2015 — 2017

MCLAUGHLIN CENTRE

BIENNIAL REPORT

UNIVERSITY OF TORONTO

Director's Message

We have hit full stride in our mission *to advance genomic medicine through research and education*. The Centre's investments have been instrumental in bringing the University of Toronto to the forefront in genome sequencing and its applications in medicine. We support the world's largest 'open science' genome sequencing project applied to autism. We have enabled a generous partnership between Illumina Inc. and our researchers, for the application of genome sequencing to any family in need of diagnosis. Additional partnerships have been forged with computer science academics and local start-up companies, to develop new infrastructure for storage and analysis of the 'big data' generated and its linkage to health records. Recognizing that such advances cascade into the need to deliver complex findings to families, we are now financing an increased number of training spots for genetic counsellors. With Massey College, we proudly started the new Science Journalism Fellowship, which is unique in Canada. All of these activities link to the Canadian Personal Genome Project, moving forward our mission to illuminate the path for 21st century medical practice. I remain steadfast that each dollar investment be strategic, defined by Robert S. McLaughlin himself as "one grade only, and that the best".

STEPHEN SCHERER PhD DSc FRSC, Director

Chairs' Message

We are proud to be advisors to the dedicated work by the McLaughlin Centre as it continues to build on a legacy of support for training of physicians and health care professionals, and promotion of health research. Opportunities for funding have been expanded during the past five years, beyond their seminal place in the University of Toronto medical school and teaching hospitals, to encompass allied disciplines from throughout the University, such as computer science, engineering, public health and others. This expansion is being done with particular consideration for the burgeoning field of Artificial Intelligence, with its potential to transform so many aspects of medical research and practice. We anticipate a bright future, given the Centre's substantial endowment with potential to unleash additional scientific funding, and given what we recognize as a strong competitive edge through its impressive members and mentees.

TREVOR YOUNG MD PhD FRCPC FCAHS, Chair Executive Committee
ALAN BERNSTEIN OC OOnt PhD FRSC FCAHS, Chair Oversight Committee

TREVOR YOUNG

ALAN BERNSTEIN

Governance

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Dean, Faculty of Medicine, University of Toronto

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Professor of Neurosurgery, Toronto Western Hospital, University of Toronto

J. CHRISTOPHER C. WANSBROUGH
Chairman, Rogers Telecommunications Limited

TREVOR YOUNG MD PhD FRCPC FCAHS
Dean, Faculty of Medicine, University of Toronto

Research Highlights

ACCELERATOR GRANTS FUNDED [2015]

ANNE BASSETT MD, CENTRE FOR ADDICTION AND MENTAL HEALTH (with David Chitayat, Mount Sinai, and others), Genomic screening as a window on the developing fetus, newborn and beyond

DANIEL DECARVALHO PhD, UNIVERSITY HEALTH NETWORK (with Rayjean Hung, Mount Sinai), Pilot study to develop a cost-effective gene panel to detect pancreatic cancer-specific cfDNA methylation suitable for clinical use

CLAUDIA DOS SANTOS MD, ST. MICHAEL'S HOSPITAL (with Jennifer LY Tsang, McMaster, and others), Epigenetic Profiling in Severe Sepsis – (EPSIS)

ALFONSO FASANO MD PhD, UNIVERSITY HEALTH NETWORK (with Anthony Lang, TWH, and others), Surgicogenomics in Parkinson's disease: towards an understanding of the genetic contributors of outcome variability after deep brain stimulation surgery

ROBIN HAYEEMS PhD, THE HOSPITAL FOR SICK CHILDREN (with Wendy Ungar, SickKids, and others), Costs and clinical consequences of pediatric Whole Genome Sequencing: a comparison to conventional genetic tests

MICHAEL HOFFMAN PhD, UNIVERSITY HEALTH NETWORK (with Peter Dirks, SickKids, and others), Interpreting epigenetic DNA modifications in glioblastoma stem cells

MEREDITH IRWIN MD, THE HOSPITAL FOR SICK CHILDREN (with David Malkin, SickKids, and others), Translating the discovery of novel neuroblastoma

PETER KANNU MB ChB PhD, THE HOSPITAL FOR SICK CHILDREN (with Karen Chong, Mount Sinai, and others), Next Generation Sequencing a Cohort of Unique and Unclassified Lethal Skeletal Dysplasias

SHAF KESHAVJEE MD, UNIVERSITY HEALTH NETWORK (with Mingyao Liu, UHN), A genomics-based rapid diagnostic tool for the treatment and repair of donor lungs during ex vivo lung perfusion

STEPHEN LYE PhD, MOUNT SINAI HOSPITAL (with Alan Bocking, U of Toronto, and others), Host-microbe genomic approaches to understanding obesity and diabetes in pregnancy

BERGE MINASSIAN MD, THE HOSPITAL FOR SICK CHILDREN (with Danielle Andrade, UHN, and others), Identifying Genetic Bases of Intractability in Epilepsy

LUCY OSBORNE PhD, UNIVERSITY OF TORONTO (with James Ellis, SickKids, and others), The epigenetic landscape in neurons from 7q11.23 deletion and duplication syndromes

SAMIR PATEL PhD, PUBLIC HEALTH ONTARIO (with Allison McGeer, Mount Sinai, and others), An integrated genomic solution for managing bacterial outbreaks and transmission in the health care system

JIM STAVROPOULOS PhD, THE HOSPITAL FOR SICK CHILDREN (with Marsha Speevak, Credit Valley Hospital, and others), Development of a multi-centre clinical database to promote standardized reporting of genomic copy number variants for prenatal and postnatal diagnostics

MICHAEL TAYLOR MD PhD, THE HOSPITAL FOR SICK CHILDREN (with John McPherson, OICR), Validation of Structural Variants in Medulloblastoma Using Long Read Sequencing Technology

ROSANNA WEKSBERG MD PhD, THE HOSPITAL FOR SICK CHILDREN (with Evdokia Anagnostou, Holland Bloorview, and others), Application of a novel reduced representation bisulfite sequencing technology for the epigenetic study of autism

JAY WUNDER MD, MOUNT SINAI HOSPITAL (with Adam Shlien, SickKids, and others), Investigation of Genetic Alterations and Drug Sensitivities in Undifferentiated Pleomorphic Sarcomas and Corresponding Clinical Characteristics

ACCELERATOR GRANTS FUNDED [2016]

GEOFFREY ANDERSON MD PhD, UNIVERSITY OF TORONTO (with Nathan Herrmann, Sunnybrook, and others), Linking Genomics and Health Trajectories (LIGHT) for Dementia Research

MOUMITA BARUA MD, UNIVERSITY HEALTH NETWORK (with Andrew Paterson, SickKids, and others), Molecular Diagnosis in Adult-onset Familial and Sporadic Focal and Segmental Glomerulosclerosis (FSGS)

ANNE BASSETT MD, CENTRE FOR ADDICTION AND MENTAL HEALTH (with Lisa Strug, SickKids, and others), Whole Genome Sequencing to uncover the genetic architecture of familial schizophrenia

YVONNE BOMBARD PhD, ST. MICHAEL'S HOSPITAL (with Nancy Baxter, St. Mike's, and others), Genomics ADvISER: A genomics decision AiD on Incidental SEquencing Results

SHELLEY BULL PhD, MOUNT SINAI HOSPITAL (with Irene Andrulis, Mount Sinai, and others), New Approaches to Identification of Novel Rare Variants in Early-onset Breast Cancer

DARCY FEHLINGS MD, BLOORVIEW RESEARCH INSTITUTE (with Richard Wintle, SickKids), An Investigation of Clinically Relevant Genomic Variations in Spastic Diplegic Cerebral Palsy

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ACCELERATOR GRANTS FUNDED [2016] – *continued from previous page*

REBECCA GLADDY MD PhD, MOUNT SINAI HOSPITAL (with Brendan Dickson, Mount Sinai, and others), Genetics of Leiomyosarcoma - are there distinct subtypes?

MICHAEL GOLLOB MD, UNIVERSITY HEALTH NETWORK, Whole Genome and Exome Sequencing for Gene Discovery in Gene-Elusive Sudden Death Syndromes

HOWARD LIPSHITZ PhD, UNIVERSITY OF TORONTO (with Cheryl Shuman, SickKids, and others), Addressing workforce issues required to support genomic medicine: proposal to increase genetic counselling matriculates at the University of Toronto

BERGE MINASSIAN MD, THE HOSPITAL FOR SICK CHILDREN (with Patrick Cossette, U of Montreal, and others), Identifying Genetic Bases of Intractability in Epilepsy

ABDUL NOOR PhD, MOUNT SINAI HOSPITAL (with Maian Roifman, Mount Sinai, and others), A Study of Diagnostic Utility of Whole Genome Sequencing (WGS) in Prenatal Diagnosis

LUCY OSBORNE PhD, UNIVERSITY OF TORONTO (with Ryan Yuen, SickKids), Identifying rare variants in Dup7q11.23-related autism using Whole Genome Sequencing

JIM STAVROPOULOS PhD, THE HOSPITAL FOR SICK CHILDREN (with Christian Marshall, SickKids, and others), Assessing Whole Genome Sequencing Copy Number Detection for Clinical Diagnostics

MICHAEL TAYLOR MD PhD, THE HOSPITAL FOR SICK CHILDREN, Validation of Structural Variants in Medulloblastoma Using Long-Read Sequencing Technology

ROSANNA WEKSBERG MD PhD, THE HOSPITAL FOR SICK CHILDREN (with John McLaughlin, PHO, and others), Developing an Essential Epigenetic Resource: DNA Methylation Profiling of White Blood Cell DNA in Pediatric Controls

ACCELERATOR GRANTS FUNDED [2017]

DANIELLE ANDRADE MD, UNIVERSITY HEALTH NETWORK (with Berge Minassian, SickKids, and others), Epilepsy Genomics Discovery and Treatment

ANA ANDREAZZA PhD, UNIVERSITY OF TORONTO, The Canadian Mitochondrial Network

ANNE BASSETT MD, CENTRE FOR ADDICTION AND MENTAL HEALTH (with Simone Vigod, Women's College, and others), Proof of principle linkage of Ontario-wide medical data to a multi-system genomic disorder

JENNIFER BROOKS PhD, UNIVERSITY OF TORONTO (with Karen Tu, ICES, and others), Linkage of Whole Genome Sequencing and administrative health data for the study of autism

RONALD COHN MD, THE HOSPITAL FOR SICK CHILDREN (with Laura McAdam, Holland Bloorview, and others), Towards identification of comprehensive mutational landscape in congenital muscular dystrophy

ANDREW CREAN MD, UNIVERSITY HEALTH NETWORK (with Brian McCrindle, SickKids, and others), A TRIO-Based Approach to Uncovering Putative Loci for Complicated Kawasaki Disease in a Caucasian Population using Whole Genome Sequencing

NICK DANEMAN MD, SUNNYBROOK RESEARCH INSTITUTE (with Roberto Melano, PHO, and others), Guiding Empiric Antibiotic Treatment Using Combined Patient Epidemiologic and Pathogen Genomic Predictors

DARCY FEHLINGS MD, BLOORVIEW RESEARCH INSTITUTE (with Richard Wintle, SickKids), An Investigation of Clinically Relevant Genomic Variations using Whole Genome Sequencing in Individuals with Cerebral Palsy

NAHUEL FITTIPALDI PhD, PUBLIC HEALTH ONTARIO (with Sharon Unger, Sinai Health, and others), Bacillus cereus contamination of human milk banks: Whole Genome Sequencing to the rescue

LINDA HIRAKI MD ScD, THE HOSPITAL FOR SICK CHILDREN (with Dafna Gladman, UHN, and others), Discovering Mendelian variants in multiplex families with systemic lupus erythematosus (SLE)

ELENA KOLOMIETZ MD PhD, SINAI HEALTH SYSTEM (with Patrick Shannon, Sinai Health, and others), Elucidating the genetic etiologies in non-syndromic congenital hydrocephalus using WGS-based analysis

JORDAN LERNER-ELLIS PhD, SINAI HEALTH SYSTEM (with Chantal Morel, UHN, and others), Genome Sequencing in Adult Patients with Undiagnosed Rare Disease

CHRISTIAN MARSHALL PhD, THE HOSPITAL FOR SICK CHILDREN (with Marc Fiume, DNAstack, and others), Cloud platform for clinical analysis and interpretation of genomes

CHRISTOPHER PEARSON PhD, THE HOSPITAL FOR SICK CHILDREN (with Jean-Louis Mandel, U of Strasbourg), Genetic Factors of CTG/CAG Repeat Contractions in Repeat Instability Families

SUSAN POUTANEN MD MPH, SINAI HEALTH SYSTEM (with Lee Goneau, U of Toronto, and others), Identifying novel virulence factors/clones that independently predict poor outcomes in extended spectrum beta-lactamase-producing Escherichia coli bloodstream infections

IVAN RADOVANOVIC MD PhD, UNIVERSITY HEALTH NETWORK (with Marie Faughnan, St. Mike's, and others), Whole exome sequencing of sporadic and Hereditary Hemorrhagic Telangectasia (HHT) associated arteriovenous malformations

NEAL SONDHEIMER MD PhD, THE HOSPITAL FOR SICK CHILDREN (with Jim Kennedy, CAMH, and others), Mitochondrial variation, nuclear coordination and the risk for psychiatric illness

10 SIGNIFICANT MCLAUGHLIN CENTRE SUPPORTED PUBLICATIONS

KOTLYAR M, PASTRELLO C … AND JURISICA I. In silico prediction of physical protein interactions and characterization of interactome orphans. Nature Methods. Jan 2015

SHLIEN A … CAMPBELL PJ AND TABORI U. Combined hereditary and somatic mutations of replication error repair genes result in rapid onset of ultra-hypermutated cancers. Nature Genetics. Mar 2015

RAJ B AND BLENCOWE BJ. Alternative Splicing in the Mammalian Nervous System: Recent Insights into Mechanisms and Functional Roles. Neuron. Jul 2015

OSKOUI M, GAZZELLONE MJ … AND SCHERER SW. Clinically relevant copy number variations detected in cerebral palsy. Nature Communications. Aug 2015

STAVROPOULOS DJ … COHN RD AND MARSHALL CR. Whole Genome Sequencing Expands Diagnostic Utility and Improves Clinical Management in Pediatric Medicine. NPJ Genomic Medicine. Jan 2016

MORRISSY AS … MARRA MA AND TAYLOR MD. Divergent clonal selection dominates medulloblastoma at recurrence. Nature. Jan 2016

VINCENT A, AUDO I … AND HEON E. Biallelic Mutations in GNB3 Cause a Unique Form of Autosomal-Recessive Congenital Stationary Night Blindness. American Journal of Human Genetics. May 2016

MARSHALL CR, HOWRIGAN DP … AND SEBAT J. Contribution of copy number variants to schizophrenia from a genome-wide study of 41,321 subjects. Nature Genetics. Jan 2017

YUEN RK … PLETCHER MT AND SCHERER SW. Whole genome sequencing resource identifies 18 new candidate genes for autism spectrum disorder. Nature Neuroscience. Apr 2017

ANDERSON JA, MEYN MS … AND HAYEEMS RZ. Parents perspectives on whole genome sequencing for their children: qualified enthusiasm? Journal of Medical Ethics. Aug 2017

HIGHLY CITED U OF T MCLAUGHLIN CENTRE-FUNDED RESEARCHERS* [2015-17]

GARY BADER PhD, UNIVERSITY OF TORONTO (2016)

IGOR JURISICA PhD, KREMBIL RESEARCH INSTITUTE, UHN (2015-16)

ANTHONY LANG OC MD FRCPC FAAN FCAHS FRSC, TORONTO WESTERN HOSPITAL (2015-17)

STEPHEN SCHERER PhD DSc FRSC, MCLAUGHLIN CENTRE AND THE HOSPITAL FOR SICK CHILDREN (2015-17)

**https://clarivate.com/hcr/researchers-list/archived-lists/*

10 Big Stories

1. DARCY FEHLINGS

Darcy Fehlings (MD), a physician-scientist at Holland Bloorview Kids Rehabilitation Hospital, leads a provincial Cerebral Palsy (CP) database called CP-NET. With funds from the Ontario Brain Institute and the McLaughlin Centre, it is used to investigate risk factors for CP, and will potentially inform strategies for prevention and neural repair. She contributed to groundbreaking research, published in 2017, showing that 1 in 4 children with the hemiplegic form of CP has significant genetic copy number variation. The study was a front page feature in the *Toronto Star* on 8/8/2017. Along with University of Toronto researchers, Dr. Fehlings is studying how these genes interact with other established risk factors, aiming to improve management strategies for the hundreds of children with CP who are under her team's care.

2. JAMES DOWLING

Jim Dowling (MD, PhD) is a clinician scientist in Neurology, Genetics and Genome Biology at SickKids, and is the inaugural Mogford Campbell Chair in Paediatric Clinical Neuroscience. Dr. Dowling created the first clinic in Canada to provide expert diagnostic assessment for children with unsolved muscle disease. His research focuses on discovering genes and therapies for childhood neuromuscular diseases. Supported by a McLaughlin Centre Accelerator Grant, he has been working to understand causes of malignant hyperthermia (MH) - a severe, potentially fatal reaction in some individuals to certain anesthetic drugs. To better define MH genetics, his team uses a multi-modal approach, which includes genome sequencing, RNA studies, and modeling for disease validation.

3. ALFONSO FASANO

Alfonso Fasano (MD, PhD) is co-director of the surgical program for movement disorders at Toronto Western Hospital, associate professor of medicine in the Division of Neurology at the University of Toronto, and clinician investigator at the Krembil Research Institute. His expert focus is treatment of movement disorders with advanced technology (infusion pumps and neuromodulation). Dr. Fasano and his team are characterizing the genotypes and clinical characteristics of patients with Parkinson disease who have undergone deep brain stimulation and had long-term follow-up, in order to understand the genetic basis of who does or does not respond well to treatment. They call this precision medicine approach 'surgicogenomics', and hope that results will inform the decision process for future candidates for this advanced treatment option.

4. BRETT TROST

Though early in his career, Brett Trost (PhD) has already witnessed the emergence of computational biology from niche discipline to a tool indispensable for studying human disease. As a Research Fellow with Dr. Stephen Scherer at SickKids, Dr. Trost is eager to contribute and develop his expertise in machine learning, a field currently garnering huge public attention and anticipation of its applications. Specifically, he is using these tools to sift through reams of data from genome sequences, to "learn" what identifies a variant and which of those may be risk factors for disease, particularly as applied to conditions such as autism and schizophrenia. He is already the recipient of prestigious awards including the Governor General's Academic Gold Medal, the Lap-Chee Tsui Fellowship for Research Excellence (inaugural recipient) and the Canadian Institutes of Health Research's highly esteemed Banting Postdoctoral Fellowship.

5. LUCY OSBORNE

Research in the laboratory of Professor Lucy Osborne (PhD) (Molecular Genetics and Medicine) at the Faculty of Medicine, University of Toronto, focuses on a small region of chromosome 7, and children who either are missing one of these segments (the cause of Williams-Beuren Syndrome) or have an extra copy (leading to a form of autism). It is particularly intriguing that the two groups show contrasting social behaviours. With support from the McLaughlin Centre, Prof. Osborne is probing underpinnings of the neurodevelopmental changes in these children, both the genes and the factors that influence the genes, aiming to identify mechanisms and pathways that could be targeted for new therapeutic approaches. The work has been further funded by the USA-based Simons Foundation. She also serves as the current Graduate Coordinator for U of T's Institute of Medical Science.

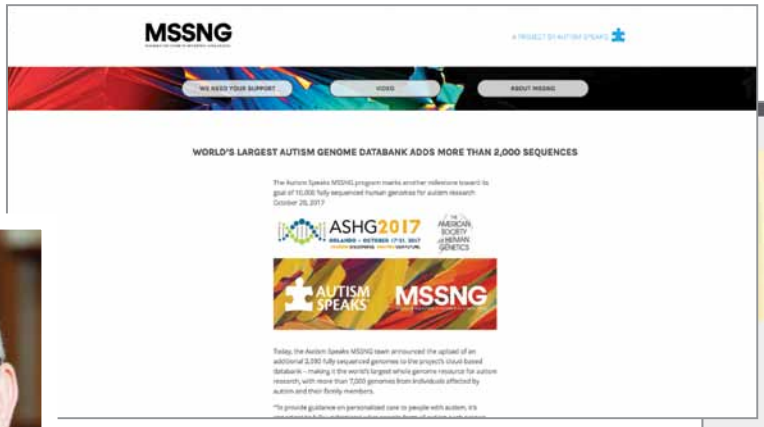
6. MICHAEL HOFFMAN

The Princess Margaret Cancer Centre is home to the research group of Michael Hoffman (PhD), who calls himself a computational genomicist. His team uses intricate software and data analysis to understand how changes in DNA relate to cancer – particularly the changes described as "epigenetics". Sequencing reveals a forest of genetic and epigenetic variation, but what are the consequences? Factors that bind to DNA can affect gene regulation, and these pathways are often altered in different cancers. Within a wide-ranging research program, a McLaughlin Accelerator grant is supporting Dr. Hoffman as he studies the origins of an aggressive form of brain tumour called glioblastoma. Machine-learning techniques feature prominently, and some tools being developed create a virtual laboratory approach to studying cancer cells.

10 Big Stories

SIOBHAN ROBERTS

JIM LEBANS



7. SCIENCE JOURNALISM FELLOWSHIP

In 2016, Massey College and the University of Toronto announced the new McLaughlin Centre Journalism Fellowship for a science journalist, under the larger William Southam Program. Experienced mid-career journalists who have worked in science, medicine and/or health fields for at least five years are eligible; the selected applicant spends a year as a McLaughlin Centre Fellow, in order to broaden his or her horizons in a university setting, and to foster improvements in science journalism. There are no academic prerequisites, and each Fellow is free to enrol in any graduate or undergraduate courses, while using the full facilities of the University of Toronto and Massey College. The inaugural Fellow (2016-17) was Jim Lebans, who came with over 20 years' experience with the CBC science program, *Quirks and Quarks*. He was followed by Siobhan Roberts (2017-18), an independent science journalist who writes for the likes of *The New Yorker* and *The Walrus*, and whose latest book is *Genius at Play, The Curious Mind of John Horton Conway* (2015).

8. MSSNG AUTISM GENOME DATABASE

MSSNG is neither a typo nor an acronym, but a multi-million dollar initiative by Autism Speaks to find the missing letters (parts of the puzzle) for Autism Spectrum Disorder (ASD). With the McLaughlin Centre as a major supporter and stakeholder, MSSNG is well on the way to being the world's largest database for ASD research, to include 10,000 whole genomes from affected individuals and their families, as well as detailed clinical and related data. It is 'open access' through the Google Cloud, so that any qualified researchers worldwide can make use of the invaluable resource, and share findings. With laboratory and genome analysis based at The Centre for Applied Genomics, MSSNG is a flagship for genomic medicine and 'big data' in Toronto and well beyond. The group has already engendered two highly cited publications in high-profile journals, reporting on the first 85 families (*Nature Medicine* 2015) and then the first 5205 sequences (*Nature Neuroscience* 2017).

9. *npj GENOMIC MEDICINE*

To enhance the impact and international visibility of the McLaughlin Centre's support for genomics research and education, Dr. Stephen Scherer undertook to be the inaugural editor of a new Nature Partner Journal: *npj Genomic Medicine*, which launched in January 2016. Additional Toronto support includes Associate Editor Dr. Lisa Strug (SickKids and U of T), Assistant Editor Dr. Hin C. Lee (McLaughlin Centre) and Editorial Board member Dr. Adam Shlien (SickKids). Other Board members include Canadians Dr. Robert Hegele (Western) and Dr. Brent Richards (McGill). International Associate Editors include Prof. Mohammed Al-Qahtani (Saudi Arabia), Prof. Stylianos E. Antonarakis (Switzerland), Prof. Charis Eng (USA), Prof. Charles Lee (USA), Prof. Dennis Lo (Hong Kong) and Dr. Stephen F. Kingsmore (USA). Of 73 publications to date, 12 have been led or co-authored by University of Toronto investigators. The journal is now included in PubMed and SCI-E (Web of Science).

10. U OF T MSC PROGRAM IN GENETIC COUNSELLING

Under Program Director Cheryl Shuman (SickKids) and Medical Director David Chitayat (Mt. Sinai Hospital), the University of Toronto MSc Program in Genetic Counselling is unique in Ontario, and has been an international leader since its inception in 1998, with 75 graduates by spring 2018. Working in a range of health disciplines, these professionals advance genomic medicine in roles including patient and family care, research and teaching. In the last year, genetic counsellors in U of T-affiliated hospitals have overseen 20,905 patient visits - including prenatal, pediatric, adult, general medical and cancer - in addition to research contacts. With recent support by the McLaughlin Centre, the program expanded from 4 to 6 new students per year, enhanced the learning environment, offered merit and needs-based scholarships, and supported research clinical rotations.

Education Highlights

The McLaughlin Centre is playing a key role in the development of a new generation of physician-scientists equipped to lead the frontier of genomic medicine research and practice. We do this through support of medical student scholarships in the MD/PhD Program at the University of Toronto (17 McLaughlin Scholars in 2015-17) and the Comprehensive Research Experience for Medical Students (CREMS) Scholarship Program (14 CREMS Scholars in 2015-17).

Exemplifying the important research generated by these scholars is Nicholas Light, who, as a second-year MD/PhD student supervised by Dr. David Malkin, co-authored a paper in *Cell* (2017)[1], which reported an extensive assessment of mutational burden through sequence analysis of tumours and will provide insights for design of clinical trials. As a third-year MD/PhD student in Prof. Freda Miller's laboratory, Siraj Zahr elucidated a novel transcriptional mechanism in mice that underlies neuronal specification from neural precursors, published in *Neuron* (2018)[2]. Each of these discoveries has important implications for clinical science, and positions these students at the leading edge in their development as clinician scientists.

NORMAN ROSENBLUM MD FRSC, Education Program Director

[1] Cell (2017) 171:1042-1056
[2] Neuron (2018) 97:520-537

MCLAUGHLIN MD/PHD SCHOLARS [2015–17]

SUSAN ARMSTRONG
MICHAEL ATKINS
ROBERT CIVITARESE
ASHISH DESHWAR
JIEUN KIM
NICHOLAS LIGHT
CHRIS MCFAUL
SWAPNA MYLABATHULAS
ENOCH NG
BEN OUYANG
AYESH SENEVIRATNE
LINDA VI
TEJA VORUGANTU
HO YEE WAN
JARED WILCOX
SIRAJ ZAHR
KIRILL ZASLAVSKY

CREMS SCHOLARS [2015–17]

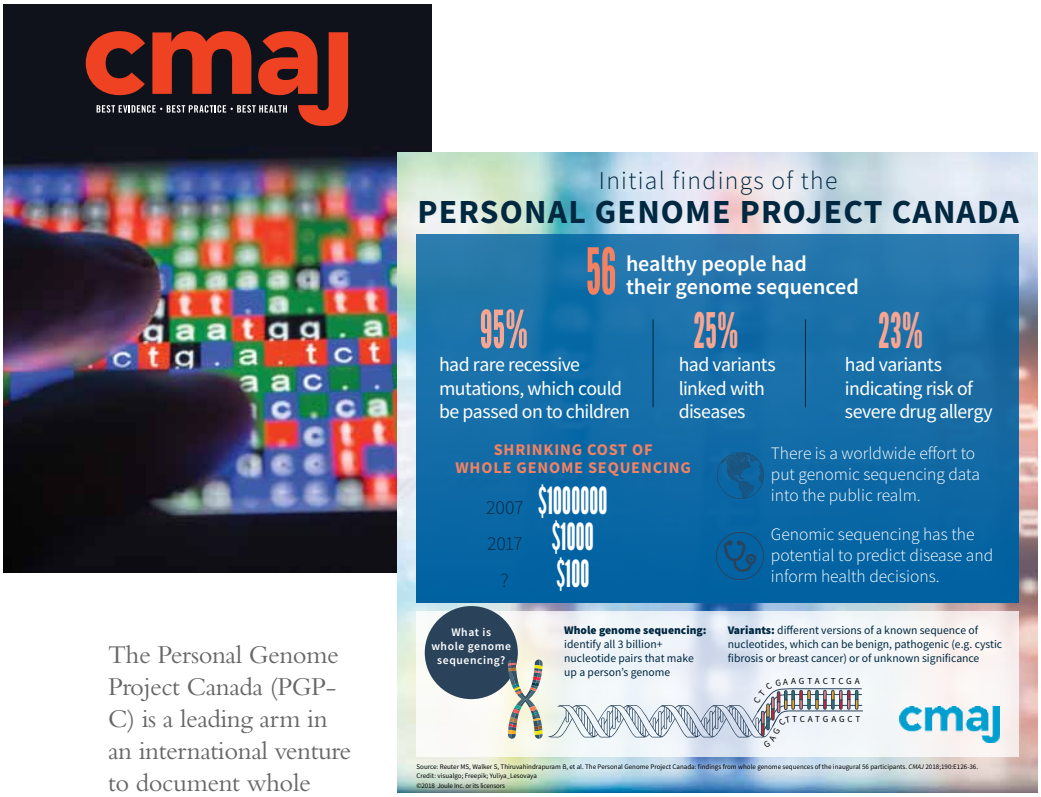
CALVIN DIEP
OLENA HELEN GENIS
MATHEW HALL
CHRISTOPHER HUE
SARAH KANJI
MIN JOON LEE
ANATH LIONEL
MENDEL LOEWENTHAL
RAGEEN RAJENDRAM
SHIHAB SARWAR
XIAOHE (DIANA) SUN
JULIA WOO
WEINING YANG
ROMAN ZYLA

MSC PROGRAM IN GENETIC COUNSELLING GRADUATES [2015–17]

JESSICA BAKER
ROBYN BYRNE
AMANDA CARNEVALE
FELICIA COLLURA
NICOLE GOJSKA
STEPHANIE HEDGES
COURTNEY HUM
SHELLEY MACDONALD
STEPHANIE NEIL
MELISSA RUINSKY
KOWUTHAMIE THARMAKULASINGAM
EVAN WEBER

Special Highlight

PGP CANADA



The Personal Genome Project Canada (PGP-C) is a leading arm in an international venture to document whole genome sequences and health information of volunteers from the general population. In making this database resource openly available, it aims to advance understanding of genetic and environmental contributions to human health and disease. There is a great need for control data in many studies, and PGP-C will provide for that with Canadian representation. At the same time, the project is creating an opportunity to study how information from genomic data can best be integrated into routine clinical and health care. A key feature of this initiative is open sharing of information and data online, including whole genome sequences and personal and family histories; therefore, a rigorous and extensive consent process is required of the participants. Data and experiences from the inaugural 56 participants were published in early 2018 in the *Canadian Medical Association Journal*, with cover stories in the *Globe and Mail*, setting a standard for the world community.

THE WORK WAS FUNDED BY THE UNIVERSITY OF TORONTO'S MCLAUGHLIN CENTRE, THE CANADA FOUNDATION FOR INNOVATION, GENOME CANADA-ONTARIO GENOMICS, THE GOVERNMENT OF ONTARIO, THE CANADIAN INSTITUTES OF HEALTH RESEARCH (CIHR), MEDCAN HEALTH MANAGEMENT INC., DNASTACK AND SICKKIDS FOUNDATION.

Financial Highlights

The McLaughlin Centre was founded in 2001 by a $50M bequest from the R. Samuel McLaughlin Foundation. In 2006-07, $1M of the principle was matched by the Ontario Government to establish the Graduate Student Endowment Fund (GSEF)-McLaughlin Fellowships. The book value of Endowment ($51,009,694) comprises the McLaughlin Endowment ($49,009,694) and GSEF-McLaughlin Fellowships ($2,000,000). The book value remains unchanged from 2014 to 2017.

SUMMARY OF THE MCLAUGHLIN ENDOWMENT

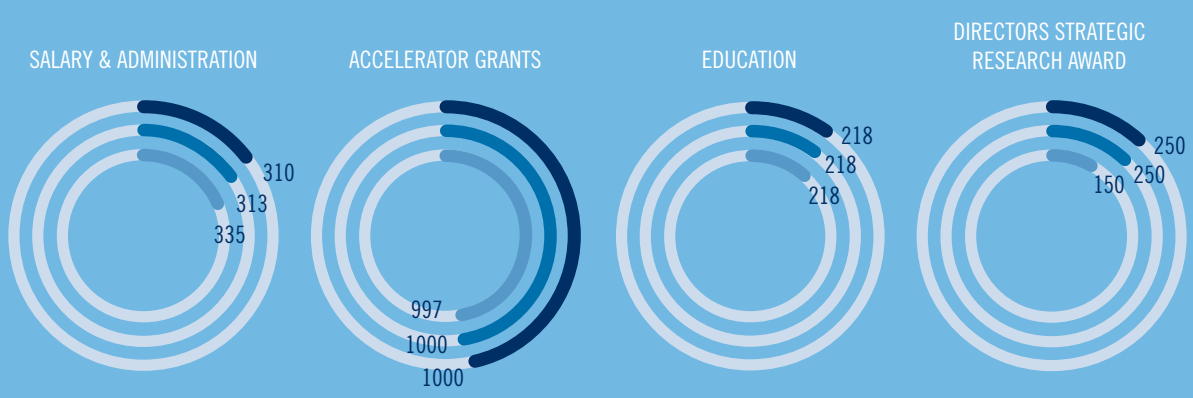
(FOR THE YEAR ENDED APRIL 30 2017)

		2016-17	2015-16	2014-15
MARKET VALUE OF ENDOWMENT	McLaughlin Endowment	61,875,148	55,553,683	57,870,364
	GSEF-McLaughlin Fellowships	2,091,988	1,878,260	1,956,587
		63,967,136	**57,431,943**	**59,826,951**
ANNUAL PAYOUT	Annual Payout (% Book Value)	4.37%	4.29%	4.29%
	McLaughlin Endowment	2,157,478	2,116,305	2,116,305
	GSEF-McLaughlin Fellowships	72,944	71,552	71,552
		2,230,422	**2,187,857**	**2,187,857**
	GSEF-McLaughlin Fellowships	(72,944)	(71,552)	(71,552)
	Financing payback on McLaughlin Endowment*			(292,524)
ENDOWMENT PAYOUT FOR DISBURSEMENT		**2,157,478**	**2,116,305**	**1,823,781**

* Funds available for Disbursement are the McLaughlin Endowment payout less annual reductions to repay financing (payback completed in 2014-15)

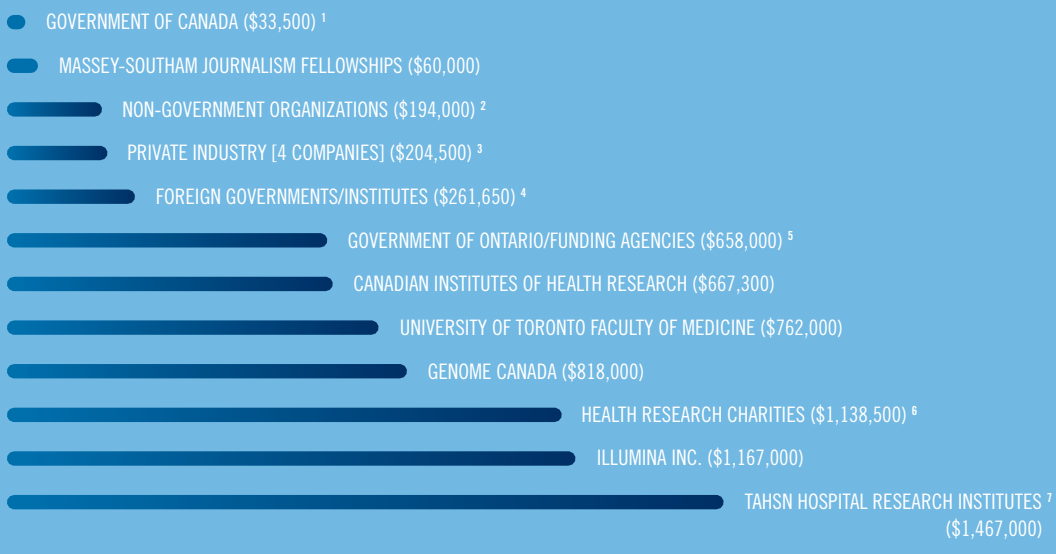
MCLAUGHLIN CENTRE DISBURSEMENTS ($ IN THOUSANDS)

	2016-17	2015-16	2014-15
TOTAL	$2,157,478	$2,116,305	$1,823,781

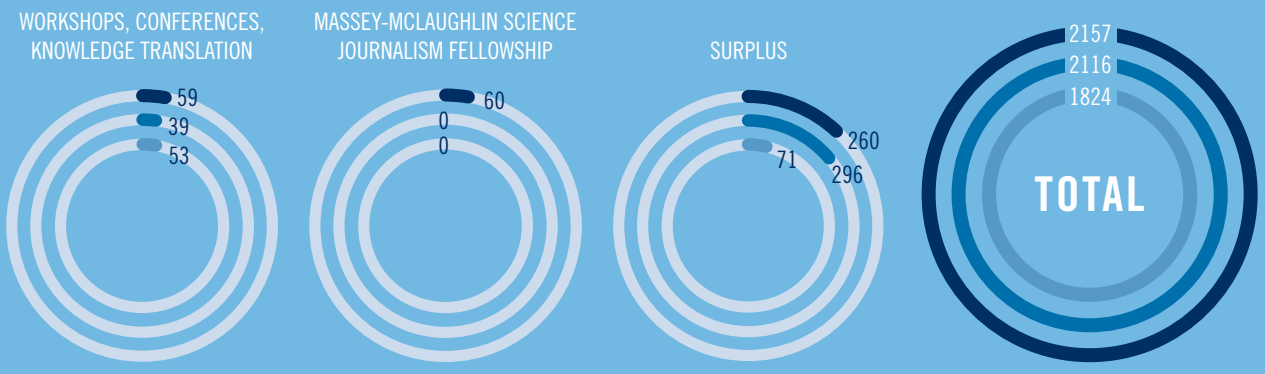


PARTNER INVESTMENTS TO MCLAUGHLIN CENTRE FUNDS 2014-17

(TOTAL $7,431,450)



1. Government of Canada: Canada Research Chairs Program, Networks of Centres of Excellence **2. Non-Government Organizations:** Personal Genome Project Canada, Canadian Cancer Society Research Institute, Canadian College of Medical Geneticists, Canada's Genomics Enterprise **3. Private Industry:** DNAstack, Pacific Biosciences, Roche Diagnostics, Sanofi Pasteur **4. Foreign Governments/Institutes:** American Society of Human Genetics, Cincinnati Children's Hospital Medical Center, International Society of Psychiatric Genetics, Mayo Clinic, National Institutes of Health, Simons Foundation Autism Research Initiative **5. Government of Ontario/Funding Agencies:** Ontario Brain Institute, Ontario Institute for Cancer Research, Ontario Genomics, Public Health Ontario **6. Health Research Charities:** Autism Speaks Canada, Autism Speaks US, Brain & Behavior Research Foundation, Canadian Breast Cancer Foundation, Catherine and Maxwell Meighen Foundation, CureSearch for Children's Cancer, Fidani Foundation, Lupus Foundation of America, March of Dimes Foundation, MitoCanada Foundation, Thrasher Research Fund **7. TAHSN Hospital Research Institutes:** SickKids Centre for Genetic Medicine, SickKids Foundation, SickKids Research Institute, Sinai Health Research Institute, The Centre for Applied Genomics, University Health Network Research Institute



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