Gershon, Chairman of the Department of Anatomy and Cell Biology at Columbia visited our Anatomy Department at McGill and then wrote an external evaluation. This review and others (following) provide a snapshot of the strengths and weaknesses of our Anatomy Department during this era, and are worth examining:

In his review, while impressed with the accomplishments of the department, Dr. Gershon made several important criticisms:

“The Department is an extremely fragile one and unless action is taken soon to assist the department, a major asset of the University will rapidly converted into a distressing liability. The physical plant and facilities are antiquated, inefficient, and a significant obstacle for modern research and recruitment. Even the teaching space leaks, smells and may be toxic.

The current “stars” in the Anatomical firmament of McGill are aging and inbred. There is only one assistant professor, and he is quite senior. Staff of good quality have been willing to accept working conditions that would be appalling to outsiders. Excellent research is being done, but by a very senior faculty. The staff needs an infusion of youth. Much of the research, while impeccable in quality, is traditional in form. Newer areas of Cellular and Molecular Biology need to be introduced. The staff
members are aware of this and the phrase “molecular biology” was mentioned so frequently that one wondered if it was a new greeting in Montreal! However, hiring one young molecular biologist will not rectify a deficiency of either youth or molecular biology. Scientists need a critical mass of like-thinking fellow scientists in order to flourish.

The quality of teaching is excellent, but the teaching load is excessive and oppressive. Remarkably, this is a self-inflicted wound! However these teaching efforts cannot help but diminish the research productivity of the Department. Time spent in a classroom is rewarding, useful, and certainly necessary, but it is not time during which scientific discoveries are made, papers are written, or grant applications are filed. Discoveries are made in laboratories and grants are written in offices. The balance in the Department of Anatomy is so skewed toward teaching that the activity threatens the excellence of the Department. This teaching commitment is likely to interfere with recruitment, especially given that molecular biologists can be attracted to departments of Biology, Physiology, Biochemistry, and Microbiology where a much smaller fraction of teaching is required.”

In his report, Gershon recommended that, apart from renovations to address safety issues such as inadequate ventilation, the highest priority must be given to renovation of space which most affects research and recruitment. A major effort must be made to hire four or five new faculty members to create a critical mass of molecular biologists in a field that overlaps if possible with other strengths within the department or elsewhere in the University community. A decrease in the teaching load would also be very helpful. It is possible that fewer good Ph.D. students would be recruited if the Undergraduate and Masters Programs were to be curtailed, but it is not certain that this would occur, especially if the image of the department were to change to one with a new vibrant program in Molecular Biology.

On the same occasion as Dr. Gershon’s visit, a University cyclical review committee prepared an internal review. The committee was composed of Donald Baxter (Director of the Montreal Neurological Institute), Robert Carroll (Chair of the Department of Biology), W.S. Lapp (Physiology), Sharon Wood-Dauphinée ((Physical and Occupational Therapy) and a 3rd year Medical Student. Their report addressed many of the same issues as the report by Dr. Gershon, stating that: “The eighty-year old Strathcona building is an architectural delight but is totally unsuited for a department with wet research laboratories. There is no emergency electrical power system, jeopardizing the tissue culture incubators and deep freeze units. The wide geographical separation of research laboratories makes it difficult for staff and students to interact. All major grants are held by senior professors such as Drs. Leblond, Clermont and Osmond. Dr. Bergeron supplies 20% of the funding, Dr. Warshawsky supplies 6%. Amongst the four junior staff members hired in the past eight years, one was denied tenure and has left. Two left for personal and professional reasons, and only one remains”.

The committee was concerned about lack of guidelines for graduate students as well as the need for supervisory committees for each student. It was felt that Anatomy’s teaching programs, while an obvious strength, may also be their greatest weakness, and the department should consider reducing its
teaching commitments, especially in classical anatomy. The teaching and research goals of the department were seen to be potentially in conflict.


Carlos Morales came to our department at McGill in 1981 as a postdoctoral fellow. He had obtained a D.V.M. in Veterinary Medicine in 1977 at the Universidad del Nordeste, Argentina. From 1977-1980, he was a postdoctoral fellow at the same university. At McGill, Morales obtained a Ph.D. in 1984 under the supervision of Yves Clermont. He spent 1985-1987 as a Research Associate in the Biochemistry / Biophysics Program at Washington State University.
Morales returned to our department at McGill as an Assistant Professor in 1987. He was promoted to Associate professor in 1993, and to Full Professor in 2000. He was a FRSQ Chercheur Boursier Junior I and II (1989-1996) and Senior (1997-2001).

Administratively, Morales has served on numerous Departmental and University committees, including the University Biohazards committee.

Over the course of his research career, Morales’ interest focused on lysosomes, and especially their sphingolipid activator proteins (saposins) which are required for the lysosomal degradation of glycosphingolipids. Most of these saposins are derived from a precursor protein, prosaposin, and mutations in its gene are responsible for various lysosomal storage disorders. Morales discovered that prosaposin was sorted in the Golgi apparatus and transported to the lysosomes in a mannose-6-phosphate-independent manner. Recently, he demonstrated that sortilin is involved in the alternative sorting of prosaposin and saposins. He has shown that sortilin has a cytoplasmic binding motif similar to the mannose-6-phosphate receptor. This acts as an adaptor protein bridging the receptor and clathrin, a required step for the targeting of sorted proteins to lysosomes. He has recently found that sortilin is also involved in the targeting of several lysosomal hydrolases including cathepsin H, cathepsin D and acid sphingomyelinase.

Morales is currently interested in the intracellular transport mechanisms of the above molecules. A common feature of lysosomal sorting receptors such as sortilin and the mannose 6-phosphate receptor is that after delivery of their cargo to the endosomes, they are recycled back to the trans-Golgi network (TGN). The Morales lab is analyzing the mechanisms of “forward transport” (TGN to endosomes), and “reverse transport” (endosomes to TGN) of these receptors.

Morales has over 120 peer-reviewed publications and 27 book chapters. He has presented 36 invited talks, organized 11 meetings, and edited two books.

Throughout his career, Carlos Morales has been known as a superb and admired teacher. For many years he was the coordinator and principal lecturer in our B.Sc. course ANAT 261 (“Dynamic Histology”). He has also played a major role in the Basis of Medicine curriculum, especially teaching the reproductive organs in the Life Cycle Unit.

At the graduate student level, Morales has supervised over 16 M.Sc. students, and 7 Ph.D. students. He has also supervised the research projects of 60 undergraduate B.Sc, students!

He has introduced a variety of important teaching innovations, including the development of “digital slides” (see below). In recognition of his teaching achievements, Morales was named in 2004 to the Honor list for Educational Excellence of the McGill Faculty of Medicine. In 2015, he awarded the Leo Jaffe Teaching Award, long overdue, of the Faculty of Science.

For his scientific achievements, Carlos Morales was awarded the special service award of the International. Society of Andrology as well as the Outstanding Service award of the American Society of
Innovations in the Teaching of Histology

In past decades, students sat at long tables in the histology lab and each student had their own microscope and slide box containing a set of about 100 slides. In recent years, the histology laboratory has been completely renovated, and the students are now grouped in approximately 30 work tables. Each table has its own computer and television monitor by means of which students view a pre-laboratory talk delivered via a Power-Point presentation. Each table also has a microscope equipped with a digital camera linked to the TV monitor. By this means, groups of students can examine the microscope slides. Unlike gross anatomy, histology images are essentially two-dimensional, and thus can be realistically portrayed on a monitor screen. Such group viewing of images has allowed the use of a much smaller number of microscopes and slide collections to accommodate an ever-increasing number of students. This is a very important consideration when maintenance of such microscopes and slides is costly.

An important new innovation has come with the development of “digital slides” program by Dr. Morales (see above). To create this computer teaching program, over one hundred of our best histology slides were digitally scanned and the data was fed into a computer program whereby students can “examine” all regions of each slide at all magnifications right up to oil immersion. The system has worked extremely well and is eagerly used by the students. The main advantage of this new approach for the teaching of histology is the continuous availability of high quality “histological slides” which cannot be broken and can be improved and enriched over the years as histologists can digitally share the “perfectly fixed, cut and/or stained material” with their colleagues.
Digitization has also affected our student evaluation process. Formal final histology examinations were once carried out in the laboratory using a series of preparations on microscopes which students viewed sequentially. The final examinations are now held in a lecture theatre where students view sequential histological images on a large screen.

For student self-learning, the department has created a digital atlas of histology which has combined light and electron microscope images with schematic drawings.

73. The Facility for Electron Microscope Research (FEMR)

In the last decades of the twentieth century, electron microscopy remained a very important tool in our department, but as research methodologies evolved, other techniques such as confocal fluorescence microscopy increased in importance. As a result, our EM laboratory was less used by our departmental members. At the same time, it was becoming more and more expensive to maintain a modern state of the art EM facility. By the mid 1990’s, our EM laboratory had lost its MRC multiuser grant, and the department did not have enough funds to maintain its four electron microscopes.

In 1996, at the request of the Chair John Bergeron, an Advisory Committee (consisting of R. Murphy, M. Chrétian, A.C. Cuello, M.S. Du Bow, R. Michel and A. Shrier) recommended that the departmental EM laboratory be turned into a University Core Facility which would generate extra operating support and create interactions with scientists outside. At the same time, Hershey Warshawsky initiated talks with Bruce Lennox which led to the creation of this new facility.

To administer this facility, it was recommended that we hire a first rate molecular cell biologist who would extensively use electron microscopy in his or her work and who could attract members of other departments to use our facility. As a result, Hojatollah Vali was recruited to our department in 1998 as an Associate Professor.

This new facility, called the EM Centre, was created in 1997 from the integration of our EM laboratory with those of the Departments of Biology, Pathology, Mining, Metals and Materials Engineering, Chemical Engineering, the School of Occupational Health, and the Montreal Neurological Institute. Further collaboration with other institutions occurred in 2001. With a grant from the Canadian Foundation for Innovation (CFI), our EM Centre became the leading member of a regional imaging consortium called the Montreal Network for Materials, Structural and Molecular Imaging (MNMSM). This network included the Université de Montréal, the Ecole Polytechnique, and other industrial partners.

Finally, in 2003, our EM Centre changed its name change to the Facility for Electron Microscope Research (FEMR), whose mission is “to promote and advance the science and practice of all microscopic imaging and micro-diffraction techniques in order to elucidate the ultrastructure and function of diverse materials”.
At McGill, this FEMR facility is used by over one hundred investigators in twenty Departments, and spread over four Faculties. It is the only fully established cryo-TEM facility in Canada and one of only a handful in the world capable of collecting and processing atomic-resolution images at low temperatures (-160oC) and undertaking 3-D electron tomography (cryo-ET) of organelles, cells and tissues as well as other beam-sensitive materials at ambient and low temperatures.

Its equipment includes:

**Five Transmission Electron Microscopes**
1) FEI Titan Krios 300 kV Cryo-STEM (acquired in 2010)
2) FEI Tecnai G² F20 200 kV Cryo-STEM (acquired in 2009)
3) FEI Tecnai G² Spirit 120 kV TEM (acquired in 2011)
4) FEI Tecnai 12 120 kV (acquired in 2004)
5) Philips CM 200 200kV TEM (transferred from Physics dept.in 2008)

**Four Scanning Electron Microscopes**
1) Hitachi S-3000N Variable Pressure SEM (VP-SEM) (2001-2013)  
   (damaged by flooding and sold for scrap)
2) Hitachi S-4700 Field Emission-STEM (FE-STEM) (2001-2013)  
   (damaged by flooding and sold for scrap)
3) Hitachi S SU-8000 Field Emission-STEM (FE-STEM) (located in the Engineering Department)
4) Philips X-L30 Field Emission-STEM (FE-STEM) (located in the Engineering Department)

**One Confocal Microscope**
1) Zeiss L S510 Confocal Microscope under the supervision of Dr. John Presley

The centerpiece of the FEMR is the FEI Titan Krios 300 kV cryo-field emission scanning-transmission electron microscope (cryo-S/TEM). The acquisition of this advanced, multi-million dollar microscope; the first Krios to be installed in Canada, underscores McGill's commitment to leadership in both medicine and nano-biological research.

Researchers use cryo-TEM techniques to visualize a broad range of assemblies and nanometer-scale structures at near-atomic resolution and in three dimensions.

Cryo-TEM provides valuable structural information for numerous scientific disciplines including cell biology, microbiology, medical, biomolecular, molecular, pharmaceutical and materials sciences. It has emerged as the primary tool for correlating structural and dynamical information ranging from atomic
resolution structures obtained from NMR or X-ray crystallography all the way up to whole microorganisms and tissue sections. The future for cryo-EM is the comprehensive, high resolution structural mapping of entire cells, which will lay the structural foundation for understanding biological systems at unprecedented detail and providing the spatial context for systems biology.

**NOTE** These instruments are described in more detail in our departmental web site (see Facilities / FEMR)

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**74. Hojatollah Vali (McGill: 1998-)**

Hojatollah Vali joined our Department in 1998 as an Associate Professor. This was a joint appointment with the Department of Earth and Planetary Sciences, which had recruited Vali to McGill in 1997. Vali had obtained his Ph.D. in 1983 in Mineralogy from the Technische Universitat Munich in Germany. From 1983-1989, he did postdoctoral work at the same institution. During this period, he also served as a NRC Senior Fellow at the NASA Johnson Space Center (1996) and as a Staff Scientist (Geological and Planetary Sciences) at the California Institute of Technology (1988-1989).

In our Department, Vali was promoted to Full Professor. His primary role has been to administer and contribute to our department’s new Facility for Electron Microscopy Research (FEMR).

In his research career, Vali’s interest has encompassed a wide variety of topics. These include 1) the investigation of biomarkers as signatures of ancient biologic activity in intraterrestrial and extraterrestrial materials, 2) the interface between organic and inorganic systems leading to the nucleation and growth of crystals, as relevant to pathological mineralization in human tissues, 3) the study of intracellular magnetite crystal formation by magnetotactic bacteria and the investigation of biogenic magnetite nanocrystals, 4) characterization of the structure and texture of metallic substrates and the interactions of extracellular matrix proteins that are involved in cell adhesion on modified and
non-modified substrates; 5) investigation of the effects of fibronectin-modified surfaces of metallic stents on attachment, proliferation and migration of vascular smooth muscle cells, 6) investigation of the structure and composition of porous carbon- and silica-based supports to enable the design and syntheses of new types of supported catalyst systems.

In recent years, Vali has also collaborated with other members of our Department on topics including investigation of Golgi proteins during germ cell differentiation in the testis, the cytoplasmic droplet of spermatozoa, apoptosis in yeast cells, and extracellular matrix mineralization. A very productive researcher, Vali has authored or co-authored over 125 peer-reviewed scientific papers. In terms of teaching, he has taught the popular undergraduate (B.Sc.) course “Astrobiology”.

75. Chantal Autexier (McGill: 1997-)

Chantal Autexier joined our Department as an Assistant Professor in 1997. She had obtained a B.Sc. in Biology from Concordia in 1985 and a Ph.D. in Microbiology and Immunology from McGill in 1991. She did postdoctoral studies at Cold Spring Harbor Laboratory with Carol Greider (Nobel Laureate 2009) from 1991-1996.

At McGill, Autexier was promoted to Associate Professor in 2003 (with tenure) and Full Professor in 2010. She had salary awards as a MRC Scholar and FRSQ Chercheur-boursier Junior, Senior and National. She is a Senior Investigator at the Bloomfield Centre for Research in Aging at the Lady Davis Institute for Medical Research at Montreal's Jewish General Hospital. From 2009-2011, she was Associate Director
for Faculty Development and Training at this same institution. She has also served on several committees both at McGill and the Lady Davis Institute.

Chantal Autexier is an internationally recognized scientist in the field of telomerase structure and function. In her research career, she has aimed to identify and characterize specific and essential mechanisms regulating telomerase and telomere function in telomere maintenance, cellular immortalization and cancer that can be validated as specific and effective therapeutic targets in tumor cells and premature aging diseases of telomere maintenance.

Chantal Autexier has over 52 peer-reviewed publications, 11 reviews, 9 book chapters and 217 abstracts. She has given over 49 seminar presentations at McGill, and 54 more nationally and internationally. She has organized 8 conferences, and has given several media presentations on her telomerase work. She has been a reviewer for over 30 scientific journals and a grants panel member for several agencies.

In terms of teaching, Chantal Autexier co-ordinates and teaches the course: ANAT 541 (Cellular and Molecular Biology of Aging). She has also has taught in ANAT458 (Membranes and Cellular Signaling) and ANAT 690 (Cell and Developmental Biology), as well as teaching in the Departmental Medicine and to medical students.

She has supervised the research projects of over 8 B.Sc., 8 M.Sc. and 12 Ph.D. students. She has been on the advisory committee of over 41 graduate students and has been internal or external examiner for over 66 Ph.D. theses.

76. Natalie Lamarche-Vane (McGill: 1998-

Natalie Lamarche joined our department as an Assistant Professor in 1998. She had a salary award as a William Dawson Scholar from 2004-2014. She had obtained her B.Sc. (Biochemistry) at the Université de Montréal in 1987, followed by her Ph.D. (Molecular Biology) at the same university in 1993. From 1994-1998, she was a Postdoctoral fellow in the laboratory of Professor Alan Hall at the MRC Laboratory for Molecular Cell Biology, University College London, London, U.K.
After coming to McGill, Natalie Lamarche was promoted to Associate Professor (with tenure) in 2004, and to Full Professor in 2010. During these years, she was also a Chercheur Boursier, Junior, Senior, and National. Since 2010, she has been an Associate Member of the Department of Biology and the Goodman Cancer Research Center.

Administratively, Lamarche has served on various McGill committees. From 1998-2009, she was the Graduate Program of our Cell Biology and Anatomy program, and from 2010 to 2012 she served in the important role as the Interim Chair of our Department.

In her research career, Natalie Lamarche-Vane has investigated the role of small Rho GTPases in the context of neurobiology and cancer. These Rho GTPases (in particular Rho, Rac, and Cdc42) act as molecular switches that activate or deactivate intracellular signaling pathways. They play crucial roles in many cytoskeletal-dependent cellular processes such as cell migration and adhesion, morphogenesis, cell cycle progression, gene expression, and apoptosis. Each of these cellular functions has an active role during development and progression of cancer. In her neurobiological research, Lamarche has investigated the molecular mechanisms which underlie the effects of Rho GTPases leading to a coordinated and directed response of growth cone navigation. These GTPases regulate the actin organization of cells, and they are in turn regulated by extracellular axon guidance cues (e.g. netrin-1 molecules) which attract or repel different classes of axons. These cues act through cell surface receptors which pass on the message to intracellular signaling pathways. These in turn activate or deactivate the Rho GTPases. Growth cone attraction involves the netrin-1 receptor DCC (Deleted in Colorectal Cancer) whereas repulsion involves the UNC5H proteins.

The Rho GTPases themselves are activated by guanine nucleotide exchange factors (GEF) and are deactivated by GTPase-activating proteins (GAP). In principle, a surface receptor could activate a Rho GTPase by inhibiting a GAP or by stimulating a GEF. However it seems to be the indirect coupling of the receptor (via a signaling pathway) to a GEF that drives the Rho GTPase into its active state.

It was known that the binding of netrin-1 to the surface receptor DCC results in the activation of Rac1 GTPase, but the GEF involved in this process had not yet been identified. Dr. Lamarch-Vane’s work has determined that DCC, the SH3/SH2 adaptor protein Nck1, the Ser/Thr protein kinase p65-activated protein (PAK1), and the Rho GEF (called Trio) are all present in the same signaling complex, thus establishing Trio as a GEF that mediates netrin signaling in axon outgrowth and guidance through its ability to activate Rac1.

This work has and will continue to provide new insights into the molecular mechanisms of axon guidance and will also impact directly on the understanding of the pathology of mental retardation, neurodegenerative diseases, multiple sclerosis, dementia, Alzheimer’s disease, Down’s syndrome, spinal cord injuries, and brain tumors.
Regulators of Rho GTPases are critical for normal cellular responses and are targets for subversion during oncogenic transformation. The Lamarche-Vane lab recently identified a Rac1/Cdc42 regulator CdGAP as a novel molecular player in Transforming Growth Factor β signaling. The lab has also contributed to the identification of gain-of function mutations in the CdGAP gene linked to a human developmental disorder, the Adams-Oliver syndrome. This has provided the basis for the second thrust in the laboratory, i.e. to study the role of CdGAP in breast tumorigenesis, metastasis and developmental disease. The molecules identified in all of these studies may be important candidates for neurological and tumor drug therapy.

Lamarche-Vane has authored over 49 peer-reviewed publications and 2 book chapters, and has three patents. She has given over 68 invited seminars at McGill and elsewhere, over 20 of these at national and international meetings. She has organized 5 meetings, and has served on several grants panels. She has been an Associate Editor for Biology of the Cell, and a reviewer for over 22 journals.

She has supervised the research projects of students of over 16 undergrad B.Sc., 6 M.Sc., and 9 Ph.D. students as well as 4 Post-doctoral students. She has participated in numerous student advisory committees, comprehensive exams and thesis examinations at McGill and elsewhere.

In her teaching career, Natalie Lamarche coordinated and taught in numerous courses, including the undergraduate courses: Membranes and Cell Signaling, and Diseases of Membrane Trafficking and the graduate courses: Cell and Developmental Biology, and Experimental and Clinical Oncology.

77. Marc McKee (McGill: 1999-)
Marc McKee came to McGill from the Université de Montréal in 1998 as a tenured Associate Professor in the Faculty of Dentistry (Division of Biomedical Sciences) as well as in our Department of Anatomy and Cell Biology.

Marc had previously obtained a B.Sc. in our Department in 1982, followed by a M.Sc. in 1984, and a Ph.D. in 1987 under the supervision of Hershey Warshawsky. In 1987-1989 he was a Research Fellow in Orthopedic Surgery at Harvard and the Children’s Hospital in Boston, under the supervision of Melvin Glimcher and William Landis, and also spending much time during this period in the lab of Antonio Nanci at Université de Montréal.

In 1995 he joined the Université de Montréal as an Assistant Professor in the Department of Stomatology in the Faculty of Dentistry. In 1998, he was promoted to Associate Professor at the same institution. He was awarded salary awards as a Chercheur-boursier Junior I, II, Senior and Chercheur National.

After moving to our Department at McGill in 1998, McKee became Associate Dean (Graduate Studies and Research) in McGill’s Faculty of Dentistry in 1999. In 2006 he was promoted to the position of James McGill Professor in our Department and in the Faculty of Dentistry. This is the equivalent to a Canada Research Chair (Tier 1), and recognizes research of world-class caliber.

Administratively, McKee has served on many committees at the Departmental, Faculty and University levels in both our Department and the Faculty of Dentistry dealing with recruitment, promotions, tenure, research policies, etc.

McKee’s research has primarily focused on mineralization (calcification) of extracellular matrices in bones and teeth, and in other biomineralizing systems such as inner-ear otoconia and eggshells. In particular, he has investigated the role of mineral-binding proteins in normal mineralization and in pathologic mineralization as seen in urolithiasis (kidney stones), arthritis and vascular calcification (including atherosclerosis). He has studied how biomineralization is regulated by investigating the control of the phosphate/pyrophosphate balance in extracellular matrices by alkaline phosphatase and other pyrophosphate-handling proteins, and by investigating how extracellular matrix proteins and enzymes control mineral crystal growth. The proteins/enzymes focused upon include osteopontin, bone sialoprotein, dentin matrix protein-1, matrix Gla protein, ALPL, PHEX and PHOSPHO1. To study these processes, a variety of morphological, biochemical, immunochemical, cell biological and molecular techniques have used which include electron microscopy, atomic force microscopy, confocal microscopy, immunocytochemistry, in vivo experimentation using normal and transgenic mice, in vitro cell culture and crystal growth systems, and standard biochemical and chemical assays. In other work McKee has examined extracellular matrix organization and composition at cell-matrix and matrix-matrix interfaces, including at implantable biomaterial interfaces.
He has authored or coauthored 200 peer-reviewed publications, in addition to 364 conference abstracts. Many of the publications are in journals with high impact factors. He has an h-index of 52 (Thompson Citation Reports Core Collection Database) and 62 (Google Scholar Citations). He is one of only a few who have won two “Distinguished Scientist Awards” from the International Association for Dental Research, their highest honor for research achievements.

McKee has organized over 18 scientific conferences and has served on several editorial committees. He has been invited to speak at over 130 scientific conferences, as well as participating in many media and public relations presentations. He has served on numerous grants panels, reviewed many grants, and been a reviewer for over 50 scientific journals.

In terms of teaching, Marc McKee’s main contribution to our Department has been in coordinating and the giving of lectures in a major part of the Histology course to first year Medical and Dental students. He also designed and implemented with Hershey Warshawsky and Carlos Morales the transformation of the histology teaching lab into computer/microscope workstations with digital file access, also using digital materials prepared by departmental members Yves Clermont and Michael Lalli. He has supervised over 8 M.Sc. and 9 Ph.D. students as well as numerous undergraduate B.Sc. and dental students, both in our Department and in the Faculty of Dentistry.

In recognition of the high quality of his teaching, he has been awarded the Howard Katz award for teaching in Dentistry (2005) and the Faculty of Medicine Honor List for Educational Excellence (2008).

78. The New Light Microscopy (Confocal Immunofluorescence and STED Microscopy)

The early history of light microscopy has been described in a previous section of this work (see “A Brief History of Light Microscopy”). By the 1930’s, it could be believed that light microscopy, with its limit of resolution at 200 nm, had provided all that it was capable of, and it was proposed to Charles Leblond that, in terms of further research potential, “histology (i.e. light microscopy) was dead horse ... to be replaced by biochemistry”. He disagreed, and indeed a new technology came to the rescue of light microscopic investigation in the form of histochemistry. In this procedure, specific stains could identify specific classes of chemical molecules in tissues. In the case of the Golgi apparatus, for example, the use of the Periodic Acid Schiff stain by Leblond and his colleagues revealed the presence of carbohydrate residues in the Golgi apparatus, providing the first important clue that it might have a role in glycoprotein synthesis (see “C.P. Leblond”).

A much more powerful histochemical tool became available with immunocytochemistry which eventually led to a rebirth of the importance of light microscopic investigation (“a powerful kick for a dead horse”). In traditional immunocytochemistry, an antibody molecule is attached to a marker molecule which can be visualized in a light microscopic section. The antibody specifically binds to a corresponding antigen, and the distribution of these antigens in a section is revealed by the marker molecules.\textsuperscript{539}

An even more powerful and sensitive tool came with immunofluorescence microscopy. Fluorescent molecules absorb light at one wavelength and emit it at another wavelength. If a molecule is illuminated at its absorbing wavelength, and then viewed through a filter that only allows light of the emitted wavelength to pass through, the molecule will glow against a dark background. This is achieved using a fluorescence light microscope. This technique is also very sensitive since, because of the dark background, even a minute amount of fluorescent molecules can be detected, whereas these would give only the faintest tinge of color in regular light microscopy.\textsuperscript{536}

In immunofluorescence microscopy, fluorescent dye molecules are coupled to antibody molecules. These in turn bind to specific antigen molecules located in the cells or extracellular matrix of tissue sections. Two commonly used fluorescent dyes are fluorescein which emits an intense green light, and rhodamine which emits a deep red light. By coupling fluorescein to one antibody and rhodamine to another, the distribution of both antigen molecules can be visualized in the same cell.\textsuperscript{537}

These above dye molecules are artificially introduced into cells from the outside in tissue sections, and thus (with the exception of special techniques such as microinjection) the procedure could only be used on dead fixed tissue. A great advance came with the use of green fluorescent protein (GFP) isolated from a jellyfish. This protein is encoded by a single gene which can be cloned and introduced into living cells of other species where it is fluorescent. The GFP coding sequence can also be inserted at the beginning or end of the gene for another protein, yielding a chimeric product of that protein with a GFP domain attached. GFP tagging is the clearest way of showing the distribution and dynamics of a protein in a living cell.\textsuperscript{542}

As with all light microscopic studies, the obtainable resolution of structures is not nearly as great as that obtainable with conventional electron microscopy. However one avoids many of the time-consuming steps of the latter process which may also lead to artifacts. Even more importantly, cells may be seen under much more physiological circumstances, and sequences of events may be examined in real time and in color in living cells rather than being limited to the static black and white images of dead cells as seen in the electron microscope.

Various new procedures have also aided in improving resolution in light microscopic studies. One of these deals with the loss of resolution when examining thick sections of tissue. It is well known, for example, that in both ordinary light microscopy and fluorescence light microscopy the image observed in thin sections of less than 1µm thickness is crisp (has a higher resolution). This is because the microscope is focused on a particular focal plane, and in a thin section all portions of the specimen are in
focus. In a thicker section or whole animal, on the other hand, portions of the specimen above and below the plane of focus are also illuminated and cause a blurring of the image Alberts 540.

This problem is overcome in confocal fluorescence microscopy, in which illuminating light from a laser beam is precisely focused at a single small spot at a specific depth in the specimen. The fluorescent light emitted is collected and brought to an image at a suitable light detector. A pinhole aperture is placed in front of the detector at a position that is confocal with the illuminating pinhole, i.e. where the rays from the illuminated point in the specimen come to a focus. Thus the light passing through the pinhole to the detector is mainly coming from the focused light, whereas light which is out of focus is largely excluded from the detector. To build up a two-dimensional image of that portion of the specimen in focus, data from each point are collected sequentially by scanning across the field in a raster and are displayed on a video screen. This image has the same crispness as seen in a thin section. The 200 nm limit of resolution obtainable in the light microscope still applies of course, but it may be noted that in fluorescence light microscopy, because of the dark background, even structures smaller than the 200 nm limit of resolution may be observed. Thus microtubules, which are 25 nm wide, are visible, but, because of diffraction effects, they appear to be 200 nm wide Alberts 539.

A particularly exciting recent advance has been the development of new “super-resolution” fluorescence light microscopic techniques which increase the real resolution obtainable in the light microscope well beyond the normal limit of 200 nm. These allow objects separated by as little as 20 nm to be imaged and clearly resolved, an order of magnitude improvement! One of these “super-resolution” techniques is STED (STimulated Emission Depletion) microscopy which works as follows: In ordinary fluorescence light microscopy, the excitation light is focused to a spot on the specimen by the objective lens which then captures the light by any excited fluorescent molecule. Because of diffraction effects, this gives rise to a blurred image.

Because of this blurring, two fluorescent molecules that are separated by less than 200 nm will be imaged as a single blurred spot. In the STED technique, the fluorescence of any molecules at the periphery of the blurred image of the molecule being examined is temporarily switched off. This is done by adding a second bright laser beam which wraps around the excitation beam like a torus, switching off fluorescent molecules everywhere except at the very center of the point spread function, a region as small as 20 nm across. The diffraction limit is breached because very closely spaced potentially fluorescent molecules are in one of two different states, i.e. fluorescing or dark. By this means resolutions of 20 nm have been achieved in biological specimens, allowing microtubules, for example, to be visualized at their true width of 25 nm. This breakthrough has ended the longstanding resolution limit of the light microscope, once again reinvigorating its role in cell biology research Alberts 551-553.
John Presley joined our Department as an Assistant Professor in 2002. He had obtained a B.A. in Biology at the University of Texas in 1985, and then his Ph.D. in Microbiology from the same university in 1990. He was a Postdoctoral Fellow in the Department of Pathology at Columbia University from 1990-1995, and then was an IRTA fellow in the laboratory of Dr. Jennifer Lippincott-Schwartz at NICHD, NIH. At McGill, Presley was promoted to Associate Professor with tenure in 2008.

In his research career Presley has focused on the following topics: Sorting of membrane components from endosomes and subsequent recycling to the cell surface by a bulk flow process, ER-to-Golgi transport visualized in living cells using green fluorescent protein, ER-to-Golgi transport and cytoskeletal interactions, Golgi tubule traffic and the effects of brefeldin A, retention of misfolded proteins in the ER, the key roles of Rab proteins 18 and 43 in ER/Golgi trafficking, and the essential role of ARFGAPs 2 and 3 in COP1 coat assembly on Golgi membranes of living cells.

He has authored over 45 peer reviewed articles and has given over 22 invited seminar presentations. In terms of teaching, Presley teaches and coordinates our undergraduate course ANAT 262 (Molecular and Cell Biology) and lectures in the ANAT 365 course (Cellular Trafficking). His graduate teaching includes ANAT 690 (Cell and Developmental Biology).
An especially important administrative role of John Presley is the supervision of our Departmental Confocal Fluorescence Microscope facility. Our department obtained its first confocal microscope several years ago. This instrument is part of the equipment of our Facility for Electron Microscope Research (FEMR) under the supervision of John Presley, and is now used by a wide variety of users.

80. Government Funding Initiatives

McGill – Government Funding and the Modern Era

In the 1950’s, McGill was essentially still a private institution. In spite of continuous appeals for government aid over its history, had received very little government funding and There was a feeling in some quarters in 1955 that the university should remain private with limited enrollment, and become a “Princeton of the North”. Principal Cyril James made it clear, however, that without government support, McGill would probably end up as semi-elite liberal arts college. Thus McGill opted for government support Frost 2: 258.

The College-age population in Canada proceeded to increase from 860,000 in 1950 to 1.5 million in 1970, and the percentage of that population attending university increased from 7% in 1950 to 20% in 1970 Frost 2: 258. McGill’s student enrollment increased from 7,352 students in 1950 to 16,818 students in 1970, and its operating budget from the government went from $845,011 to an astounding $15,228,858 (a 1,783% increase)! A major program of physical rebuilding was undertaken at a cost of $150 million. Thus in the 1950’s and 1960’s McGill changed profoundly in its structure, its interests and its community relationships, essentially becoming a whole new university F2:261!

There was some fear at the time that McGill would be drawn more and more into a Quebec “Réseau des Universités” and become a Université du Québec III. Fortunately, the Quebec government exercised a much more enlightened and constructive control, and McGill received fair treatment Frost 2: 429.

The Canadian Foundation for Innovation (CFI)

The Canadian Foundation for Innovation was established by the federal government in 1997, and its mandate is to fund new research initiatives which must be transformative rather than simply incremental. Its mission is to promote the development of research networks and partnerships and it favors applications from multidisciplinary, interdepartmental, and even inter-institutional groups. The project was mandated to distribute $3.65 billion by the year 2010. Only 40% of the funding for any project is provided by CFI, meaning that the remainder must come from other levels of government and industrial partners.

The Canadian Research Chairs (CRC) Program
At the beginning of the new millennium, the Canadian government realized that Canadian universities were facing serious challenges in competing internationally to attract and retain the world’s best researchers. Resources of Canadian Universities could rarely match those available south of the border, and Canada’s research excellence was being threatened.

In the Canada Research Chairs Program, the government announced that two thousand research professorships would be funded for the period from the years from 2000 to 2008. These were allocated to individual universities, and the amount received by each institution was in proportion to the amount of research grant funding it had recently received from the federal granting councils. Under these conditions, McGill received one hundred and sixty-two professorships. Since Canadian universities were lacking sufficient excellent researchers both at the junior and senior levels, the CRC program offered appointments at two levels. Tier I chairs at the senior level were for outstanding researchers with an international reputation, while Tier II chairs at the junior level were for exceptional emerging researchers. Fortunately for McGill, the Quebec government cooperated fully with the federal government in this program even though education in Canada falls within the provincial jurisdiction. In fact, the Quebec government went even further and awarded a tax honeymoon to all new hires from outside of Quebec. Such individuals did not have to pay any provincial income tax for the first five years, raising their take-home pay by at least 20%. Special emphasis was placed on recruiting Canadian scientists who were working abroad and might wish to return to Canada.

McGill also introduced a second initiative in order to retain outstanding researchers already on the university staff. For senior individuals, they provided James McGill Professor Awards to increase their salaries to the level of CRC Tier I. Similarly, for junior individuals, they provided William Dawson Scholar awards to increase their salaries to the level of CRC Tier II.

81. Elaine C. Davis (McGill: 2002-)
Dr. Elaine C. Davis joined our Department as an Associate Professor (tenure-track) in 2002. She was the first new senior researcher hired by both our Department and McGill University as a whole, under the Canada Research Chair (CRC) program. Because of her international reputation as an expert in the field of extracellular matrix biology, along with her teaching experience in gross anatomy, McGill recognized that Dr. Davis would be a great asset to our Department at McGill. As a Canadian, she had also let it be known that she was interested in coming back to Canada. Negotiations were carried out and she agreed to come to our Department as a Tier II Canada Research Chair (CRC).

Davis had obtained her B.Sc. in Honours Biology in 1984 at the University of Western Ontario. She obtained her M.Sc. in Zoology in 1987 at the same institution. She then came to our Department at McGill, where she was one of the last students under the supervision of C.P. Leblond. She graduated with her Ph.D. at McGill in 1992, having used electron microscopy (EM) to examine the formation of elastic laminae during aortic vascular wall development. Because she had worked quite independently of Dr. Leblond, whose main focus was basement membrane ultrastructure, her five important Ph.D. publications were all published as sole author, a rarity in today’s world.

From 1992-1997, Davis was a Postdoctoral Fellow, and then Research Assistant Professor in the Department of Cell Biology at Washington University School of Medicine in St Louis, where she trained with Dr. Robert P. Mecham. In 1997, she was recruited to the University of Texas Southwestern Medical Center at Dallas, Texas as an Assistant Professor, and in 2002, she was recruited back to McGill as a Associate Professor (tenure-track) and CRC.

At McGill, Davis was promoted in 2005 to Associate Professor with Tenure. In 2008, she also assumed the position of Assistant Dean (Graduate Studies) in the Faculty of Medicine, and then, in 2010, the position of Associate Dean (Biomedical B.Sc., Graduate and Postdoctoral Affairs). From 2012-2014, Davis served as Associate Chair (Education) of our Department of Anatomy and Cell Biology. The position of Associate Dean, with a staff of three administrators and a yearly budget of $6 million, occupies approximately 50% of her time. In 2015, Davis was promoted to Full Professor in our
Davis has also served on over 17 university committees and on 10 more committees in her capacity of Associate Dean.

In her research career, Davis has focused on how extracellular matrix components direct cell function, cell differentiation and tissue development as it relates to human disease. A primary research thrust has been on the elastic fiber system which is involved in a number of genetic and acquired diseases, including Cutis Laxa, supravalvular aortic stenosis, William Beuren syndrome, Marfan syndrome and others. The Davis lab has sought to provide fundamental information concerning the role of elastin in vascular development and in smooth muscle cell differentiation. The lab has used a combined approach of genetically modified mouse models, EM analysis and molecular biology to study the biogenesis and ultrastructure of the elastic fiber system. This knowledge provides the urgently needed basis for an in-depth understanding of the pathogenesis of vascular occlusive diseases and other diseases with involvement of the elastic fiber system. A second research focus in the Davis lab is on the role of fibulin-4 and fibulin-5 in vascular and skin development and diseases. Finally, a current major focus is on the role of the peptidyl prolyl cis-trans isomerase FKBP65 in bone development. FKBP65 has been linked to autosomal recessive osteogenesis imperfecta. Research, carried out both in vitro and in vivo, focuses on the function of FKBP65 in tropoelastin and collagen secretion and assembly.

Davis has authored over 94 peer-reviewed scientific publications (with an H-index of 32), 7 book chapters, and 104 abstracts. She has given over 60 invited presentations, has chaired or co-chaired over 14 conferences, and has served as a reviewer for over 16 journals and on the grant panels of several agencies.

As an experienced gross anatomy teacher, upon arrival at McGill, Davis immediately assumed responsibility for teaching the anatomy of the pelvis (Reproductive Unit) and posterior abdominal wall (Renal Unit) to 1st year medical and dental students, as well as participating in the Anatomy for Surgeons course taught to 4th year students. She also lectured in graduate courses in Extracellular Matrix Biology and Transmission Electron Microscopy. When the new medical curriculum was introduced in 2014, Davis’ teaching was expanded to include lecturing for the entire abdomen (Digestion Unit) and the lower limb (Movement). With laboratories being given twice on each topic (to different segments of the medical/dental class), along with her additional lectures, her total teaching time for gross anatomy has doubled. In addition, for 2 years, she organized and was co-director of the Longitudinal Research Theme for 1st and 2nd year medical students, whereby they plan a research project and then participate in a research experience as part of the new curriculum.

At the graduate level, Davis has supervised the research projects of over 9 B.Sc., 8 M.Sc. and 2 Ph.D. students and 1 postdoctoral fellow. In addition, she has served on numerous student advisory committees and Ph.D. Comprehensive Examinations and Thesis Defenses.

She has had high student rankings for her teaching at McGill, in addition to having won several teaching awards at Washington University and UT Southwestern. For her research achievements, she was
elected vice-chair and chair for the 2005 and 2007 Gordon Research Conferences on Elastin and Elastic Fibers. She also organized and co-chaired the North American Vascular Biology Organization - Vascular Matrix Biology and Bioengineering Workshop in 2011. In addition, she has had prominent media attention for her role in the co-discovery of Urban-Rifkin-Davis syndrome (Cutis Laxa with severe pulmonary, gastrointestinal and urinary abnormalities).

82. Craig Mandato (McGill: 2003-)

Craig Mandato joined our department in 2003 as an Assistant Professor and Canada Research Chair (Tier II) in Cellular Contractility. He had obtained a B.Sc. (Biochemistry) in 1994 at the University of Waterloo, followed by a Ph.D. (Invertebrate Cellular Immunity) in 1998 at the same university. From 1998-2003 he was a post-doctoral fellow in the Department of Zoology at the University of Wisconsin.

At McGill, Mandato was promoted to Associate Professor with tenure in 2008. He became an Associate Member of the Department of Biology in 2005, and of the Department of Experimental Medicine in 2006. In terms of administration, Mandato has served on over thirty University committees including the Staff Benefits Advisory Committee, the Long Term Disability Committee, the University Tenure Committee, and the Medical School Admissions Committee.

Since 2012 he has served as Chair of our Department, an appointment recently renewed for a five year term. He has fulfilled this role enthusiastically, taking a keen interest in all aspects of our Department and its relationship to other parts of the university. At the same time, he has maintained his CIHR Operating Grant funding for an additional five years.

Throughout his career, Mandato’s research interest has centered on the process of cytokinesis or fission in eukaryotic cells. Aberrant cytokinesis results in aneuploidy, which is the leading cause of spontaneous
miscarriages in humans and is the hallmark of many human cancers. During animal cell cytokinesis, a contractile ring (composed of actin filaments and myosin-2) is responsible for generating the force necessary for the fission event, while microtubules are responsible for directing the assembly of the contractile ring. The goal of the Mandato lab is to understand the underlying cellular and molecular mechanisms. To do this he has analyzed microtubule–actin filament interactions during the production of wounded-induced contractile rings, using the Xenopus egg as a model system.

Mandato has also studied the role of microtubule/actomyosin-associated proteins such as Gas-2 and CRMP4 in cell division and mitotic chromosomal alignment. In other studies, he has investigated the properties of human molecules (e.g. 14-3-3, transmembrane protein 85) which suppress apoptosis in yeast cells. Finally, he has studied topics as diverse as the distribution of aquaporins in the efferent ducts and epididymis of rats and the composition of the cytoplasmic droplet (Hermes Body) of epididymal sperm.

Mandato has authored over 42 peer reviewed publications and 3 book chapters. He has given 16 invited seminar presentations. In terms of teaching, Craig is the main instructor and course coordinator for ANAT 261 (Histology), and also teaches or has taught in ANAT 262 (Cell and Molecular Biology), ANAT 396 and 432 (Research Projects), ANAT 416 (Disease and Development), ANAT 518 (Advanced Topics in Cell Biology) and ANAT 690 (Cell and Molecular Biology). In the Med/Dent BOM curriculum, he teaches in Unit 1 (Cell Biology). He has supervised the research projects of over 30 undergrad students, 3 M.Sc., students, 3 Ph.D. students (plus 3 more co-supervised), and 3 Post. Doc. students.

83. Dieter Reinhardt (McGill: 2004-)
Dieter Reinhardt joined our Department as an Associate Professor in 2004. This was a joint appointment with the Faculty of Dentistry. In 2006, he was awarded a Canada Research Chair (Tier I) in Cell-Matrix Biology, which was renewed in 2013.

Reinhardt had obtained his M.Sc. in biology in 1989 at the German Cancer Research Center, Heidelberg. He obtained his Ph.D. in biochemistry in 1992 at the University of Munich (His research was conducted at the Max-Planck Institute for Biochemistry). From 1993-1998 he was a Postdoctoral Fellow at the Shriners Hospital for Children in Portland, Oregon. From 1998-2004, he was an Assistant Professor in the Department of Medical Molecular Biology at the University of Lubeck, Germany. At McGill, Reinhardt was promoted to Full Professor in 2011.

In terms of administration, Reinhardt has served on several committees, with a particular interest in laboratory safety. In 2009 he was awarded the Departmental Safety Committee Productivity Award. He also has attended several teaching as well as safety/technical workshops at McGill.

In his research career, Reinhardt has focused on investigating cell-extracellular matrix dynamics as it relates to human disease. Mutations in multiple components of the extracellular microfibril/elastic fiber system give rise to a number of genetic connective tissue disorders. Reinhardt has focused on those diseases such as the Marfan syndrome. His research addresses the cell-extracellular matrix dynamics of the microfibril/elastic fiber system. One goal is to identify all components of these supramolecular aggregates by means of combined biochemical, genetic, cell biological, proteomic, and recombinant protein technology approaches, and to determine their functional and tissue-specific roles.

In recent years it has become increasingly evident that besides having structural and mechanically supporting functions, the microfibril/elastic fiber system has significant and vital roles in cell communication in particular via growth factors of the TGF-β superfamily. Identification of such signaling properties and mechanisms is another focus in the lab. In order to advance the understanding of the pathological aspects of the relevant connective tissue disorders, his laboratory aims to correlate genotypes with biochemical phenotypes, and to identify gene products involved in modification of the pathogenetic pathways.

Reinhardt has authored over 100 scientific publications, nearly all of which were peer reviewed. These publications had attracted about 4200 citations (an average of 49/publication). His h-index is 36. He has given 98 invited presentations and chaired 5 conferences including the renowned Gordon Research Conference on Elastin in 2013. He has been an editor for 4 journals and a reviewer for 42 others. He has served on several grants panels.

In terms of teaching, Reinhardt has taught for example in ANAT 690 (Cell and Developmental Biology), ANAT 212 (Molecular Mech. of Cell Function), and ANAT 458 (Membrane and Cell Signalling), as well as DENT 669 (Extracellular Matrix Biology).
He has supervised the research projects of 39 undergraduate students, 26 graduate students and 9 postdoc students. He has served on several graduate thesis and evaluation committees, and has been external and internal examiner for several theses.

In recognition of his research achievements in translational research, Reinhardt received in 2010 the CIHR Research Ambassadors Knowledge Translation Award. In 2012, he founded the Canadian Connective Tissue Society.

84. Isabelle Rouiller (McGill: 2007-)

Isabelle Rouiller joined our Department as an Assistant Professor in 2007. At this time, we were awarded a new cryo-electron microscope, and the Canadian Foundation for Innovation (CFI) stipulated that we should have a new staff member whose primary interest was in cryo-electron microscopy.

Rouiller was trained in France as an engineer at the Lyon Institut. Sci. Nat. graduating in 1989. This was followed by specialization in Biochemistry at Tufts University in Boston (1991-1993) and then by the equivalent to a M.Sc. at Lyon in 1994. From 1994-1998 she was a Ph.D. student in Cellular Biology and Virology at the University of Hertfordshire. From 1998-2002, she was a postdoctoral fellow at the Scripps Res. Inst. in San Diego, followed by a period as a research associate at the Burnham Institute at San Diego from 2002 to 2006).

In her research career, Rouiller has focused on structure-function relationships of macromolecular complexes using three-dimensional cryo-electron microscopy and cryo-electron tomography. The lab has investigated protein complexes involved in vesicular transport as well as transport across lipid membrane barriers. This has included the study of the entry of non-enveloped viruses into the cell, the role of toxins in membrane crossing (for example anthrax toxins), and the role of ATPase p97 in
extracting protein from the endoplasmic reticulum. Other research in the lab has investigated membrane dynamics (fission and fusion) and has included the study of DRP1 (a GTPase involved in mitochondria fission), and the mechanism of assembly of COP1-coated vesicles.

Rouiller has authored over 27 scientific papers and given over 26 seminars.

In terms of teaching, she has organized and taught the ANAT 542 course in Transmission Electron Microscopy, as well as teaching in ANAT 262, 432, and 690. In other departments, she has taught in the courses BIOC 450; BTEC 555; EXMD 610; PHAR 706. She has supervised the research projects of 7 B.Sc., 5 M.Sc., 1 Ph.D., and 4 Postdoc. Students.

85. Geoffroy Noel (McGill: 2010 - )

Geoffroy Noel joined our Department of Anatomy and Cell Biology as a Faculty Lecturer in the fall of 2010. He had begun his education in France, obtaining a Licence in Cell Biology and Physiology at the Université Paris VI in 2003, a M.Sc. in Neurosciences at Université Lyon I in 2005, along with a Magistère in Biology- Biochemistry at the Ecole Normale Supérieure in the same year. He then traveled to the University of British Columbia where he obtained his Ph.D. in 2010 having studied the distribution of aquaporin-4 molecules.

In 2012, after two years at McGill, Noel temporarily left our Department to join the Department of Cellular and Physiological Sciences at the University of British Columbia. He was then recruited back to McGill in 2014 as an Assistant Professor in our Department as well as being the Director of our new Division of Anatomical Sciences.

From 2011 to the present, Noel has also been an Associate Member of McGill’s Faculty of Medicine and of the McGill Centre for Medical Education. He has served on numerous committees in the Faculty of
Medicine dealing with curriculum, student admissions and promotion, safety, and the McGill Medical Museum.

In terms of teaching, Geoffroy Noel came to McGill with a strong background in teaching (during his Ph.D.) in both anatomy and neuroanatomy, and his primary interest was a career in teaching and medical education. During his initial two year period at McGill, he rapidly demonstrated his enthusiasm and exceptional abilities as an educator and educational researcher.

Noel’s abundant teaching at McGill has included several Units in the first year MD undergraduate program, e.g. “Endocrinology”, “Metabolism and Nutrition”, “Musculoskeletal System and Blood” (called “Movement” since 2013), “Nervous System and Special Senses” (Human Behavior), “Gas, Fluid and Electrolyte Homeostasis” (Respiration and Circulation), and Life Cycle (called “Reproduction and Sexuality” since 2014). In all of these courses, he oversaw the gross anatomy component, gave lectures, presented video-taped pre-laboratory talks, and tutored students during the laboratories. In the second year Dental undergraduate program, he carried out similar activities in the “Oral Health” Unit.

In an additional Unit: “Pathobiology, Treatment, and Prevention of Disease”, Noel facilitated small group activities involving the nervous system. In the fourth year of the MD program, Noel also participated in the Unit: “Anatomy for Surgeons”, tutoring students in the laboratory as well as chairing seminar sessions.

Noel also designed and coordinated a new course ANAT 323: Neuroanatomy for second year students in the Physical and Occupational Therapy program, in which he gave all the lectures, presented video-taped pre-laboratory talks, and tutored students during the laboratories.

In all of the courses above, during the year 2015, he gave over 50 hours of lectures and tutored in laboratories for over 110 hours. Noel has been appreciated by students as a superb teacher, and in those courses where numerical student feedback ratings were given, he has achieved a very high average of 4.6/5.

Finally, Noel runs our annual summer Anatomy prosection program, a full-time 4 week-long dissection program whose purpose is to generate prosections to replace those continually used in our teaching program. In this program, he supervises students in the laboratory for an additional 160 hours.

In terms of research, Noel has over 11 articles in peer-reviewed journals, the earlier ones relating to his Ph.D. work and the more recent ones relating to Medical Education. Current interests include the need for an inter-professional approach in anatomy teaching to better understand each profession’s role in patient care. He is also studying the use of 3D printing to create computer-based models which help students grasp difficult anatomical concepts (such as the inguinal canal). In addition, he has created a highly innovative low-tech T-shirt patchwork model used to teach the three-dimensional organization of mesenteries of the peritoneal cavity.

He is an editorial board member or a reviewer for four journals and a major anatomical textbook. He has given several invited and media presentations regarding McGill’s Body Donor Program. He was also
an invited Scientific Leader at the Anatomical Exhibition of Real Human Bodies presented by Body Worlds in Vancouver, 2008.

In recognition of his excellence in educational research, Geoffroy Noel was awarded the 2014 Jonathon Campbell Meakins and Family Memorial Scholarship by the McGill Centre for Medical Education. For his teaching excellence at the University of British Columbia, he was given three teaching awards. Then, at McGill in 2015, he was awarded the Osler Outstanding Teaching Award by the McGill Faculty of Medicine. This award, the most prestigious in Medicine, is presented by the final year medical class to the teacher thought to have had the greatest influence on their medical career. Considering that Noel had only been on the McGill faculty for three years (not including two years spent away at the University of British Columbia), this is a remarkable achievement!

86. Bui Khanh Huy (McGill: )

87. Nicole Ventura (McGill: )
Nicole Ventura joined our Department as an Academic Associate in the Division of Anatomical Sciences in July 2015. She became an Assistant Professor in Jan 2016.

She had completed a B.Sc. in Biomedical Sciences at the University of Guelph in 2010, followed in 2012 by a M.Sc. (Anatomical Sciences) in the Department of Biomedical and Molecular Sciences at Queens University. She than completed a Ph.D. in the same Department in 2015, studying the developmental origins of cardiovascular disease. From 2013-2014 she was a Human Gross Anatomy Lecturer in the M.Sc. Occupational Therapy Program at Queens University. She also had the position of Chief Prosector, carrying out full body cadaveric dissection and laboratory demonstrations for the MED 110 Normal Human Structure Course.

At McGill, in a manner similar to that of Geoffroy Noel, Nicole Ventura’s primary career interest has been in teaching and medical education. Her teaching roles thus far have included lecturing and laboratory instruction in the Anatomy component of the Foundations of Dentistry Course for second year Dentistry students, stream leader in our Anatomy for Surgeons Course for fourth year Medical students, Course Directorships of our ANAT 316 Human Visceral Anatomy Course, our ANAT 315 Anatomy of the Limbs and Back Course, our Library Research Study Course, and our Special Topics Course (in the Department of Kinesiology and Physical Education). Finally she serves as an Anatomy Lecturer in the “Respiratory” and “Movement” Blocks of our Fundamentals of Medicine and Dentistry Course for first and second year students, as well as participating as a laboratory demonstrator in seven Blocks of this Program throughout both years.

Following a background of Clinical teaching assignments at Queens University, Nicole Ventura also has participated in the Anatomy laboratory component of the 2015 McGill Orthopedic Residency Summer Academic Term.

In terms of Graduate teaching, she has supervised two M.Sc. students at Queens University and provided supervision/mentorship for six others. At McGill, she has supervised Medical and Undergraduate B.Sc. students in their Research Projects.

In terms of Committee work, she has served as a member or chair of several McGill committees including the Undergraduate Curriculum Committee, Commemorative Service Committee,
Undergraduate Course Coordinators Committee, Basic Science Committee, Centre for Medical Education, and the Medical and Dentistry Admissions Board of Evaluators.

Her current research activities at McGill include:

1) Interprofessional, near-peer teaching in medicine and nursing – evaluation of the ability to cross professional borders and encourage collaborative learning early in practice. (in collaboration with Dr. Geoffroy Noel and Sandie Larouche in the Department of Anatomy and Cell Biology).


Ventura has published 8 articles in refereed journals and has made 28 presentations in conference proceedings, several of which were international.

In recognition of her academic scholarship and teaching achievements, she has been awarded several honors including the Franklin Bracken Graduate Student Fellowship (2013-2014), Dean’s Award for Top Oral Presentation (2014), Queen’s Graduate Award (2010-2015), R. Samuel McLaughlin Fellowship (2014-2015), and Professor’s Prize for Outstanding Graduate Work in Anatomy (2015).

88. Susanne Bechstedt (McGill: )

89. Joaquin Ortega (McGill: )
90. The Revolution in Communications: Recollections of Past Times

In our current world of the internet and dizzying advances in technology, most students may find it difficult to imagine what conditions were like many years ago in terms of the tools available for teaching, information retrieval, and communication of scientific information.

Teaching Methodologies

Historically, many lectures were simply presented orally with no audiovisual aids, especially before lecture rooms were equipped with electricity! It was common for a lecturer to simply read his notes to the class. In Anatomy, some professors might hand out bones during a lecture or show a wet specimen at the front of the class. If used, the main audiovisual aid was the blackboard. Some professors became masters at these presentations, using many different colors of chalk. Some even learned to draw with both hands at the same time! Preliminary drawings were sometimes placed on the blackboards in advance and finished during the lecture. The presentations of Yves Clermont in our Department are legendary.

The only other audiovisual material in the early years might consist of large drawings on panels. As mentioned earlier, Sir William Dawson made superb illustrations on bedsheets which he hung on the walls of the Redpath museum auditorium.

Throughout most of the last century, lectures, pre-laboratory talks, and scientific presentations made frequent use of slides. The Department maintained a large collection of slides. Most of these were large glass “lantern slides” which were shown on old-fashioned “lantern-slide” projectors. As our lecture theatres became equipped with carousel slide projectors, the glass slides were replaced by 35 mm slides, but for many years the old projectors remained in place and glass slides were still used.

In the classroom, a huge change came with the introduction of overhead projectors. Use of the blackboard was increasing replaced by hand-written textual material or diagrams on 8”x 11” acetate
sheets. Pages of text and images could also be photocopied onto the acetate sheets. A great advantage of this teaching methodology was that the image could be labeled in front of the class using overhead pens of various colors. Lectures at this time might often make use of all three audiovisual aids (blackboard, overhead transparencies, and 35 mm slides) in the same presentation.

The biggest revolution came with the arrival of personal computers and Powerpoint technology. The tremendous power of this new tool soon caused the almost complete disappearance of overhead projectors and 35 mm slide projectors. Now all lecture theatres provide computers and projectors and a lecturer simply arrives with his presentation on a USB stick!

The use of handout material has also changed over the years. When copies of diagrams (even unlabeled) were first distributed to classes in the 1970’s, some professors considered this to be unacceptable spoon feeding. In more recent years, the Medical School has encouraged the production of complete sets of notes of all lectures. In addition, with the advent of Powerpoint technology, the illustrations of lectures may be made available to students before as well as after lecture itself, and students may download this onto their own computers.

Some professors preferred the older methodologies. Sandra Miller in our Department continued to present her lecture material using an overhead projector, and having her students label handout diagrams during the class. She felt that this provided a more intimate contact with the students and that the students’ active participation enhances the learning process. Another Departmental member, Louis Hermo has maintained the use of colored blackboard diagrams in his teaching with equally great success.

Closed-circuit Television Facilities

Our Department was one of the pioneers at McGill in introducing closed-circuit television systems. These were first installed in Lecture Room C and the Assembly Hall on the initiative of Dennis Osmond and Carl Harvey, and they were to provide pre-laboratory talks. The Instructional Communications Center at McGill played a key role over many years in providing expertise to our Department in installing and maintaining the new equipment.

Carl Harvey also produced a series of student review tapes on gross anatomy which became legendary. These solo, black and white presentations were made by Carl in the absence of any outside technical support or camera crew! When Carl Harvey transferred to the Anatomy Department at Baylor University, he produced a whole new series of colored review tapes which he made available to our Department.

In recent years, all of our pre-laboratory talks are recorded each year and are available for preview or review by the students. As a result, the era of the Harvey tapes has passed.

The Photography Facility
This facility was run by Tony Graham, who was the departmental photographer from 1959. In this era, virtually all departmental light-microscopic photography, both for research and teaching, was carried out under his direction in a central photographic center. With its enormous Zeiss photomicroscope and several dark rooms, this was Tony’s private kingdom. Although at times difficult to work with, Tony was an excellent photographer and turned out excellent results in countless publications.

An additional service carried out by Tony Graham was the “annual departmental photograph” which was taken in front of the Strathcona Medical Building. For many years, this photograph served as an annual record of all the members of the department, including faculty members, graduate students, post-doctoral fellows, visiting scientists, technicians and secretaries. This practice was discontinued after the retirement of Tony Graham, but has fortunately been reinstated by our current chair, Craig Mandato!

Information Retrieval from the Scientific Literature

In the decades after the Second World War, there was a world-wide outburst of intellectual activity, resulting in an information explosion which has since grown exponentially Frost 2: 256. It is interesting to compare the tools of information retrieval and storage today with those of earlier times.

In the days before computers and electronic search engines, the only way to ensure one’s awareness of the most recent articles was to routinely scan all of the new journals in one’s field each week. In our Department, Saturday mornings were traditionally set aside for members to sit in the library and review that week’s new journals.

An innovation came with the arrival of the publication: “Current Contents”, which showed the tables of contents of all the current journals published in each month. This eliminated the need to have access to every journal, but one could not see the whole article in question – only its title. Soon computer technology began to come to the rescue. At first, researchers could hire a reference librarian to use INDEX MEDICUS to do a computerized search the scientific literature. Then the same search engine became available to the public in the “reference” section of the Medical library. At first the information as only available in large hard-copy volumes which one needed to scan. Finally, computers using Compact Disks were available, and researchers were able to carry out their own literature searches, but only on computers in the Medical Library!
When a researcher found an article, he or she might laboriously hand-copy data onto index cards. In the early days, no Xerox photocopying facility existed. A system that developed in order for researchers to have their own copy of a scientific article was the “reprint system”. With this system, researchers and graduate students filled out reprint request forms and mailed them to the authors of the articles. When scientific articles were published, it was common practice to make some hundreds of copies of reprints. These were mailed to people of interest or to those individuals who requested a reprint. This process was time consuming and costly, but if one actually received the reprint, one possessed the most detailed information possible.

If researchers listed scientific articles on huge numbers of index cards, the question arose as to how to keep track of all the information. Obviously the cards could be arranged according to author, date, or subject matter, but every system posed logistical problems. One system was to use McPhee cards which had up to 100 perforated holes near the edge of the card and these were assigned to different categories of knowledge. To activate a category, a punch was used to convert the hole into a notch, and a knitting needle was used to separate the cards in which the notch had been created from those in which it had not. By repeating this time-consuming process with different notches, one could retrieve articles based on several categories.

A more realistic alternative, perhaps, was to simply read the “Discussion” and “References” sections of the articles themselves, and especially to concentrate on excellent “review articles” which would summarize the more important articles in the literature.

For many years, the idea of having access to most or all journal articles on one’s own office computer was only a dream. Yet, slowly, this all come to pass. With PUB MED, all of the data of INDEX MEDICUS electronic search engine is available on one’s own office computer. With PUB CRAWLER, an individually tailored search of topics of one’s own interest can automatically be carried out each day. Finally, the full text and images of most articles can now be downloaded to one’s own computer. This has all resulted in a fundamental change in the role of the library system. Many researchers never physically enter the library building, and the role of the library is essentially to provide the necessary databases.

The Departmental Anatomy “Library”

When the Medical Library moved to the McIntyre Building in 1965, the magnificent Strathcona Building reading room was left for the use of our Anatomy Department. At this time, it was felt by researchers in our Department that it was much too inconvenient, every time they needed a journal, to have to travel to the Medical Library, where the journal might not even be available! The need of an accessible collection of journals was evident. As a solution, various researchers privately subscribed to journals and made them available to all members of the Department in the Departmental Reading Room. This was referred to as the “Anatomy Library” although it had no official status in the McGill Library system. The Department paid the salary of a person who ran the library, and for many years the position was held by Praha Ramamurthy (who in fact held a Master of Library Science degree). In time, all of the current journals needed to be bound into volumes and this cost was also borne by the Department. All of this
money was taken from research grants, which was not strictly allowed by the granting agency regulations. In addition, journals purchased on a private subscription were not supposed to be made available to users in a library setting.

Since the Department could not subscribe to all of the desired journals, especially in other fields, the Medical Library permitted a graduate student from the Anatomy Department to pick up a selection of recent unbound journals each week and place them in our Departmental reading room for a period of one week. The Medical library was quite obliging in providing this service since, on the whole, they objected to the concept of departments having unofficial libraries. It was felt that the money spent on these private collections was money that could have been used to fund the McGill library system itself which always was acknowledged to be underfunded by the University.

Researchers informed themselves about the scientific literature each week by visually scanning all the new relevant journals. In our Department, the customary work week ran, at a minimum, from 9:00 am to 5:00 pm on all week days and from 9:00 am to 1:00 pm on Saturday. Even teaching was carried ou on Saturdays, with lectures to the medical and dental students beginning at 8:30 am!

For the Departmental faculty and graduate students, Saturday morning was the opportunity to peruse the journals, and the reading room was usually very busy at this time. On one occasion, the chairman, C.P. Leblond, had a visitor from Harvard on a Saturday morning, and he took him up to the reading room and around the building to meet departmental members. He was shocked and furious on this particular occasion when very few individuals were in the reading room or even in their laboratories!

**Duplication of Information**

As mentioned above, no photocopying machines were available in the early 1960’s, and the whole concept of document duplication was at a very primitive stage. If multiple copies of a document were required, a mimeograph machine called a Gestetner was used. Drawings were made using a stylus which removed the wax on a waxed sheet of stencil paper. Alternatively, text was typed onto the waxed sheet. The sheets were then inserted onto an inked roller which was rotated manually, and the ink was forced through the stencil to produce the copies. Obviously this procedure could not reproduce previously typed text or the photographic images in scientific articles.

In the production of scientific manuscripts or theses, all tasks were done by hand. If more than one copy of a thesis was required, duplicate copies were produced by using carbon paper behind the original typed sheets. Naturally, the fourth copy was of less quality than the original. In the case of illustrations (drawings, graphs or photographs), these had to be produced by hand for each copy of the document. This often involved doing all the labeling of photographs several times.

**Scientific Publishing**
Antonio Haddad came to our Department from Brazil as a visiting professor in the 1970’s (see “Antonio Haddad and the Brazilian Connection” above), and noted some of his memories in an article entitled: *The McGill University Department of Anatomy and Brazilian Universities: A Connection Analyzed by One of the Actors*.

In describing his experience in the field of scientific publishing, he recalled that “up until the last millennium (2000), nearly all scientific knowledge was diffused on printed paper. In the 1970’s, an article or a chapter of a book had be typed and retyped many times before sending it to an editor, where it was typeset by the printer. The photomicrographs were made through negative images obtained on films which were afterwards reproduced on photographic paper. These photographs were then used by the printer to produce the article on regular paper. The manufacturing of a journal or a book was time consuming due to the printing techniques used at that time. Everything had to be transported by mail: the manuscript sent by authors to the journal, the galley proofs sent by editors to authors and the corrected versions returned, the distribution of the journal throughout the world, and so on. Between finishing an investigation in the laboratory and getting the article in a journal on the shelf of a library it usually took more than one year. This would depend on the location of the country of the publisher, the home of the addressee and the way used to send the journal (surface or air mail)”.

In today’s world, manuscripts are electronically sent instantly to a publisher in a publication-ready format. Although hard-copy versions of journals are still produced, most journal articles are accessed electronically, and many journals are now exclusively disseminated online (check). The days of reprints are completely over since both text and illustrations of any article can be accurately reproduced on the reader’s own computer.

**Personal Computers**

The acquisition of personal computers by secretarial staff and individual faculty members in the 1980s revolutionized the workings of the department. Prior to this time, all documents had to be typed in hard copy, often by Departmental secretaries. Changes to a manuscript or abstract would then be carried out in long-hand and then the pages would be retyped as often as necessary – sometimes twenty or more times!

The advent of personal computers has changed everything! Most faculty members have taken over all production of their own documents, including manuscripts, letters, and records. Even recording of students’ marks and examination of their transcripts are all done electronically. As a result, the Departmental secretarial staff has dramatically decreased!

**91. Research and The Departmental Graduate Studies Program**
For a description of research and publication in the early years of McGill’s history, see section 13. “Early Research and Publication” in Chapter 2.

In the late 1800’s McGill’s medical school had the highest standards and best facilities in North American in terms of teaching. On the other hand, due to poor government funding and its (non-research orientated) intellectual heritage from Edinburgh University, interest, space and funding for research were still sadly lacking. Thus McGill’s best students, such as William Osler, went to the reformed universities of Germany for graduate training in laboratory medicine.

McGill University’s first graduate degrees developed slowly. Doctorate degrees were awarded in the 1880’s in the fields of Divinity and Philosophy. By 1900, McGill was granting some M.Sc. degrees in science. Then in 1906 the Faculty of Arts (which included Science) established a Graduate School with a Ph.D. program. The first Ph.D. awarded (in 1909) was in physics, and in subsequent years the university graduated an average of one Ph.D. and twenty Masters Degrees per year.

In 1922, in order to supervise graduate work throughout the University and to ensure common high standards, McGill created the “Faculty of Graduate Studies and Research”. The entrance requirement was usually an honors Undergraduate Degree. The Master’s Degree required one year of further study and a research thesis, while the Doctoral Degree required an additional two years of study and the writing of a research thesis. The Department of Chemistry was the most successful department in these early years, with 198 Doctorates and 74 Master’s Degrees over a 21 year period. This was thanks largely to Otto Mass who had joined the department in 1916.

Our Departmental Graduate Studies Program

The first mention of graduate studies in the department of Anatomy appears in the University Calendar of 1926, in which M.Sc. programs were offered in Advanced General Anatomy and the Specialized Anatomy of the Eye, Ear, Nose and Throat (taught by Samuel Ernest Whitnall), as well as Histology, Embryology, Neuroanatomy (taught by Simpson), and Physical Anthropology (taught by Thompson).
For admission to the M.Sc. program, candidates were required to have a M.D. degree or be in the process of obtaining a M.D. after completing a B.Sc. degree. From 1937 onwards, however, the completion of a B.Sc. alone was sufficient. All graduate students were required to demonstrate in Anatomy classes to medical students.

In 1938, the first Ph.D. program in Anatomy was offered in the fields of Gross Human Anatomy, Comparative Anatomy, Physical Anthropology, Histology, Cytology, and Genetics. Candidates were required to first have a M.Sc. degree.

In these days most of the publications of our Anatomy department were in the above fields of human gross anatomy, histology and perhaps physical anthropology (e.g. Whitnall’s classical publication on the eye).

By the 1930’s, multidisciplinary research was becoming more common in all departments, and our Anatomy department often carried out biochemical or endocrinological studies. Thus when Hans Selye joined our department (from the Biochemistry department) during the late 1930’ and 1940’s, his research continued to be chiefly in the field of endocrinology. Selye was prolific as a scientific publisher. In the McGill departments of Biochemistry and Anatomy, he published over 300 papers (from 1933-1946). In our Anatomy department alone, he published 219 papers (from 1936-1956) (in his entire career he published 1700 articles and 39 books – See “46. Hans Selye” in chapter 5).

Many of Charles Leblond’s initial publications were also endocrinological in nature, but then his focus changed to the investigation of basic cellular processes using the radioautographic technique. In his career at McGill, Leblond published 430 scientific articles.

In 1945, the Experimental Morphology course (ANAT 607) was introduced into our Anatomy graduate curriculum (supervised by Leblond). Other graduate courses included Physical Anthropology (taught by Martin) and Advanced Neuroanatomy (taught by McNaughton of the Montreal Neurological Institute).

In 1963, the graduate course in Physical Anthropology was discontinued, and other new courses were added. These included: ANAT 601A (Gross Anatomy), 601B
(Head and Neck Anatomy), 602 (Neuroanatomy), 603 (Applied Anatomy), 604 (Advanced Neuroanatomy), 606 (Histology), and 608 (Embryology).

In 2009, the name our Graduate Program was changed from “Anatomy” to “Cell Biology and Anatomy”. This name change reflects the fact that all current research in the Department is in cell biology rather than anatomy. It was felt that this name change would help in recruiting students wanting to pursue a career in cell biology. In 2012, all reference to Anatomy was deleted and the program name became “Cell Biology”.

In the 60’s and 70’s, most students entering our graduate program had no degree with a major in anatomy/cell biology since our undergraduate B.Sc. program was just beginning. Frequently these students would have taken no courses at all in any of the “anatomical sciences”. Thus a knowledge base had to be established from the ground up.

The author’s graduate program required, in addition to Experimental Morphology, the medical courses in Histology (full year), Gross Anatomy (one and one half years), Biochemistry (full year), Neuroscience (full year), General Pathology, and an intensive laboratory course in Biochemistry. Graduate students were also expected to attend all of the weekly departmental seminars although this did not constitute a formal course.

Nearly all students took gross anatomy and this provided a valuable source of demonstrators for the medical students. In the author’s case, he also took on the role of “Anatomy Prosector” an intensive and time-consuming program which involved dissecting a human body completely and giving multiple demonstrations each week to the medical students throughout the year.

When gross anatomy was no longer required in our graduate program, very few students took this course and their presence as demonstrators was sorely missed in the laboratory!

In these times, to provide for living and tuition expenses, many graduate students received funding from the grant of their research director or from external awards. Funding was not guaranteed, however, and some students had none. Graduate students demonstrated in the medical gross anatomy and histology courses for free. There were no Teaching Assistant positions.
Most students entering our graduate program took a M.Sc. degree, requiring 2-3 years. A following Ph.D. degree usually required 4 years. These times varied considerably, however. Some students took as long as seven years to complete a Ph.D. Some others skipped the M.Sc. degree and obtained their Ph.D. in as few as five years.

Some students occupied the position of Faculty Lecturer in their final year(s) with a commensurate pay increase. It was not unusual for senior graduate students to teach entire courses (such as Gross Anatomy for physical therapy students).

A feature of our Anatomy departmental program was that, unlike the situation in some American universities, the student started carrying out research on day one, and the learning process was similar to an apprenticeship. Teaching was usually also required from the earliest stages, with second year M.Sc. students being asked to demonstrate in the medical Histology course. Some senior students were also assigned minor administrative duties such as involvement in departmental audiovisual operations (in the case of the author).

Many of our Ph.D. students graduated therefore with considerable experience in research, teaching and even administration. In this situation, the transition from “student” to “professor” was not as pronounced as in departments requiring no teaching.. Since one was paid as a student (albeit a minimal salary) and one’s tasks as a student were essentially similar to those later on, it was possible to feel in retrospect that one’s professional career was initiated even while still a graduate student.

Some limitations of our Anatomy graduate program existed at that time, namely that:

1) Apart from Experimental Morphology, the program contained no genuine “graduate level” courses (especially in Cell Biology) which could introduce students to new areas and techniques of investigation.

2) There were no graduate student committees for individual students. Each graduate student was under the exclusive supervision of that student’s own research director, so that there was no input from other faculty members.

3) The student’s Ph.D. comprehensive examination was held near the very end of their program, i.e. too late to provide valuable guidance during the earlier stages.
4) In addition, this examination was not truly comprehensive but rather mainly tested knowledge of work carried out by members of our own Anatomy department.

In the ensuing years, all of these limitations have been addressed as outlined below.

Features of our current Graduate Program

All students now have an advisory committee which meets at least once a year. In addition, the Ph.D. comprehensive examination has been changed and is now at an earlier stage in the student’s Ph.D.program.

To remedy the lack of genuine graduate level courses, the following courses have been added to our program:

- ANAT 541 (Cell and Molecular Biology of Ageing)
- ANAT 542 (Transmission Electron Microscopy),
- ANAT 565 (Diseases and Membrane Trafficking),
- and
- ANAT 690 (Cell and Developmental Biology)
- ANAT (Seminars in Cell Biology).

Previous courses were no longer required (i.e. ANAT 601A (Gross Anatomy), 601B (Head and Neck Anatomy), 602 (Neuroanatomy), 603 (Applied Anatomy), 604 (Advanced Neuroanatomy), 606 (Histology), and 608 (Embryology).

For living and tuitions expenses, students are now guaranteed a minimum stipend of $18,000 (MSc) or $20,000 (PhD) either from external awards or the research director’s grant. Since the students are guaranteed funding, the enrollment of students in the different Departments is limited by the number of faculty members and their research laboratory space and funding. Currently, fellowships for tuition assistance are awarded to new incoming students in compensation for tuition fees higher than Quebec-resident students. This allows students to pay Quebec Tuition fees (approximately) for the residency period of their degree. Students who are also competitive to acquire their own stipend are therefore especially desirable since this allows their supervisors to allocate more funds to recruiting other students or
fund additional research projects. Graduate student demonstrators are now awarded salaried Teaching Assistant positions.

A report on the Graduate Programs in the five McGill Biomedical Departments in 2012 considered that all of these programs, including that of Anatomy and Cell Biology were of excellent quality. Coming from high caliber Undergraduate Programs, most students entered the graduate program requiring little course work except for seminars. This allowed the program to be very research intensive. Most students entered the program having already decided on their field of interest and their research director. This was particularly the case if a student had been introduced to research by taking an undergraduate research project. Many students were able to fast-track from the M.Sc. program to the Ph.D. program during the first two years.

At present, the primary objectives of our graduate program are to attract highly qualified students and to provide excellent training at the graduate level. We believe that, to achieve this excellence, it is essential to provide guidelines at an early stage which clarify expectations and inform graduate students about the wealth of resources available within the Department and the University as a whole. For this reason, the graduate program committee holds a mandatory orientation session which discusses the course and credit requirements, the roles of the supervisor, mentor and advisory committee, the different fellowships available, departmental research currently in progress, departmental seminars, the comprehensive exam, and thesis preparation and submission.

Since 2010, each new graduate student has been assigned a mentor, with whom he/she meets on a yearly basis. The mentor is a member of the student’s advisory committee as well as the Graduate Affairs Committee. The role of the mentor is to provide administrative and academic guidance, to ensure that the student meets with his/her advisory committee once a year, and to help the student with any other specific issues.

Since an integral part of graduate teaching is the development of communication skills, several measures have been taken to ensure that our graduate students
acquire these skills. These include: 1) required attendance at departmental seminars, 2) presentation of work at informal “research in progress” seminars, and 3) presentation of a formal seminar required for M.Sc. and Ph.D. degrees, as well as a formal seminar to obtain permission to transfer from M.Sc. to Ph.D. status.

**Suggestions for the Future**

It has been suggested that advertising of our Graduate Program to undergraduate students be carried out by means of “research days”, “lunch with the chair” sessions, “fairs”, etc.

Students have also mentioned challenges with the Strathcona building in terms of laboratory facilities and the isolation of different laboratories from one another.

The department should initiate a system to track the career paths of our graduates. This would provide a valuable resource to the University and Department in terms of outcomes, and to the current students as to possible career paths. It would be useful to have graduates who are currently in non-traditional careers return to the department to give presentations as part of career development programs.

**92. The Departmental Undergraduate Science Program**

In the early years of McGill University, a Faculty of Science did not exist, and undergraduate science courses were taught by the Arts Faculty. This did not reflect an opinion that Science was less important than Humanities. In fact, a general Arts degree in the 1890’s required compulsory science courses in Mathematics and Chemistry, as well as additional courses in Physics, Geology, Botany and Zoology.

In 1931, the Arts Faculty’s name was changed to “Arts and Science” and both B.A. and B.Sc. degrees were offered. The Anatomy Department, although located in the Faculty of Medicine, offered B.Sc. courses in Comparative Anatomy, Comparative Neurology, Physical Anthropology, and Histology. The latter intensive 6 credit Histology course was the same course as taught to the medical students and it could be used for credit if the B.Sc. students were subsequently accepted into the M.D. program.

By 1969, the above courses were replaced by new courses which included a six credit a combined course in Gross Anatomy and Histology (6 credits), Advanced Gross Anatomy (3 credits), Human Embryology (3 credits), and...
credits), and Dynamic Histology (6 credits). This last course examined a variety of topics of research carried out by departmental faculty members.

In 1971, separate Faculties of Arts and Science were created. The new Science Faculty included the Department of Biology, but the “Biomedical” Departments of Anatomy, Biochemistry, Physiology, Microbiology and Immunology, Pharmacology, and Pathology remained in the Faculty of Medicine. This reflected the fact that historically at McGill these disciplines had been taught to medical students before they began to be offered to undergraduate B.Sc. students.\textsuperscript{Frost 2:366}

Up until this time, B.Sc. students had been able to register in individual courses offered by the Anatomy Department but the Department had no organized undergraduate program. This was introduced in 1972 when the Department offered a complete 90 credit Undergraduate Anatomy B.Sc. Program. Within this program the students could choose three levels of specialization: “Faculty Program” (63 required “Anatomy Program” credits), “Majors” (66 required credits), or “Honors” (72 required credits). The Anatomy Program credits had to be from the list of Anatomy courses following plus certain required courses in other biomedical disciplines. The remainder of the 90 credits consisted of electives.

The following Anatomy courses were offered:

- ANAT 261A Introductory Histology (4 cr)
- ANAT 311A Human Musculo-Skeletal Anatomy (3 cr)
- ANAT 312B Human Visceral Anatomy (3 cr)
- ANAT 413A Anatomy of Limbs and Back (4 cr) (for Physical Therapy students)
- ANAT 421B General Human Neuroanatomy (3 cr)
- ANAT 462D Dynamic Histology (6 cr); (research carried out by departmental faculty members)
- ANAT 481B Human Embryology (3 cr)
- ANAT 431D Seminars in Morphological Sciences (6 cr)

In 1974, a 6 credit Research Project course, ANAT 432D was offered to our undergraduate students. This course, supervised by Departmental faculty members, became hugely popular, and was one of the highlights of our program. In 1975, the Research Project course was increased to 12 credits.

At the same time, our graduate level Experimental Morphology course was reassigned to the 500 level (ANAT 533D), and was thus made available to both graduate and B.Sc. students. In our Honors Program, these 12 additional credits made the required course load extremely heavy (90/90 credits) and almost no students enrolled in this program!

In 1980 several major revisions of our program occurred:

1) A new course, ANAT 214A Systemic Human Anatomy (3 cr) was added
2) The ANAT 311A course, Human Musculo-Skeletal Anatomy, was discontinued.

3) It was replaced by ANAT 315A, Regional Anatomy of Limbs and Back (4 cr) (a dissection course reserved for students in Physical and Occupational Therapy and Honors Anatomy).

4) ANAT 316A, Visceral Anatomy (3 cr) was given to students in Physical and Occupational Therapy.

5) Our Introductory Histology course, ANAT 261(4 cr), was renamed “Introduction to Dynamic Histology”.

6) Our Dynamic Histology course (ANAT 462) was discontinued and replaced by five new specialized courses concentrating on research being carried out by departmental members in different fields. These courses were: (ANAT 322, ANAT 362, ANAT 363, ANAT 364 and ANAT 365). Other courses were added or removed, resulting in the following program:

   ANAT 322, Neuroendocrinology (3 cr) (taught in succession by Brawer, Nadler, Beaudet, and Walker)
   ANAT 362, Calcified Tissues (3 cr) (taught by Warhawsky)
   ANAT 363, Dynamic Histology of the Gastrointestinal and Male Reproductive Systems (3 cr) (taught by Clermont and Leblond)
   ANAT 364, Cells and Tissues of the Hemopoietic and Immune Systems (3 cr) (taught by Lala, Osmond, and Miller)
   ANAT 365, Cell Biology of the Secretory Process (3 cr) (taught by Bennett and Bergeron)
   ANAT 431 Seminars in Morphological Sciences (4 cr) was added (taught by Kopriwa, later Morales)

7) The ANAT 432 course, Research Projects in Anatomical Sciences, was decreased from 12 to 6 credits.

At this time, there were 371 students in our program.

In 1986, the course ANAT 363, Dynamic Histology of the Gastrointestinal and Male Reproductive Systems, was retired. In 1989, there was a 34% increase in our anatomy B.Sc. program, giving the highest student/staff ratio in the University. In 1992, a new course was added, ANAT 541, Cell and Molecular Biology of Aging (3 cr) (taught by Wang and later Autexier). In 1994, the ANAT 362, Calcified Tissues, was retired. In the same year, a new course was added, ANAT 262, Topics in Cell Biology (3 cr) (taught by Walton and Laird). In 1996, ANAT 364 (Cells and Tissues of the Hemopoietic and Immune Systems) was retired, and a new course was added, ANAT 212, Molecular Mechanisms of Cellular Function (3 cr) (taught by Branton and staff). In 1999, a new elective course was added: ANAT 205, Astrobiology (3 cr) (taught by Vali). In 2000, a new course was added, ANAT 458, Membranes and Cellular Signaling (3 cr) (taught by Greenwood and Silvius). In 2002, the Neuroanatomy course, ANAT
321) (3 cr) was renamed “Circuitry of the Human Brain” to reflect a change in its content. In 2005, the ANAT 365 course, Cell Biology of Secretion, was renamed “Cellular Trafficking” to better represent its content. In 2007, a new course was added, ANAT499, Supervised Library Research (3 cr).

In 2009, three new courses were added:

ANAT 416 Development, Disease and Regeneration (3 cr)
ANAT 542 Transmission Electron Microscopy (3 cr) (taught by Rouiller)
ANAT 565 Cell Biology (our graduate course now made available to undergraduate students)

The enrollment figures in the Anatomy and Cell Biology Undergraduate Program for various years were:

<table>
<thead>
<tr>
<th>Year</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>311</td>
</tr>
<tr>
<td>1977</td>
<td>322</td>
</tr>
<tr>
<td>1980</td>
<td>371</td>
</tr>
<tr>
<td>1981</td>
<td>513</td>
</tr>
<tr>
<td>1989</td>
<td>34% increase</td>
</tr>
<tr>
<td>2007: 473 (Fac. Prog: 162</td>
<td>Lib: 8</td>
</tr>
<tr>
<td>2009: 595 (Fac. Prog: 95</td>
<td>Lib: 71</td>
</tr>
<tr>
<td>2010: 611 (Fac. Prog: 17</td>
<td>Lib: 81</td>
</tr>
<tr>
<td>2011: 616 (Fac. Prog: 1</td>
<td>Lib: 70</td>
</tr>
<tr>
<td>2012: 576 (Fac. Prog: 0</td>
<td>Lib: 67</td>
</tr>
</tbody>
</table>

These tables highlight the increases in the number of students enrolled in the Anatomy and Cell Biology program over the years. In fact, since the inception of the undergraduate program in 1969, the number of students has increased enormously, going from a handful to over 600 students.

Students are thought to be attracted to our programs for a number of reasons: 1) good teaching, 2) flexibility in the choice of courses, 3) the perception that the programs are an excellent preparation for further clinical health science professions.
In recent years, the name of the Department was changed from “Anatomy” to “Anatomy and Cell Biology”, reflecting the fact that all of departmental research and nearly all of the undergraduate courses are in Cell Biology rather than in Anatomy. (The listing of all our courses in the university calendars as ANAT probably gives a mistaken impression.) Students perhaps perceive “Cell Biology” as modern and dynamic whereas “Anatomy” is old fashioned. On the other hand, the name “Anatomy” may attract many students into our program since they perceive it a premedical program.

In the past, fewer students have been enrolled in the Honors Program of our Anatomy and Cell Biology Department than is the case in other biomedical Departments. This may be so because the primary aim of many of the students is to enter Medicine or Dentistry. The most important requirement for entrance into Medicine or Dentistry is a high GPA, and since this is thought to be more difficult to maintain in an Honors program.

It may be asked as to why our program is viewed as a premedical program. Obviously in today’s world, being an Anatomist is no longer perceived as a research career. Cell Biology, on the other hand is a relatively new field and perhaps does not carry the historical prestige of the older disciplines like Biochemistry, Physiology, Microbiology or Immunology. As a result, perhaps fewer students envisage Cell Biology as a career discipline in its own right, and worthy of specialization at the Honors level.

From the early days of our undergraduate program a major strength has been the offering of our ANAT432 Research Project (9 credits). Students can take the course over the academic year or over the 4 months of the summer. This is a hands-on research course that allows students to perform experiments, collect the data, read the exhaustive literature, learn techniques, organize data, write up a report with a critical approach and then present their data in a 15 minute oral presentation to a jury of 5 academic staff members. A midterm exam requires a written abstract and tutorial sessions are given on writing a hypothesis, abstract, etc. This course is highly rated by the students and is in great demand.

There is also a new 3 credit course ANAT396, which is also a research course, in which students can perform limited number of experiments and learn to read and interpret the literature. The course introduces students to a specific field of research depending on whom they have chosen to work with. The enrolment for this course varies from 7-19 students in a given year.

As of 2010 and 2011, the Department has organized an Undergraduate Research Day where the staff and graduate and undergraduate students give insights into their research activities. Over 250 of our undergraduate students attended this event, and we have attracted 40 students into our honors program. This is an overwhelming number for our staff since all of these students take the ANAT432 research project course.

In the early years of our program, student advising was assigned to various members of the professorial staff. This task was carried out with different degrees of enthusiasm and competence, i.e. sometimes with great dedication and knowledge, but at other times lacking in quality. As the numbers of students continued to increase, the position was demanding more and more professorial time. To continue the
program, and to ensure quality and consistency, it was decided to hire a Departmental Advisor whose major job description would be student advising. The Department was fortunate to engage the services of Victoria Catania who exceeded all expectations in this role.

As the Student Affairs Administrator/Advisor, Vittoria meets with students to discuss their course load and gives advice for future career choices. She ensures that they have taken all courses required to graduate and reviews their transcripts making sure that they have met all requirements for graduation. She contacts the students at key points during the year to inform them of major changes, to invite them to come for advising in order to be prepared for registration, and to confirm that they are on the right track to graduation. Over the past six years, the number of students graduating in the Anatomy & Cell Biology Major Program has grown from 106 to 168 (check). This is an enormous task and one that is performed with great care, respect for students, and dedication. Vittoria is also involved in interacting with the undergraduate anatomy student council for organizing different activities during the school year. She is a member of our Departmental Undergraduate Affairs Committee, which meets to discuss matters relevant to our Program, and ensures that the requests and concerns of the students are amply discussed and modified when the need arises. The Presidents of the undergraduate society (MACSS) are also part of this committee, and their feedback is taken seriously.

Over the years, the dramatic increases in enrollment in our Anatomy and Cell Biology B.S. Program have not been matched by increases in our Departmental teaching staff. Valuable and essential help in teaching has been provided by other members of the McGill community who are cross-appointed to our department. These individuals form valuable research collaborations with our departmental staff and frequently place their graduate students in our graduate program. Many of these colleagues have also generously participated in the teaching of our anatomy and cell biology courses, partly in contributing to the teaching component of their tenure dossiers.

93. New M.D.C.M. (Medical Undergraduate) Curricula

Since its inception, our medical school has participated in numerous reviews of its teaching curriculum. A full-scale review of the M.D.C.M. curriculum was undertaken in 1955, and another in 1967. In the latter, the school year was divided into four 10-week blocks. It was felt that students should no longer be considered as passive containers to be filled with facts, but needed to be associated in the teaching-learning process. Too much emphasis had been placed on teaching and not enough on learning. Greater use of seminars and discussion groups was necessary.

In 1969, the Dean of Medicine, Maurice MacGregor reported that, during the past two decades, “These is no aspect of the teaching curriculum which has not been re-evaluated, revamped or adjusted in some way”. The emphasis on the accumulation of facts declined to allow room for the study of behavioural sciences and for an earlier introduction to clinical medicine and surgery Frost 2: 375: Too much emphasis had
been placed on teaching rather than learning. The student needed to be considered as an associate in the teaching-learning process, which could be achieved by the greater use of seminar discussions, assignments of research projects, student electives, and more exposure to the clinical patients and their problems Frost 2: 375.

In 1967, the school year was divided into four ten-week blocks. One of these could be spent away from the university in a wide variety of electives Frost 2: 375. The various subjects in the first year and one half of the curriculum, e.g. anatomy, histology, biochemistry, physiology, pathology, and pharmacology were taught in isolation from one another. Only embryology was taught in synchrony with anatomy.

In 1995, the curriculum was revised to provide a more integrated systems approach. The Basis of Medicine (BOM) part of the curriculum during the first year and a half was divided into eight Units, each covering a different body system, i.e.:

1) Introduction
2) Respiratory, Cardiovascular, and Urinary Systems (dissection of thorax; examination of prosections of posterior abdominal wall).
3) Reproductive System (examination of prosections of pelvis)
4) Digestive System (dissection of abdomen)
5) Musculoskeletal (including Hematology) (examination of prosections of upper and lower limbs
6) Central Nervous System and Special Senses (examination of prosections of head and neck)
7) Immune system
8) Pathology and Pharmacology

Each unit included the anatomy, embryology, histology, physiology, biochemistry, and genetics of the system being considered. All anatomy was covered by the end of unit 6 and was not included in units 7 and 8.

In 2005, the curriculum was further modified by the important introduction of the Physicianship component which referred to the two roles of the physician as healer and professional.

While these changes improved the curriculum, deficiencies remained. The LCME/CACMS accreditation body felt that there was insufficient promotion of independent learning. There is too much emphasis on the acquisition of facts. Medical school should be a time to develop the skills of lifelong learning. Students need to approach medicine scientifically and develop the ability to think critically. Nonetheless, there may be too much emphasis on specialization. McGill has the smallest percentage of students choosing family medicine as a career (18%) in all of Canada. University of Toronto has approximately 30% of its students choosing family medicine.

Other criticisms of the curriculum were that students performed poorly in public health and in communications, cultural competence, legal, ethical and organizational aspects of the practice of medicine. This was perhaps because the demands of the factual content of BOM hampered the students’ acquisition of the knowledge, attitudes and behaviours of physicianship. Students also need to
learn to work in and lead interprofessional teams of healthcare workers, including nurses, physical and occupational therapists, etc.

Therefore another major revision of the curriculum has been introduced in 2013. The aim is that all students will be competent to address the clinical presentations as outlined by the Medical Council of Canada in their Objectives for the Qualifying Examination. The new curriculum will therefore be more ‘case’ based, focusing on acquiring the necessary knowledge to completely understand a clinical presentation, such as chest pain, slurred speech, cough, and less ‘fact’ based. The clinical presentations have been grouped into the traditional regions of the body (thorax, abdomen, pelvis, limbs, head and neck), but also new topics (called blocks) have been added such as ‘infection, immunity and public/global health’.

For the Department of Anatomy and Cell Biology, the new curriculum will considerably change the amount and style of our teaching. The general feeling from the clinical teaching staff and the curriculum review committee is that there is too much detailed anatomy, histology, and embryology in the first 18 months. These disciplines will now need to be taught with a focus on only the knowledge needed to understand the clinical presentations. This might involve giving fewer lectures, each of which would cover more topics but in less detail. In our previous curriculum, about 60% of student contact time consisted of lectures. Although there is little or no evidence that other teaching methods are more effective in training physicians in the basic sciences, it is felt that, with extensive lectures, students are playing too passive a role. Students have a wide variety of learning styles, and for most learners reinforcement of material through various teaching and learning methods is desirable. These may include laboratory sessions, small group activities, case and problem-based learning, simulation sessions, written essays, and direct clinical experience. A pedagogical principle to be emphasized is “situated learning” which means that knowledge is best presented in authentic context.

Anatomy and histology have always been distinguished by the fact that only these subjects have had a high proportion of the learning experience in the laboratory. This emphasis will continue in the new curriculum. The logistics of this laboratory teaching, however, will change somewhat, since in the new curriculum, 1/5 of the class will usually be in the hospitals each day for clinical exposure to family medicine. Thus it will usually be necessary to have two labs for each laboratory session in order to accommodate all of the students. This will actually improve the learning environment since each laboratory session will have fewer students, providing more access to prosections and demonstrators. On the other hand, the teaching time of staff members and demonstrators will be doubled. A further change will come from the fact that in the new “basic of medicine”, anatomy laboratory teaching will be spread out over the first year and one half. Thus from September through December each year, both first and second year students will be having gross anatomy laboratories.

The design of the new undergraduate medical curriculum clearly focuses on general practice needs early in the undergraduate medical curriculum. This in turn will necessitate an increased emphasis, in later years, on the more detailed anatomical needs of students entering surgical or radiological specialties.
For many years, our Anatomy for Surgeons course has admirably contributed to this further training and it is hoped that such a course will be continued.

94. Post-graduate Medical Training in Anatomy

For many years, our Department has contributed to post-graduate teaching programs. This has especially involved teaching of McGill residents in Surgical specialties such as Orthopaedics, Obstetrics and Gynaecology, Cardiology, Gastroenterology, and Otolaryngology. This teaching of students in a longitudinal fashion has been considered essential and is appreciated by Associate Deans of Medical Education and Directors of Resident training. Since we are the only center in Montreal providing opportunities for dissecting cadavers, this constitutes a unique contribution by McGill University. Frequently, in the past, groups of residents from the Université de Montréal have come to our Department for training sessions.

Since the creation of the McGill Simulation Centre, our Department has carried out an essential role in embalming cadavers by a specialized “Thiel” method such that the tissues remain more similar to their situation in life. These cadavers are then loaned to the Simulation Centre for specialized instruction to surgical residents. When needed, our Department also prepares some residents for these simulations by teaching relevant anatomy on standard embalmed cadavers.

Finally, in the tradition of “life-long learning”, our Departmental facility has routinely been used for various workshops instructing in Surgical innovations such as Minimally Invasive Surgery.

95. The Evolution of Teaching Approaches in Gross Anatomy.

In Anatomy departments, the time allotted to the teaching of gross anatomy has been reduced to make way for other newer disciplines in the medical curriculum. Even in the days of Francis Shepherd, it came to be realized that over 300 hours of gross anatomy instruction was simply too much! In the laboratory, the time-honored practice of dissection is still often considered the most thorough method of learning, but it has been retained only for the study of certain regions of the body. Thus in the Medical/Dental class, dissection is carried out in the thorax and abdomen. The laboratory teaching in other regions, as well as all teaching for students in our B.Sc. and Physical and Occupational Therapy Programs, is carried out by means of pre-dissected specimens (prosections).

To generate an adequate number of these prosections, we introduced, several years ago, a Summer Work Program in which ten medical/dental and four physical/occupational therapy students were hired to spend one summer month creating prosections under the guidance of a professor. This program has proved to be extremely popular and is considered a wonderful extension of the first year anatomy learning experience for the students involved.
It should be noted that the emphasis on Gross Anatomy teaching has varied considerably in medical schools worldwide. On the one hand, in many of North America’s finest medical schools, traditional Anatomy laboratory instruction with dissection is emphasized for all medical students. At the other extreme, the Quebec francophone schools such as the Université de Montréal, Université de Sherbrooke, and Université Laval, have abandoned cadaver teaching altogether. It may be asked if a thorough anatomical training with dissection is necessary for all medical students or only for those heading for Surgery, Obstetrics and Gynecology, or Radiology, and should dissection courses be offered to these students as an option. At McGill, the very popular “Anatomy for Surgeons” course is directed mainly at the approximately thirty students in their final year who are headed for surgery. Tradition and emotional factors are involved in the whole question. Is there a question of inertia? “Our teachers, dissected, we dissect, and our students must dissect. Society expects future doctors to cut up dead bodies.” Aside from its many other intrinsic merits, the study of anatomy by dissection is now a symbolic rite of initiation that socializes members into a professional tradition. Yet as described earlier in this work, it may play an important role in the professional training of young doctors. In our new curriculum, some dissection of the body has been retained and it will be interesting to see future events.

A recurring problem for Gross Anatomy instruction has been the need for adequate laboratory assistance. In previous decades, the demonstrators consisted mainly of surgical residents who participated in the first year anatomy teaching as part of their Masters degree program. Additional demonstrating was provided by graduate students and faculty members. A special role was held by the “prosector”, a graduate student who traditionally dissected the whole body just in advance of the medical class and then demonstrated his dissection to the whole class. In the days before closed-circuit television, only 8-10 medical students could view the prospected specimen at once. Therefore the prosector needed to repeat the talk up to sixteen times in order to accommodate the entire class!

In time, funding to pay for the surgical resident demonstrators was lost and they became no longer available. All demonstration then had to be provided by graduate students and faculty members. Over the years, however, as research increasingly emphasized cell and molecular biology, fewer and fewer graduate student took gross anatomy as part of their Ph.D. program. In recent years no graduate students have been trained in gross anatomy and thus none have been available as demonstrators. This has resulted in the number of demonstrators in the lab being too few – well below the ideal ratio of demonstrators to students. For many years, we attempted to supplement the numbers of demonstrators by hiring foreign medical doctors who, lacking the credentials to practice medicine in Quebec, participated in our teaching program. Unfortunately, the quality of assistance provided by these individuals was quite variable.

With the introduction of closed circuit television facilities in our department by Dennis Osmond and Carl Harvey, the presentation of pre-laboratory talks changed dramatically. Instead of the prosector giving repeated presentations to small groups of medical students, the pre-laboratory talks were given to the whole class at once. These were given in Lecture Room C, which was equipped with a digital camera housed over a specimen table along with several TV monitors. These were live talks of about 20 minutes’ duration, following which the students entered the gross laboratory. Subsequently, a camera
and TV monitors were installed in the gross anatomy laboratory and, since that time, the pre-laboratory talks have been given in the laboratory itself.

This television system was also used by Carl Harvey to produce a whole series of superb student review video tapes covering every region of the body (see “Carl Harvey”). The equipment in the gross laboratory has since been replaced by a newer generation, and the pre-laboratory talks are recorded and made available to students for later review on the student web site.

In the Anatomy courses given to our B.Sc. students as well as our students in Physical and Occupational Therapy, there is a ready supply of demonstrators. This is because these courses are given in first or second year of their three-year program, and therefore many demonstrators are available from the ranks of the students in later years. Students are particularly keen to do this demonstrating since it is enjoyable and a valuable learning experience.

96. The Future of Anatomy Departments

Where exactly is Anatomy going? By the 1950’s gross anatomy had ceased to be a vital area of research. In our department. Some research still centered on fine structure of tissues and cells, but most often the principle topic of interest was the function of organelles and their resident molecules. Structure remained an important aspect of all studies, but increasingly the investigative tools included those of biochemistry and molecular biology. Departmental names have often been changed to include “Cell Biology” and/or “Molecular Biology”. In some cases, Anatomy departments simply ceased to exist, with the teaching of gross anatomy teaching was taken over by departments of Surgery, and the cell biology research and teaching distributed among other biomedical departments.

In a competitive research-orientated Department of Anatomy and Cell Biology, it is understandable that the primary concerns of a chairperson would lie in the areas of Cell and Molecular Biology and in graduate studies. The heavy departmental responsibility for the teaching of gross anatomy and histology to large numbers of health science students in our department has created problems attracting a chairperson in the past. A solution of this problem has been found in administratively creating a new Division of Anatomical Sciences within the Department whose director is responsible for all instruction in courses of Gross Anatomy and Histology and Neuroanatomy. We have been fortunate to recruit Dr. Geoffroy Noel for this position. Responsibility for instruction in our undergraduate cell biology courses, graduate courses, and departmental research, on the other hand, lies in the hands of the Departmental Chair.
97. Current Directions of Departmental Research

(Notes from Annual Report 2012)
Current research in our Department focuses on Molecular cell biology of the extracellular matrix, cell surfaces, cellular signaling and trafficking, the cytoskeleton, internal membranous systems, apoptosis and development, hard tissue biology, the male reproductive tract, and biomaterials.. These research areas are extensively interconnected and can be summarized under a common integrated thematic umbrella of “Cell-Matrix and Cellular Dynamics in Development and Disease”.

Our technical tools include regular and cryo-immune electron microscopy, advanced light microscope technology, imaging of individual proteins, living cells, transgenic/knockout animals, protein purification and characterization of complexes, application of tandem mass spectrometry and bioinformatics to protein characterization (i.e. proteomics), and genetic approaches using model organisms.

Connective tissue disorders represent physically debilitating, often chronic illnesses that constitute a major economic and psychosocial challenge to society. To meet this challenge, basic and applied research is required on extracellular matrices, the major component of connective tissues, and the mechanisms by which matrix components communicate with cells. In recent years it has become increasingly evident that besides a critical role in structural and mechanical support, extracellular matrix components contribute to cell communication, in particular via growth factors of the TGF-β superfamily. These cell-extracellular matrix dynamics are frequently disturbed in connective tissue disorders affecting the cardiovascular, skeletal, and dermal systems.

Considering the potential of extracellular matrix fiber systems for generation of new biological nano-materials, artificial tissues and organs, several projects have clearly the potential to bridge between disciplines and to span the full spectrum from basic science to applied research.

In our Department and in other departments at McGill, there is a well-funded, critical mass of world-renowned experts investigating extracellular matrix, cell signaling, and matrix-related bioengineering materials science. Convergence of these clusters of excellence provides a unique opportunity to consolidate these strengths to form a multidisciplinary research center that will integrate health sciences, bioengineering, and clinical research. This group would interact with currently established research centers at McGill and in the Montreal area, including the “Centre for Bone and Periodontal Research”, and the “Facility for Electron Microscopy Research”.

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98. Appendix: Other Faculty Members of the Department of Anatomy

W.M. Fisk (McGill: 1922-1939)
Lecturer. Taught Histology.

F.S. Jackson (McGill: 1922-1936)
Lecturer. Taught Embryology. Assistant Professor in 1925.

L.M. Thomson (McGill: 1922-1929)
Lecturer. Assistant Professor in 1925.

J. Beattie (McGill: 1929-1934)
Assistant Professor. Associate Professor in 1932.

H.E. Mac Dermot (McGill: 1932-1939)
Lecturer.

D.S. Forstner (McGill: 1932-1943)
Lecturer. Assistant Professor in 1942.

H.E. Rowlinson (McGill: 1932-1936)
Lecturer in Anatomy. Assistant Professor in 1936.

D.J. Bowie (McGill: 1932-1939)
Became.

J.S. Baxter (McGill: 1934-1936)
Lecturer.

H.D. O’Brien (McGill: 1938-1939)
Assistant Professor.

Sydney M. Friedman (McGill: 1941-1950)
Teaching Fellow. Assistant Professor in 1946, Associate Professor in 1949.
Friedman published five articles with Hans Selye in 1940-41 on the actions of steroid hormones on the ovaries, testis, as well as on experimental renal atrophy caused by ligation of the ureter.
Sidney Friedman and his wife Constance (a demonstrator in our Department) left McGill in 1950 to participate in the founding of the Medical School of the University of British Columbia.
Friedman authored a superb set of gross anatomy atlases entitled: “Visual Anatomy. These atlases (on the Thorax, Abdomen, Pelvis, Limbs, and Head and Neck) were initiated while Friedman was still at McGill. They were unique in showing regions of the body as a series of planes, a highly useful concept. In later years, these volumes, even though out of print, were frequently referred to by our McGill Anatomy students as a valuable resource.

Constance Friedman (McGill: 1942-1950)
Demonstrator. Both Sidney and Constance Friedman left McGill in 1950 to participate in the founding of the medical school of the University of British Columbia.

Richard C. Greulich (1945-1951)
Assistant Professor. Had been a graduate student from 1950-1952. Associate Professor in 1949.

E.W. Workman (McGill: 1946-1964)
Lecturer.

J. Gross (McGill: 1946-1950)
Teaching Fellow.

Octavia Hall (McGill: 1946-1950)
Teaching Fellow. Lecturer in 1949.

Catherine Stevens (McGill: 1946-1953)
Teaching Fellow. Lecturer in 1951.

Pheobe Cox (McGill: 1951-1957)
Lecturer. Assistant Professor in 1955.

B. Walker (McGill: 1957-1958)
Lecturer.

Jan Langman (McGill: 1957-1965)
Associate Professor. Full Professor in 1960. He left McGill to join the staff of the University of Virginia in 1965. Langman became famous for his textbook on Human Embrology.

L. Heller (McGill: 1957-1963)
Lecturer.

I. Smart (McGill: 1958-1963)
Lecturer.

Sandborn (McGill: 1963-1964)
Assistant Professor. Director of our E.M. Laboratory. Left to go to University of Montreal.

Assistant Professor.

B.A. Young (McGill: 1963-1964)
Assistant Professor.

Lecturer. Assistant Professor in 1965. She was director of our E.M. Laboratory. In these early days, she kept an inventory of all studies in the literature which had used electron microscopy! Died suddenly in 1966.

Assistant Professor.

Otto Hommes (McGill: 1965-1967)
Lecturer.
A.N. Freedman (McGill: 1965-1966)
Lecturer.

J.E. Blundell (McGill: 1965-1967)
Lecturer.

Lecturer.

Lecturer. Ph.D. graduate student.

B.L. Thompson (McGill: 1969-1971)
Assistant Professor.

Edith Aston (McGill: 1969-1972)
Lecturer.

Lecturer. Prominent surgeon. Head of Montreal General Hospital Trauma Unit.

Lecturer.

Alfred Weinstock (McGill: 1969-1971)
Lecturer in our department in 1969. He left McGill to go to California.

Melvin Weinstock (McGill: 1972-1984)
Assistant Professor. Ph.D. student with C.P. Leblond from 1969-1972. Associate Professor in 1979. He left our department in 1984 to Faculty practice dentistry.

**R.S. Harris (McGill: 1972-1974)**
Professor.

**Feisal Brahim (McGill: 1972-1974)**
Lecturer. Ph.D. with Dennis Osmond from 1966-1973. Left to join Faculty of Granada University in Caribbean.

Assistant Professor. Ph.D. with C.P. Leblond. He left in 1971 to practice Dentistry in California.

Lecturer. Assistant Professor in 1975. Tragically, he died in a swimming accident some years ago.

Assistant Professor. A surgeon, he prepared many of the excellent prosections in our anatomical museum. He returned to surgical practice in 1976.

Lecturer. A Ph.D. with Dr. Leblond.

**P. Oliver (McGill: 1985-1987)**
Lecturer.
Tony Antakly (McGill: 1984-1990)

Assistant Professor. He moved to the Université de Montréal in 1990.

Assistant Professor. He worked for many years as a research associate with John Bergeron.


Assistant Professor. He had obtained his Ph. D. in Romania, and worked for several years as a research associate with C.P. Leblond. In 1997, he moved to Quebec City to work at the Centre hospitalier de Laval.


Assistant Professor. Worked with Yves Clermont and other members of the Reproductive Team. He left McGill in 1997 to become a faculty member in the Department of Anatomy at Queens University.

Assistant Professor. He left the department in 1998 to join the faculty of the Department of Anatomy at the University of Western Ontario.


Assistant Professor. Associate Professor in 1997. He left the department in 1998 to join the faculty of the Department of Anatomy at the University of Western Ontario.

Rita Carriere (McGill: )

Instructor. Ph.D. with C.P. Leblond. He coordinated and taught the Limbs and Back Gross Anatomy course students in Physical and Occupational Therapy.


Assistant Professor. Left McGill in 2008 to join the faculty of the Royal Military College in Kingston.

Danny Baranes (McGill: 1999-2001)

Assistant Professor. He left McGill in 2001 to join a university in Israel.

Martin Laterich (McGill: 2003-2006)

Associate Professor. Moved to the Université de Montréal in 2006.

Fiona Bedford (McGill: 2003-)

Assistant Professor. Canada Research Chair, Tier II. From 1990-1994 she was a Ph.D. student at the Biochemistry Institute of Cancer Research at the University of London. From 1994-1997 she was a postdoctoral fellow in the Departments of Physiology and Pharmacology at the University of California, San Francisco. From 1997-2002, she was a postdoctoral fellow at the MRC Lab for Molecular Cell Biology, University College, London.

The Bedford lab was interested in identifying molecular mediators that control the balance in the excitatory/inhibitory ratio required for normal brain function. This research has strong relevance to neurological diseases (e.g. epilepsy) and neurodevelopmental disorders (e.g. autism) as they arise from a disruption in the excitatory/inhibitory balance.
In terms of teaching, Fiona Bedford’s main contribution has been coordination and some lecturing (4 hr) in ANAT 365 (Cell biology of the secretory process), ANAT 262, ANAT 432, ANAT 458, NEURO 310, and ANAT 690D.

Ayman Behiery (McGill: 2007-)

Faculty Lecturer. Had been a part-time senior demonstrator in our department for several years as. He is widely acknowledged by the Medical and Dental students to be an outstanding teacher in the laboratory, and in recognition of this excellence he was awarded the Osler Award. In addition to demonstrating, Ayman taught living anatomy, lectured to the first year Medical and Dental students, and co-instructed in the gross anatomy of the limbs and back to Physical and Occupational Therapy students. In recent years, assumed responsibility for the Visceral Anatomy course on the head, neck and trunk which is taught to the students of Physical and Occupational Therapy as well as to students in Exercise Science.

Justin Kollman (McGill: 2011-)

Assistant Professor. Ph.D. in 2005 from the University of California, San Diego (Division of Biology). From 2005-2012 he was a Postdoctoral Fellow in the Department of Biochemistry and Biophysics at the University of California, San Francisco. The Kollman lab studied the structures of the complex macromolecular machinery of cellular organization, with a focus on bacterial cytoskeletal systems and organelles.

Faculty member of the Department of Neurology and Neurosurgery. Cross appointed to our department as Associate Professor in 1974. Full Professor in 1995. Don was a practicing neurologist and instructor in Neurology. He was an extremely able Unit head of Unit six of the medical curriculum (The Special Senses) for many years. As such, he coordinated the Head and Neck portion of gross anatomy. He retired in 2003, and carries out paleontological studies with the Redpath Museum.

Heather Davis (McGill: 1985-1990)
Assistant Professor. Heather Davis joined McGill in the School of Physical and Occupational Therapy. She was cross appointed to our department. She coordinated and taught the Limbs and Back course in gross anatomy to students in Physical and Occupational Therapy. She left McGill in 1990 for a position in Paris.

**Alain Beaudet (McGill: 1981-)**

President of the CIHR since 2008. He was President of FRSQ from 2004-2008. He is director of the Functional Neuroanatomy Laboratory at the MNI. He has investigated the role of neuropeptides in the CNS, the control of intracellular receptor trafficking and its role in neuronal signaling and new pain therapies.

Ph.D. (neuroscience) from the Université de Montréal. He did a postdoctoral stay with Bernard Droz at the Centre d’Etudes Nucléaires at Saclay and at the Brain Research Institute of the University of Zurich. Cross appointed to Assistant Professor in our department in 1974, to Associate Professor in 1988, and to Professor in 1993.

**Sam David (McGill: 1988-)**
Sam David is a faculty member of the Department of Neurology and Neurosurgery at the Montreal General Hospital. Cross appointed to Associate Professor in our department in 1988, and to Professor in 2009. Sam gives lectures on the embryology and anatomy of the ear to the medical/dental students.


Faculty member at the Lady Davis Institute of the Montreal Jewish General Hospital. She was cross appointed to Associate Professor in our department in 1988, and to Full Professor in 1993. Wang worked on the cell biology of aging and has a very prominent international reputation.
Marilyn Miller (McGill: 1990-2002)

Faculty member of the Department of Neurology and Neurosurgery. Cross appointed to Assistant Professor in our department in 1990 and to Associate Professor in 1993. She left McGill to work for N.I.H. in Washington, D.C.

Orest Blaschuk (McGill: 1990-)

Faculty member of the Division of Urology in the Department of Surgery in 1987. Cross appointed to our department as Assistant Professor in 1990. He became Associate Professor in both departments in 1993. In our department, his main teaching role was as lecturer and coordinator of the course “Experimental Basis of Embryology” from 1991-1994. Blaschuk’s research concerned a family of cell adhesion molecules, known as the cadherins. Developing novel cadherin antagonists for use in the treatment of a wide variety of diseases.

School of Physical and Occupational Therapy. Cross appointed to our Anatomy Department as an Assistant Professor in the same year.

Gary Wild (McGill: 1993-2008)

Gary Wild carried out a post-doctoral year with Gary Bennett. He was appointed an Assistant Professor in 1993. Prior to coming to our department, Gary had obtained a Ph.D. in the Department of Pathology, and then his M.D.C.M. degree at McGill. He is a practicing gastroenterologist and clinical research scientist at the Montreal General Hospital.


Associate Professor. Worked as research associate with John Bergeron. His main appointment was at the Montreal Biotechnical Institute. Became Chairman of the McGill Department of Biochemistry.

Richard Murphy (McGill: 1998-2001)

Faculty member and then Chairman of the Department of Neurology and Neurosurgery at the MNI. Tragically, he died suddenly in 2001.

Barry Posner (McGill: 1998-)

Director of McGill’s Polypeptide and Protein Hormone Laboratory in the Department of Medicine. Barry had received his MD in 1961 from the University of Manitoba. This was followed by graduate work at MIT and at NIH. At McGill, Posner was promoted to Associate Professor in 1975 and Full Professor in 1979. He was cross-appointed to our department as Full Professor in 1998. Barry Posner’s research interests involved insulin signaling and the endosomal system. He carried out several studies with John Bergeron on internalization of insulin receptors. In the 1980’s he carried out studies on peroxovanadium
compounds which were potent insulin mimetics. In elucidating their mechanism of action, he defined the key role of phosphotyrosine phosphatases in regulating receptor tyrosine kinases. He also identified lipid rafts as sites of intense signaling both at the cell surface and in endosomes. More recently, he has identified several genes responsible for diabetes. He has published over 250 articles.


Joined the Department of Biology at McGill in 1990 as an Assistant Professor. He had obtained his Ph.D. in biology at MIT. He then did postdoctoral work in the Genetics Department at Cambridge University. At McGill, Lasco was promoted to Associate Professor in 1996 and to Full Professor in 1999. He became Chair of the Biology Department in 2000. Cross appointed to our department as Associate Professor at this time. Paul Lasco’s research interests involved the assembly of the pole plasm during oogenesis in Drosophila melanogaster fruit flies. This pole plasm is necessary for the formation of germ cells, immortal cells needed for gonad formation.

Philip Barker (McGill: 1998-)

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Faculty member of the Department of Neurology and Neurosurgery at the MNI. He was cross appointed to our department as Assistant Professor in 1998 and was promoted to Associate Professor in 2003 and Full Professor in 2008. Studies cell surface receptors and signaling pathways in the CNS, neurotrophins which are secreted factors that play crucial roles in the development and maintenance of the CNS, p75 – a cell surface neurotrophin receptor which initiates apoptosis, LGI 1 which is a secreted protein along with its receptor which plays a role in CNS development, inhibitors of apoptosis (IAPs).

Timothy Kennedy (McGill: 1998-)

Faculty member of the Department of Neurology and Neurosurgery at the MNI. He was cross appointed to our department as Assistant Professor in 1998, and promoted to Associate Professor in 2003. Tim Kennedy’s research interests involve the molecular mechanisms that direct neural development. How do such mechanisms influence the organization and plasticity of the mature mammalian CNS? Kennedy studies the identification of biochemical signals that direct cells and axons to move (axon guidance), or then to stop once they have reached their goal and have made appropriate connections with neighbouring cells. Also studied are synapse formation and plasticity and oligodendrocyte precursor migration.

Antonis Koromilos (McGill: 1998-)
Faculty member of the Department of Oncology. He was cross appointed in our department as Assistant Professor in 1998, and promoted to Associate Professor in 2003. His research interests include: signal transduction, virus-mediated oncogenesis, protein phosphorylation, cell cycle control, apoptosis, interferon, ER stress, tumour suppressor p53

Peter McPherson (McGill: 1998-)

Faculty member of the Department of Neurology and Neurosurgery at the MNI. A James McGill Professor. He was cross appointed to our department Assistant Professor in 1998, and promoted to Associate Professor in 2003. McPherson's research activities have included use of proteomics (subcellular fractionation coupled with high throughput mass spectrometry) to define the full compliment of proteins in clathrin-coated vesicles of the brain. He characterized the functions of some of these proteins. Current studies investigate the formation of CCVs which are the major vehicle for endocytic uptake of protein and lipid cargoes including signaling receptors CCVs are used for reformation of synaptic vesicles after neurotransmitter release. The link between endocytosis and signaling and regulation of the actin cytoskeleton is also being studied.

Alfredo Ribeiro-da-Silva (McGill: 1997-)
Joined the Department of Pharmacology and Therapeutics at McGill in 1990. Alfredo had obtained his MD in 1973 from the University of Porto in Portugal. He obtained his Ph.D. in 1985 in Anatomy and Histology at the same institution. From 1986-1989 he was Associate Professor of Histology and Embryology at the University of Porto.

At McGill, he was promoted to Associate Professor in 1996 and to Full Professor in 2004. He was cross appointed to our department as Associate Professor in 1997, and promoted to Full Professor in 2004. Alfredo Riberio-d-Silva’s research interests involve the mechanisms underlying chronic pain states in both the CNS and PNS. He is particularly interested in arthritis and neuropathic pain models. He uses immunocytochemical approaches at both the LM and EM levels. Topics include: Changes with aging in dopaminergic and noradrenergic innervations in rat neocortex; expression of neurokinin 1 receptor in neurons in polyarthritis; autonomic fiber sprouting in skin in chronic inflammation.

Wayne Sossin (McGill: 1998-)

Faculty member of the Department of Neurology and Neurosurgery at the MNI. He was cross appointed to our department as Assistant Professor in 1998, and promoted to Associate Professor in 2005. Wayne Sossin’s research interests include the biochemical changes that occur in the brain during learning and memory. These studies include the identification of molecular memory traces that underlie behavioral memory. These could involve the activation of persistent kinases, translation of new proteins, or
changes in the cytoskeleton. Sossin studies the simple nervous system of Aplysia where behavioral memory is encoded by changes in the synaptic strength of identified neurons.

**Stefano Stifani (McGill: 1998-)**

Faculty member of the Department of Neurology and Neurosurgery at the MNI. He was cross appointed to our department as Assistant Professor in 1998, and promoted to Associate Professor in 2005. Stefano Stifani’s research interests involve the events that regulate the generation of nerve cells from pleuripotent neural stem/progenitor cells. He studies mechanisms that control normal mammalian nervous system development to better understand a) neural diseases caused, at least in part, by perturbations of the developmental process; and b) how to promote neural regeneration and repair in response to disease or trauma. He uses forebrain and spinal cord as model systems, and uses 1) in vivo genetic approaches using knockout or transgenic mice; 2) in vivo assays in genetically manipulated chick embryos; 3) in vitro proliferation and differentiation assays using primary cultures of mouse neural progenitor/stem cells.

**Dominique Walker (McGill: 1998-)**

Full Professor in the Department of Psychiatry. She is the Director of the Neuroscience Research Division of the Douglas Institute. She was cross appointed to our department as Assistant Professor in 1998, and promoted to Associate Professor in 2005. Dr. Walker’s research interests are in the implications of neonatal stress on brain development and in the neuroendocrine responses to stress. Specifically she asks how infant-related stimuli can modify response to stress in the mother and participate in shaping the development and behavior of the infant. The responses are controlled through the connections
between the hypothalamus, pituitary gland, and the adrenal gland – the HPA axis. Neonatal stressors included repeated pain and changes in levels of leptin, a protein critical in the regulation of body weight and obesity.

96. Appendix: Chairs of Department of Anatomy (and Cell Biology)

John Stephenson (1829)
Oliver T. Bruneau (1842)
William E. Scott (1856)
Francis J. Shepherd (1883-1913)
Auckland C. Geddes (1913-1919)
Samuel E. Whitnall (1919-1934)
Cecil P. Martin (1936-1954)
Charles Philippe Leblond (1954-1974)
Yves W. Clermont (1975-1985)
Hershey Warshawsky (1995-1996)
John Bergeron (1996-2009)
Natalie Lamarche-Vane (2010-2012)
Craig Mandato (2012- )

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