



Molecular Genetics  
UNIVERSITY OF TORONTO

# MoGeNews

Issue 3 - November 2014



*MoGen Departmental Retreat 2014*

**Editor's Message**

This latest issue of MoGeNews is packed with exciting new content, including substantial student-driven contributions. We hope that you will enjoy the highlights of community events, spotlights of several recent alumni, research highlights, and coverage of exciting faculty and student achievements. In our efforts to enhance community and communication we have revised the [Departmental website](#), so please check it out and enjoy the new look, revised structure, and ease of navigation!

In order to effectively capture highlights from our MoGen community members, we need to hear from you. In particular, we strive to build a stronger community that connects our alumni with current Molecular Genetics faculty and trainees. To this end, we have created a Community Page on our website that provides a forum for faculty, students, staff, and alumni to network and communicate. Please join the community by clicking [here](#). We hope that our alumni will engage with the community, and will also take a moment to visit the website and [update us](#) on exciting career developments, discoveries or achievements.

Sincerely,

Leah Cowen

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## Community Events



**Student Versus Faculty Softball Game.** On a sunny afternoon in August, students and faculty gathered in King's College Circle for a friendly game of softball. The student team, Nucleotide Base Runners, was the heavy favourite coming into the game. They were coming off of a strong finish in the quarterfinals of the U of T Intramural Softball league and had the benefit of playing together for the whole summer season. Ball Busters, the aptly

named and newly assembled faculty team, was led by graduate coordinator and baseball enthusiast Peter Roy and included PIs from all nodes. As the clear underdogs, the faculty team made up for their lack of experience with plenty of enthusiasm and trash talking. "I definitely think the students are going to win," said Alex Lin, GSA president, ahead of the big match. "The faculty team doesn't really stand a chance since they're all over the age of forty." Click [here](#) to find out how the game went down.



**Departmental Retreat.** The 2014 MoGen retreat was held at the Geneva Park YMCA September 17th-19th. This year we saw our highest ever registration, with 49 faculty, 41 rotation students, 105 graduate students, 17 postdocs/research staff and 3 MoGen undergrad specialists signing up on our flashy new webpage (thanks to Evan Moir and Jim Rini). For

details on the many exciting moments from the Power Hour to bonfire, click [here](#).

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## Alumni Spotlights



**Dr. John Calarco, Bauer Fellow, Harvard University, discusses launching his career as an independent investigator in the FAS Center for Systems Biology after completing his doctoral work with Dr. Benjamin Blencowe and Dr. Mei Zhen in the Department of Molecular Genetics.** John talks about falling in love with experimental research during his PhD, his experience running his own

research program, and how he is tackling fundamental questions regarding how splicing decisions are regulated in neurons and the implications for development and function of the nervous system. Click [here](#) to read more.



**Dr. Anastasia Baryshnikova, Lewis-Sigler Fellow at the Lewis-Sigler Institute for Integrative Genomics at Princeton shares her scientific journey from starting as an undergraduate at the University of Milan in Italy, to joining Dr. Charlie Boone's laboratory in the Department of Molecular Genetics.** Anastasia highlights key memories from graduate school, advice for current and prospective students considering a career in academia, and her research interests in mapping the functional organization of the cell on a global scale. To read

more, click [here](#).

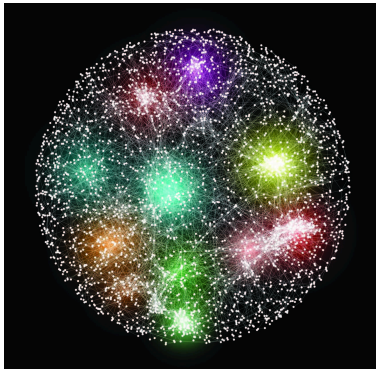


**Dr. Wendy Dobson-Belaire, Management Consultant at IMS Brogan, the Canadian division of IMS Health, discusses her career trajectory from completing her PhD with Dr. Scott Gray-Owen in the Department of Molecular Genetics, to obtaining an MBA, to embarking on management consulting for pharmaceutical companies, governments, and trade organizations.** She highlights the benefits of having a PhD and the transition from bench science, and provides advice to students thinking about career opportunities in consulting.

Click [here](#) to read more.

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## **Spotlight on MoGen Research Field - Functional Genomics and Proteomics**



*Genetic interaction map of a eukaryotic cell (Science 2010 327: 425-31).*

MoGen research in the area of Functional Genomics and Proteomics uses technologically advanced methods to comprehensively understand how the information encoded in genes and proteins ultimately functions in an organism. We aim to systematically explore the basic cellular processes underpinning growth and development, and to identify changes that cause disease.

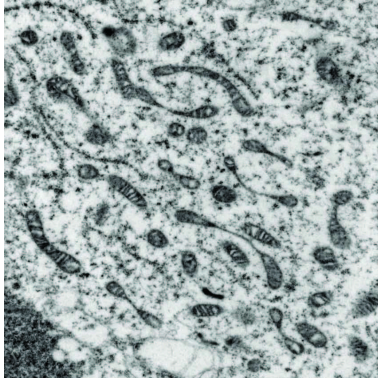
Genomics and proteomics are two of the newest biological disciplines, and research in these areas has been driven by the application of technology to biology. Two important technologies driving these disciplines are DNA sequencing and mass spectrometry. New technologies for DNA sequencing were created as part of the global effort to sequence the human genome, completed in 2001. In the years since then, major advances in DNA sequencing now make it possible to obtain the entire DNA sequence of any individual and to determine all of the RNAs present in a cell. Mass spectrometry is a method for determining the quantity and identity of molecules, and can be used to measure molecules ranging from cholesterol and chemotherapy drugs to cellular proteins. Mass spectrometry has been particularly useful in characterizing which proteins are expressed in particular cells, and this information is a powerful complement to quantitative data from DNA and RNA sequencing. The results from these methods and from other large-scale, often robotically assisted, approaches are analyzed using increasingly sophisticated computational methods.

Our diverse labs form an innovative, interdisciplinary, and intensely collaborative community, and our pioneering work holds a leadership position in Canada and internationally. Faculty in this research field apply the techniques of genomics and proteomics to address topics as varied as the causes of cancer, the fundamental biochemical reactions of life, the evolution of pathogens, and the interactions between different proteins.

We encourage you to read the full [Field Spotlight](#) for a closer look at some of the exciting research in Functional Genomics and Proteomics.

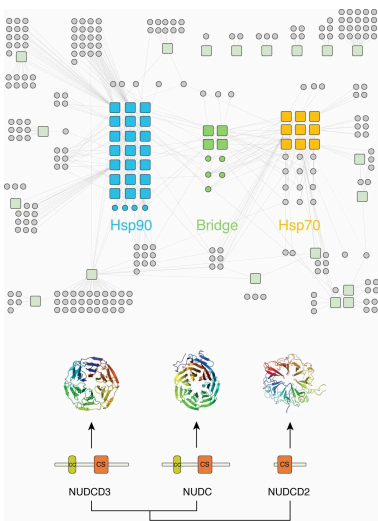
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## Research Highlights



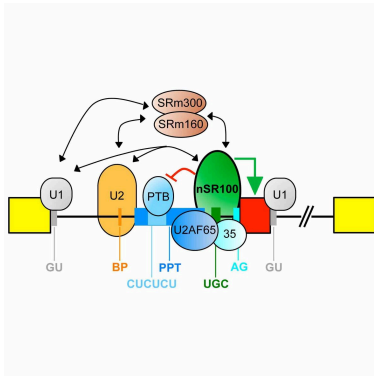
*Electron microscopy of cyst cell mitochondria from wildtype *Drosophila testes*.*

**Discovery of a new link between the cell membrane and the mitochondrial matrix that controls metabolic state.** (*Cell* 2014, 158;1293-208). MoGen team led by Helen McNeill discovered that the large cell-surface cadherin Fat, known for its role in the regulation of planar cell polarity and the Hippo pathway, is also essential for normal oxidative phosphorylation. Fat is proteolytically processed to release an intracellular fragment, which is targeted to mitochondria, where it interacts with components of the electron transport chain. Loss of Fat leads to increases in reactive oxygen species and a switch to aerobic glycolysis that is reminiscent of the Warburg effect.



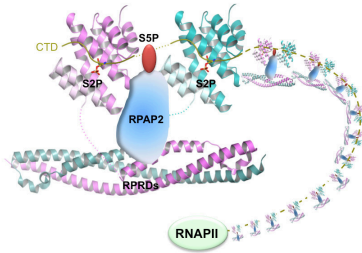
*Proteostasis network in human cells.*

**Study reveals the architecture of cellular homeostasis circuitry.** (*Cell* 2014 158:434-48). An international team led by MoGen scientists Mikko Taipale and Anne-Claude Gingras, and Whitehead scientist Susan Lindquist, systematically investigated protein-protein interactions of key chaperones required for modulating the folding and function of target proteins. They identified a complex landscape of interactions for Hsp90 and its co-chaperones, with implications for understanding cancer and neurodegenerative disease.



**Team led by Ben Blencowe has identified and characterized a large network of conserved brain-specific alternative exons that is critical for neurogenesis.** (*Molecular Cell* 2014, 56:90-103). A neural-specific splicing regulator previously discovered in the Blencowe laboratory, nSR100/SRRM4 (Calarco et al. *Cell*, 2009), activates this exon network by binding to adjacent, specialized intronic splicing enhancer motifs, and by

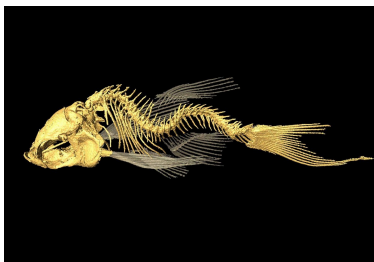
facilitating the recruitment of multiple early splicing complex assembly factors. Discovery of this global splicing activation mechanism facilitates our understanding of the molecular mechanisms underlying neuronal differentiation, evolution for brain complexity, and neuronal developmental disorders such as autism.



**Study led by Jack Greenblatt illuminates structural and functional features of regulation of human RNA polymerase II.**

(*Nature Structural and Molecular Biology* 2014, 21:686-95). Human RNA polymerase II carboxyl-terminal domain (CTD) contains 52 heptapeptide repeats that are important for transcriptional

regulation and transcription-coupled RNA processing. This work demonstrates that dimeric RPRD proteins specifically recognize serine 2 and serine 7 phosphorylated (S2P, S7P) CTD repeats so as to organize the CTD into “CTDsomes” and recruit the phosphatase RPAP2 for CTD serine 5 (S5P) dephosphorylation.



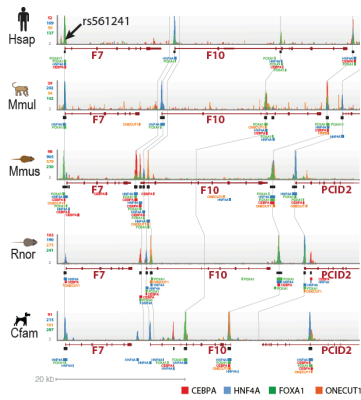
*Photo credit: Madeline Hayes and Matthijs van Eede.*

**MoGen researchers identify novel molecular origins of congenital and idiopathic forms of adolescent idiopathic scoliosis (AIS).** (*Nature Communications* 2014, 5:477).

The team led by Brian Ciruna pioneered a zygotic *ptk7* zebrafish model of AIS, deficient in a key regulator of Wnt signalling. They identify genetic links between congenital and idiopathic forms of scoliosis and implicate dysregulated Wnt signaling in AIS, which manifests as a late onset spinal deformity that

occurs in 3% of school children worldwide.





**International team led by Michael Wilson demonstrates that comparing transcription factor binding between species is a powerful way to locate the DNA necessary for tissue specific gene expression.** ([eLife 2014, 3:e02626](#)).

They mapped the precise binding locations of a set of essential liver transcription factors in five mammalian species. As expected, only a minority of combinatorial transcription factor binding locations were shared between species. However, the shared combinatorial binding events were frequently found near genes involved in critical liver metabolic pathways and coincided with numerous regions mutated in liver-related diseases.

## Faculty Highlights & Awards



**Dr. Lap-Chee Tsui receives the 2014 Henry G. Friesen International Prize in Health Research.**

The Prize, established by Friends of the Canadian Institutes of Health Research (FCIHR), in collaboration with the Canadian Academy of Health Sciences recognizes leaders of exceptional achievement in science and health policy of international stature. Dr. Tsui was a professor in Molecular Genetics when he cloned CFTR, and his current U of T appointment is as an emeritus professor in the Department. He was also

instrumental in our establishment of the joint PhD with Hong Kong U.



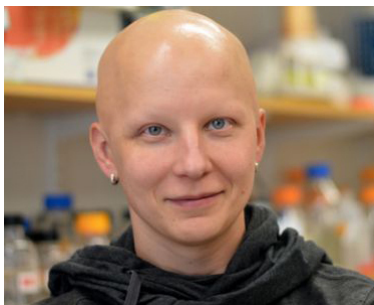
**Professor Brenda Andrews leads team awarded a \$1 million Connaught Fund Global Challenge Prize.** Their project focusses on the hot field of personalized medicine. The project is called Connaught Network for Modeling and Mapping Complex Disease: Addressing the Global Challenge to Understand our Personal Genomes.



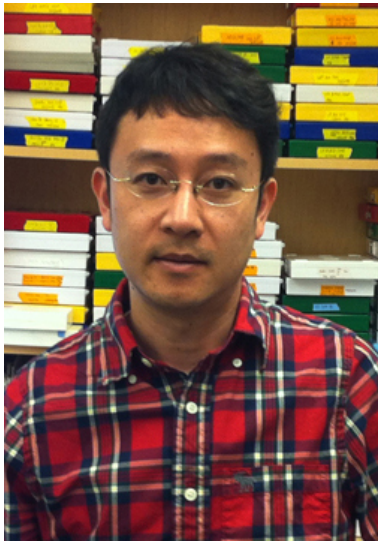
**Dr. Stephen Scherer celebrated for great strikes towards cracking the autism code.** Scherer's team found a statistically significant way of predicting autism, which has been hailed as offering hope to parents seeking early treatment. Click [here](#) for details.

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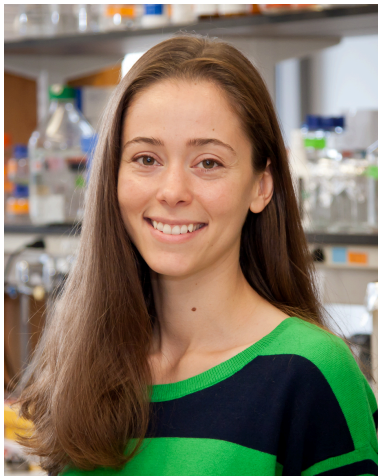
## Welcome to Our New Professors



Mikko Taipale was appointed to the Department of Molecular Genetics as an Assistant Professor in October 2014, and is located in the Donnelly Centre Research Node. Prior to this appointment, he was a Postdoctoral Fellow in Susan Lindquist's laboratory in the Whitehead Institute for Biomedical Research (Cambridge, MA). His plan is to take advantage of high-throughput proteomics and genomics approaches to understand how the mammalian proteostasis network is organized and how it is regulated in health and disease.



Tae-Hee Kim was appointed to the Department of Molecular Genetics as an Assistant Professor in November 2014, and is located in the SickKids Research Node. He completed postdoctoral training at the Dana-Farber Cancer Institute. Applying mouse genetics, epigenomics and gut organoid cultures, his lab investigates the developmental basis of gut stem cell renewal, differentiation, and cancer.



Olivia Rissland was appointed to the Department of Molecular Genetics as an Assistant Professor in November 2014, and is located in the SickKids Research Node. She was previously a Postdoctoral Fellow in David Bartel's laboratory in the Whitehead Institute for Biomedical Research (Cambridge, MA). She plans to use a combination of classical molecular biology techniques and transcriptome-wide approaches to understand the fundamental mechanisms controlling gene expression and to explore how these pathways are misregulated in

disease.

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## Graduate Student Highlights & Awards



*The 2014 graduate class poses for our yearly class photo in the CCBR atrium.*

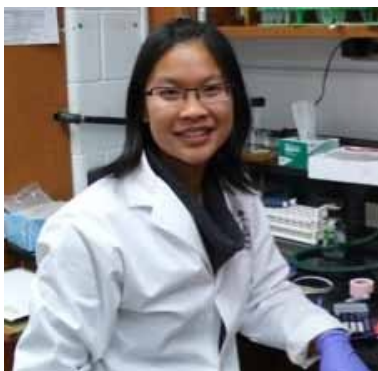
## **Welcome to our new graduate students!**

MoGen warmly welcomes its 2014 graduate class! These 41 first year students joined us from more than six countries, three provinces, and twenty different undergraduate institutions to begin their graduate studies on Sept. 2nd. The students are currently immersed in their first year coursework and rotations, and will choose their lab “homes” by the end of this semester. Say hello if you see these new students around campus and join us in wishing them all the best of luck as they embark on their graduate studies! Julie Claycomb, the newly appointed Assistant Graduate Coordinator, will be available as a resource for supporting new students and seasoned veterans alike.



## **Launch of new Career Development**

**Workshops.** In a recent survey, graduate students voiced that they desired more information on career development including information on what their career options are after graduating, how to find future jobs, and how to effectively network. In order to address these issues and strengthen the Molecular Genetics community, the Molecular Genetics Graduate Students’ Association has teamed up with Dr. Julie Claycomb and Dr. Leah Cowen to launch a new career development initiative. This initiative involves hosting monthly workshops on various topics relating to career development in an informal setting that encourages discussion between graduate students and speakers with different experiences with career development in science. Click [here](#) to learn more about the workshop series and the first workshop entitled, “Never have I ever...”.

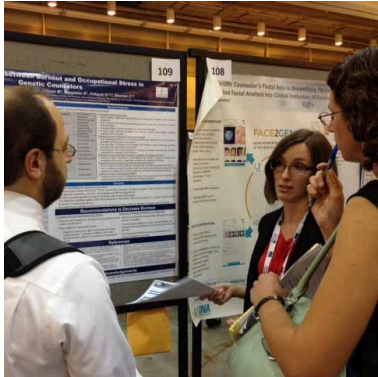


## **Jinglin (Lucy) Xie won a prestigious poster prize at the 2014 Yeast Genetics Meeting in Seattle, Washington.**

Lucy's poster ranked second out of 400 posters. Her work focused on "Dissecting the role of calcineurin and protein kinase C signalling in Hsp90-dependent caspofungin tolerance."



**Genetic Counselling student Amanda Carnevale was awarded the 2014 Jane Engelberg Memorial Fellowship Student Research Award.** This prestigious award of the National Society of Genetic Counselors recognizes her research project on "Psychosocial Impacts Related to Receiving a Diagnosis of Klinefelter Syndrome in Adulthood."



**Brittney Johnstone, MSc Genetic Counselling class of 2014, won the best poster award at the recent National Society of Genetic Counselors annual conference.** Brittney's poster outcompeted 236 other poster presentations and focused on: "The Relationship between Burnout and Occupational Stress in Genetic Counsellors."



**Leslie Ordal, MSc Genetic Counselling class of 2014, was selected by renowned geneticist, Dr. Judy Hall, for the poster walk at the American Society of Human Genetics conference.** Only 3 posters out of 185 were highlighted for the poster walk in the Clinical Genetics and Dysmorphology section. Leslie's research was on congenital limb reduction defects associated with maternal thrombophilia.



**Anna Roy (Delgado-Olguin lab) wins first prize and Curtis Boswell (featured in photo, Ciruna lab) wins second prize for the Molecular Genetics Retreat Junior Poster competition.**



**Ashish Deshwar (Scott lab) wins the first prize for the Molecular Genetics Retreat Senior Poster competition.**



**John Laver (featured in photo, Lipshitz/Smibert labs), Matthieu Quesnel-Vallieres (Blencowe lab), and Sihui Guan (Zhen lab) tie for the second prize for the poster competition at the Molecular Genetics Retreat.**



**Matthieu Quesnel-Vallieres (Blencowe lab) wins the Hannah Farkas-Himsley & Alex Himsley Memorial Prize.** The Hannah Farkas-Himsley and Alexander Himsley Memorial Prize is awarded to our Department every other year, alternating with the Biomedical Engineering Group.

The award honours the memory of Dr. Hannah Farkas-Himsley, a Professor from the former Department of Microbiology. The award is given based on the applicant's contributions to research.



**Sang Hu (David) Kim (Cowen lab) wins the L. W. Macpherson Award.** The Department offers the Macpherson award on a competitive basis to the best acclaimed all-round registered M.Sc./Ph.D. student working in the broad area of Microbiology. The award honours the late Dr. Lachlan W.

Macpherson, a Professor and Acting Chair from the former Department of Microbiology and Parasitology.



**Amanda Veri (Cowen lab) wins the Eric Hani Fellowship.** This fellowship is awarded to outstanding first, second or third-year graduate students in the Faculty of Medicine on the basis of financial need. Preference is given to students undertaking research in microbiology.



**Shixuan Liu (Kafri lab) wins the Roman Pakula Award.** The Roman Pakula Award is offered on a competitive basis to the best acclaimed all-round M.Sc. student registered in the Department of Molecular Genetics. The award honours the late Dr. Roman Pakula, a Professor and Acting Chair from the former Department of Microbiology.



**Olga Zaslaver (Caudy lab, Amy featured in photo) wins the Norman Bethune Award.** The Bethune award is a result of an honorarium given in 1988 to Mr. Frederick Kahan, a Senior Scientist in Exploratory Biological Research at Merck Sharp and Dohme for his contribution to the development of the antibiotic "Primaxin". Mr. Kahan wished that the money be given to his alma mater, the University of Toronto, and wished the prize to be named in honour of Dr. Norman Bethune. The award is available on a competitive basis to a graduate student in the first two years of a Ph.D. program. The aim of the award is to recognize and encourage young, talented researchers on the threshold of their careers.

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## Undergraduate Student Highlights



*Harley Mount, 3rd  
Year MGY Specialist*

We are delighted to welcome our new class of 22 second-year undergraduate Specialist students to the Department of Molecular Genetics. These outstanding students are the second class to participate in our revamped program that provides enhanced mentorship and opportunities for research early in their studies. The new Specialists have been paired with a faculty mentor and over the coming year will participate in a variety of special activities including lunchtime discussion groups with eminent faculty members, increased interactions with the graduate students and the GSA, and lab shadowing.

We are building on the success of last year's inaugural class of Specialists, many of whom did research in our labs over the summer and are now in their third year of study. The overwhelming majority of these students found the experience of being in a real lab to be a transformative experience in their education. The intensive training our Specialists receive both in the lab and in the classroom will expand their perspectives and give them a unique and powerful advantage as they embark on the next stages of their careers, whether those careers are in biomedical science or something completely different. Click [here](#) for more details on our specialist program and the perspective of one of our third year specialists, Harley Mount.

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