Subject: Molecular Genetics eNewsletter - MoGeNews - Issue 10

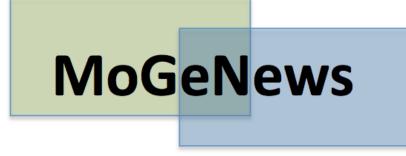
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Issue 10 - January 2018

Editor's message

Happy New Year and welcome to our next issue of MoGeNews!

There are exciting additions and changes to the Department to report. This has been a banner year for new recruits, both student and faculty, and new educational initiatives. Our incoming class of over 75 new graduate students have finished or are completing their rotations, and are settling into their new homes. We have recruited new faculty to the core group, to support the new Masters in Medical Genomics that will begin in the fall of 2018, and from our partner nodes at Sickkids and the Donnelly Centre. Both recruits to MaRS, Dr. Thomas Hurd (highlighted in the last newsletter) and Dr. Aaron Reinke (highlighted below), have now arrived in Toronto and are located on the 15th and 16th floors, respectively.

I hope you enjoy this summary of activities and research in MoGen from the last several months. As always, we encourage all members of our community to keep us posted on discoveries, awards and achievements. Your input is crucial as we continue to build an engaged community.

Graduate students! If any of you would like some experience with scientific writing and would like to contribute to this newsletter, please contact me. For this issue, I am very grateful to one of our new students, Jonathan Palozzi, for contributing the alumni spotlight. Many thanks!

Barbara Funnell

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Table of Contents

1. M.H.Sc. in Medical Genomics

2. Community Events: 3rd Annual Career Development Symposium, MoGen Retreat 2017, 2017 Holiday Party

3. Alumni Spotlight: Frédéric Sweeney

4. Research Highlights

- 5. Faculty Highlights and Awards
- 6. Trainee Highlights and Awards



M.H.Sc. in Medical Genomics

New Professional Master's Program in Medical Genomics

The Department of Molecular Genetics is launching a new M.H.Sc. in Medical Genomics, which will open



Medical Genomics

its doors to students in September 2018, and will be the first of its kind in Canada. The program will target both clinically and laboratory-focused students, and will provide a unique training and learning environment to teach practical and theoretical aspects of modern genetics and genomics with a strong focus on clinical application. This twoyear course-based graduate program will consist of a core set of courses, comprised of lectures, discussions, projects, and case studies, and will culminate in a hands-on Capstone Practicum.

The Department of Molecular Genetics is a leading hub for fundamental and clinical genomics research,

and the new M.H.Sc. in Medical Genomics will capitalize on this by translating established research expertise into a new professional training program. By drawing on our diverse faculty, with strengths ranging from research in mechanisms of disease to oncology and clinical genetics, we will be able to train medical genomics professionals who are oriented towards a new era of research and clinical science. Students graduating from the program will obtain professional and practical skills that will help situate them in a world in which genetic and genomic data are routinely collected and analyzed across a wide range of patient populations and medical indications.

The inaugural M.H.Sc. cohort is being recruited now! See the program's website here for details.

Community Events



3rd Annual MoGen Career Development Symposium

Empowering trainees. Engaging alumni. The 3rd Annual MoGen Career Development Symposium was held on June 9th, 2017 at the Chestnut Conference

Centre in downtown Toronto. Dr. Leah Cowen and Dr. Barbara Funnell organized

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this year's event, designed to promote interactions between trainees and our many extraordinary alumni from the Department of Molecular Genetics. The mission is to provide mentorship for our trainees in the many career options available to them by highlighting the paths followed by our alumni.

The afternoon included round-table discussions between alumni and trainees, networking sessions, and a panel discussion by six distinguished graduates from Molecular Genetics: Dr. Jacques Archambault (Professor, McGill University), Dr. John Calarco (Assistant Professor, University of Toronto), Dr. Frédéric Sweeney (VP Business Development & Strategic Alliances, bioMérieux SA), Dr. Elizabeth Higgins (Analytical Development & Quality Control, GE Healthcare Life Sciences), Dr. Melanie Szweras (Partner, Bereskin & Parr LLP), and Dr. Jennifer Semotok (Senior Genetic Counsellor, Gene DX). We were supported by over a dozen generous sponsors from our friends in biotechnology and the university community. The symposium provided a lot of time for trainees to network with alumni and seek advice at the round-tables, coffee break and wine-and-cheese that capped off the afternoon. It was a great success!

For more information about the day, please see our alumni website.

Please save the date for the 2018 event: the 4th Annual MoGen Career Development Symposium will be held on **Monday, June 4, 2018** at the Chestnut Conference Centre. More details will be posted on the MoGen website in the coming weeks.



MoGen Retreat 2017 We gathered for our 2017 Molecular Genetics Retreat at Geneva Park YMCA, on September 20th-22nd. The retreat was organized by Dr. Jim Rini, Dr. Julie Lefebvre, and Dr. Leah Cowen, with the assistance of Eric Chapman, Samantha Esteves,

Lauren Tracey, and their GSA team. Our Chair, Leah Cowen, organized an excellent scientific program comprising 15 faculty talks that captured the diversity and excellence of the research in MoGen.

The retreat kicked off on Wednesday evening for first-year students and faculty for Power Hour night. PowerHour is our beloved tradition for student recruitment, in which faculty deliver their research & lab life pitch in a strict 3-minute/1 slide presentation. On Thursday, the remaining attendees arrived for our largest turn-out yet: 44 PIs, 73 rotation students, 145 graduate students, 15 post-docs/staff, and 12 undergraduate MGY specialists. The day began with opening remarks from Leah Cowen followed by 2 sessions of talks, including talks by our newest faculty members Hannes Rost, Aaron Reinke, and Thomas Hurd. The poster session followed in the late afternoon, with a record of 137 presentations. All available wall space was covered with posters, and rooms were filled with MoGen members presenting their work, and interacting and learning about their peers' research. The poster session is always a highlight of the retreat as it showcases the superb research being performed by our trainees. Seven posters were selected for cash awards. We capped off our day with a fantastic line-up of dinner entertainment organized by Eesha Sharma, Noah Hahn, and Reuben Samson. The celebrations went into the night at the fire pits, and with music and dancing in the Barn. We were up and early for the morning session. Thanks to all for a successful retreat! Hope to see you at Geneva Park for our 2018 retreat, which will be held on Wed. Sept. 19th - Fri. 21st, 2018. For more photos and highlights, click here.



MoGen Holiday Party!

We celebrated the 2017 holiday season at the annual MoGen holiday party on Friday, December 8, 2017 at the University of Toronto Faculty Club.

MoGen students, postdocs, faculty, staff members, and their guests met for this packed event planned by our Graduate Students'

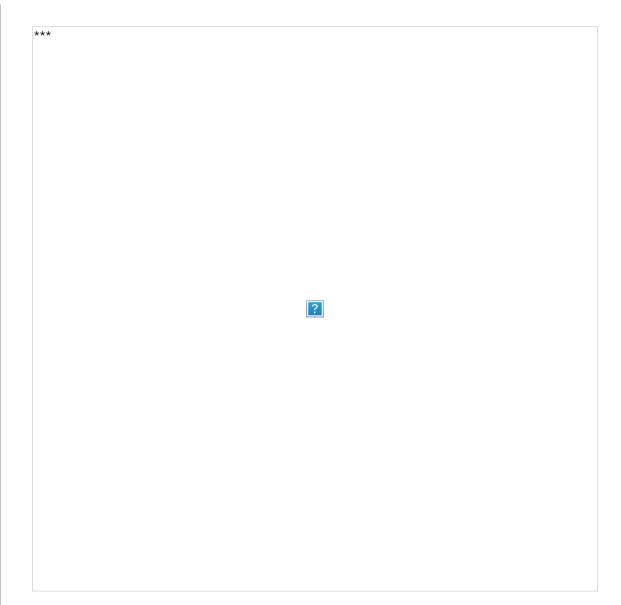
Association. Holiday cheer was abundant; and there was a great deal of smoozing and talking and laughing and dancing over the course of the evening. The departmental dress code improved substantially over our typical lab attire. Who knew we were such fashionistas? Our community greatly enjoyed this festive celebration, and we all appreciated the hard work done by GSA members who organized the event.

Alumni Spotlight

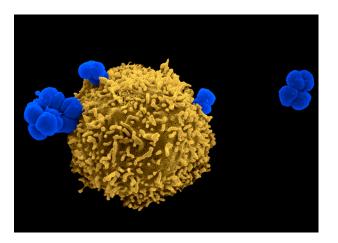


Dr. Frédéric Sweeney is the Vice President of Corporate Development and Strategic Financing Lead at bioMérieux, a multinational biotechnology company specializing in diagnostic tools. He is based in Boston. An alumnus of Dan Durocher's lab at the LTRI, Frédéric now uses his scientific background to scout for new technologies in a rapidly growing technology field. In this spotlight, Frédéric shares his thoughts on his career path and advice on how to translate your scientific training into a successful career in biotech. Click here for the full spotlight.

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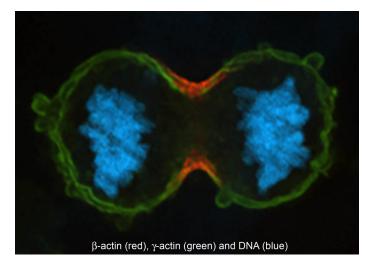


Research Highlights



The symptoms of a bacterial disease are often generated by our immune system causing tissue damage as it attempts to clear the infection. During gonorrhea, infection by the bacteria *Neisseria gonorrhoeae* elicits a massive influx of activated antimicrobial neutrophils, which results in profuse discharge from the genital tissues. A new study led by **Dr. Scott Gray-Owen**, published in *Cellular Microbiology*, reveals that the potent phagocytic and inflammatory response elicited when bacteria bind to the neutrophil-expressed decoy receptor CEACAM3 requires the synergistic integration of signals from the CEACAM3 cytoplasmic immunotyrosine-based activation motif (ITAM) and microbial-sensing pattern recognition receptors such as the endotoxin-specific toll-like receptor 4 (TLR4). This process allows an intensified response relative to TLR-mediated signals alone, and provides a checkpoint control to prevent ITAM-mediated triggering of cytotoxic neutrophil functions in the absence of a secondary danger signal.

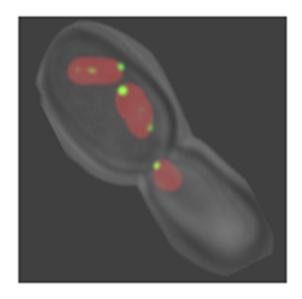
(Cellular Microbiology 2018, doi: 10.1111/cmi.12788)



Cytokinesis is the last stage of cell division when two daughter cells of equal genetic content are generated from one mother cell. An actomyosin contractile ring drives invagination of the plasma membrane, creating a furrow between the segregating chromosomes. A new study by Dr. Andrew Wilde

uncovers a new activation mechanism of the actin filament nucleator DIAPH3, and discovers that DIAPH3 is the first nucleator to have actin isoform specificity. The research, published in *Nature Communications*, examines how different isoforms of actin are controlled spatially and temporally to achieve successful cell division. (*Nature Communications* 2017, doi:10.1038/s41467-017-01231-x)

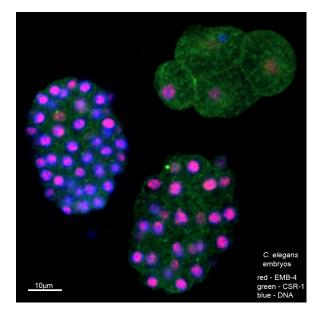
Fungal infections, and emergence of drug-resistant strains, are global health problems. Fungal pathogens sense and respond to environmental cues, and the environmental sensors are often crucial for virulence and for the emergence of resistance to antifungal therapies. A new study led by **Dr. Leah Cowen**, and published in *Nature*



Communications, has examined a critical transcriptional regulator called Cas5 in *Candida albicans*, one of the leading fungal pathogens in humans. The study reveals that Cas5 governs distinct transcriptional programs that switch targets in response to different environmental conditions, uncovers how cell wall integrity is coupled with cell cycle regulation, and describes circuitry governing antifungal drug resistance.

Click here to read more. (*Nature Communications* 2017,

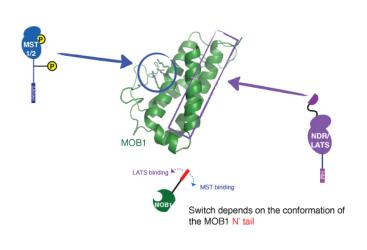
doi:10.1038/s41467-017-00547-y)



Reproductive fertility and thus perpetuation of a species require carefully regulated patterns of gene expression during development of the germline of the organism. Studies using the nematode worm *Caenorhabditis elegans* have established that small RNA pathways and RNA processing are key contributors to a complex repertoire of both positive and negative mechanisms of transcriptional regulation. Research by **Dr. Julie Claycomb**, published

in two papers in *Developmental Cell*, identified a conserved splicing/nuclear export factor (EMB-4/Aquarius/IBP160) as a critical part of these germline nuclear small RNA pathways. The Claycomb lab observed that loss of *emb-4* led to distinct alterations in two small RNA pathways, the CSR-1 and HRDE-1 nuclear 22G-RNA pathways. Therefore EMB-4 is necessary to properly distinguish different germline transcripts for regulation by different types of small RNA pathways. Moreover, subsequent studies have identified EMB-4 as functioning in other small RNA pathways, pointing to it as a core component of nuclear small RNA pathways across species.

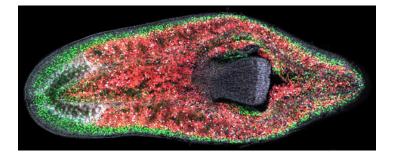
(*Developmental Cell* 2017, doi: 10.1016/j.devcel.2017.07.003 and doi:



Understanding how cancer develops requires understanding the complicated cellular pathways involved. Dr. Anne-Claude Gingras, Dr. Frank Sicheri and their laboratories have collaborated to study MOB1, a key regulatory protein in the Hippo pathway, a signalling system implicated in suppressing tumour growth. This work, published in two

articles in *Molecular & Cellular Proteomics*, examined the structure and interactome of MOB1 to dissect the intricate regulatory steps in this key signaling pathway. Click here to read more.

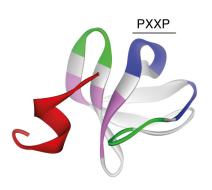
(*Mol Cell Proteomics 2017*. doi: 10.1074/mcp.M117.068130 and doi: 10.1074/mcp.M116.065490).



Freshwater planarians or flatworms have some of the best regenerative abilities of any animal, and how they heal themselves points to the mechanisms of wound healing in humans.

Research led by **Dr. Bret Pearson**, and published in *PLoS Genetics*, has discovered a pathway that plays a key role in how the flatworm responds to injury. The study shows that a worm gene called *yorkie*, an effector of the Hippo signalling pathway, negatively regulates stem cell proliferation and the transcriptional wound response program, and is necessary for proper regeneration. In other words, too much (as well as no) response to injury is detrimental to proper healing. Click here to read more. *PLoS Genetics* 2017, doi: 10.1371/journal.pgen.1006874

SH3 domains mediate protein-protein



interactions in many eukaryotic signal transduction pathways. Most SH3 domains recognize proline-rich sequences, but there is growing evidence that this is not the only recognition specificity. A study by **Dr. Sachdev Sidhu, Dr. Gary Bader**, and **Dr. Philip Kim** used high-throughput experimental and computational methods to survey the SH3 interaction landscape in an unbiased manner. The research, published in *Structure*, obtained a map of 154 specificity profiles for 115 human SH3 domains,

revealing a wide variety of recognition motifs, most of which were previously unknown. The study reveals unexpected diversity in the ways proteins bind to their partners. Click here to read more.

(Structure 2017, doi: 10.1016/j.str.2017.07.017)



Glioblastoma is the most common and malignant form of adult primary brain

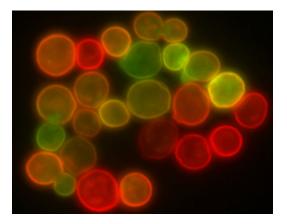
tumour. An international research team, led by **Dr. Peter Dirks** and Dr. Benjamin Simons (Cambridge University) used an innovative barcode-like system to track the behaviour of individual brain cancer cells. The study, published in *Nature*, found that only a few of the marked cells could give rise to long-term

tumour growth, suggesting that a large portion of patient tumours contain cells that cannot multiply to make tumours grow. The diversity of growth behaviours reflected a simple program of cell fate decision-making. The research also identified two drugs that differentially targeted distinct glioblastoma stem cells, suggesting new therapeutic strategies for the treatment of this aggressive cancer.

Click here to read more.

(*Nature* 2017, doi:10.1038/nature23666)

Identifying the molecular targets of chemical treatment is critical to the development of safe and effective drugs. However determining these targets has proven slow compared to the development of chemical libraries. Dr. Charlie Boone, with collaborators Dr.



Chad Myers (University of Minnesota), Dr. Minoru Yoshida and Dr. Hiroyuki Osada (RIKEN Centre, Japan), have developed a high-throughput chemical-genetic screening platform to probe the functional targets of chemical libraries in an unbiased and systematic manner, using the yeast *Saccharomyces cerevisiae*. The study, published in *Nature Chemical Biology*, mapped the cellular processes affected by thousands of chemicals in seven different

compound libraries. Click here to read more. (*Nature Chemical Biology* 2017, doi:10.1038/nchembio.2436)



An innovative business model to find cures for and fight rare diseases is being pioneered by Dr. Aled Edwards. He and business partner Owen Roberts have launched an open source pharmaceutical company called M4K Pharma (Meds for Kids), to seek cures for rare diseases that conventional drug companies consider too risky to pursue. See the full story in UofT News.

Faculty Highlights and Awards

Welcome to New Faculty

Dr. Aaron Reinke, new faculty recruit to Molecular Genetics

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Dr. Aaron Reinke has joined the Department as an Assistant Professor, starting September 2017, on the 16th floor of the MaRS West Tower. His research program is focused on a unique model system of microsporidial parasites that infect worms, specifically studying co-evolution of *Caenorhabditis* nematode hosts and *Nematocida* pathogens. His research encompasses interdisciplinary approaches



with biochemistry, genetics, systems biology, and technology development. He completed his undergraduate studies at the University of California, Davis, and his PhD at the Massachusetts Institute of Technology in Amy Keating's laboratory studying bZIP-mediated protein-protein interaction networks using biophysical approaches. During his postdoctoral work with Emily Troemel at the University of California, San Diego, he has developed technology to identify microsporidian effector proteins with tissue and subcellular specificity in *C. elegans*, and has leveraged genomic analyses to dissect mechanisms of host-pathogen

interactions.



Dr. Ryan Yuen is a Scientist in Genetics & Genome Biology at the Hospital for Sick Children, and joined the Department as an Assistant Professor in 2017. He received his PhD from the University of British Columbia, and his postdoctoral training with Steve Scherer at Sickkids. Dr. Yuen studies how genetic and epigenetic variations contribute to human health, with a focus on neurodevelopmental and neurological disorders.



Dr. Hannes Röst joined the Department as an Assistant Professor in 2017, in the Donnelly Centre for Cellular & Biomolecular Research. He completed his PhD in ETH Zurich and his postdoctoral training with Mike Synder at Stanford University. His research interests are to understand biology on a personalized level and his lab uses next-generation mass spectrometry to analyze proteomic and metabolomic data in high-throughput.

Dr. Erin Styles joined Molecular Genetics as an Assistant Professor, Teaching Stream, in 2017 and she is the Director of the new Masters of Health Sciences



program in Medical Genomics. She received her PhD with Brenda Andrews in Molecular Genetics. She focuses on designing and implementing a program that provides practical, actionable training in medical genetics and genomics.



Dr. Martina Steiner was appointed Assistant Professor, Teaching Stream in MoGen in 2017. She completed her Ph.D. at ETH Zurich, and holds a Master's degree in Secondary and Higher education. Her main focus is to establish and teach in the M.H.Sc. Medical Genomics program.



Dr. Johanna Carroll was appointed Assistant Professor, Teaching Stream in MoGen in 2017. She received her PhD at the University of California-Berkeley, and postdoctoral training the Dana Farber Cancer Institute and Harvard Medical School. Her main focus is to establish and teach in the M.H.Sc. Medical Genomics program.

Faculty Honours & Awards

Dr. Janet Rossant has been recognized by UNESCO and the L'Oréal Foundation as one of the five outstanding women scientists from around the world. She will receive a *2018 L'Oréal-UNESCO For Women in Science Award* in March in Paris. Dr. Rossant is being honoured for her contribution to the understanding of how tissues and organs are formed in the developing



embryo. Read the full story in the **UofT News**.

Dr. Rossant has also been honoured with a 2017 honorary Doctor of Science degree from Cambridge University, for her research which "has helped to uncover the cellular and molecular events that control early-stage embryo development in mice, with implications for stem cell biology and understanding developmental disorders". See the full Cambridge announcement here.



Dr. John Dick has been awarded the *2017 Keio Medical Science Prize* by Keio University in Japan. The prize honours "researchers who have made an outstanding contribution to the fields of medicine or the life sciences. It is the only prize of its kind awarded by a Japanese university." Dr. Dick is recognized for his contributions to the understanding of cancer stem cells and cancer. See the full announcement from Keio University.



Dr. Brenda Andrews has been appointed to the rank of University Professor. It is the highest academic rank at the University of Toronto and is usually awarded to no more than two per cent of the tenured faculty. Dr. Andrews is recognized for extraordinary scholarly achievement and leadership at the University. See the full story here.

In addition, Dr. Andrews has been appointed to the governing council of the Canadian Institutes of Health Research (CIHR), the main federal funding body for health research and innovation. The council is instrumental in developing the research priorities of

CIHR and of Canada. See the full story in UofT News.

Dr. Stephen Scherer has been honoured with a 2017 Honorary Doctor of Science from the University of



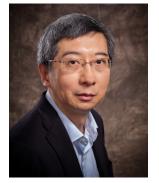
Waterloo, where he completed his undergraduate studies, for Dr. Scherer's "ground breaking contributions to the understanding of genetic variation, especially as it relates to human health and disease". See the full Waterloo statement here.

Canada Research Chairs

Eight faculty from Molecular Genetics have been named Canada Research Chairs (also see stories in U of T News on Jun 8, 2017 and Nov 7, 2017):



Dr. John Dick - *Tier 1 Canada Research Chair in Stem Cell Biology*. Dr. Dick's research examines the genetic pathways that control human hematopoietic stem cells in order to understand these pathways and how changes lead to the development of leukemic stem cells and leukemia.



Dr. C.C. Hui - *Tier 1 Canada Research Chair in Mouse Development and Disease Modelling.* The Hui lab uses mouse genetics to decipher and understand the genetic control of animal development and the molecular mechanisms involved in tumorigenesis.

Dr. Lucy Osborne - *Tier 1 Canada Research Chair in Genetics of Neurodevelopmental Disorders.* Dr. Osborne uses mouse and human genetic analyses to probe the



underlying molecular basis of these disorders.



Dr. Frank Sicheri - *Tier 1 Canada Research Chair in Structural Principles of Signal Transduction*. Research in the Sicheri lab is focused on elucidating the mechanism of action of signalling molecules through the use of structural, biochemical, and molecular techniques.



Dr. Julie Claycomb - *Tier 2 Canada Research Chair in Small RNA Biology*. Research in the Claycomb lab is aimed at uncovering the molecular mechanisms by which small RNA pathways related to RNA interference modulate chromatin throughout animal development.

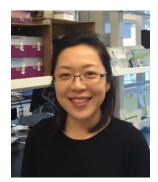


Dr. Ran Kafri - *Tier 2 Canada Research Chair in Quantitative Cell Biology* . The Kafri lab is interested in how quantitative aspects of cellular identity, for example, cell size, are specified and regulated.

Dr. Jason Moffat - Tier 2 Canada Research Chair in

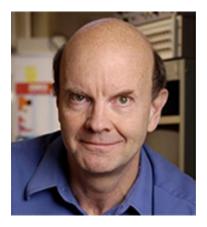


Functional Genetics. The Moffat lab uses genome-scale lentiviral-based RNA interference technology and computational techniques to define genetic interaction networks that are critical for cancer cell proliferation.



Dr. Jeehye Park - *Tier 2 Canada Research Chair in Molecular Genetics and Neurodegenerative Diseases.* Research in the Park lab investigates the molecular mechanisms of neurodegenerative diseases with the aim of identifying targetable pathways for therapeutic interventions.

In Memorium



Dr. John Roder, Professor Emeritus in Molecular Genetics, passed away on January 6, 2018. He was one of the Lunenfeld Tanenbaum Research Institute's first scientists, recruited by Lou Siminovitch in 1985 from Queens University, and he joined the Department in 1987.

John was an amazing scientist and colleague. In midcareer, he decided to switch his entire scientific focus from natural killer cells and immunology to the genetics of neuroscience, and went on to become a

world leader in this field. For more information on John's life and career, click here.

Trainee Highlights and Awards

Graduate Student Awards 2017

Molecular Genetics has a number of competitive awards and fellowships given annually (and announced at the retreat) to our graduate students. Congratulations to all students!!

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This year the awardees are:

L.W. Macpherson Award Harley Mount (Ensminger lab)





Roman Pakula Award Kaitlin Laverty (Hughes/Morris Labs)



Norman Bethune Award Dustin Ammendolia (Brumell Lab)

Eric Hani Fellowship Elissa Currie (Gray-Owen Lab)



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MoGen Retreat Poster Awards 2017

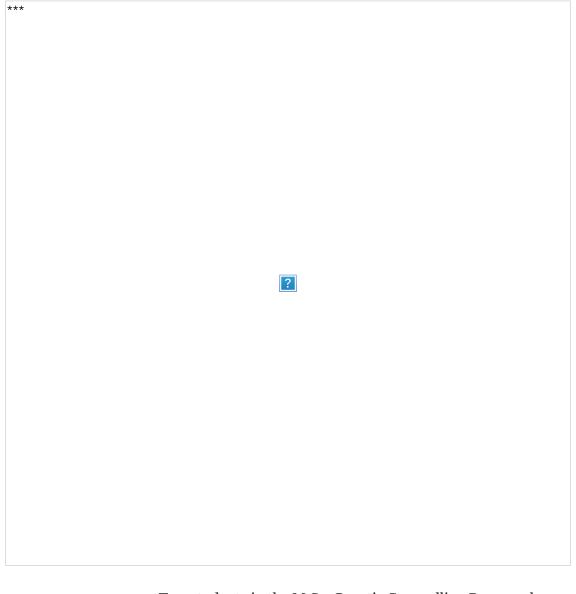
Seven students received awards for their posters at the MoGen retreat this year:



(left to right): Daniel Witvliet (Zhen Lab) Eesha Sharma (Blencowe lab) Chloe Rose (Ciruna lab) Kwamaa Duah (Cowen lab) Shixuan Liu (Kafri lab) Michael Pryszlak (B. Pearson

lab)

Ashrut Narula (Rissland lab)



Two students in the M.Sc. Genetic Counselling Program have



been awarded the inaugural McLaughlin Centre, University of Toronto Scholarships:

Emily Thain



Kalene van Engelen

Five Molecular Genetics graduate students have been awarded **2017 Cecil Yip Doctoral Research Awards**. The award is given to first year graduate students in the Donnelly Centre whose proposed projects extend beyond traditional scientific field boundaries. Click here to read more about the recipients and their research.

The 2017 recipients are:



Alexander Sasse (Morris lab)

Kaitlin Laverty (Hughes/Morris labs)



Dmitri Segal (Taipale lab)

Greg Martyn (Sidhu lab)



Clarence Hue Lok Yeung (Andrews/Boone labs)

Links to previous editions of MoGeNews

To access previous issues of MoGeNews, please click on the relevant link:

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Issue 1

- Issue 2
- Issue 3
- Issue 4
- Issue 5
- Issue 6
- Issue 7
- Issue 8
- Issue 9

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