



Health Science Inquiry
Interview by Rhalena Thomas

Spotlight On Careers



Dr. Thomas Durcan

Dr. Thomas Durcan is an assistant professor at McGill University and a group leader of the Montreal Neurological Institute (MNI)-induced pluripotent stem cell (iPSC)/CRISPR Platform in Quebec. The Platform was established in 2015 with funding from Brain Canada, the MNI, the Quebec Parkinson's Network and private sources. Having now expanded and grown into the MNI Open drug Discovery platform, the group works with academic and industry partners to provide iPSC training and to work with these groups to develop iPSC-centric assays that can be adapted for drug discovery assays. All cell-lines, assays and findings with these open assays will be made available under the auspices of the MNI Open-Science initiative. Dr. Durcan received his PhD in cellular and molecular biology from the University of Notre Dame and completed his postdoctoral training with Dr. Edward Fon at McGill University, where his research focused on understanding the function of parkin, a Parkinson's disease-associated protein. In his own lab, Dr. Durcan's research is focused on the cell biology of Parkinson's disease and other neurodegenerative disorders. His group uses induced pluripotent stem cells to understand why these disorders develop.

1. Can you describe your position and typical work day or week?

I have a twofold position: the first is one that has an academic focus, as assistant professor, and the second is as group leader of the iPSC Discovery platform. In my academic capacity, I supervise students, overseeing their projects in the PhD program, I teach classes, and I sit on several committees, where I give my input and provide guidance to students. While doing this, I also work on getting papers published and applying for research grants. My other position is the translational part of the job. While Dr. Fon is the director of the platform and oversees activities, I manage the day-to-day aspects, and ensure that project milestones are met. We have a team of about 15 people working on different aspects of neurodegenerative and neurodevelopmental disorders. We work on developing new assays and stem cell lines, as well as making the assays more high-throughput. My initial engagement in the platform was to form partnerships with other companies. A key partnership was with the Center for Research and Development in Vancouver, who helped us introduce automation and high content screening, through a partnership termed NeuroCDRD. The other key partnership was with the Structural Genomics consortium (SGC), that brought expertise in assay development, leading to the formation of the NeuroSGC tissue platform group within the iPSC discovery platform.

Now, more recently, I've been in discussions with Big Pharma. For example, in November, Takeda (the largest Pharmaceutical company in Japan) announced an Amyotrophic Lateral Sclerosis (ALS) partnership termed NeuroTakeda, and we were brought in at an early stage to be part of the meeting. The Japan team and I developed a project plan and budgets in order to initiate the project in December 2017. We now have funding for the next three years to develop new open (publically available) assays for ALS and look for new molecules as therapeutic targets. However, my day-to-day responsibilities are different. I have a lot of meetings, both with the (platform) team and elsewhere. I spend a lot of time answering emails related to projects in and out of the group, as well as other matters. Sometimes, there is trouble shooting that needs to be done. There is a lot of writing to do. I don't do any bench work anymore; it is something that has fallen by the wayside. Now, I'm part of a bigger picture. It's nice being at the bench, but you sometimes get too ultra-focused to the effect that you don't see the whole picture. Most of my planning of the projects involves figuring out how to get the right people (for each position); and making sure that everything gets done on a daily basis. I work with many people within the MNI and other groups including the SGC, CDRD, Takeda and other partners. Together, we take those concepts and put the nuts and bolts in them to make sure that all of the steps get completed.

2. What is the pathway you took from graduate school to your position?

When I finished my postdoctoral fellowship, I was thinking about leaving science, or at least, leaving research and going into publishing. I interviewed with Neuron and Nature Cell biology, but for different reasons it didn't work. When one door closes, another one opens; and it just so happened that at that same time, the lab manager position opened up in Dr. Fon's lab. I was responsible for managing the lab and placing orders for about a year, when the idea of developing a stem cell platform was brought to my attention. I approached Dr. Fon and asked to manage the platform, helping to

bring in Brain Canada funding and setting up the team, with the recruitment of a research assistant for the platform. We started off as a small group with just two or three of us doing everything to set up the platform. In 2015, I was offered the position of assistant professor. In a way, I came into the position by falling through the back door. Now that I have the position, I make sure to work hard each and every day to advance to the next level. I have received the Parkinson's Canada new investigator's award, Michael J. Fox Foundation funding, Kennedy's Disease Association funding, and we have several grant applications that are under review at FRSQ, NSERC and other places.

The position I have isn't a tenure track position, but I am still fortunate enough to have my current position, which lets me do everything an assistant professor on a tenure track would. I teach, write, supervise and do all the administrative work like any other assistant professor. An advantage of my current positions (as assistant professor and associate director of the iPSC Discovery platform) is that I see both the academic and the industry worlds and get to know and work with people in both. In a few years, I might be interested in doing something else and I might consider changing positions (if an opportunity came up in industry). However, right now, I really enjoy what I do here, and there are a lot of exciting things happening to keep me occupied at the MNI for the coming years.

3. Are there other platforms like the one you have here?

Yes, I think the world standards are probably the Harvard Stem Cell institute or the RucDR biologics, which are two large bio-depositories run in a business-like fashion. Our group in Quebec has started later than in many other places and we have been playing catch-up for a while. There are platforms of various sizes in ICM, France, at Oxford, and at Cambridge. I think that it's something that people are recognizing as a good thing to have available. Sometimes, individual labs will do stem cell work on their own. However, consolidating all of the stem cell work can be more valuable because it lets us get better pricing, and allows us to bring in expertise, companies and workshops to benefit surrounding labs. The goal for the first three years of our platform was to build and grow it; it's now there. The current work involves expanding and branding the platform, and in the next three years, we hope to move the platform onto the next level.

The stem cell platform is a hybrid business model. We work with outside users but we also have internal projects. I think it's most similar to the clinical research unit at the MNI, where they work with Pharma and bring in clinic trials. They have a very defined structure. In the first three years in the iPSC platform, we also needed to work on implementing a defined structure. How do you make a structure that is business-like in an academic setting (which is not easy by any means)? We needed to define group units, team leaders, and set specific goals. It could not be 'wishy-washy', we have group meetings and set specific agendas so that everyone knows what they were doing. We need to show concrete progress over the next three years and that we developed new molecules or tools that will push the field forward.

4. Is there a lot of demand in the iPSC platform for people with masters and doctoral degrees?

A problem in academia is that people do a MSc, followed by a PhD and a postdoc, but then what? If you don't want to follow the conventional route (of becoming a professor or working in industry), what do you do? Here, we are providing new opportunities and looking for very diverse staff. We have people from many different nationalities that have settled in Canada and who each bring a distinct mindset, skills and talents. We are always on the lookout for new people although at the moment we have almost reached capacity, but it's good problem to have, as now we have to find new ways to grow and expand. We try to attract talent from people at McGill and the MNI who want to stay in Montreal. A lot of people go to a University and do a PhD, but then leave. I don't think that that is a good model. I think that if people work hard and do good work, you should try to keep them, which is the model that is used at Harvard. In doing so, you build a network of people familiar with the institute and who can drive the research forward.

5. How do you envision the future of healthcare research?

Big data and multi-omics will be the next stages of health research. Now, we have the technology and the capacity to do really exciting things. There will be three main groups: biology groups that can work with cells, engineering groups that can actually manipulate cells to grow in a distinct fashion, and computational groups that can test models and fit the data together. I think that when students are trained now, they will start on one aspect of a project and will gradually grow into a big team-based project. We will work the way that physics works, where papers have 20 or 30 authors because everyone is contributing distinct pieces of a puzzle that fits together.

I think that the key to making progress in health research is to open up the data, like we are doing at the MNI with the open science initiative. I think that scientists have been working in closed silos for too long, afraid to speak about their work or engage with patients. We need to get out more and figure out how to engage with patients. There is a disconnect between researchers and patients who go to the hospitals when they get sick. How do we show those patients

what it is that we do and highlight the benefits of their involvement in the research process through cells, DNA or even clinical information? Right now, everything (i.e. medical records) is paper-based and 20 years behind the available technologies. This should not be the case. Instead, there should be an electronic record that goes to a centralized database for each patient so that you can immediately start to put different pieces together. This is ongoing but should be further advanced. If we found something interesting from patient cells using our assays, we could incorporate our findings with the patient data, and we could eventually pinpoint patient stratification. Right now, it is seen as a failure if you test a molecule in 1000 Parkinson's patients and see a response in only 20. However, it is possible that there is a specific signature for those 20 patients that causes them to respond to treatment differently. I think that medicine will be turning towards a patient-centric focus. Using patient stem cells and high throughput screens is one way of getting better treatments.

6. Do you have any advice for grad students interested in pursuing a similar career path?

You have to love science and go into it with an open mind. There are days when this job will wear you down, but there are also days when you will love what you are doing. The truth is that you have to have a passion for it...whether you want to work in industry or academia, you need to have a question. I don't think it matters where you work or know what you want to study once you have that question that you feel will make a difference. Go in with open eyes, not with a defined plan. Science and life throw obstacles and challenges along the way, so it is important to be adaptable. On my first day of grad school, they said 'work hard, play hard' and I've always kept that as a motto. I try to work hard and enjoy life at the same time. I think it is also a good way for grad students to work: *be serious about your work, don't be serious about yourself.*