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Research Strengths

We are pleased to present the Annual Research Report for 2017. The Department of Ophthalmology and Visual Sciences continues to increase its research profile and increase its links with national and international collaborators to produce research of the highest quality with meaningful clinical impact.

I am pleased to welcome Dr. Jayne Vianna as a new faculty member to the department. Jayme is the QEII Foundation Scholar in Glaucoma Research and Assistant Professor in the department. He has been highly productive as a post-doctoral fellow and is well on the path of being a successful independent researcher. Our research grant capture and productivity remains impressive, particularly given the relatively small size of our department.

Research projects are funded with grants from the Canadian Institutes of Health Research, National Science and Engineering Council, Atlantic Innovation Fund and numerous private sector sources.

I invite you to explore our achievements in the various research areas, those of our trainees and the facts and figures for this year. I want to thank Leah Wood, our research manager for compiling this document. Do not hesitate to contact us with any questions, queries or comments (contact information is on the back page). Our objective as always is to improve.

A message from the Department Head and Chief: Dr. Marcelo Nicolela

We are pleased to share with you our 2017 Research Report: we had another successful year in research, maintaining a good publication record, attracting new grants and presenting our results nationally and internationally. For a clinical department of our size, our research productivity is very impressive.

I would like to point out that research in our department is not only thriving with our well established research groups, but I am very pleased to see the enthusiasm and productivity of our new staff members, who are having the drive and passion to pursue research while carrying a significant clinical load.

In this report, we are highlight one of our newer research members, Dr. Jayme Vianna, and one of our residents, Dr. Tom Zhao. Congratulations to both of them for the great work they are doing.

I would like to thank our research director, Dr. Balwantray Chauhan, our research manager, Leah Wood, and all the other members of the research committee for their commitment in advancing research in our department and for their efforts in putting together this research report. I am sure that with the guidance of the research committee, our department members and residents will continue to excel in research!

A message from the Research Director: Dr. Balwantray Chauhan

We are pleased to present the Annual Research Report for 2017. The Department of Ophthalmology and Visual Sciences continues to increase its research profile and increase its links with national and international collaborators to produce research of the highest quality with meaningful clinical impact.

I am pleased to welcome Dr. Jayme Vianna as a new faculty member to the department. Jayme is the QEII Foundation Scholar in Glaucoma Research and Assistant Professor in the department. He has been highly productive as a post-doctoral fellow and is well on the path of being a successful independent researcher. Our research grant capture and productivity remains impressive, particularly given the relatively small size of our department. Research projects are funded with grants from the Canadian Institutes of Health Research, National Science and Engineering Council, Atlantic Innovation Fund and numerous private sector sources.

I invite you to explore our achievements in the various research areas, those of our trainees and the facts and figures for this year. I want to thank Leah Wood, our research manager for compiling this document. Do not hesitate to contact us with any questions, queries or comments (contact information is on the back page). Our objective as always is to improve.
Prior to joining the Dalhousie University Department of Ophthalmology and Visual Sciences at Dalhousie University as a research fellow in 2014, Dr. Jayme Vianna practiced ophthalmology in his birthplace of São Paulo, Brazil. Although Dr. Vianna had been interested in science and research since childhood, his first real exposure to research occurred during medical school where he developed a passion for it. Despite his keen interest in research, Dr. Vianna did not consider a career in research after graduation from medical school because conducting research was not a common practice for physicians in Brazil due to severely restricted funding and support for research endeavors. Dr. Vianna practiced as a glaucoma specialist for a few years and stayed involved in research and teaching as much as he could during his free time; however, he felt that there was still something missing in his professional life. There were many clinical questions, particularly related to glaucoma, that he was faced with every day and wanted to answer using research. His increasing scientific curiosity and interest in research drove his decision to relocate to Canada and pursue a full-time research fellowship in glaucoma at Dalhousie University on the recommendation of a colleague.

Dr. Vianna joined the Glaucoma Research Group at Dalhousie University and focused his research on optical coherence tomography (OCT), a highly sophisticated technology used to image the layers of the retina, in combination with other diagnostic tests to detect glaucoma in its very early stages.
Early detection of glaucoma is critical in allowing physicians to successfully manage and treat this potentially blinding disease. Currently, Dr. Vianna is heading up an international multi-center study with the goal of validating a standard definition of glaucoma in various stages of the disease. Although there has been a significant improvement in tests used to diagnose glaucoma, there is poor agreement among experts as to how to precisely define glaucoma, specifically which criteria from any (or a combination) of these tests to best describe the disease at all stages. Dr. Vianna plans to use web-based tools to obtain and combine the opinion of hundreds of glaucoma specialists globally regarding hundreds of patients with varying stages of glaucoma progression. He will then analyze the responses to determine which diagnostic criteria best approximates the combined assessment of glaucoma specialists, providing an evidence-based validation of a glaucoma definition.

Dr. Vianna is also researching how to use artificial intelligence to assist clinicians in detecting early-stage glaucoma. Current imaging technologies provide hundreds to thousands of data points. Even for well-trained glaucoma specialists, this amount of information can be overwhelming to analyze, particularly in early-stage glaucoma, causing clinicians to often make sub-optimal assessments. Dr. Vianna is developing tools based on artificial intelligence to combine and analyze this data and help clinicians make more accurate assessments to ultimately lead to better patient outcomes.

In 2017, Dr. Vianna was named the QEII Foundation Scholar in Glaucoma Research, to which he credits as one of his greatest achievements in his career thus far. By devoting his career to research, Dr. Vianna hopes to help advance the body of knowledge related to glaucoma as well as improve the technology used to detect the disease in order to help clinicians best manage and treat their patients. Dr. Vianna ultimately hopes that his research reduces the visual disability and burden related to glaucoma.
Awards & Accolades

2017 Dr. R. Evatt and Rita Mathers Trainee Scholarships

Corey Smith, Sonia Manuchian and Tareq Yousef are the recipients of the 2017 Dr. R. Evatt and Rita Mathers Trainee Scholarships.

Corey Smith is the recipient of the Research Fellowship in Ophthalmology and Visual Sciences. The research carried out by Corey and his supervisor Dr. Balwantray Chauhan will investigate a new diagnostic technique that involves imaging perfusion of blood in a specific regions of the retina. He will determine the amount of short and long-term variability to understand if this technique is reproducible and reliable. If this work is successful, he will test the new imaging method for glaucoma patients with the aim of providing eye doctors with more information for diagnosing and treating glaucoma and other eye diseases.
2017 Awards

Dr. Alan Cruess: Life Fellow of the Academy: 35 Years of Service - American Academy of Ophthalmology

Dr. Claire Hamilton: Hot Topic Poster Presentation Designation - 2017 Canadian Ophthalmology Society Annual Meeting

Dr. Corey Smith: Physiology & Biophysics Best Graduate Student’s Publication - Department of Physiology and Biophysics of Dalhousie University

Dr. Jayme Vianna: 2017 Best Glaucoma Paper Award for an Ophthalmologist-in-Training - Canadian Glaucoma Society

Dr. Marcelo Nicolela: 2017 "COMA" Award for Most Relevant Presentation during the 2017 Walter Wright Symposium - Department of Ophthalmology and Visual Sciences, University of Toronto

Dr. Rishi Gupta: 2017 Ophthalmology Clinical Teaching Award - Department of Ophthalmology and Visual Sciences Resident Group

Dr. Rishi Gupta: Royal College of Physicians and Surgeons Continuing Professional Development Award - Royal College of Physicians and Surgeons

Sonia Manuchian was awarded the Master of Clinical Vision Science Scholarship for her research with supervisor Dr. Johane Robitaille. Sonia will study which treatment: laser ablation or anti-VEGF (vascular endothelial growth factor) therapy produces better binocularity (ability to fuse images from both eyes) in children born with an eye disease called retinopathy of prematurity.

The Master of Vision Science scholarship was awarded to Tareq Yousef, who under the supervision of Dr. William Baldrige, is investigating the possible novel connections that intrinsically photosensitive melanopsin retinal ganglion cells (ipRGCs) make within the retina, and the changes they impose on retinal signaling mediated by the important chemical messenger, dopamine.
Resident Research

Resident Research Project Fund Recipient

Dr. Tom Zhao, PGY3, was a recipient of the Dalhousie Department of Ophthalmology and Visual Sciences Resident Research Project Grant for his research project titled: “DENAQ photoswitch as a chemical visual prosthesis in a model of acquired retinal degeneration”. Vitreoretinal diseases cause irreversible blindness in the developed world. Many conditions, such as the dry form of age-related macular degeneration, and genetic conditions such as retinitis pigmentosa, currently have no effective treatment. One characteristic of this group of diseases is that the pathology is in the retinal photoreceptors, while the conduction pathway via bipolar and retinal ganglion cells to the brain remain intact. Therefore, there has been great interest in the past few years in salvaging the remaining conductive pathway to improve or even create vision. Tom’s research examines whether DENAQ, a recently engineered photosensitive molecule, has the potential to restore visual responses in an animal model of acquired retinal degeneration known as light induced retinopathy which can potentially model different stages and severity of retinal damage such as age-related macular degeneration and retinitis pigmentosa.

Resident Research Projects

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Supervisor</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Mark Seamone</td>
<td>PGY 5</td>
<td>Drs. Alan Cruess &amp; Melanie Kelly</td>
<td>Intravitreal anti-VEGF therapy reduces ocular inflammation in peptidoglycan and endotoxin induced uveitis</td>
</tr>
<tr>
<td>Dr. Amr Zaki</td>
<td>PGY 5</td>
<td>Dr. Rishi Gupta</td>
<td>Assessment of anxiety and pain associated with intravitreal injections</td>
</tr>
<tr>
<td>Dr. Claire Hamilton</td>
<td>PGY 5</td>
<td>Dr. Lesya Shuba</td>
<td>Comparison of outcomes of trabeculectomy with subconjunctival injection of mitomycin C versus topical application with cellulose sponge</td>
</tr>
<tr>
<td>Dr. William Best</td>
<td>PGY 4</td>
<td>Dr. Daniel Belliveau</td>
<td>Dalhousie medicine undergraduate ophthalmology education: Targeted needs assessment</td>
</tr>
<tr>
<td>Dr. Aaron Winter</td>
<td>PGY 4</td>
<td>Dr. Alon Friedman</td>
<td>Traumatic brain injury and retinal vascular pathology</td>
</tr>
<tr>
<td>Dr. Wesley Chan</td>
<td>PGY 3</td>
<td>Dr. Jai Shankar</td>
<td>Transverse venous sinusus stenosis on magnetic resonance imaging in patients with idiopathic intracranial hypertension – A pilot study</td>
</tr>
<tr>
<td>Dr. Harald Gjerde</td>
<td>PGY 3</td>
<td>Drs. Johane Robitaille &amp; Jason Berman</td>
<td>The utility of a fzd4 knockdown zebrafish model for an efficacious drug screen for FEVR</td>
</tr>
<tr>
<td>Dr. Tom Zhao</td>
<td>PGY 3</td>
<td>Drs. Steve Barnes &amp; Francois Tremblay</td>
<td>DENAQ photoswitch as a chemical visual prosthesis in a model of acquired retinal degeneration</td>
</tr>
<tr>
<td>Dr. Amit Mishra</td>
<td>PGY 2</td>
<td>Dr. William Baldridge</td>
<td>Cannabinoid-mediated chloride dynamics in mammalian retinal ganglion cells</td>
</tr>
<tr>
<td>Dr. Aishwarya Sundaram</td>
<td>PGY 2</td>
<td>Drs. Christopher Seamone and Dan O’Brien</td>
<td>Settle plate testing to measure air quality testing in a tertiary care ophthalmology department</td>
</tr>
<tr>
<td>Dr. Danielle Cadieux</td>
<td>PGY 2</td>
<td>Dr. Anuradha Mishra &amp; Mark Goldszmidt</td>
<td>A grounded theory study of self-directed learning approaches to operative education in senior surgical residents at Dalhousie University</td>
</tr>
<tr>
<td>Name</td>
<td>Program</td>
<td>Supervisor(s)</td>
<td>Project Title</td>
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<tr>
<td>Ben Smith</td>
<td>Post-Doctorate Physiology and</td>
<td>Drs. François Tremblay &amp; Balwantray Chauhan</td>
<td>Dendritic retraction and associated physiological responses in retinal ganglion cells in experimental glaucoma</td>
</tr>
<tr>
<td>Corey Smith</td>
<td>PhD Physiology and Biophysics</td>
<td>Dr. Balwantray Chauhan</td>
<td>Labelling and longitudinal in vivo imaging of retinal ganglion cells</td>
</tr>
<tr>
<td>Dan Lafrenière</td>
<td>BSc Biology</td>
<td>Dr. Melanie Kelly</td>
<td>Effects of intravitreal bevacizumab on aseptic models of ocular infection</td>
</tr>
<tr>
<td>Dinesh Thapa</td>
<td>MSc Pharmacology</td>
<td>Dr. Melanie Kelly</td>
<td>Cannabinoids in corneal pain and inflammation</td>
</tr>
<tr>
<td>Douglas Iaboni</td>
<td>BSc Medicine</td>
<td>Dr. Balwantray Chauhan</td>
<td>Characterization of retinal ganglion cell subtype expression of yellow fluorescent protein in the Thy1-YFP line H transgenic mouse line</td>
</tr>
<tr>
<td>Elizabeth Cairns</td>
<td>PhD Pharmacology</td>
<td>Drs. Melanie Kelly &amp; William Baldrige</td>
<td>Strategies for neuroprotection and intraocular pressure modulation in experimental models of glaucoma</td>
</tr>
<tr>
<td>Faisal Jarrar</td>
<td>BSc Medical Sciences</td>
<td>Dr. Balwantray Chauhan</td>
<td>Non-retinal nerve fibre layers within the optic nerve head neuroretal rim</td>
</tr>
<tr>
<td>Heather Gerrie</td>
<td>BSc Biological Sciences</td>
<td>Dr. François Tremblay</td>
<td>In-Vivo evaluation of vision restoration with photoswitch BENAQ</td>
</tr>
<tr>
<td>Jack Quach</td>
<td>BSc Medical Sciences</td>
<td>Dr. Jayme Vianna</td>
<td>Asymmetry of peripapillary retinal blood vessels positions between right and left eyes</td>
</tr>
<tr>
<td>Jacklyn Stewart</td>
<td>BSc Medical Sciences</td>
<td>Dr. Jayme Vianna</td>
<td>The effect of age and descent on retinal layer thickness in normal eyes</td>
</tr>
<tr>
<td>Jared Shapiro</td>
<td>BSc Neuroscience</td>
<td>Dr. Steve Barnes</td>
<td>Multielectrode array analysis</td>
</tr>
<tr>
<td>John Gobran</td>
<td>BSc Pharmacology</td>
<td>Dr. Balwantray Chauhan</td>
<td>Effects of 3D stratification of retinal ganglion cells in Sholl analysis</td>
</tr>
<tr>
<td>Jonah Brodeur</td>
<td>BSc Medical Sciences</td>
<td>Dr. François Tremblay</td>
<td>Change in intrinsic activity of retinal ganglion cells during induced retinal degeneration</td>
</tr>
<tr>
<td>Justine Sy</td>
<td>MSc Clinical Vision Science</td>
<td>Dr. Balwantray Chauhan</td>
<td>Functional retinal ganglion cell activity after light induced damage in mice</td>
</tr>
<tr>
<td>Lianne Esmores</td>
<td>MSc Clinical Vision Science</td>
<td>Dr. François Tremblay</td>
<td>Short- vs long-term retinal challenges by antiepileptic Vigabatrin</td>
</tr>
<tr>
<td>Mairin Hogan</td>
<td>BSc Medical Sciences</td>
<td>Dr. Steve Barnes</td>
<td>Calcium imaging of glutamate response in Thy1-GCaMP3 mouse retinal ganglion cells</td>
</tr>
<tr>
<td>Mark Saldhana</td>
<td>BSc Neuroscience</td>
<td>Dr. William Baldridge</td>
<td>Melanopsin in the zebrafish retina</td>
</tr>
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<td>Name</td>
<td>Program</td>
<td>Supervisor(s)</td>
<td>Project Title</td>
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<tr>
<td>Mike Craig</td>
<td>MSc Clinical Vision Science</td>
<td>Dr. François Tremblay</td>
<td>Interocular inhibition: An opportunity to determine how binocular integration is taking place within various visual areas of the occipital cortex</td>
</tr>
<tr>
<td>Ross Porter</td>
<td>MSc Pharmacology</td>
<td>Dr. Melanie Kelly</td>
<td>Cannabinoid 2 receptor signaling during ocular inflammation</td>
</tr>
<tr>
<td>Skye McIntosh</td>
<td>BSc Neuroscience</td>
<td>Dr. William Baldridge</td>
<td>Halibut retinomotor movement before and after metamorphosis</td>
</tr>
<tr>
<td>Syed Mohammad</td>
<td>BSc Medicine, University of Ottawa</td>
<td>Dr. Balwantray Chauhan</td>
<td>Assessing the Effect of Head Tilt on the Recorded Value of the Fovea-Bruch’s Membrane Opening Centre Angle as Assessed by Optical Coherence Tomography</td>
</tr>
<tr>
<td>Tareq Yousef</td>
<td>MSc Medical Neuroscience</td>
<td>Dr. William Baldridge</td>
<td>Melanopsin-mediated neuronal signaling in the teleost retina</td>
</tr>
</tbody>
</table>
On November 2, 2017 faculty and trainees attended the 3rd Annual Department of Ophthalmology and Visual Sciences Research Club that took place in the Tupper Medical Building Commons. The evening featured short presentations by some of our residents and fellows regarding their research projects that generated lots of discussion and new ideas surrounding the ongoing research in our department.
On April 3, 2017, faculty and students attended the 28th Annual Department of Ophthalmology and Visual Sciences Research Day, a full-day symposium at the Lord Nelson Hotel & Suites. This event showcased the current basic science and clinical research carried out in our department and in collaboration with departments both within and outside of Dalhousie.

The Keynote Lecturer, Dr. Peter Dolman, from the University of British Columbia, delivered two excellent presentations entitled “Controversies and Research in Endonasal Dacryocystorhinostomy” and “Evaluation and Management of Thyroid Orbitopathy.”

Congratulations to the 2017 Research Day Award winners:

Resident Category

1st Prize: Dr. Mark Seamone “The effect of intravitreal bevacizumab in experimental models of ocular inflammation”

2nd Prize: Dr. Claire Hamilton “Comparison of outcomes of trabeculectomy with subconjunctival injection of mitomycin C versus topical application with cellulose sponge”
Junior Trainee Category

1st Prize: Delaney Henderson “Characterizing longitudinal in vivo changes of RGC dendrites after retinal injury”

Senior Trainee Category

1st Prize: Andrea Nuschke “Axonal transport in retinal ganglion cells following elevated IOP”

52 Invited presentations by department members
34 Peer reviewed manuscripts published

Number of international and national invited presentations by department members in 2017.


**Book Chapters**


**Other Publications**

Gupta RR, Lewis D (2017) Bridging the Gap: An added dimension to coloboma repair - American Society of Retina Surgeons [Video]


Cruess AF (2017) Blinded by the promise of stem cell treatments - Impact Ethics
Number of newly acquired and continuing research grants and contracts in 2017. All research projects in which a department researcher is a team member are included.

- **0.9 million** in new and ongoing research contracts
- **2.4 million** in ongoing and new research grants
- **3.3 million** in research funding

The value of research funding including revenue from all awards generating funds in that year (for multi-year awards, the revenue is reported the year it is budgeted).
New Research Grants and Contracts


Tremblay F, Bardouille T, Craig M (2017). Interocular inhibition: An opportunity to determine how binocular integration is taking place within the various visual areas of the occipital cortex - IWK - $5,000.


Continuing Research Grants and Contracts


Shuba LM, Nicolela MT (2016 - 2017). A prospective, double-masked, randomized, multi-center, active-controlled, parallel-group, 3-month study assessing the safety and ocular hypotensive efficacy of PG324 Ophthalmic Solution 0.02% and Latanoprost Ophthalmic Solution 0.005% in subjects with elevated intraocular pressure - Aerie Pharmaceuticals Inc. - $118,475.


Nicolela MT. (2015 - 2018). Additive effect of twice-daily brinzolamide 1% /Brimonidine 0.2% fixed dose combination as adjunctive therapy to a prostaglandin analogue - Novartis Inc. - $173,000.


Dickinson J, Cruess A, Gupta RR (2015 - 2017). Open-label phase-4 study to examine the change of vision-related quality of life in subjects with diabetic macular edema (DME) during treatment with intravitreal injections of 2 mg aflibercept according to EU label for the first year of treatment. (AQUA) - Bayer - $257,072.


Continuing Research Grants and Contracts (continued)

Nicolela MT (2014 - 2017). A double-masked, randomized, multicentre, active-controlled, parallel, 12 month study assessing the safety of AR-13324 Ophthalmic Solution, 0.2% q.d. and b.i.d. compared to Timolol Maleate Ophthalmic Solution, 0.5% b.i.d. in patients with elevated intraocular - Aerie Pharmaceuticals Inc. - $152,140.


Nicolela MT (2012 - 2019). A randomized clinical trial of selective laser trabeculoplasty (SLT) in open angle glaucoma who have been previously treated with complete SLT – Canadian Institutes of Health Research - $90,200.
