

THE DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY

Schulich School of Medicine & Dentistry



Celebrating the Diamond Jubilee
of Microbiology and Immunology at Western

1939-2014

FOREWORD

Greetings,

Welcome to the 75th anniversary celebration of the Department of Microbiology & Immunology at the Schulich School of Medicine & Dentistry, Western University. This event is marked with the hosting of a symposium “Celebrating the Diamond Jubilee of Microbiology and Immunology at Western” bringing together our current and former students, staff and faculty, and many distinguished members of the University community.

Starting in 1939, the Department has maintained its excellence in teaching and research mandate and serving the community at large. In 1999, we celebrated our 60th anniversary with the symposium “Challenges of Microbial and Immune Diseases in the Next Millennium”. At this 75th anniversary, I extend a special welcome to our many alumni who have travelled to London, to join us. It provides us an opportunity to renew old acquaintances and build new relationships.

The Diamond Jubilee Symposium will highlight the achievements of many of our alumni and work of some of our current faculty while providing a forum for scientific and social interactions. While I acknowledge the contributions of all those who served the Department during the past 75 years, I would like to thank the organizing committee chaired by Dr. Wayne Flintoff for their dedicated effort to organize this event. I particularly would like to thank Professor Emeritus Robert G.E. Murray, a distinguished member of the Department over the past 68 years, for his inspiration and dedication that underlines the spirit of this event.

Bhagirath Singh
Acting Chair and Professor
Department of Microbiology and Immunology

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ANNIVERSARY PROGRAM

Symposium - Room 3250, 3M Centre, Western University

Chair - Susan Koval

- 12:30 p.m. Robert G.E. Murray - Getting started and then what?
- 12:55 p.m. Sara Galsworthy - Messages from the microbes: lessons learned (or not!)
- 1:20 p.m. Alp Sener - Transplantation related tissue injury: Is there a stinky solution for this unavoidable problem?
- 1:45 p.m. Bryan Heit - Macrophages – Gatekeepers of infection, inflammation and autoimmunity
- 2:10 p.m. Rodney Dekoter - There and back again. An immunologist's tale.
- 2:35 p.m. Nutrition Break
- 3:05 p.m. Barbara Burleigh - Intracellular niches: Using the host to probe the biology of Chagas' disease parasite.
- 3:30 p.m. Thalia Assuras - Learning: The unique gift claimed by journalists.
- 3:55 p.m. Malcolm Finkelman - From fermentation to mycotic diseases: A generalist's journey.
- 4:20 p.m. Brad Thompson - All I really need to know about Microbiology and Immunology I learned at Western.
- 4:45 p.m. Wayne Flintoff - Closing Remarks
- 5:00 p.m. Wine and Cheese Reception - Green Leaf Café (Garden), Somerville House
- 7:00 p.m. Celebratory Dinner - London Club, 177 Queen's Avenue, London
- 7:00 p.m. Cash Bar
- 7:30 p.m. Dinner with complimentary wine
Host: Bhagirath Singh
Guest Speaker: David Colby
Music: Sonja Gustafson

75th Anniversary Organizing Committee: Wayne Flintoff (Chair), Kim Arts, Carole Creuzenet, Rod Dekoter, Bethany Heinrichs, Bryan Heit, Bhagirath Singh and Fred Williams

GUEST SPEAKER BIOGRAPHIES



THALIA ASSURAS

Thalia Assuras has more than 30 years of experience as a broadcast journalist, writer, public speaker, communications consultant and media trainer. Thalia holds a BSc Honors degree in Microbiology and Immunology and a MA in Journalism, both from Western University.

Thalia has performed at the highest levels of broadcast journalism as an anchor and correspondent at the ABC and CBS networks in the United States, and at Canada's CTV and Global CanWest networks. She has reported or anchored coverage of the wars in Iraq and Afghanistan; natural disasters including earthquakes; presidential summits; politics from the White House and Capitol Hill to national elections;

tragedies from the terrorist attacks of September 11th to the triumphs of the Olympics; and breaking news events from airline disasters to campus violence.

Few communications professionals have the extensive body of experience and the corresponding professional judgment and skills that Thalia brings to her consultancy, including national name recognition, honors and tributes, and a wealth of professional colleagues and friends in government, business, media and foundations.

Throughout her career in news and public relations, Thalia has taught communications courses, lectured, served as master of ceremonies for many events and programs, written about the profession, and advised newcomers to the communications career path.



BARBARA BURLEIGH

Barbara Burleigh is an Associate Professor in the Department of Immunology & Infectious Diseases at the Harvard School of Public Health in Boston, MA where she has been a faculty member since 1999. Barbara holds a PhD degree in Microbiology and Immunology from Western University. Her thesis work, under the supervision of Dr. Michael W. Clarke, Department of Microbiology and Immunology, Schulich School of Medicine & Dentistry, focused on endocytosis and nutrient acquisition in the African trypanosome, *Trypanosoma vivax*. As a student, Barbara was awarded a CIDA scholarship and conducted much of her thesis research at the International Laboratory for Research on Animal Diseases in Nairobi, Kenya. As a post-doctoral

fellow in the Department of Cell Biology at Yale University, Barbara shifted her focus to the Chagas' disease parasite, *Trypanosoma cruzi* – a leading cause of infectious myocarditis in South and Central America. Exploiting genome-scale transcriptomic and functional approaches, Barbara has worked toward understanding the molecular basis of intracellular infection by *T. cruzi* and the critical role of host cellular and metabolic pathways in sustaining parasitic infection. It is her sincere hope that these studies will contribute to the development of new treatments for Chagas' disease.



RODNEY P. DEKOTER

Rodney (Rod) DeKoter obtained his PhD in 1996 in Microbiology and Immunology from Western University under the supervision of Sharwan K. Singhal, Department of Microbiology and Immunology, Schulich School of Medicine & Dentistry. He obtained postdoctoral training in Immunology and Hematology under the supervision of Harinder Singh at the Howard Hughes Medical Institute, University of Chicago before starting an independent faculty position at the University of Cincinnati, Ohio in 2001. Rod returned to Schulich Medicine & Dentistry in the spring of 2009 and is now an Associate Professor in the Department of Microbiology and

Immunology. The focus of his research is immune system development, with a particular interest in the molecular genetics of childhood leukemia.



MALCOLM A. FINKELMAN

Malcolm Finkelman serves as Director of Clinical Development for Associates of Cape Cod, Inc., a FDA-licensed manufacturer of diagnostic reagents. Malcolm holds a MEd in Biochemical Engineering and a PhD in Microbiology and Immunology, both from Western University. He has worked in the biotechnology industry for over 30 years. His early career focus was on biotechnology process and product development. Malcolm has an extensive background in recombinant host fermentation, recombinant protein production and polysaccharide biochemistry, including bio-synthesis, measurement, and applications. His current responsibilities

include clinical mycology diagnostic research and product development for mycotic infection diagnostics. His research interests include the application of bacterial endotoxin and (1[®]3)-b-D-glucan diagnostic reagents as potential metrics for the translocation of pro-inflammatory macromolecules from the intestinal lumen to the circulation, as well as the utilization of beta-glucan assays in non-serum bodily fluids such as cerebrospinal fluid and others.



SARA GALSWORTHY

Sara B. (Sally) Galsworthy earned her BA from Pomona College in 1960 followed by a PhD in Physiological Chemistry with Minors in Organic Chemistry and Zoology in 1965 from the University of Wisconsin. Sally began her career as Assistant Professor in the Department of Biology at Edgewood College in Madison, Wisconsin in 1965 before moving to pursue a Postdoctoral Fellowship with Dr. R.G. E. Murray at Western University in 1971. In 1974, Dr. Galsworthy became Assistant Professor of Microbiology and Immunology and in 1983 was appointed Assistant Dean of Graduate Studies, Biosciences and Physical Sciences at Western. Sally served as

Acting Chair of the Department of Microbiology and Immunology from 2001-2002 before retiring as Professor Emerita in 2003.

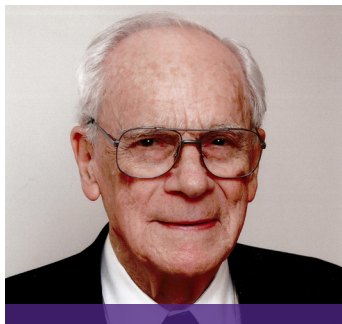
While at Western, Sally's research interests included the pathogenesis of *Listeria monocytogenes*, with specific interests in the mechanisms underpinning its motility, and its ability to stimulate monocytopoiesis and suppress immune responses directed towards the bacterium.



BRYAN HEIT

Bryan Heit is an Assistant Professor in the Department of Microbiology and Immunology, Schulich School of Medicine & Dentistry, Western University, a position he has held since July 2011. In his role, Bryan has been investigating the receptors and signaling pathways involved in the removal of both pathogens and apoptotic cells, and trying to uncover how deficits in these pathways lead to chronic inflammatory diseases such as atherosclerosis. These studies have been supported by funding received from the Canadian Institutes for Health Research, the Natural Sciences and Engineering Council, and the Canadian Foundation for Innovation.

Bryan received his PhD in 2008 from the University of Calgary, working in the laboratory of Dr. Paul Kubes investigating the signaling pathways that regulate neutrophil chemotaxis and inflammation. This was followed by a postdoctoral fellowship with Dr. Sergio Grinstein at the Hospital for Sick Children, Toronto, where Bryan researched the signaling pathways involved in the intracellular survival of several bacterial pathogens, discovered a novel lipid signaling process involved in cell death, and elucidated the phagocytic pathway used for the dual purpose of cholesterol uptake and plasmodium phagocytosis.



ROBERT G.E. MURRAY

Robert (Bob) G.E. Murray completed his undergraduate education at McGill University, followed by further education at Cambridge University in Pathology and Bacteriology. He returned to McGill University in 1943 for training in Medicine. He served briefly in the Canadian Army Medical Corps, followed by a stint at Western University in 1945 as a Lecturer in Bacteriology. He was promoted to Professor and Head of the Department of Bacteriology and Immunology in 1949 and served as Head until 1974. During that time, he also served as Chief of the Microbiology Service at Victoria Hospital from 1948-1965. He continued to serve as Professor of Microbiology and Immunology from 1974-1984. In 1984, he was named Professor Emeritus, and received an Honorary DSc from Western in 1985.

Bob's research in bacterial structure, function, and systematics brought numerous honours and awards, including a Fellowship in the Royal Society of Canada, 1958; the Canadian Society of Microbiologists Award in 1963; election to the American Academy of Microbiology in 1973; the Flavelle Medal, Royal Society of Canada in 1984; and the J. Roger Porter Award, American Society for Microbiology in 1987. Bob holds Honorary degrees from the Universities of Western, Guelph, Victoria and McGill. He served as Founding President of the Canadian Society of Microbiologists; Founding Editor of the Canadian Journal of Microbiology and was appointed an Officer of the Order of Canada in 1998, for his lifetime contributions to the development of microbiology in Canada.

In 2007, the Canadian Historical Society and the Champlain Society of Canada published a book honoring the professional careers of Drs. E.G.D. and R.G.E. Murray. The title of the book is: "The Meaning of Life: The Scientific and Social Experiences of Everitt and Robert Murray, 1930-1964."



ALP SENER

Alp Sener earned his Biology degree from the University of Texas at Austin in 1994. Upon concluding his undergraduate studies, he obtained his PhD in renal physiology in 1999, followed by his MD in 2002 from the University of Calgary. Subsequently, Alp completed his Urology residency at the Schulich School of Medicine & Dentistry, Western University in 2007. He then spent two years at the University of Maryland Medical Center in Baltimore as the American Society of Transplant Surgeons/Novartis Fellow in Transplantation. While in Maryland, he was trained in kidney and pancreas transplantation and completed a research fellowship in transplant immunology. He is currently an Assistant Professor of Surgery, and Microbiology and Immunology and is the Director of the Renal Transplant Fellowship program and the Chair of Surgical Research at the Schulich School of Medicine & Dentistry, Western University. In addition to his clinical practice, Alp maintains a translational research laboratory evaluating the role of endogenously produced gasotransmitters, particularly hydrogen sulphide, as it relates to various disease states including chronic renal failure, renal cell carcinoma and ischemia reperfusion injury of renal transplantation.



BRAD THOMPSON

Brad Thompson has held the positions of Chairman of the Board, President and Chief Executive Officer of Oncolytics Biotech Inc. since April 1999. Prior to his role with Oncolytics, Brad was the Chief Executive Officer of SYNSORB Biotech from 1994 to 1999. From 1983 to 1994, Brad worked in a senior role at the Alberta Research Council. He is a current member and Emeritus Chairman of BIOTECANADA and sits on the boards of various other biotechnology companies. He received his PhD in Microbiology and Immunology from Western University.

HISTORY OF THE DEPARTMENT

The Department originated as the Department of Bacteriology and Immunology in the Faculty of Medicine at Western University when the University was located on South Street.

Its primary focus was to teach medical students and provide a diagnostic bacteriology service for nearby Victoria Hospital and the War Memorial Children's Hospital, which was previously a function of the Department of Pathology. A research presence in the Faculty of Graduate Studies was developed, and

after the Faculty of Medicine moved to the University Campus in 1965, the Department expanded its teaching responsibilities by starting a BSc Honors program in Bacteriology and Immunology, as well as offering basic courses in association with the Faculties of Science, Dentistry, and Nursing.

We are a strong department within the Schulich School of Medicine & Dentistry, and proud of our history and achievements during the past 75 years.



Faculty and Staff, 1968
Department of Bacteriology and Immunology

BEGINNINGS AND PROGRESSION

Dr. Igor N. Asheshov arrived in London, appointed Professor and Head of a new Department of Bacteriology and Immunology in 1939. His immediate task was to design appropriate laboratories in a building added to Victoria Hospital, which opened in 1941.

The Department of Bacteriology and Immunology formed part of the Hamilton King Meek Memorial Laboratories, serving the hospital along with the Departments of Pathology and Pathological Chemistry. Professor Asheshov initiated a research program, began an effective service laboratory, engaged the first graduate student (F.C. Heagy) in 1947, and taught with style. To ease the load, a medical bacteriologist, Dr. R.G.E. Murray, was appointed in 1945 to assist in all functions.

It was a happy arrangement, but in 1948, Professor



I.N. Asheshov
Professor and Head, 1942-1948
Department of Bacteriology and
Immunology

Asheshov resigned to head a March of Dimes poliomyelitis project concerning antibiotics that might interfere with viruses.

Dr. Murray, after assuming the role of Acting Head for a year, was appointed Professor and Head of the Department.

In 1949, he recruited Dr. Carl F. Robinow as a senior colleague. This was a supportive appointment

that allowed a conjunction of mutual interests in microscopy and research in microbial cytology, concentrating on bacteria and bacteriophage at first, and later with Dr. Robinow studying fungal cytology.

Research was associated with graduate students from 1950 onwards. A departmental association with colleagues at the Agricultural Research Institute on campus, notably with Dr. C.L. Hannay and Dr. E.B. Roslycky, began in 1951 and continued later with other Agriculture Canada microbiologists. Electron microscopy was added in 1954, and in 1955, biochemical cytology was initiated with the career appointment of Dr. P.C. Fitz-James, the first National Research Council (Medical Research Council) Associate.

These steps initiated a lasting and productive graduate program and research that gained international recognition. Undergraduate teaching concentrated on the second year course for medical students. The research and clinical activity of the department increased radically after 1955, requiring physical expansion and additional appointments for the hospital services, including Dr. E.W.R. Campsall for bacteriology, Dr. A. Bakerspiegel for mycology, and Dr. I.B.R. Duncan for virology. These appointments also strengthened teaching and, in the case of virology, a laboratory relationship with St. Joseph's Hospital.

Physical rearrangements in Victoria Hospital helped, but space and development awaited the move of the Faculty of Medicine to the University Campus in 1965.

The move was to bring the progressive integration of the basic medical sciences programs of the Faculty of Science with specialized fourth-year honors components between 1965 - 1969 and the building of



R.G.E. Murray

Associate Professor and
Acting Head, 1948-1949
Professor and Head, 1949-1974
Department of Bacteriology
and Immunology



C.F. Robinow

Professor and Acting Head,
1960-1961, 1968-1969
Department of Bacteriology
and Immunology



E.L. Medzon

Associate Professor and
Acting Head, 1973-1974
Department of Bacteriology
and Immunology

University Hospital in 1972. The Clinical Bacteriology Laboratory and its personnel were left to be run by Victoria Hospital.

During this period of change, a Faculty of Dentistry was formed, allowing an extension of The Department of Bacteriology and Immunology into an addition of the Medical Sciences Building in 1968. This new laboratory and teaching space allowed a series of appointments from 1965 to 1972. The first among these new appointments was Dr. J. Robinson in general bacteriology, Dr. E.L. Medzon in immunology and virology, Dr. J. Rozanis in dental bacteriology, and Dr. K. Ebisuzaki in genetics. Immunology underwent a major development with the arrivals of Dr. N.R.StC. Sinclair in 1967, Dr. G.H. Strejan in 1968, and Dr. S.K. Singhal in 1970.

Expanded teaching of microbiology in the Faculty of Science brought Dr. P.O. Wilkins in 1968 and Dr. S.B. Galsworthy in 1971. A short-lived program of environmental engineering by Dr. P.O. Wilkins brought the association of Professor J.E. Zajic of Engineering

Science. This move and physical changes were accomplished expertly by the Chief Technical Officer Mr. David Cornelius and Mr. John F. Marak. In addition, Ms. Marion Luney, A.R.T., set up the laboratory teaching.

For its part, University Hospital had, at the outset, a service laboratory with teaching and research functions under Dr. J.L. Whitby from the Department of Medicine. His cross-appointment renewed clinical contact. He was soon joined by Dr. R.H. Behme and Dr. W.A. Black, and later by Dr. D. Colby, and Dr. M. John to provide a research and diagnostic back-up.

Facilities were built in University Hospital to encompass medical student and residency teaching. The two other teaching hospital microbiology departments were, and continued to be, a resource and these colleagues have contributed a great deal over the years as members of our Department; Dr. E.J. Penikett, Dr. E.W.R. Campsall, Dr. Z. Hussain, and Dr. R. Lannigan at Victoria Hospital and Dr. I.B.R. Duncan, Dr. L.A. Hatch, Dr. O. Hammerberg, Dr. H. Bialkowska-Hobrzanska and Dr. G.



N.R. Sinclair
Professor and Acting Chair,
1974-1976
Department of Bacteriology and
Immunology
Professor and Chair, 1981-1990
Department of Microbiology and
Immunology

Reid at St. Joseph's Hospital.

In 1974 Professor Murray resigned as Head of the Department to return to normal professorship. Dr. E.L. Medzon and Dr. N.R.StC. Sinclair each acted as Head for one year until Professor Samuel Dales, from the Public Health Research Institute of the City of New York, took up the Chairmanship in 1976.

Initiating a new administrative structure, Dr. Dales added a new concentration on virology and cell biology with the effective recruitment of Dr. R. Anderson and Dr. V.L. Morris as virologists, and Dr. W.F. Flintoff as a cell biologist. Genetics had developed a strong program in biology and to help contribute to that field Dr. T.G. Linn was appointed as a microbial geneticist in 1978.

During this period, inter-departmental associations were reinforced with joint appointments recognizing common research and practical interests in immunology and cell biology. Joint appointments included Dr. W.B. Chodirker from the Division of Clinical Immunology and Allergy, Dr. D.A. Bell and Dr. M. Harth from the Division of Rheumatology, in the Department of Medicine, Dr. D. Denhardt from the National Cancer Institute of Canada (NCIC) Cancer Research Laboratory, and Dr. A. Chambers from the London Regional Cancer Centre. The name of the Department changed to Microbiology and Immunology in 1978 to

reflect the breadth of competence.

In 1981, Professor Dales stepped down as Chair to continue his scientific interests in the Department. He was replaced by Professor N.R.StC. Sinclair, whose immunological interests played a part in increasing the scope of research in the Department. Research interactions evolved with University Hospital involving immunosuppression, the transplant programs, and a clinical trial of Cyclosporin by Dr. C. Stiller together with clinical research interests in expanding the neuroscience effort. This combination of intentions was incorporated into the founding of The John P. Robarts Research Institute in 1968 which was intended to promote and administer selected areas of research. The establishment of Robarts provided an opportunity for expansion of departmental recruitment as well as providing additional space and facilities.

At its outset, Dr. Strejan and Dr. Singhal were able to expand their research on autoimmune diseases and immunomodulation. Retirements and withdrawals from active teaching required additional appointments to the department, namely Dr. S.F. Koval in bacterial structure in 1984, Dr. M.W. Clarke in parasitology in 1986 and Dr. M.A.Valvano in bacterial virulence in 1988.

In 1990, Professor N.R.StC. Sinclair stepped down after two terms as Chair. Dr. W.F. Flintoff and Dr. S.B. Galsworthy both acted as Chair during the interim, and in 1992, Professor Bhagirath Singh, was appointed Chair with a cross appointment to Robarts as co-director of the Immunology group. Professor Singh brought an extensive research program in immunology including an approach to the prevention of diabetes. This interest in diabetes resulted in a Medical Research Council (MRC) Development Grant and, in 1996, a major grant from the MRC-Juvenile Diabetes Foundation International to support new recruitment and a group effort.

Fortunately, the initiation of this program coincided with the opening of the Siebens-Drake Research

Institute (SDRI), co-administered with Robarts and fused with the former Agricultural Research building. The result during the period from 1993-96 was the appointment of Dr. T.L. Delovitch in autoimmune diabetes, Dr. D.J. Kelvin in chemokine regulation, Dr. B.M.C. Chan in cell movement in immune diseases, Dr. J. Madrenas in T-cell regulation and Dr. A. Ochi in cell signalling, all of whom contributed to the Type-1 diabetes research in SDRI.

In 1997, following Dr. Dales retirement, Dr. G. McFadden was recruited as a virologist (pox viruses) to join Dr. G.A. Dekaban (human retroviruses) and Dr. C. Strathdee (human neurodegenerative disorders) in the laboratories at Robarts and SDRI. SDRI also incorporated Agriculture Canada microbiologists, Dr. D. Cuppels, Dr. K.R. Dobinson and Dr. M. Gijzen, who had appointments in the department and contributed expertise on plant pathogens and soil microbiology. The subsequent appointments to the Department included Dr. M. Bhatia in stem cell growth and control and Dr. D.E. Heinrichs in *S. aureus* pathogenesis, both in 1998.

By this time, the Department had developed productive research programs together with graduate and undergraduate teaching of broad scope and extensive involvements outside the boundary of the formal Department of Microbiology and Immunology. But more developments were to come.

It is important to note that clinical microbiology was a major service function of the Department but the Meek Laboratory responsibility reverted to Victoria Hospital when the medical school moved to the University Campus in 1965.

The microbiologists retained contact with the Department through teaching appointments and departmental responsibilities, as was the case for the microbiologists at both St. Joseph's and University Hospitals. To encourage a more formal arrangement, the Department formed a Division of Clinical Microbiology in 1992 with Dr. R. Lannigan as Director from 1992-1998. The centralizing of all the microbiology laboratory services at Victoria Hospital as part of "Hospital Rationalizing" in 1998 changed the



S. Dales

Professor and Chair, 1976-1981
Department of Microbiology and
Immunology



W.F. Flintoff

Professor and Acting Chair,
1990-1991, 2001-2003
Department of Microbiology and
Immunology



S.B. Galsworthy

Associate Professor and Acting
Chair, 1991-1992
Department of Microbiology and
Immunology



B. Singh

Professor and Chair, 1992-2001;
Acting Chair, 2012-present
Department of Microbiology
and Immunology



M.A. Valvano

Professor and Chair, 2004-2012
Department of Microbiology
and Immunology



D.E. Heinrichs

Professor and Acting Chair,
2009-2010
Professor and Vice-Chairman,
2010-2012
Department of Microbiology
and Immunology

pattern, but retained this resource for the Department and its teaching function.

The Division of Clinical Microbiology was relocated from Microbiology and Immunology to the Department of Medicine, with affiliations to the Department of Pathology. Several faculty members have cross-appointments in our Department.

In late 1999, the MRC, the major national research funding organization for health research, underwent a major re-structuring. The Canadian Institutes of Health Research (CIHR) was created in June 2000. It established 'virtual' research institutes as the major initiative.

Dr. B. Singh was recruited as the inaugural Director of the Institute of Infection and Immunity in January 2001. With its administration located at Western, Dr. Singh's capable leadership over 10 years helped, this institute become the premier research institute of the CIHR, providing new initiatives, funding opportunities, and

policy directions for the Canadian research community in infection and immunity. This appointment of Dr. Singh to the CIHR Directorship brought about changes in the Department.

Dr. W. Flintoff assumed the position of Acting Chair of the Department while the recruitment process for a new Departmental Chair was underway. In 2004, Dr. M.A. Valvano was appointed Departmental Chair, a position he held until his resignation and relocation in 2012.

In 2009, Dr. Heinrichs served as Acting Departmental Chair for one year when Dr. Valvano was on a study leave. To assist in the management of the Department, Dr. Heinrichs assumed the role of Vice Chair from 2010-2012. The administration is currently in flux awaiting a new chair. In the interim, Dr. B. Singh is serving as Acting Chair.

From 1999-2014, several appointments have occurred to strengthen, enhance, and expand the research and

teaching profiles of the Department. These have been directed to research areas emphasizing collaborative initiatives while maintaining teaching mandates. Drs. C. Creuzenet (2001) and J. McCormick (2002) were appointed with main research interests in Microbiology. Appointments in Immunology were made to Drs. S. Kim (2003), M. Haeryfar (2006) R. Dekoter (2009), B. Heit (2011), and S. Kerfoot (2012). Drs. L. Hertel (2005), S. Barr (2008), and J. Dikeakos (2012) were appointed with Virology based research interests.

The Department has consistently contributed to the body of knowledge and to the societal side of the biological sciences in Canada. It was pivotal in the foundation of the Canadian Society of Microbiologists (CSM) in 1950 and in 1951 R.G.E. Murray chaired the inaugural meeting. In 1954, he initiated its journal, the

Canadian Journal of Microbiology and was its editor from 1954-60. Subsequent Presidents of the Society include C.F. Robinow, E.L. Medzon, and S.F. Koval while J. Robinson spent years as Secretary and S.F. Koval as the Meeting's Secretary. R.G.E. Murray became associated with the International Union of Microbiological Societies (IUMS) Congresses and the International Committee for Systematic Biology starting in 1958. The Canadian immunological community has benefitted from our faculty members with N.R.StC. Sinclair serving as the President of the Canadian Society for Immunology (CSI) from 1981-1985. More recently, S.K. Singhal, B. Singh, B.M.C. Chan, and M. Haeryfar have served on the council of the CSI.



Faculty, 1992
Department of Microbiology and Immunology

RESEARCH PROFILE

The research intent of the Department was mainly bacteriological up to 1965. There were major contributions to the description and understanding of structural cytology of bacteria and of cells infected by phage.

C. Robinow's micrographs and descriptions concerning the character and behaviour of bacterial nucleoids illustrated textbooks for many years.

P.C. Fitz-James pioneered biochemical studies of bacterial endospores during his PhD in the Department and continued on as an MRC Associate. He also participated with C.L. Hannay (Agricultural Research Institute) in the recognition of the parasporal protein crystals of *B. thuringiensis*, now an important insect larvicide.

The Department and its students contributed extensively in the transition from light microscope cytology to the applications of electron microscopy. Notably, they provided a first view of the structure of endospores (Robinow); the stages of differentiation in endospore formation (Fitz-James); and the resolution of the envelope components and plasma membrane of bacteria (Robinow, Murray). This included the detailed description of S-layers of cell walls (Murray), and the cytology of phage infection (Murray).

Cytological studies of the nuclei of mycelial fungi (Robinow) culminated in detailed electron microscopy of nuclear behaviour and mitosis in yeasts. Structural studies of bacteria continue today (Koval).

It is noteworthy that a long series of international "spore conferences" and "workshops on bacterial paracrystalline surface layers" (S-layers) were derivative and still taking place today.

In more general microbial biology R.G.E. Murray has had personal and directive involvement (1964-90) with both Bergey's Manual and the International Committee on Systematic Bacteriology, which record and regulate systematic data for bacterial taxonomy. That association and research (Robinow, Murray) stimulated a deep concern for a formal recognition of the unique structure of bacterial cells, which led to effective proposals that the Bacteria be classified as a Kingdom in 1960.

Biodiversity was evident and representatives of a number of microbial groups were studied in the department: *Trypanosoma* (Clarke); *Listeria* (Galsworthy); *Bdellovibrio* (Robinson, Koval); *Deinococcus* (Murray); *Burkholderia* (Valvano); *Staphylococcus* (Heinrichs, McGavin); *Micrococcus* (Bialkowska-Hobrzanska); *Helicobacter* (Creuzenet); and *Streptococcus* (McCormick) among others. Molecular genetic studies of the cell surfaces of select pathogenic bacteria progressed, (Valvano, Heinrichs) as did molecular taxonomic studies (Bialkowska-Hobrzanska).

Recent appointments have expanded the Microbiological research areas to include the role of bacterial surface carbohydrates in virulence (Creuzenet) and superantigen toxins (McCormick). The new area of microbiome research is led by Dr. G. Reid who has been working on probiotics research at Western with global collaboration over several years.

The virology research of early years sought antibiotics interfering with bacteriophage (Asheshov) and studied cytological effects of phage infection (Murray), which anticipated understanding of the biochemical events. Formal teaching on animal viruses was introduced after 1960 along with diagnostic facilities (Duncan, Hatch)

and basic research after 1965 (Medzon), becoming intensive after 1976 (Dales).

Significant research developed on Poxvirus biology, particularly vaccinia virus morphogenesis and genetics (Dales), and on Coronavirus (Dales, Anderson) with concentration on neurovirulence.

Poxvirus research continued later (McFadden) with a productive focus on Myxomavirus replication and viral modulation of the immune system of the host.

Gene transfer by virus vectors was also studied (Dekaban, Strathdee). Cytomegalovirus infections (Hertel) and HIV and its regulation (Barr, Dikeakos) joined the spectra of viruses that have been investigated in recent years.

Immunological research started after 1965 and contributed consistently to the immunological background needed for the transplantation service developed at University Hospital and to the understanding and treatment of autoimmune diseases. First, there was solid work on immunosuppression (Sinclair), antigenicity (Strejan), and natural suppressor cells (Singhal). Among lasting contributions was the explanation of Fc-dependent inhibition of immune responses as co-inhibition by specific antibody/antigen complexes (Sinclair). Interest in diseases with autoimmune features led to studies on multiple sclerosis and neurodegenerative effects of

immune reactions (Strejan, Ebers), as well as systemic lupus erythematosus (Bell, Cairns). Immunological interest in neurodegenerative disease (multiple sclerosis) had a parallel in virology research (Dales).

After 1992 came intensive studies of immune system participation and the molecular/genetic control in susceptibility to autoimmune diabetes (Singh, Delovitch). All this, along with the continuing study of immune modulation by bone marrow-derived molecule, Reptimed (Singhal), T-cell responsiveness (Madrenas, Ochi) and cellular homing and migration (Chan, Kelvin) provided broad immunological approaches to current practical problems and effective associations with research colleagues in medical departments (Grant, Jevnikar, Ebers, Bell, Cairns, Lazarovits).

Coordinated in many ways were studies on cell-cell interactions and movements in metastasis (Chambers, Chan, and Morris), autoimmune disease and allergic reactions (Chan), as well as the regulation of cell growth (Flintoff). More recently, studies involving bone marrow stem cells (Bhatia) and xenotransplantation (Zhong, Kelvin) were initiated.

In the last several years, Immunological research has been expanded to include macrophage signaling mechanisms (Kim), cytotoxic T lymphocyte responses to viral pathogens and tumor antigens (Haeryfar), regulation of gene expression in the immune system



(Dekoter), phagocytosis and efferocytosis in immunity (Heit), and B- and T-cell activity in autoimmune diseases (Kerfoot), areas previously investigated by other departmental members.

Research and teaching collaboration with other departments and faculties has been encouraged and potentiates productive work and student interactions. This has often been recognized by cross appointments such as with the Faculty of Science (Dr. Y. Kang, former Dean of Science and a virologist, Dr. M.A. Lachance of Plant Sciences, yeast biology).

There were many cross appointments with the Department of Medicine whose researchers have interests in infectious or immunological diseases and cell regulation (Dr. T.W. Austin, Dr. D.A. Bell, Dr. G.A. Cairncross, Dr. E. Cairns, Dr. G.C. Ebers, Dr. A.M. Jevnikar, Dr. A.I. Lazarovits, Dr. E.D. Ralph, and Dr. C.R. Stiller) and with the London Regional Cancer Centre (Dr. A.F. Chambers, Dr. J. Koropatnick and Dr. J. Mymryk).

There have been effective collaborations, mostly without formal appointments and based on a long close association, with the Department of Biochemistry to the extent that the major fourth-year Honors research project course of both departments was jointly designed and administered by Dr. J.H. Ball and Dr. S.B. Galsworthy, an exemplary effort.

Joint appointments have continued to encourage research interactions. In 2004, Dr. C. Trick was appointed jointly with the Department of Biology to examine ecosystem health; Dr. T. Mele, in 2006, with the Department of Surgery, to study immune responses in bacterial sepsis; and Dr. M. McGavin in 2009, with the Department of Medicine, to investigate the treatment of *Staphylococcus aureus* infections. Two appointments were also made through initiatives with Robarts; Dr. P. O'Connell in 2002 investigating dendritic cell biology, and Dr. M. Carpenter in 2003 exploring stem cell biology.

Over the past several years, cross appointments have also been made to complement the main research activities of the Department. These included the appointments of Dr. A. Jevnikar (Medicine) in 1994, Dr. A. Sener (Surgery) in 2009, and Dr. L. Gunaratnam (Medicine) in 2010, to investigate kidney transplantation and rejection; Dr. Cadieux (Lawson Health Research Institute) in 2008 and Dr. W. Miller (Lawson Health Research Institute) in 2009 to assess probiotic activity; Dr. S. Elsyed (Medicine) in 2009 to pursue interests in clinical microbiology; and Dr. Z-C Yuan (Agriculture Canada) in 2010 to study environmental factors that modulate bacterial pathogenesis.

Changes at Robarts have impacted departmental faculty members' involvement in the Institute. Most of the immunology and virology faculty who were at Robarts have left or retired. The current Molecular Medicine Group has few faculty members with appointments in the Department (Singh and Dekaban). Dr. Dekaban, a professor in the Department, is currently head of this group.

With the development of new undergraduate teaching initiatives and physical space re-organization, the teaching of undergraduate Microbiology and Immunology has become complex. As a consequence, in 2009, Dr. K. Summers was appointed as an Educator to manage such programs as well as develop new curriculum.

As a result of appointments, relocations, and retirements, the faculty complement now consists of 19 primary, seven cross, three joint, eight post-retirement, and seven adjunct appointments. The research interests of the faculty cover a wide variety of current areas under the umbrella of Microbiology & Immunology and have strengthened our research and teaching programs.

PHYSICAL LOCATION

The faculty changes and appointments over the past several years have forced a reorganization of the physical space of the Department. The Departmental office remains on the third floor of the Dental Sciences Building, serving the needs of the Chair and Department with competent staff. Ms. Kim Arts is the Administrative Officer, Mr. Frederick Williams, the Teaching and Research Coordinator, Ms. Fernanda Russell, the Graduate Studies Coordinator, Ms. Jennifer Brace, the Undergraduate Studies Coordinator, and Ms. Pamela Foster, the Departmental Secretary.

The research activities are distributed across several places. A majority of the research laboratories are concentrated on the third floor of the Dental Sciences Building, third floor of the Health Sciences Addition, and first and second floors of SDRI. A few

faculty members have their research enterprises at the Lawson Health Research Institute, St. Joseph's Hospital, Robarts, and the London Regional Cancer Program. A new faculty lounge on the third floor of the Dental Sciences Building was developed in 2010 after constant prodding by Dr. R.G.E. Murray. This has proven to be a productive initiative for faculty interactions.

The undergraduate teaching laboratories were relocated in 2005 to a common teaching laboratory on the first floor of the Medical Sciences Building, a facility shared with other basic science departments for the efficient use of space, facilities and equipment. Technical support for the Microbiology & Immunology laboratories is expertly provided by Ms. Lydia Dafoe.

Although the Department is still somewhat physically dispersed, these new arrangements allow for a stronger fostering of interactions among faculty members, postdoctoral fellows, and students to pursue integrated research and training programs. As a result, faculty continue to be very successful in obtaining peer-reviewed grant support from various agencies, as well as industry funding to support their research activities. Publications in high-quality journals remain the signatures of these research programs.

Thus, the research activities of the Department have expanded significantly to reflect the current trends in the areas of Microbiology and Immunology. The main objective of excellence, on which the department was originally founded, remains. Currently, over 3 million dollars in annual research funding has been obtained for research by the Faculty despite restricted funding by agencies.



Faculty and Staff, 1972
Department of Bacteriology and Immunology

DEPARTMENTAL TEACHING



Graduate Students promoting the program, 2009

Departmental teaching to a wide variety of students has never been static and continues to be a major priority embraced by our faculty. Recently, the undergraduate program has undergone several changes with the introduction, by the University, of 'Modules' and the Bachelor of Medical Sciences degree.

Students continue to receive fundamental training and education in the basic concepts of the disciplines, but in a more integrated format with appropriate optional courses. The mainstay of the program remains the independent research project in fourth year, offered jointly with the Departments of Biochemistry, and Anatomy and Cell Biology.

Currently, there are 23 students enrolled in the Year Four Honors Specialization in Microbiology and Immunology and eight students in the Year Four

Honors Specialization in the Biochemistry of Infection and Immunity. Several others pursue these areas as majors or minors.

The second and third year courses offered by the Department are popular choices for students in other disciplines in Biomedical Sciences and Science. Dr. Flintoff was the inaugural Associate Dean, from 2004-2006, for the new Bachelor of Medical Sciences program, offered jointly by the Faculty of Science and the Schulich School of Medicine & Dentistry. The appointment of Dr. Summers to initiate in the Department an Educator/Coordinator role ensures that the undergraduate program remains current and attractive.

The Department has always maintained a strong graduate program leading to thesis-based Master of Science and Doctor of Philosophy degrees. Graduate course work and seminars have been re-structured to provide more timely presentation of current areas of interest with ample opportunities for students to develop effective general knowledge and communicative skills.

In 2013, a one year non thesis-based Master's program was introduced for highly motivated undergraduate students wishing to pursue a professional degree. Currently, there are 62 students enrolled in our graduate programs.

In addition to the above teaching initiatives, faculty enthusiastically share their expertise by teaching in the professional programs of medicine, dentistry, and nursing.

RECOGNITION OF DEPARTMENTAL MEMBERS

The calibre of the faculty, students and staff continue to be recognized locally, nationally, and internationally with a wide variety of awards, honors, and prizes.

Drs. Murray and Stiller are Officers of the Order of Canada, which recognizes and commends a lifetime of outstanding achievement. Drs. Dales, Denhardt, Kang, McFadden, Murray, Robinow, and Singh are elected Fellows of the Royal Society of Canada while Drs. Chambers, Madrenas, McFadden, Reid, Singh, and Stiller are elected members of the Canadian Academy of Health Sciences. Dr. Murray is a Fellow of the American Academy of Microbiology.

Drs. Kang, Murray, and Stiller are among the many Canadians to receive the Diamond Jubilee Medal for service that has benefited the country.

In 1957, Drs. Murray and Robinow were recognized by the Royal Society of Canada with the Harrison Prize. In addition, Dr. Murray received the Flavelle Medal for meritorious achievement in biological sciences from the same society in 1984.

Several faculty members have received Honorary Degrees for their outstanding contributions to their disciplines: Dr. Kang has received an DSc from Carleton University; Dr. Murray has four DSc degrees from the universities of Western, Guelph, Victoria, and McGill. Dr. Reid, has a DSc from Orebro University, and Dr. Robinow has a DSc from Western.

At the local level, Western University has honored Drs. Chambers, McFadden, and Reid with the Hellmuth prize, the Institution's highest acknowledgement of research excellence.

Other notable awards include:

- 1957 - Dr. Murray received the J. Roger Porter Award (US Federation of Culture Collections) by the American Society for Microbiology
- 1963 - Dr. Murray was awarded the first CSM Award
- 1993 - Dr. Murray received the Bergey Medal for contributions to Bacterial taxonomy by the Bergey's Manual Trust
- 2001 - Dr. Singh received the Bernhard Cnader Award for distinguished scientific leadership and accomplishments in Immunology from the CSI
- 2006 and 2008 - The Fisher Award (CSM) for exceptional new researchers in microbiology was awarded to Drs. Heinrichs and McCormick, respectively.
- 2007 - Dr. Reid received the Elie Metchnikoff Prize for Nutrition and Health (Moscow) with Dr. Bruce, and Massey University Distinguished Alumni Achievement Award
- 2007 - The McMaster University Distinguished Alumni Award was awarded to Dr. Kang
- 2008 - The Roche Award (CSM) for outstanding microbiological research accomplishments by a senior investigator was awarded to Dr. Valvano
- 2008 - Dr. Singh was awarded the John Reynolds Award for exceptional service to Immunology in Canada from CSI
- 2008 - The Kidney Foundation of Canada research award was presented to Dr. Jevnikar
- 2012 - Distinguished Alumni Award from Western was presented to Dr. Roder (a PhD graduate from our program and a faculty member at the University of Toronto)

Since its inception in 1994, numerous faculty members have been recognized with the Schulich School of Medicine & Dentistry Dean's Awards of Excellence. The accomplished recipients were:

- 1994 - Drs. Dales and Ebers
- 1995 - Drs. Stiller and Strejan
- 1996 - Dr. Flintoff
- 1997 - Drs. Chambers, Lala, and Singh;
- 1998 - Drs. Chaconas and Lazarovits
- 2000 - Dr. Zhong
- 2002 - Drs. McFadden and Reid
- 2005 - Dr. Madrenas
- 2006 - Dr. Valvano
- 2007 - Dr. Koropatnick
- 2008 - Drs. Bell, Cairns, and Delovitch
- 2009 - Drs. Colby, Jevnikar, Kang, and Madrenas
- 2012 - Dr. Heinrichs

Drs. Madrenas and Jevnikar received Faculty Scholars Awards in recognition of their scholarly accomplishments.

Microbiology and Immunology staff have also been recognized for their contributions to Departmental and faculty activities with Dean's Awards of Excellence for Staff. The worthy recipients were K. Inchley in 2003, L. Dafoe in 2006, F. Williams in 2008, K. Arts in 2009, and E. Colley in 2010.

There have also been awards and prizes for graduate students. The University's Collip Medal for the outstanding graduating PhD student in the medical sciences has been awarded to students from our program. These recipients were Drs. Pearce in 1959, Roder in 1977, Essani in 1983, Ralling in 1986, Cameron in 2001, Teft in 2009, and Kirchhof in 2010. In 2012, Mr. J. Cheung received the University's Governor General's Medal for outstanding Master's student.

Four faculty have been recipients of Canada Research Chairs, a federal government initiative to achieve highest levels of research excellence: Dr. Haeryfar, Tier II Chair in Immunopathogenesis; Dr. J. Madrenas, initially a Tier II Chair in Transplantation and Immunobiology and subsequently a Tier I Chair in Immunobiology; Dr. McFadden, Tier I Chair in Molecular Virology; and Dr. Valvano, Tier I Chair in Infectious Diseases and Microbial Pathogenesis.

Faculty and students continue to garnish numerous salary awards and prizes for their research accomplishments and contributions. Many serve on grant review panels, on editorial boards, and as paper reviewers providing invaluable contributions to the academic community.



Group of faculty members, 2014
Department of Microbiology and Immunology

SPECIAL AND SUPPORTIVE DEVELOPMENTS OF THE DEPARTMENT

In May, 1999, in recognition of its first 60 years as an academic department, a symposium entitled "Challenges of Microbial and Immune Diseases in the Next Millennium" was held. As part of this celebration, the Department was the benefactor of a one million dollar endowment for graduate education, enhancing the graduate students' experience. These funds continue to provide entrance scholarships to outstanding students and travel awards for students to present their work at national and international meetings. It also supports the Infection and Immunity Research Forum and the R.G.E. Murray lectureship, an annual lecture given by an internationally recognized leader in microbiology and immunology. The

lectureship offers the opportunity for students and faculty to interact with the speaker.

The endowment was named in honour of Frederick Luney, a pioneer in laboratory medicine in London, Ontario who served as the Pathologist at St. Joseph's Hospital for many years. This endowment fulfilled the wishes of the donor Mrs. Marion (Luney) Murray, revealed after her passing in 2013.

In 1998, the graduate students developed, organized and managed a Distinguished Lectureship Series, sponsored by 3M. This successful endeavor permitted the invitation of high-calibre researchers, and an opportunity for many to interact with scientific leaders, whose work has had a major impact on biomedical research. This Lectureship Series provided the foundation for the successful Infection and Immunity Research Forum, a research day including a distinguished lecture and involving graduate students and postdoctoral fellows from Western and its neighbouring universities.

In 2010, the Centre for Human Immunology (CHI) was launched with support from the Schulich School of Medicine & Dentistry and the Lawson Health Research Institute. Dr. Singh serves as its inaugural Director, with Drs. Madrenas and Heinrichs serving as Associate Directors. This city-wide center serves to link research efforts at basic and clinical settings across all areas of human immunology and infectious diseases. The Centre is currently the coordinating node of the CIHR-Human Immunology Network (CHIN).



First 4th year class, 1968
Department of Bacteriology and Immunology

ENDOWMENT IN RECOGNITION OF THE DEPARTMENT'S 75TH ANNIVERSARY

In January 2014, the Department received a \$1.2 million endowment gift from the estate of Mrs. Marion Murray. Mrs. Murray, who passed away in March 2013, was a member of the Department for 23 years.

As part of our 75th Anniversary, based upon the wishes of Mrs. Murray, these funds will be directed to our graduate studies program under the names of Dr.

Frederick Winnett Luney and Dr. Robert George Everitt Murray. The newly established faculty lounge will be named after Dr. R.G.E. Murray for his help and support of the lounge. In addition, a photograph of Mrs. Marion Murray will be placed in this lounge in recognition of her several gifts to the Department over the past 15 years.

SUMMARY

From its beginning as a teaching and service Department, Microbiology and Immunology has progressed into a very strong academic unit at the Schulich School of Medicine & Dentistry.

Our teaching programs, at all levels, attract high calibre students. The graduate student population has grown from two in 1950, to 62 in 2014. The research activities have developed to encompass current areas of Microbiology and Immunology, which are competitive in attracting significant resources even in times of limited funding.

This strong research effort results in important contributions to the scientific knowledge in these disciplines.

The Department has enthusiastic, strong links with clinical and basic science departments, research institutes and hospitals. In addition, it has built links with schools, community groups and national organizations.

The foundations have been well established and the Department is poised to further develop its mission of excellence in research and training. It has the strengths to continue to thrive in the future and maintain a centre that embraces the disciplines of Microbiology and Immunology. We are proud of our accomplishments and are delighted to celebrate our 75th anniversary.

Booklet authored by Professors R.G.E. Murray, W.F. Flintoff, and B. Singh.

PAST AND PRESENT FACULTY MEMBERS

The Department of Pathology & Bacteriology 1939-1943
 The Department of Bacteriology & Immunology 1943-1978
 The Department of Microbiology & Immunology 1978-present

Abbasi, P.*	Chambers, A.F.	Harris, J.F.	Macdonald, H.R.	Ridgway, A.A.G.
Abrahams, S.	Chan, B.*	Harth, M.	Madhosingh, C.	Robinow, C.F.
Adler, R.	Cheevers, W.P.	Hatch, L.A.	Madrenas, J.*	Robinson, J.
Anderson, R.	Chodirker, W.B.	Heagy, F.C.	Maki, A.	Roslycky, E.B.
Asheshov, I.N.	Clarke, M.W.*	Heinrichs, D.E.*	Mazaheri, R.	Rozanis, J.
Austin, T.W.	Colby, W.D.*	Heit, B.*	McCormick, J.*	Sayed, H.I.
Bains, M.A.	Creighton, M.D.	Hertel, L.	McFadden, D.G.	Sener, A.*
Bakerspigel, A.	Creuzenet, C.*	Holley, W.J.	McGavin, M.*	Sinclair, N.R.StC.*
Barnard, J.E.	Cupples, D.	Howson, W.T.	McKay, J.B.	Singh, B.*
Barr, S.*	Dales, S.	Huff, R.H.	Medzon, E.L.*	Singhal, S.K.*
Barra, L.*	Dekaban, G.A.*	Hussain, Z.	Mele, T.*	Stiller, C.R.
Behme, R.J.	Dekoter, R.*	Jass, J.	Milavetz, B.I.	Strathdee, C.
Bell, D.E.	Delovitch, T.L.	Jevnikar, A.M.*	Miller, W.	Strejan, G.H.*
Bhatia, M.	Denhardt, D.T.	John, M.A.*	Miller, S.J.C.	Summers, K.*
Bialkowska-	Dikeakos, J.*	Johns, E.P.	Min, W-P.	Teng, A.Y.T.
Hobrzanska, H.	Dobinson, K.R.	Kang, C.Y.*	Moore, D.S.	Timoshenko, A.
Bittner, J.	Duncan, I.B.R.	Kelvin, D.	Morris, V.L.*	Tini, M.*
Black, W.A.	Ebers, G.C.	Keown, P.A.	Murray, R.G.E.*	Toogood, J.H.
Blaisdell, J.L.	Ebusizaki, K.	Kerfoot, S.*	Mymryk, J.*	Trick, C.*
Brown, E.E.	Elsyed, S.	Kim, S.*	Naylor, D.H.	Tucker, M.J.
Buchanan, A.G.	Faust, E.A.	Ko, H.S.	Nicolle, M.W.	Valvano, M.A.*
Bulman, D.E.	Fisher, J.H.	Koropatnick, D.J.*	Ochi, A.	Whitby, J.L.
Burton, J.*	Fitz-James, P.C.	Koval, S.F.*	O'Connell, P.J.	White, D.
Busscher, H.J.	Flintoff, W.F.*	Krishnan, C.	Panchal, C.J.	Wilkins, P.O.B.
Cadieux, P.*	Galsworthy, S.B.*	Lachance, M.A.	Paterson, J.C.	Wilson, W.M.
Cairncross, J.G.	Gijzen, M.	Lala, P.K.	Paterson, N.A.M.	Yanover, L.R.
Cairns, E.*	Grant, D.R.	Lannigan, R.	Penikett, E.J.	Yuan, Z-C.*
Campsall, E.W.R.	Grant, R.B.	Lazarovits, A.L.	Percy, D.H.	Zajic, J.E.
Carpenter, M.	Gunaratman, L.*	Linn, T.G.*	Podesta, R.B.	Zhong, R.
Chaconas, G.	Haeryfar, S.M.*	Lipowitz, H.	Ralph, E.D.	Ziv, R.B.
Chagla, A.	Hammerberg, O.	Lucas, A.	Reid, G.*	
Chakrabarti, S.	Hannay, C.L.	Luney, F.W.	Rice, G.P.A.	

(* indicates current appointment)

