

# PAIR O DOCS

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## A Broadened Focus of Research within MD/PhD Program

Dr. Norman Rosenblum, MD, FRCPC, Director, MD/PhD Program

During the interval between this and the last issue of *Pair O Docs*, efforts towards addressing the major recommendations of the University of Toronto Faculty of Medicine Task Force on Physician Scientist Education (termed the Task Force below) have intensified and are being aligned to emerging reforms in the undergraduate medical education curriculum. Briefly summarized, the Task Force recommended that actions be initiated to develop an Integrated Physician Scientist Training Pathway that spans undergraduate and postgraduate medicine and is aimed at broadening the research opportunities available to research-interested students, diversifying the types of research undertaken within the pathway, improving integration between research- and clinical-focused curriculum, improving mentorship and career development, and linking to sustainable physician scientist careers. Through these efforts we renew our commitment to improving human health through the education of new generations of physician scientists uniquely enabled to discover and innovate in a dynamic clinical and research environment.

A critical feature of the Integrated Physician Scientist Education Pathway is the diversification of research. Why is this important? The WHO definition of human health – a “state of complete physical, mental, and social well-being (not merely the absence of disease or infirmity)” calls for research and innovation across diverse and intersecting fields of study in the natural, biomedical, social studies and humanities. While MD/PhD Programs were once largely the purview of the biomedical sciences, the mandate to be broader in our view of the types of science and research that inform the improvement of human health and the sustain-

ability of our health system requires that MD/PhD Programs increase the breadth of research that can be undertaken and indeed, the breadth of student interests and accomplishments that merit entry into these programs.

Recent discourse on the nature of health presents further challenges to our view of the types of knowledge and scientists that are needed in the context of a world in which the prevalence of chronic disease is increasing. ‘Curing’ chronic diseases and achieving ‘perfect health’ may not be attainable but rather the ability to adapt, be resilient and self-manage and thrive may be central to human happiness. Such is the argument that has been advanced to modify the WHO definition of health. Whether it is the WHO definition of human health or the suggested modified definition that informs the goals of clinician scientist training programs, it is clear that as we strengthen biomedical and translational research to harness the remarkable advances in human biology and clinical investigation, we must broaden the discourse to include the nature of health and disease, an inquiry of types of evidence, and the social context of health.

At the University of Toronto, we have begun to develop a broader approach to research efforts within the MD/PhD Program in concert with the concepts articulated above. Among our 50 students, most of whom are focused on biomedical research, some are now engaged in clinical and health services research as well as the philosophical underpinnings of our models of care. I see these developments as a ‘good start’ and look forward to further efforts as we develop new collabora-

tions with departments in the arts, social sciences, and humanities and welcome students with backgrounds in these scholarly domains. Such actions will demand increased flexibility and innovation as we integrate diverse student interests with clinical curriculum not only within undergraduate medicine but spanning into postgraduate medicine. Such is the future state towards, which we are working in the near term, all aimed at equipping the health system with a cadre of highly informed and capable physician scientist who, in their aggregate, can develop the knowledge and innovate to improve the ‘state of health’ within our population. Exciting times ahead! ■



Dr. Norman Rosenblum

### In this issue of *Pair O Docs*:

**Surgical Robotics by Kyle Eastwood**

**MD/PhD Foreign Correspondent Jonathan Fuller in London, England**

**Exclusive Interview with Dr. Lorraine Kalla**

**The Inaugural *Pair O Docs* Dramatic Data Competition**

## Pair O Docs Special Feature: Diversity in PhD training

MD/PhD students are busy expanding the program's field of view beyond the traditional basic science wet-lab disciplines into foci like clinical epidemiology, philosophy of medicine, and robotics. Pair O Docs highlights two of these students on these pages.

### Surgical Robotics: The Past, The Present, & The Future

By Kyle Eastwood (incoming class of 2012)

Over 30 years, medical robotics has become a large and far reaching field with a diverse following. Superficially, it is easy to appreciate the attention and curiosity of healthcare workers and patients who directly interact with this technology. However, from a macroscopic perspective, this industry has a significant presence in the business world and the media. Additionally, the unique problems encountered in health care related to working within the body and amongst other complex equipment, has provided many of the motivations for current academic pursuits.

*The Robotics Institute of America* defines robots as “reprogrammable, multifunctional manipulator(s) designed to move material, parts, tools, or specialized devices through various programmed motions for the performance of a variety of tasks.” The first industrial robot, of the variety that comes to mind to those familiar with manufacturing, was instituted in 1958 at General Motors, New Jersey, for automobile assembly. The rationale behind implementing such technology has continued to be accepted as: (1) Quality improvement (accuracy, precision); (2) addressing challenges posed by the work environment (ergonomics, hazards or inaccessibility); (3) cost effectiveness (reduction of errors, continuous labour hours); and (4) flexibility to change, which cannot be seen in custom single purpose machinery.

Arguably, the first instance of robotic devices implemented in surgery came from such an industrial machine. In 1985, the PUMA (Programmable Universal Machine for Assembly), a large articulated arm intended for manufacturing lines, performed a CT-guided brain biopsy. To date, there has been exciting, albeit tumultuous, growth within the industry as new technologies are created and as new companies are formed, compete, fail or consolidate. For example, the birth and formation of *Intuitive Surgical*, a company possessing the only currently FDA ap-



Kyle and his Da Vinci

proved surgical platform (Da Vinci) as of July 2000, was so interesting that it was developed into one of the famous *Harvard Business Review* cases which are used to educate MBA students around the world.

Surgical robots can be classified into one of the following categories based on how surgeons interact with them: (i) Supervisory controlled systems where the surgeon designs the operation via a computer simulation and the robot executes the plans at a later time on a patient; (ii) tele-surgical systems where the surgeon operates hand controllers at a separate console while the robot mimics these motions in real time at the patient; and (iii) shared-control systems where, for example, the robot and surgeon both hold a particular surgical instrument, and the robot guides the surgeon's hand movements based on predefined safety boundaries. The prevalence of each category is specialty dependent, and moving forward, I will refer to tele-surgical systems. This category has

become the most publicly visible as a result of the aggressive marketing and inter-hospital competition surrounding these devices in the United States.

The Da Vinci (2,585 units world-wide), as well as several other tele-operated systems still under development, function primarily in urologic, gynecologic, general, cardiac and neurologic surgeries. The growing predominance of minimally invasive surgery tends to pose technical challenges for operators using manual equipment as seen in conventional laparoscopy. The role of such tele-surgical robots is to extend the capabilities of surgeons beyond these limits, through improved dexterity and articulation of the instrument tip, the “digital” removal of tremors at the surgeon's hands as motions are translated to the robot, ambidexterity, and the elimination of the fulcrum effect (reversal of motions) that occurs when using long-shaft endoscopic instruments. Consensus data from user groups also state the advantages of reduced blood loss and decreased hospital stay.

*Continued on page 3*



## Surgical Robotics - *continued from page 2*

Interestingly however, recent large scale systemic reviews across urology, gynecology, bariatric and cardiac surgery have been largely despondent. To generalize, the results state that there are similar clinical outcomes between robotics and analogous manual laparoscopic procedures, with robotics having longer operating times and higher costs. That is to say, the aforementioned benefits of robots do not appear to make the procedures any “better” and yet cost much more. Moreover, the American College of Obstetricians and Gynecologists (ACOG), representing the largest user group of the da Vinci with 146,000 gynecological procedures performed worldwide in 2011, recently issued a statement in response to this new data. The statement indicated the advantages of robotics for complex cases, but concluded by saying “there is no good data proving that robotic hysterectomy is even as good as - let alone better - than existing, and far less costly, minimally invasive alternatives.” Considering the roots of this field began with industrial robots, perhaps consideration of the aforementioned rationale for instituting industrial systems is necessary. Put very simply, surgical robots to date have focused on objectives (1) precision and accuracy, as well as (4) adaptability to change (usability across a variety of procedures)

with the intention of accomplishing (3) cost effectiveness. However, less attention has been given to (2) which translates to surgery as a focus on procedures which cannot be performed efficiently using a manual approach. Robotics are incredibly powerful for complex cases, and this inspiration is driving the future direction of research as new minimally invasive systems developed for off-pump endovascular beating heart surgery, and highly flexible, highly multi-jointed miniature robots designed for the navigation of the cranial vault. These are anatomical regions that cannot be accessed in the same way manually. It is also predicted that future robotic devices will have a much smaller footprint and unit cost. These devices will resemble “more intelligent” individual instruments as opposed to the hulking systems inspired by industrial assembly robots seen today.

My own research aims to address the need for increased articulation in neuroendoscopic surgical instruments. Currently, these instruments cannot perform complex intraventricular manoeuvres because of their lack of dexterity and reachability. An individual surgeon cannot easily direct the endoscope and manipulate tissue simultaneously, and although the trocars used allow for multiple instrument insertions, the practice of using a single corridor causes tools to be almost coaxial,

creating the potential for collisions. Since the number of joints that surgeons can intuitively and simultaneously control by hand is limited, robotic remote-control solutions will be investigated using soft, tentacle-like (continuum) robots on the 2mm scale.

Since the majority of the current robotic systems are not fully automated, but are designed to require human input, the cost savings generated from the continuous operation and reduced error seen in their industrial counterparts has not been realized. It is these cost savings that offset the huge capital investment in robotics that makes the widespread adoption of this technology in manufacturing attractive. One of the major criticisms of these systems has surrounded the inefficiency and systemic cost of the widespread use of robotics in medicine. These trends are being encouraged in part by the aggressive marketing and interhospital competition seen in the United States surrounding robots. Despite this, robotic surgery marks a turning point in healthcare and like all new technology, it requires a cultural shift for adoption; an incubating period during which society can adjust to the idea of interacting with this technology in such an intimate way. ■

## Going Abroad During the PhD training

By Jonathan Fuller, MD/PhD Student and Foreign Correspondent (incoming class of 2010)

When the editors wrote to me one morning to request that I craft an article about my research fellowship abroad, it was the afternoon here in London, England. After reading their message, I promptly drained my cup of Earl Grey and exclaimed, “By baby George, our future king, I’ll do it!”

I’m happy to share my research-abroad experience - especially if I can convince others that they should consider doing it too.

But first, some autobiographic details. I was 2.5 years into Toronto’s MD/PhD program when I applied for one of the inaugural Weston Doctoral Fellowships. I had completed first year medicine and the PhD was well underway. My research is in

the philosophy of medicine (basically, philosophy of science applied to medicine), which is why I wanted to visit King’s College London in the UK, the centre of my field.

It was serendipitous that the W. Garfield Weston Foundation had just donated almost a million dollars to the University of Toronto to establish the Weston Doctoral Fellowships, awarded to U of T doctoral students who will spend 8-12 months doing research abroad during the third or fourth year of their PhD (the program was renewed the next academic year). This program is unique in Canada. After applying, I was fortunate to receive one of the fellowships (and also fortunate to meet the Weston family, of Loblaw fame). And now here I am, working along-



Jon in Old Committee Room, King’s Building, King’s College London, London UK

*Continued on page 6*

## MD/PhD Trainee in Focus: Patrick McVeigh

Meet Patrick. He has been a core member of the program since his MD/PhD training began in 2008. He is well known for his wits and wisdom, as well as his insightful outlook on life in general. Here is Pair O Doc's exclusive interview with Patrick.

*Hey Patrick, can you tell us about your PhD research?*

I did my PhD in Dr Brian Wilson's lab at OCI – the lab is focused on biophotonics research and my own project was centered on developing a way of doing spectroscopic imaging through a flexible endoscope when screening for lung cancer.

*What attracted you to pursue this particular research area?*

Prior to starting at Toronto I had worked in a polymer physics lab at Waterloo where I initially got interested in spectroscopy and optics (as well as deciding I definitely wasn't cut out for theoretical work). I chose the biophotonics group based on the breadth of projects and collaborators involved, especially clinically, as well the opportunity to define my own project within the larger framework of the grant under which I'd be working.

*How do you envision your research work to have impacts on your research field?*

Molecular diagnostics have exploded in cancer research in the past decade, and we can now identify cells undergoing some of the earliest phases of malignant transformation – provided the cells are outside of the body under the microscope. My research provides a platform to translate this molecular specific imaging into patients undergoing a resection procedure to ensure all the malignant tissue is removed, not just what is abnormal to the naked eye.

*Looking back, what has been the most rewarding moment from your research career so far and why?*

A side project I've been particularly interested in involves taking the miniature endoscope we're developing for lung cancer imaging and using it within a blood vessel to image atherosclerotic disease and guiding treatment with things like stents or flow diverters. The first time we tried it out and got high resolution images of a stent being deployed within an artery in-vivo, there was an audible gasp from the clinicians in the room. You know you've hit the nail on the head when they all pull out their phones to take pictures of the screen to show to their colleagues.

*How did your research training and experience help your professional and personal development?*

Throughout my time here so far I've had the opportunity to interact with a number of clinicians via various research projects – radiologists, thoracic and general surgeons, pathologists, neurosurgeons, cardiologists, otolaryngologists...some of which I've translated into ongoing clinical exposures in the clinic/OR. Given the appetite for research amongst clinicians in Toronto, by approaching them from a research angle you have the chance to work with some big players in their respective fields and use that as a jumping off point for future specialty exploration/referrals.

*How have you found the transition back to MD training?*

So far it's been great – I have always enjoyed the clinical aspect of the program (at times a PhD in optics and spectroscopy can get a bit dry) and second year has a very "real medicine" emphasis. There is also quite a bit of self-directed study time which I'm using to carry on with a few research projects I'm interested in developing longitudinally.

*If you were to give one piece of advice or wisdom to junior MD/PhD trainees, what would it be?*

Never say no to any possible collaborative project, especially those you imagine with students (usually at the bar/seminar) from other groups. People can get quite fixated on time to completion and want to try and do as little as possible to graduate quickly, but some of my most impactful and rewarding work has come from projects which won't be a part of my thesis. I'd say that if you're not testing out some ideas of your own conception, especially those you haven't told your boss about just yet, you're not doing it right.

*How is class with Sean and Gord?*

Re-integration has gone smoothly – there are a large number of 1T6s who already have a Master's/PhD, so the three of us have lots of friends to be curmudgeonly with. ■

## CITAC Updates

By Ashish Deshwar and Ayan Dey  
(CITAC Representatives)

On September 17-18th, a number of University of Toronto MD/PhD's descended on the nation's capital for the 2013 Clinician Investigator Trainee Association of Canada (CITAC) young investigators forum. Held at the National Arts center, the conference was held in association with the Canadian Society for Clinical Investigation (CSCI) and the Friends of CIHR. Highlights from the meeting included talks from multiple MD/PhD program directors, renowned clinician scientists such as Toronto's own Michael Taylor and Gary Lewis, and of course: MD/PhD trainees.

Our very own Dr. Norm Rosenblum gave a stimulating talk on salary structures and support available as a new clinician scientist at the Hospital for Sick Children. Outgoing president and U of T MD/PhD student Jared Wilcox gave a state of the union address that highlighted the continued growth of membership in CITAC over the past year. Elections were also held for the new CITAC executive and U of T MD/PhD student Kevin Wang was named president elect!

There were also lunchtime mentorship sessions that touched on a variety of topics including how to maintain a good work/life balance and advice on how to seek out research opportunities in residency.

Research from our students was very well received, Linda Vi was chosen to present her work as an oral presentation and Rob Vanner and Robyn Elphinstone both received prizes for their excellent posters and were invited to present a short talk. This year the meeting is coming home, scheduled for November 24-26<sup>th</sup> 2014 here in Toronto. Hope to see you then! ■

## Graduate in Focus: Dr. Lorraine Kalia

By Curtis Woodford

A fellow MD/PhD student invited me to go with him to a Mogwai concert at the Danforth Music Hall and despite not having heard much of their music I accepted for two reasons. One—he has excellent taste in music, and two—Dr. Lorraine Kalia mentioned that Mogwai was one of her favourite bands. Journalistic diligence practically required that I attend. Dating from their very first album, Mogwai have made a reputation of playing very, very, soft and then unleashing an all-engulfing wall of sound. The tinnitus I experienced for 36 hours after the concert confirms this observation. In a similar sense, since the beginning of her academic career at Queen's University Dr. Kalia has focused on her interest in neuroscience and neurology. This is her story.

Like many eventual MD/PhD students, Dr. Kalia was thinking about doing either research or medicine during her B. Sc. when she took an advanced chemistry course taught by Donald Weaver, a renowned medicinal chemist and practicing neurologist, and the first clinician-researcher she had encountered. It wasn't an eureka moment but it solidified her ambition to do both science and medicine and a couple years later she found herself in medical school about to start her doctoral studies in Michael Salter's lab, the pain specialist at the Hospital for Sick Children. At this transition point she says that it wasn't hard for her to leave medical school because she was looking forward to the exciting research environment in the Salter lab where she would study the regulation of the NMDA receptor by Src kinases.

While Dr. Kalia's PhD research was focused on neuroscience with implications for clinical neurology, she mentions that she doesn't think that's always how an MD/PhD student needs to choose their doctoral thesis topic. The goal for the PhD should be to learn how to do science, which is applicable to any type of research. She also emphasizes that she chose to study what she was passionate about and that the scenario should be that you "enjoy yourself while you're doing the work—obviously not every day but most days." She identifies her PhD defense as being one of the most rewarding moments of her life when all the "blood, sweat and tears were rewarded."

Going back to the last half of second year medical school with clerkship looming was a time of worrying that the PhD had erased everything Dr. Kalia had learned in preclerkship and also having to integrate into a new group of students. She notes that one of the

issues with clerkship is that it is a critical formative period that puts you on a path from a "little sliver" of exposure to a specialty and that your enjoyment of a rotation often depends on the staff, students, and residents around you. For instance, her neurosurgery rotation was done with a great attending, who was patient and really cared about the medical student experience. The lesson here is to temper your impression of a specialty from one rotation because stochasticity plays a role in your poor or excellent experience.

Dr. Kalia completed her neurology residency at the University of Toronto and emphasizes the importance of finding a residency program that allows you to do research. The strategy for doing this should be an upfront conversation with the program director. Ultimately, it is good for the resident and it enriches the program. With this in mind, Dr. Kalia did a post-doctoral fellowship with Pamela McLean at Massachusetts General Hospital who was running a lab as a PI under a "super-PI". She had always wondered why people recommended that one should spend time away from their training institution, and found that her time at Harvard gave her a different perspective on how people do science but also confirmed that the quality of the research done at her home institution was high. The experience in Boston allowed Dr. Kalia to understand "her own self-worth and the value of her MD/PhD training and residency" at the University of Toronto.

There is a pre-eminent movement disorder specialist, Dr. Anthony Lang, who kept Dr. Kalia in Toronto for her fellowship training, which she arranged to include clinical duties and time at the bench. The approach to this



was to attend the clinics of the people she was learning from and scheduling her own bench work. She used a Canadian Institutes of Health Research Phase 1 Clinician Scientist Training Award to fund her research. Notably, this award has been phased out and advocacy for its reinstatement would be a wise choice. Dr. Kalia notes that many early career physician-scientists have benefited from this funding source.

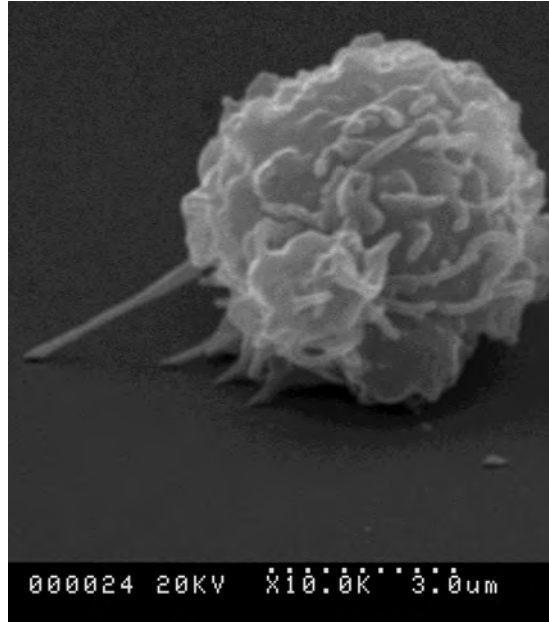
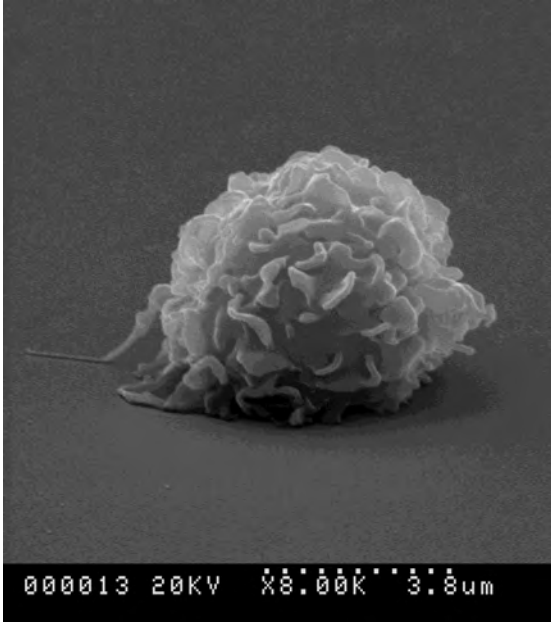
Dr. Kalia has now started a lab at the Toronto Western Hospital studying the pathogenesis of Parkinson's disease and is a movement disorder neurologist on the Toronto Western Hospital staff with clinic 1 day a week. She has developed a cadre of mentors for various aspects of the clinician-scientist life, such as people to advise on grant writing, clinical work, and navigating the institutional system. Work-life balance, especially in the early stages of a career, is an ongoing challenge because "experiments can and will fill the day, night, and weekend" if you let them. In retrospect, she would have been more rigid with self-enforced time off work. In reality, there is a continual workload increase and prioritizing or saying "no" to some things becomes an important skill. Dr. Kalia also maintains friendships and relationships with people outside medicine and science, which provides a different perspective and a break from medicine and

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## The Inaugural Pair O Docs Dramatic Data Imaging Competition

Pair O Docs has often been populated with the faces of the MD/PhD program. This year we thought it would be interesting for our readers to experience alternate visual delights: the faces of the cells and techniques that MD/PhD students are studying or developing. We hope you enjoy looking at these scientifically gorgeous images especially knowing all the work that has gone into making them!

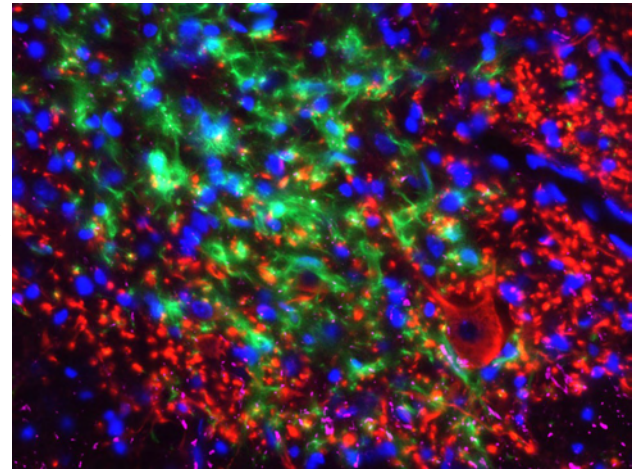


### Jacob Rullo: Leukocytes Drop Anchors

During the recruitment of white blood cells to inflamed tissues, monocytes (a type of white blood cell) are exposed to the force of flowing blood. In order to prevent them from being swept away in the sea of blood, monocytes must form structures that anchor them to the blood vessel wall. These structures are essential for monocytes in order to remain adherent to the blood vessel wall.

### Jared Wilcox: Neural Stem Cells Explore and Integrate into Their New Niche

Neural stem cells (green, EYFP) transplanted into the injured cervical spinal cord reside within the ventral horn apposed to neurons and motoneurons (red, TUJ1) without causing gliosis or immune activation (magenta, GFAP; blue, DAPI), and integrate within host tissue to improve neural conduction and forelimb function.



## Going Abroad *Continued from page 3*

side the bright lights of British philosophy for a year.

I fully endorse spending time to do research abroad. Admittedly, my research is not typical, especially in an MD/PhD program. Nonetheless, there are many reasons why the experience would be invaluable for any PhD or MD/PhD student. Here are just three.

1) Research experience at multiple institutions is considered an asset for an early career researcher – and rightfully so. Experience in another country is perhaps a special asset, as the research infrastructure and cul-

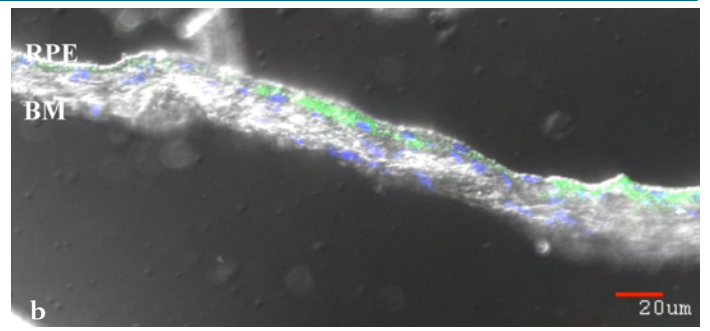
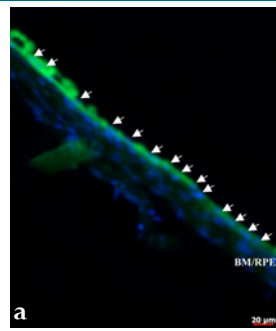
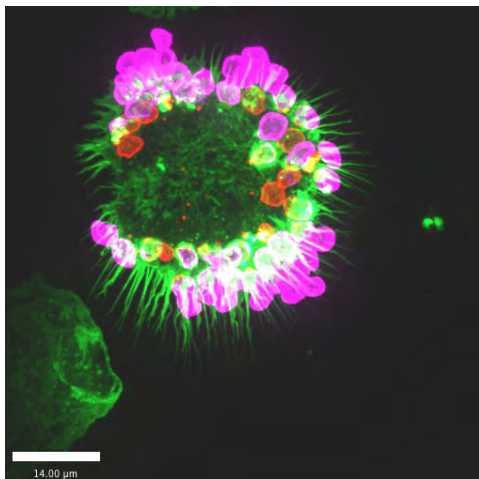
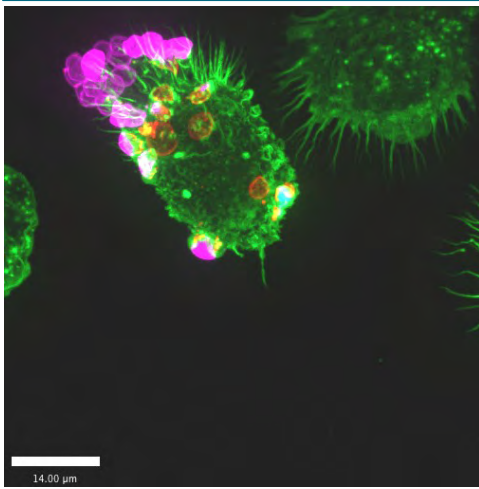
ture can vary greatly.

2) Developing an international network pays out in career opportunities down the road, including collaborations, speaking invitations and even job opportunities.

3) Since this list is sounding too pragmatic, I'll add a quote from Hippocrates: "life is short, PhDs are long". PhD students - and especially MD/PhD students – are at risk of burnout over the course of their long training program. A tenure abroad is a great way to break up the long period spent in the same city, and to acquire some valuable life experience.

To be sure, there are downsides to doing research abroad. For science students, experiments must be stopped and started up in a whole new lab, which sounds awfully disruptive. (Thankfully, all of my philosophical thought experiments are portable.) There is also a risk of losing focus, perhaps even resulting in a longer PhD (!) But if the experience is planned well ahead of time and the research contributes directly to one's thesis, I don't see why these legitimate problems cannot be avoided or lessened.

It's a trade-off that's well worth considering. ■

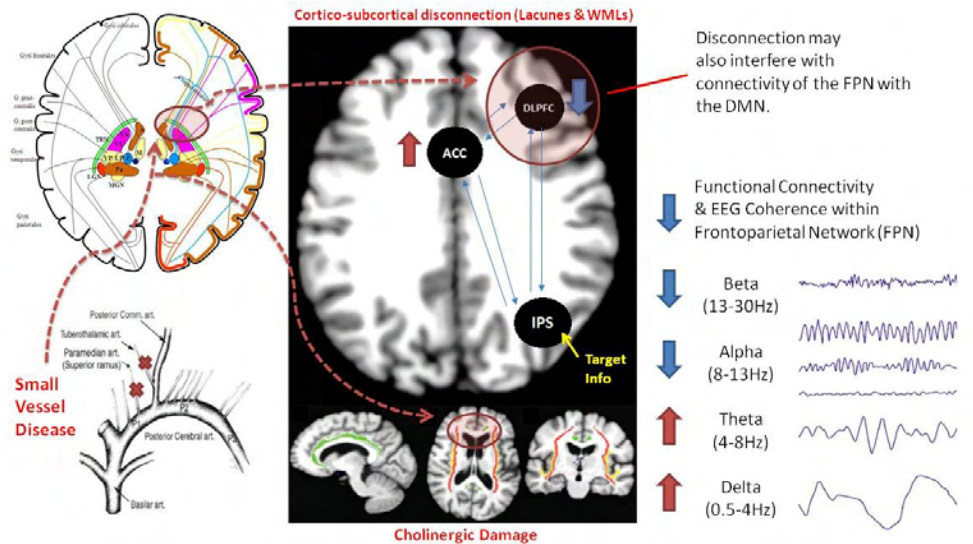


**Brian Ballios: Restoration of Sight**

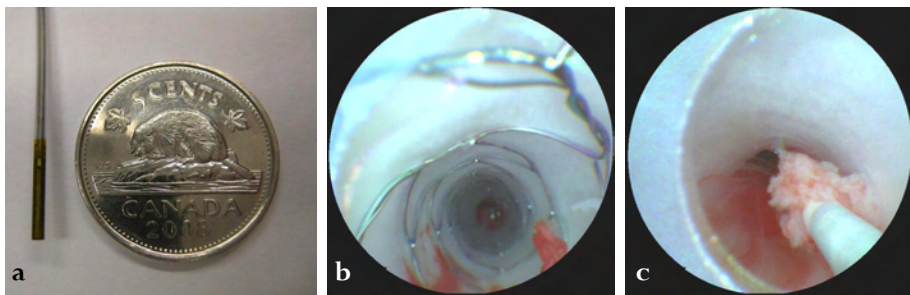
Diseases of vision affect the entire Canadian age spectrum, from newborns to our senior population. With our growing and aging population, cases of age-related vision loss, such as age-related macular degeneration (AMD), are expected to rise. Essential to the pathogenesis of AMD is loss of the retinal pigment epithelium (RPE), a monolayer of cells in the retina that support photoreceptor survival. These results demonstrate the first use of an injectable biomaterial delivery vehicle to deliver stem cell-derived RPE cells to the adult mammalian retina. The vehicle improves cellular distribution post-transplantation such that the donor RPE cells integrate in a monolayer fashion into host tissue (a), restoring normal cytoarchitecture to the outer retina (b). Reproduced with permission, Ballios *et al.* Biomaterials, 2010.

**Ilya Mukovozov: Phagocytosis in Action**

Human PBMCs were isolated from healthy volunteers and polarized to M1 macrophages *in vitro*. The images depict macrophages "eating" Ab labeled sheep red blood cells.

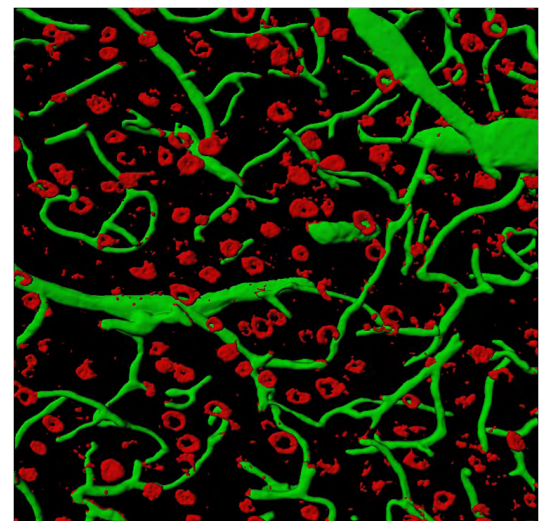


Ayan Dey



**Patrick McVeigh: Navigating through a Carotid Artery in Porcine Stroke Model**

(a) Intra-arterial HD imaging catheter with 1.22mm outer diameter (b) Visualization of an expandable stent within a porcine carotid artery with temporary flow arrest from a proximal balloon catheter (c) Visualization of clot aspiration from porcine carotid stroke model showing thrombus removal and flow restoration



Hoyee Wan



## Graduate In Focus: Dr. Lorraine Kalia - *continued from page 5*

science when going out for dinner.

From the interviewer's perspective, Dr. Kalia's career so far provides an excellent example for all MD/PhD students, and

demonstrates the strategies that need to be developed in order to be successful as a physician-scientist. As she revealed at the end of the interview, she also squeezes in time to work on her snowboarding and the odd con-

cert. Pair O Docs thanks Dr. Kalia for her time in giving us this excellent interview and in parting would like to reciprocate with some advice of our own: don't forget your earplugs. ■

## MD/PhD Class Council Update

By Brian Ballios (President) and Robert Vanner (President-Elect)



It was another busy year for class council. This last year saw Gord McSheffrey complete his term as President and Rob Vanner joined the council as President-Elect. Brian Ballios transitioned to the President of the council for 2013-2014.

Brian and Rob looked to continue the commitment of council to our student-led mentorship initiatives while increasing the scope of our activities to include students at all levels of the program. Our terrific SALT reps, Robyn Elphinstone and Amy Khan, organized a number of social events including a program potluck and Blue Jays baseball game outing. We also continued our informal transition events where students give advice to each other about navigating both MD and PhD programs. These events were well attended, and are testament to the fellowship enjoyed by our trainees.

This year saw the completion of the first year of the MD/PhD Longitudinal Mentorship Program (LMP). Established in June 2013, this program linked current trainees with practicing physician scientists, many of whom are former U of T MD/PhD alumni, in a formalized year-long program. Mentees were encouraged to meet with mentors 4-6 times throughout the year. Mentors could provide advice on career choices and opportunities. Finally, the second MD/PhD Mentorship Symposium (MMS2), hosted at the Faculty Club on April 21<sup>st</sup> 2014, acted as the capstone of the 2013-14 LMP. The MMS2 represented the continuation of a novel initiative to bring together established physician scientists and trainees to build partnerships, foster collaborations for personal and professional development, and generate an atmosphere of support. Faculty members led small group, roundtable discussions covering topics such as navigating the dual landscape of medicine and research, family-career balance, and maintaining academic productivity during medical training. There were over 60 trainees and mentors participating. Given the great success of the symposia, we have decided to make this a biannual event. We look forward to planning another year of the LMP, and begin planning for the next MMS.

We are also looking forward to having our annual town hall meeting at the close of the academic year. Started in 2013, the town hall is an opportunity for all students to voice concerns and recommendations for program improvement to the council. These suggestions are then discussed with program leadership and have led to material changes in the way curriculum is delivered. For example, in response to student feedback asking for reform to our seminar series, the program has evolved to include both trainee and physician scientist presentations. This year, the "double-feature" seminars have included a trainee presentation about their research focus, followed immediately by a presentation by an established physician scientist on issues around professional development, career path, barriers to success and future challenges. The revised seminar format has been very well received and has led to increasing student enthusiasm for the series. With trainee input, we hope to see the MD/PhD curriculum continue to develop in the coming years.

We are very happy to receive your feedback on class council's activities, and encourage you to contact the class presidents with questions or suggestions: [brian.ballios@mail.utoronto.ca](mailto:brian.ballios@mail.utoronto.ca); [rob.vanner@mail.utoronto.ca](mailto:rob.vanner@mail.utoronto.ca)

## Congratulations to Graduating Class of 2013!

Pair O Docs would like to congratulate the graduating Class of 2013 and wish them the best on their future academic endeavours!

Dr. Alvin Lin (left) and Dr. Jonathan So (right) pose with Dr. Rosenblum at their convocation (Absent: Dr. Andrew Perrin)



### Dear readers,

Do you have any suggestions for Pair O Docs? Is there a particular special feature you would like to see on Pair O Docs?

Please feel free to email us at:

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Yours truly,

Curtis & Jieun



## The MD/PhD Incoming Class of 2013

**Josh Abraham**



My decision to pursue a career in medicine was really a culmination of some diverse and rewarding experiences, some of which trace back to my childhood in India, where I was born and brought up in a circle of family and friends composed of several ethnicities. I was also incredibly fortunate to be educated in a school that emphasized the value of learning, ethics and civic responsibility, and character building, while encouraging me to seek out excellence for its own merits rather than focusing on accomplishment as measured only by grades. It wasn't until after high school that I made the move to Canada, where I embarked on an undergraduate degree at the University of Toronto majoring in human, cellular and molecular biology. Here I was very fortunate to be mentored by some truly remarkable physician-scientists, under whose guidance I became involved in basic research on cellular signaling in tissue regeneration, cancer stem cells in brain tumours, and retinal neurogenesis. It was here that I realized how deeply rewarding the tasks of caring for patients while engaged in research that might one-day benefit them must be. Pursuing a combined doctorate and ultimately a career in academic medicine is therefore the logical route to merge my interests in patient care, fundamental research, and medical education. Outside science/medicine, I enjoy cooking, spending time with my family and friends, I love animals, and I am quite literally mad about soccer! I maintain an avid interest in physical conditioning and organized training in sport – hobbies that I would probably pursue more seriously given time off.

**Matthew Carr**

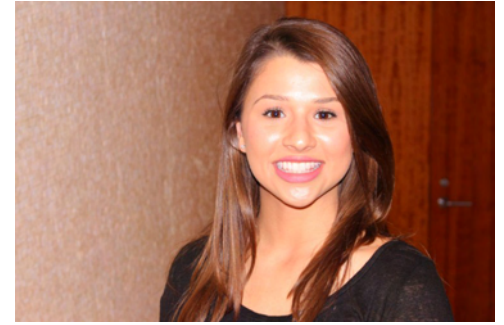


Born and raised in Vancouver, I completed my undergraduate degree in Biology at The University of British Columbia, followed by a Masters degree in the BC Firefighters' Burn & Wound Healing Research Lab under the supervision of Dr. Aziz Ghahary. I studied the role of skin cell signalling in scar formation and wound healing, during which, I developed a profound fascination towards translational "bench-to-bedside" research. Appreciating the importance and potential impact of integrating basic science research and clinical medicine led me to the MD/PhD Program at U of T. The impressive breadth and quality of medical research conducted at U of T, coupled with the program's outstanding reputation, make for an ideal environment in which to pursue my training. Outside of my academic interests, I am an avid cyclist, photographer, outdoorsman, and foodie.

While I have yet to determine my PhD project and supervisor, my research interests lie predominantly in the field of tissue regeneration, with a specific interest in the role of intercellular signaling during both normal and pathologic healing processes. I hope that my MD/PhD training will provide me with the ability to identify pertinent medical problems from a unique perspective and to develop insightful research strategies to target them.

**Caitlin Chrystoja**

I was born and raised in Toronto by parents of Indian and Ukrainian origin. I completed my undergraduate studies at the University of Toronto, majoring in Human Biology



and double minoring in Statistics and Economics. I come from a medical legacy; my parents are doctors and my grandfather was a professor in microbiology, working on human monoclonal antibodies for the early detection and treatment of breast cancer. Carrying on the family legacy, under the supervision and mentorship of Dr. EP Diamandis, I was involved in translational research to discover tissue specific serum biomarkers for varied uses, such as the early detection and prognostic monitoring of different cancer types. During that time, I fell in love with research and the ability to tangibly use scientific discovery to impact patient care. I chose UofT's MD/PhD program because of the breadth, depth, and quality of research being conducted in Toronto and its track record in producing successful clinician-scientists. In my spare time, I enjoy being active (particularly long-distance running and more recently, scuba diving) and travelling.

**Kyle Eastwood**



I completed my undergraduate training in Mechanical Engineering and Management at McMaster University in Hamilton, ON. I officially joined the MD/PhD program at the University of Toronto in September 2013. Having thoroughly enjoyed the first

year of my medical training, I look forward to the opportunity to combine my interests in medicine and engineering. I chose the University of Toronto because of the incredible research opportunities and networks offered both locally and globally.

### Carlyn Figueiredo



As a big fan of city life, I am proud to say that Toronto has been my home for the past 7 years. The University of Toronto Scarborough is where it all began with my undergraduate studies in Cell and Molecular Biology, where I was mentored by numerous outstanding scientists who helped shape my future in research. My passion for research led me to a Masters degree in laboratory medicine and pathobiology, where my studies in multiple sclerosis first sparked my interest in the bridge between basic science and clinical application. I chose the UofT MD/PhD program owing to the amazing opportunities available to immerse oneself in cutting edge research and liaise with world renowned leaders in the scientific and medical community. I am truly excited to be a part of this program at UofT, which has emerged as one of the leading institutions to train physician scientists. Outside the classroom/lab, I do enjoy singing, comedy movies, and trying out the various eats Toronto has to offer!

### Nicholas Howell



I've been at U of T for a while now. Originally from Ottawa, I came to study philosophy and political science for my undergraduate degree. Over time, however, I became more interested in the mechanisms and biological underpinnings of behaviour than in the theories describing its macro-scale organization. I ultimately graduated as a specialist in psychology and continued on to a master's degree at the Institute of Medical Science. During my training I researched the neural mechanisms of reward and impulsivity at the Toronto Western Hospital under Dr. William D. Hutchison and with Dr. Valerie Voon at the University of Cambridge's Wolfson Brain Imaging Centre. I felt that the MD/PhD program here was a strong choice because of the University's research tradition, the history of the program and its previous participants, and the numerous academic strengths across the life and social sciences relevant to health care research. It also has the advantage of being located in Toronto, close to endless bars, restaurants, and music that I can flee to when I've had enough of research for a day.

### Ben Ouyang



I was born in China, and grew up in Scarborough and Mississauga. I graduated from the Engineering Science (Biomedical Option) program at UofT in 2013, and had been interested in healthcare throughout that era. I had explored research venues with Dr. Jeffrey Karp of Harvard-MIT HST, and with Dr. Paul Santerre of UofT IBBME. During these experiences, I realized that I enjoyed research, and desired a better understanding of clinical needs and impact. Thus, I chose the MD/PhD at UToronto to gain a solid foundation of medical knowledge to

participate in patient care as well as bolster my understanding of the problems and solutions within healthcare at the best research institution in Canada. In my spare time, I play lots of badminton and volleyball, and shoot landscapes and still life in photography.

My research interests are currently centred around biomaterials, drug delivery, and the immune response to biomaterials. As I discover more about the field of medicine, I am also beginning to develop a greater interest in imaging modalities and techniques. My goals ultimately align with becoming a surgeon-scientist at a university hospital.

### Maneesha Rajora



Hailing from Halifax, Nova Scotia, I moved to Toronto to complete my M.A.Sc. in Biomedical Engineering, with a focus on biomaterials and drug-delivery, under the supervision of Dr. J. Paul Santerre. Prior to conducting graduate studies at the University of Toronto, I completed my undergraduate degree in Chemistry at Dalhousie University, where, under the supervision of Dr. Donald Weaver, I conducted my honours thesis project in the area of medicinal chemistry. Both of these experiences solidified my interest in applying basic science towards addressing relevant clinical problems. The University of Toronto MD/PhD program is a great avenue to pursue this interest. The University's amazing medical program and its renowned excellence in biomedical research made this program the optimal choice for gaining training applicable to a clinician-scientist career. The city of Toronto is also a great place to be to explore my extracurricular interests. Outside of school, I enjoy both choreographing and learning semi-classical and classical Indian dance, event

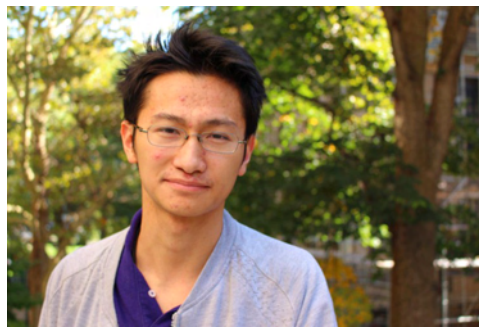


organization and checking out the diverse cuisine of Toronto.

### Patrick Steadman



I am from Etobicoke originally, then moved to Hamilton for my Honours BSc at McMaster University in Medical and Health Physics. I next moved to U of Toronto and the Department of Medical Biophysics completing my MSc with a project on neuroimaging genetic mouse models of Autism. During my time in Toronto I was connected with many clinicians, scientists and physician-scientists who I found both inspiring and down-to-earth. This welcoming environment, and my knowledge of several exciting areas of research being conducted at U of T, made choosing the MD/PhD program here a logical step. In my spare time I enjoy reading, working-out, biking and working to figure out our country's politics. From this training I want to develop a strong foundation in medicine and research, including the ability to explore my own ideas. I also look forward to collaborating with my peers and mentors here in both expanding the boundaries of medical science and practice.



### Hoyee Wan

I completed my undergraduate degree in neuroscience from the University of Toronto. I chose the MD/PhD program at University of Toronto because of the breadth of research opportunities and the collaborative nature of the research being conducted. In my spare time, I like to go cycling and play basketball.

## The Annual MD/PhD Year-End Dinner



On December 3rd, 2013, the annual MD/PhD Year-End Dinner party took place. Here are some photos to relive the good time had by everyone who were there!



Incoming class of 2007: Marko Skrtic, Dilan Disanayake, David Tsui, Brian Ballios, Gord McSheffrey, Janine Hutson



Incoming class of 2010: Kevin Wang, Ilya Mukovozov, Jieun Kim, Kirill Zaslavsky

Incoming class of 2008: Jared Wilcox, Greg Costain, Susan Armstrong, Patrick McVeigh



Incoming class of 2011: Robyn Elphinstone, Linda Vi, Lianne Rotin, Jennie Pouget, Natasha Lane, Ayan Dey



Incoming class of 2009: Enoch Ng, Sean Nestor, Rob Vanner, Florence Wu, Ashish Deshwar, Curtis Woodford



Incoming class of 2012: Kyle Eastwood, Richard Wu, Amanda Khan, Teja Voruganti, Nardin Samuel, John Soleas, Shrey Sindhwani

And, last but not least, here is the incoming class of 2013 (see preceding pages for names)!



## Publications

Michael IP, Westenskow P, Hacibekiroglu S, Greenwald AC, **Ballios BG**, Kurihara T, Li Z, Warren CW, Zhang P, Aguilar E, Donaldson L, Marchetti V, Baba T, Hussein SM, Sung H, Iruela-Arispe ML, Rini JM, van der Kooy D, Friedlander M, Nagy A. Local acting VEGF Sticky-trap inhibits vascular endothelial growth factor dependent pathological angiogenesis in the eye. *EMBO Molecular Medicine* 2014;doi: 10.1002/emmm.201303708.

**Elphinstone, R.E.**, S.J. Higgins, and K.C. Kain. (2013) Prevention of Malaria in Travelers: Bite Avoidance and Chemoprophylactic

Measures. *Current Treatment Options in Infectious Diseases*. DOI 10.1007/s40506-013-0005-x

Hawkes, M., **R.E. Elphinstone**, A.C. Conroy, and K.C. Kain. (2013). Contrasting pediatric and adult cerebral malaria: role of the endothelial barrier. *Virulence* 4(6):543-555.

McDonald\*, C.R., **R.E. Elphinstone\***, and K.C. Kain. (2013). The impact of placental malaria on neurodevelopment of exposed infants: a role for the complement system? *Trends in Parasitology* 29(5):213-219. (\*Joint

first authors)

**Erdman LK**, Dhabangi A, Musoke C, et al. Combinations of Host Biomarkers Predict Mortality among Ugandan Children with Severe Malaria: A Retrospective Case-Control Study. *PLoS ONE* (In Press).

**Fuller J.**, Upshur R.E. and M. Goldenberg. Doctors must be trained to assess credibility. *Canadian Medical Association Journal* 2014;186(1): 64.

## Publications - *continued from page 11*

**Fuller, J.** Rhetoric and argumentation: how clinical practice guidelines think. *Journal of Evaluation in Clinical Practice* 2013; 19: 433-441.

**Fuller, J.** Rationality and the generalization of randomized controlled trial evidence. *Journal of Evaluation in Clinical Practice* 2013; 19: 644-647.

**Fuller, J.,** Sankar, A. and R.E.G. Upshur. Appendix 1: Concepts in Evidence-Informed Medical Practice. *The Essentials of Clinical Examination Handbook 7th Edition* (eds . J. Hall, K. Piggott, M. Vojvodic & K. Zaslavsky), 571-583 (Thieme, 2013).

**Fuller, J.** and M.M. Olszewski. Medical history in Canadian undergraduate medical education, 1939-2012. *Canadian Bulletin of Medical History* 2013;30(2): 199-209.

**Fuller, J.,** Prescott, I.A., Moro, E., Toda, H., Lozano, A., and W.D. Hutchison. Pallidal deep brain stimulation for a case of hemidystonia secondary to a striatal stroke. *Stereotactic and Functional Neurosurgery* 2013;91(3): 190-197.

Etwel F, **Hutson JR,** Madadi P, Gareri J, Koren G. Fetal and Perinatal Exposure to Drugs and Chemicals; Novel Biomarkers of Risk Assessment. *Ann Rev Pharmacol Tox* 2014; 54:295-315.

Finkelstein Y, **Hutson JR,** Freedman SB, Wax P, Brent J. Drug-Induced Seizures in Children: Current and Emerging Trends. *Clin Toxicol* 2013;51(8):761-6.

Iwasaki M, **Wilcox JT,** Nishimura Y, Zweckberger K, Suzuki H, Wang J, Liu Y, Karadimas S, Fehlings MG. (2014) Synergistic Effects of Self-assembling Peptide and

Neural Stem/Progenitor Cells to Promote Tissue Repair and Forelimb Functional Recovery in Cervical Spinal Cord Injury. *Original Research Article. Biomaterials Epub* online 7Jan2014.

Yoon J, Appleton CT, Cecchini M, Correa R, Ram V, Wang XK, Ng E, Speechley M, **Wilcox JT.** (2013) It Begins With the Right Supervisor: Importance of Mentorship and Clinician-Investigator Trainee Satisfaction Levels in Canada. *Original Research Article. Clin Invest Med* 36(6):e269.

Antoun G, Ram VD, Wang X, **Wilcox JT,** Yoon J. (2013) Scientific overview: CSCI-CITAC Annual General Meeting and Young Investigator's Forum 2012. *Editorial Article. Clin Invest Med* 36(5):E248-252.

## Awards

**Kirill Zaslavsky** is the recipient of a 2013 CIHR Vanier Award for his research "Dissecting molecular phenotypes of SHANK2 mutations using patient-specific neurons from an autistic patient"

**Jonathon Fuller** was awarded a CIHR Vanier Award in 2013 for his research "A Philosophical Analysis of the Current Chronic Disease Model and Implications for the Care of Complex Older Patients". Jonathon also received an inaugural Weston Fellowship to spend one year studying abroad.

**Jieun Kim** received a 2013 CIHR Vanier Award for her research "Engineering interactions between the macrophage polarization and human pluripotent stem cell-derived cardiac tissue to develop an in vitro myocardial infarction model to understand

the early disease progression"

**Enoch Ng** is the recipient of a 2013 CIHR Banting and Best Canada Graduate Scholarship for his research "Targeting Neuronal Calcium Sensor-1 to treat cognitive deficits in schizophrenia"

**Natasha Lane** received a CIHR Institute Community Support Travel Award (May 2013), a UofT School of Graduate Studies Conference Grant (June 2013), and 2nd place poster prize in Health Services Research category at the Institute of Health Policy, Management and Evaluation (IHPME) Research Day (May 2013) for her poster entitled "An Evaluation Framework for Complex Infection Control Interventions in Low-Resource Settings." Natasha is also Co-Principal Investigator on a \$10,000 grant

(Dec. 2012 - Dec. 2013) from the Health System Performance Research Network entitled "Activities of Care Transition Interventions: A Realist Review"

**Robin Elphintone** received the Chinese-Canadian Medical Society (Ontario) Award in Anatomy, and an ASTMH 2013 Annual Meeting Travel Award.

**Nardin Samuel** won a "Scholar-in-Training Award" from the American Association for Cancer Research to attend an upcoming conference.

**Brian Ballios** is the 2013 recipient of the Clinical Student Research Training Award (CSRTA) from the Stem Cell Network. Brian was also selected a winner of the 2012 Donnelly Thesis Prize.

Pair O Docs is the newsletter of the MD/PhD Program at the University of Toronto. It is produced by the students in the program and is published once a year.

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