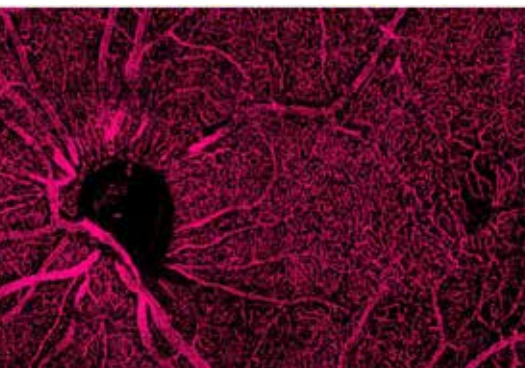
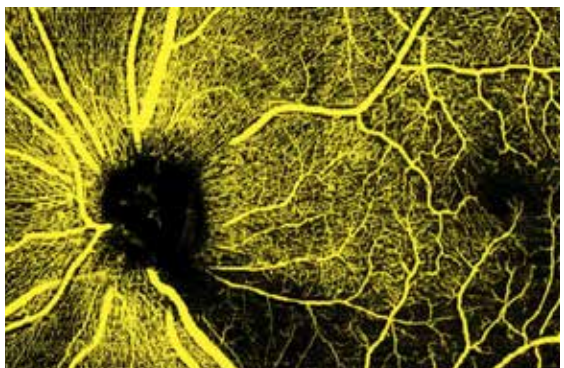
Department of Ophthalmology and Visual Sciences

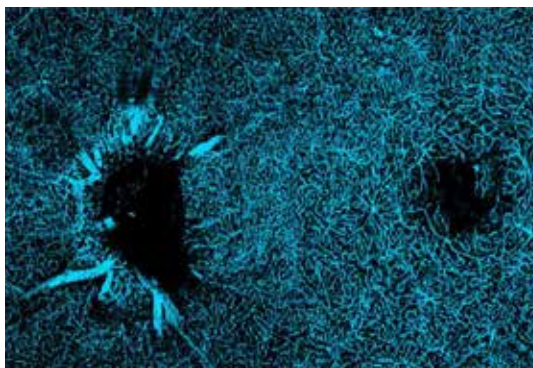
2018-2019 Annual Report

OPHTHALMOLOGY & VISUAL SCIENCES

DALHOUSIE UNIVERSITY







Dear Department members,

It gives me great pleasure to share with you Department of Ophthalmology & Visual Sciences, Dalhousie University, Annual Report 2018-2019. In the spirit of “saving the planet”, I am sending you an electronic copy of the report. The PDF file is best viewed as a booklet:

To view the document as intended:

In Acrobat (Mac/Win), go to View menu
- Select Page Display
- Select Two-Up as well as Display Cover Page During Two-Up
(you should see a check mark by each)

In Preview (Mac)
- Select View menu
- Select Two Pages

This year we expanded our Research Annual Report into a Departmental Annual Report, highlighting not only our research accomplishments, but also our deliverables in clinical care and education. I hope you enjoy reading our report. If you have any questions or concerns, please do not hesitate to contact me.

Warmest regards,

Marcelo Nicolela, MD, FRSCS

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Message from Department Head

Marcelo Nicolela, *MD, FRCSC*
Head and Chief
Department of Ophthalmology & Visual Sciences
Dalhousie University & Nova Scotia Health Authority

It is with great pleasure that I invite you to read the 2018-19 Annual Report of the Department of Ophthalmology & Visual Sciences (DOVS).

The DOVS has a rich tradition of excellence in clinical care, innovation and education. We provide state of the art ophthalmology care for residents of Nova Scotia, and subspecialty care for patients from all four Atlantic Province. Our highly skilled physicians, nurses and other allied health care professionals are recognized as some of the best in the country, and rightly so.

By reading this report, I hope you will be as impressed as I am with the breath of what we are achieving together, and optimistic about the future of the DOVS. We continue to have an excellent residency program, which was confirmed by the very positive Royal College review we had last November. We have been making strides in our undergraduate teaching, with many new initiatives detailed in this report. We continue to excel in our research mission, with a truly amazing academic productivity for a Department of our size.

We are in a transition period, with many long-standing faculty retiring and new ones being recruited. I would like to pay tribute to our outstanding faculty members who retired in the last few years: Dr. David Andrews, Dr. Ann Hoskin-Mott, Dr. Vladimir Kozousek , Dr. James McNeill, and Dr. Mo Humayun. We wish you all a happy retirement from academic life.

Finally, I would like to thank the many friends of ophthalmology, who have contributed with philanthropy to the success of the Department. Your generosity will guarantee an even brighter future for the DOVF.

The best is yet to come.

MISSION

The Department of Ophthalmology & Visual Sciences provides high quality ophthalmological care for the population of Nova Scotia and Atlantic Canada, delivers excellent medical education programs and conducts internationally recognized research a collaborative and innovative environment.

VISION

To lead Canadian ophthalmology in patient care, education and research.

VALUES

- Commitment to excellence
- Transparency, accountability, fiscal and social responsibility
- Innovation and a spirit of inquiry
- Professionalism and inclusivity
- Collaboration and community engagement

Who We Are & What We Do

Where We Deliver Care

Eye Care Centre Visits	50,450
Cobequid Clinic	1,982
IWK Ophthalmology	7,241
Total Surgical Cases	8,246

Who Delivers Care

Ophthalmologists	28
Nursing & Technical Staff	42
Administrative Staff	30
Research Coordinators	9.5

Surgical Cases by Subspecialty

Cataracts	5,105
Retinal Surgery	1,550
Glaucoma	500
Strabismus	89
Orbit/Plastics	787
Paediatrics	261

Research

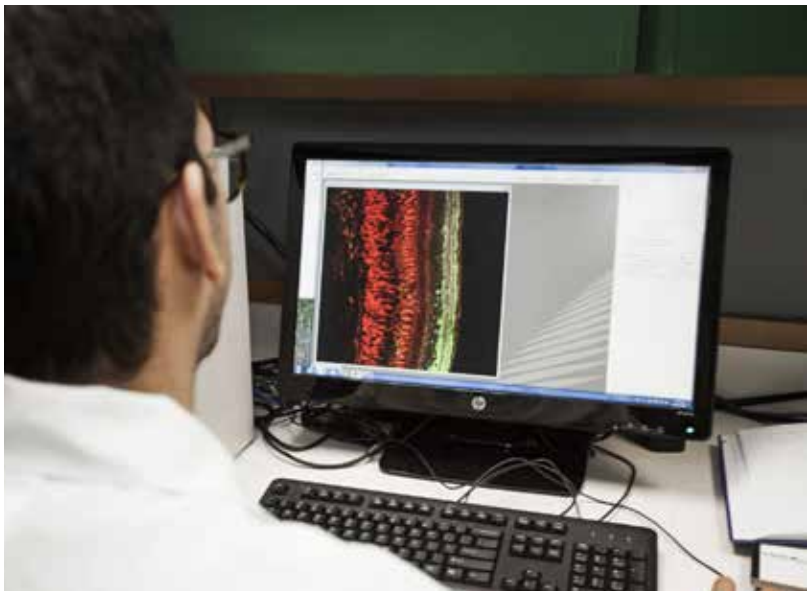
53 Invited Presentations

37 Peer Reviewed Manuscripts

$2.05M Continuing Research Grants & Contracts

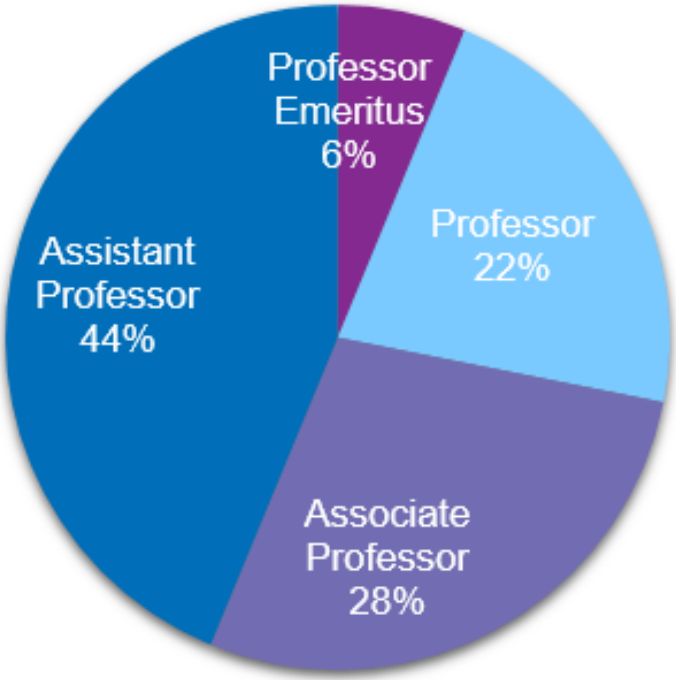
$0.37M New Research Grants & Contracts

$2.43M Total Research Funding



Who We Are & What We Do

Education



Post Graduates

Residents PGY2-5	13
Resident PGY1	4
Fellow - Clinical Glaucoma	1
Fellow - Paediatrics	1
Postdoctoral Fellows	3
Clinical Vision Sciences	13

Under Graduates

MED 4 Elective students	27
Dalhousie Medical 1 & 2 student electives	9
Emergency Medicine Resident electives	5
Total Undergraduate Teaching Hours	159

Professional Development

Grand Rounds	31
Conferences	4
Journal Clubs	4

Our Faculty

Dr. Curtis Archibald, Assistant Professor
Dr. Dan Belliveau, Assistant Professor
Dr. Balwantray Chauhan, Professor
Dr. Alex de Saint Sardos, Assistant Professor
Dr. Alan Cruess, Professor
Dr. Mishari Dahrab, Assistant Professor
Dr. John Dickinson, Associate Professor
Dr. Brennan Eadie, Assistant Professor
Dr. Carolina Francisconi, Assistant Professor
Dr. Stan George, Associate Professor
Dr. Rishi Gupta, Assistant Professor
Mr. Erik Hahn, Lecturer
Dr. Ahsen Hussain, Assistant Professor
Dr. Vladimir Kozousek, Associate Professor
Dr. Hesham Lakosha, Assistant Professor
Dr. G. Robert La Roche, Professor
Dr. Darrell Lewis, Assistant Professor
Dr. Charles Maxner, Professor
Dr. Anu Mishra, Assistant Professor
Dr. Jeremy Murphy, Assistant Professor
Dr. Marcelo Nicolela, Professor & Head
Dr. Daniel O'Brien, Associate Professor
Dr. Andrew Orr, Associate Professor
Dr. Paul Rafuse, Associate Professor
Dr. Johane Robitaille, Professor
Dr. Arif Samad, Associate Professor
Dr. Christopher Seamone, Associate Professor
Dr. Lesya Shuba, Associate Professor
Dr. John Taiani, Assistant Professor
Dr. Alex Tan, Assistant Professor
Dr. Francois Tremblay, Professor
Dr. Jayme Vianna, Assistant Professor

Joint Appointments

Dr. William Baldridge (Anatomy & Neurobiology)

Cross Appointments

Dr. David Clarke (Surgery)
Dr. Patrice Cote (Biology)
Dr. J. Godfrey Heathcote (Pathology)
Dr. Melanie Kelly (Pharmacology)
Dr. Paul Neumann (Anatomy & Neurobiology)
Dr. Sylvia Pasternak (Pathology)
Dr. David Persaud (Health Services Administration)
Dr. David Westwood (Health & Human Performance)

Distributed Learning Faculty

Dr. Paul Cheevers, Assistant Professor
Dr. David Comstock, Assistant Professor
Dr. Erin Demmings, Assistant Professor
Dr. Kenneth Hammel, Lecturer
Dr. Mohammed Kapasi, Assistant Professor
Dr. Colin Mann, Assistant Professor
Dr. Kristine Mayer, Assistant Professor
Dr. Rajender Mohandas, Assistant Professor
Dr. Kenneth Roberts, Assistant Professor
Dr. Robert Scott, Assistant Professor
Dr. Banakesa Shetty, Assistant Professor
Dr. Saraswati Sivakumar, Assistant Professor
Dr. Jeff Steeves, Lecturer
Dr. Nir Shoham-Hazon, Assistant Professor
Dr. Vicki Taylor, Assistant Professor

Emeritus Appointments

Dr. Raymond LeBlanc, Professor Emeritus
Dr. Michael Ramsey, Professor Emeritus

Ajunct Appointments

Dr. Dao-Yi Yu, Adjunct Professor
Dr. Sharon Bentley, Assistant Adjunct Professor

New Faculty Members

Dr. Brennan Eadie

Assistant Professor

Glaucoma/Comprehensive Ophthalmology

Dr. Eadie is a community based Glaucoma/ Comprehensive Ophthalmologist, who joined our Department in July 2018. Dr. Eadie completed all his formal education at the University of British Columbia, beginning with an undergraduate degree in Psychology, graduating in 2002. Dr. Eadie then completed a Master of Science, Neuroscience, graduating in 2004, followed by concurrent PhD and Medical Degrees, graduating in 2012. Dr. Eadie completed his Ophthalmology Residency at University of British Columbia, graduating in 2017. He then joined our Department in 2017 to complete a one-year Clinical & Surgical Glaucoma Fellowship. Dr. Eadie has established his practice in a community based office with some of our existing faculty members.

Dr. Lewis is a hospital-based Cornea & External Diseases specialist/surgeon. Darrell completed an undergraduate degree in Chemical Engineering at the University of Waterloo, followed by his medical degree at the University of Ottawa. Darrell is no stranger to us, having completed his residency in our Department in Halifax, graduating in 2017. Darrell has just completed a Cornea and External Diseases fellowship at the Royal Victorian Eye and Ear Hospital in Melbourne, Australia.

Dr. Darrell Lewis

Assistant Professor

Cornea/External Diseases

New & Post Retirement Faculty Members

Dr. Carolina Francisconi

Assistant Professor
Medical Retina

Dr. Francisconi completed her medical education at the Universidade Federal Do Rio Grande Do Sul, Porto Alegre, Brazil, graduating in 2012, followed by ophthalmology residency training at Universidade Federal de Ciências da Saúde de Porto Alegre, Porto Alegre, Brazil graduating in 2016. Carolina completed a 2-year Vitreoretinal Fellowship at the University of Toronto, graduating in 2018. Carolina has extended her training further by an additional year of Paediatric Retina and Research Fellowship at the University of Toronto.

Dr. Charles Maxner retired from the Department of Medicine (Neurology) at the end of June 2018, and moved to full time Neuro Ophthalmology practice beginning July 1, 2018. Dr. Maxner is a familiar and welcome full-time addition to our Department, ensuring continued excellence in Neuro-Ophthalmological service and unparalleled teaching for our residents. Chuck completed his medical education at Dalhousie University in 1979, and then went onto complete his residency in General Medicine (1981) and Neurology in (1984). In 1986, Dr. Maxner completed his Neuro Ophthalmology Fellowship at the University of Iowa, followed by a career of thirty plus years practicing Neurology.

Dr. Charles Maxner

Professor
Neuro Ophthalmology

Locum Faculty Members

Dr. Mohamed Albahiti
Locum Tenens/Assistant Professor
Surgical Retina

Dr. Albahiti is a locum tenens Vitreo-Retinal surgeon, who working with us over the summer and fall of 2018. Mohamed completed his medical education in the King Abdulaziz University in Saudia Arabia, graduating in 2003. Following that, he completed two Fellowships at the University of Montreal: One in Medical and Surgical Retina, and the other in Endoscopic Vitreoretinal Surgery and Clinical Research. Dr. Albahiti is currently working with the Vitreous Retina Macula Specialists practice group in Toronto. We are grateful to Mohamed and his colleagues for making him available to support our retina service in Halifax.

Dr. Rayan Alshareef
Locum Tenens/Assistant Professor
Surgical Retina

Dr. Alshareef provided locum tenens support for our Vitreo-Retinal team several months in the spring and summer of 2018. Rayan completed his medical education in the King Abdulaziz University in Saudia Arabia,graduating in 2008. Following that he completed a Research Fellowship with the Retina Service at WillsEye Institute. Rayan then completed his Internship and Ophthalmology Residency at McGill University, graduating in 2017. Rayan and our colleagues in Calgary generously agreed that he could take a few weeks away from the final stretch of his vitreoretinal fellowship program, to come to Halifax to help support our Retina Team and the community.

Dr. Amr Zaki
Assistant Professor
Comprehensive Ophthalmology

Dr. Zaki is a Comprehensive Ophthalmologist, who has been providing locum tenens support to a number of practices in our Department over the 2018-19 year. Amr completed an combined honours undergraduate degree in Biochemistry & Molecular Biology and Microbiology & Immunology in 2007, followed by a Masters in Pathology & Immunology in 2009, followed by undergraduate medicine graduating in 2013, all at Dalhousie University. Amr is no stranger to our Department, having completed his residency in our Department in Halifax, graduating in 2018. Amr is undertaking a Unveitis Fellowship in Portland Oregon, beginning in July 2019.

Awards & Accolades

Dr. Muhammad Humayun receives the CMA Honorary Membership Award in recognition of his career as an ophthalmologist in Nova Scotia. The longest serving ophthalmologist in Dartmouth, he has spent 45 years providing medical and surgical vision care for countless Nova Scotians, and training learners in the field.

Dividing his time between his two practices and the Eye Care Centre at the QEII Health Sciences Centre in Halifax, Dr. Humayun has devoted much of his practice to treating eye disease and vision loss for underprivileged and disabled Nova Scotians.

“My greatest career accomplishment has been to provide ophthalmology services to the patients in the underserved areas of Nova Scotia, especially to those needing financial help,” he said.

He has also helped patients in his home country of Pakistan, where for many years he was assistant editor of the Pakistan Journal of Ophthalmology.

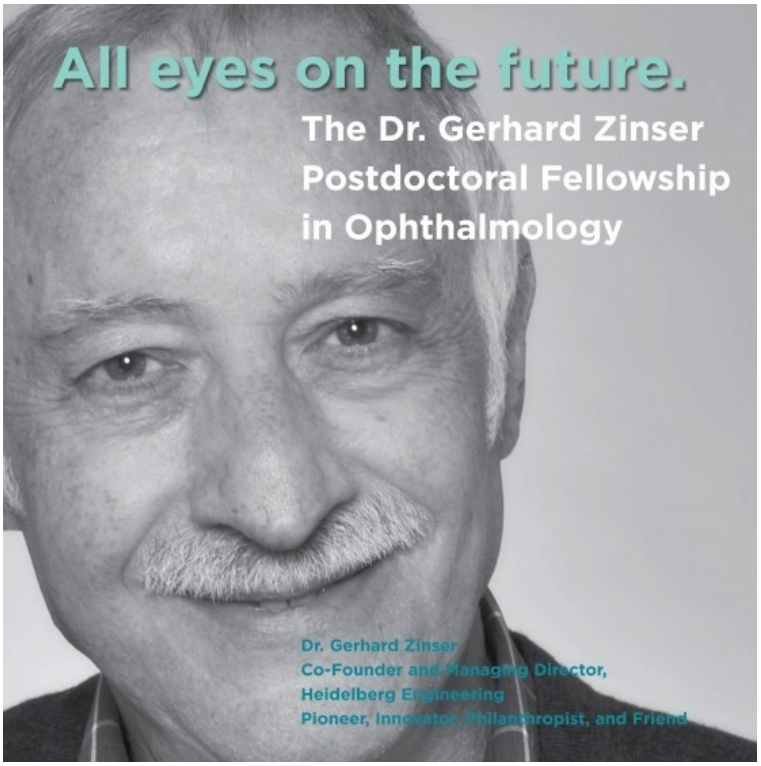
In addition, as a member of the Dalhousie Medical School Department of Ophthalmology, Dr. Humayun has helped train medical students and ophthalmology residents. “I love teaching ophthalmology residents the finer techniques of surgery procedures,” he said.

The NSHA Long Service Award ceremony took place on Wednesday, Nov 7th. Dr. Kozousek received an award for 30 years of service. Dr. Paul Rafuse was also the recipient of the NSHA Long Service Award for his 25 years of service, but he was unable to attend the ceremony.

Dr. Harald Gjerde was selected for the Best Basic Science Award at the Faculty of Medicine Resident Research Awards for his abstract titled: “The utility of a fzd4-/- zebrafish model in the screening of novel treatments for familial exudative retinopathy (FEVR)”. The awards ceremony was held on June 8, 2018.

Dr. Harald Gjerde also tied for first place in the Dalhousie University Department of Psychiatry’s Annual Student Writing Competition, in the Postgraduate Trainee Category, for his poem “Le Fou Bonnet”.

Awards & Accolades



Our DMRF welcomed members of Heidelberg Engineering to a celebration in honour of their long-standing relationship with Dalhousie's Faculty of Medicine. (In the photo you will see, left-right, DMRF CEO Mr. Brian Thompson, Dalhousie Faculty of Medicine Dean Dr. David Anderson, from Heidelberg Engineering: Director of Clinical Research Mr. Ali Tafreshi, Clinical Research Project Manager Dr. Sebastian Rausch, and General Manager, USA, Mr. Ram Liebenthal, Dalhousie Research Director of the Department of Ophthalmology & Visual Sciences Dr. Balwantray Chauhan and Dalhousie University President Dr. Richard Florizone.) Guests joined us for an afternoon event that recognized a long-standing philanthropic partnership that supports Dr. Chauhan's leading-edge glaucoma research. We were especially pleased to pay tribute to Heidelberg Engineering co-founder and Managing Director, the late Dr. Gerhard Zinser.

Dr. Kathleen Digre, University of Utah, delivered the inaugural Dr. Aditya Mishra Lecture in Neuro-Ophthalmology during the recent Atlantic Eye Symposium. Dr. Charles Maxner chaired the session.

Mathers Awards

Established in 2014, the Mathers Scholarships permit the Department to support students at the Undergraduate, Masters, PhD and Fellowship levels and are building our capacity year over year.

The Dr. R. Evatt and Rita Mathers Trainee Scholarships in Ophthalmology & Visual Sciences are enabled by a visionary endowment from the estate of the late Peggy St. George to honour her step parents pictured above.

2018 Winners

Dr. Corey Smith is the recipient of the **Research Fellowship in Ophthalmology and Visual Sciences.** He will continue his research with his supervisor Dr. Balwantray Chauhan that will investigate optical coherence tomography angiography (OCT-A) in the retina. His research will determine the amount of short and long-term variability in blood flow to understand if this technique is reproducible and reliable in healthy subjects. He is aiming to develop a three-dimensional (3D) image reconstruction of the retinal vascular network in healthy subjects and compare these models to those of glaucoma patients. He hopes that this research will lead to a new imaging method for glaucoma patients with the goal of providing eye doctors with more information for preventing, diagnosing and treating glaucoma and other eye diseases.

The PhD in Vision Science scholarship is awarded to Tareq Yousef, who under the supervision of Dr. William Baldridge, is investigating whether a light-sensitive protein, melanopsin, contributes to the process of retinal neuron light-adaptation in a fish retina model. He will investigate the possible novel connections that melanopsin make within the retina itself, and what changes they impose on retinal signaling mediated by the important chemical messenger, dopamine. Melanopsin's contribution to light-adaptation may prove imperative for the development of visual prostheses and reversing visual-impairment in the future.

The recipient of the **Masters of Vision Science** scholarship is Delaney Henderson. Delaney will be supervised by Dr. Balwantray Chauhan and will investigate how a gene delivery technique may be used to deliver fluorescent molecules that allow visualization of cells in the retina. This potential diagnostic tool may allow clinicians to monitor retinal ganglion cell death caused by glaucoma and increase our understanding of the properties of cellular loss of function.

Mathers Awards

Pictured (R-L) : Michael Craig | Danielle Cadieux | Delaney Henderson | Corey Smith | Tareq Yousef | Jonah Brodeur (not pictured)

The **Masters of Clinical Vision Science** scholarship is awarded to Michael Craig, who under the supervision of Dr. Francois Tremblay, is studying the phenomenon of binocular inhibition, wherein eyes with cataracts, optic neuritis, strabismus and amblyopia perform worse on electrophysiological vision testing using both eyes together then when tested individually. This phenomenon is thought to occur in the visual parts of the brain. The goal of the study is to use MEG (magnetoencephalography) and EEG (electroencephalography) which are complementary forms of brain imaging to attempt to locate the parts of the brain where this process takes place and to differentiate how each of these techniques captures this phenomenon.

Dr. Danielle Cadieux is the recipient of the **Concurrent Masters and Ophthalmology Residency** scholarship. Her research is being carried out under the direction of Drs. Mark Goldszmidt and Anuradha Mishra. Dr. Cadieux will study how surgical residents take initiative to independently identify learning needs, implement learning strategies, and evaluate learning outcomes in the context of the operating room to achieve the required competencies throughout their residency programs. Understanding these practices will benefit postgraduate students and educators by providing a framework to assess current practice, provide feedback, and address future needs.

The Undergraduate scholarship is awarded to Jonah Brodeur, who under the direction of Dr. Francois Tremblay, is investigating the effect that diseases such as age-related macular degeneration (AMD) and retinitis pigmentosa (RP) have on the retinal neurons at various stages of the disease using electrophysiological recording techniques in animal models. He hopes that this research will facilitate the development of treatment options in order to reduce vision loss in patients with AMD or RP in the future.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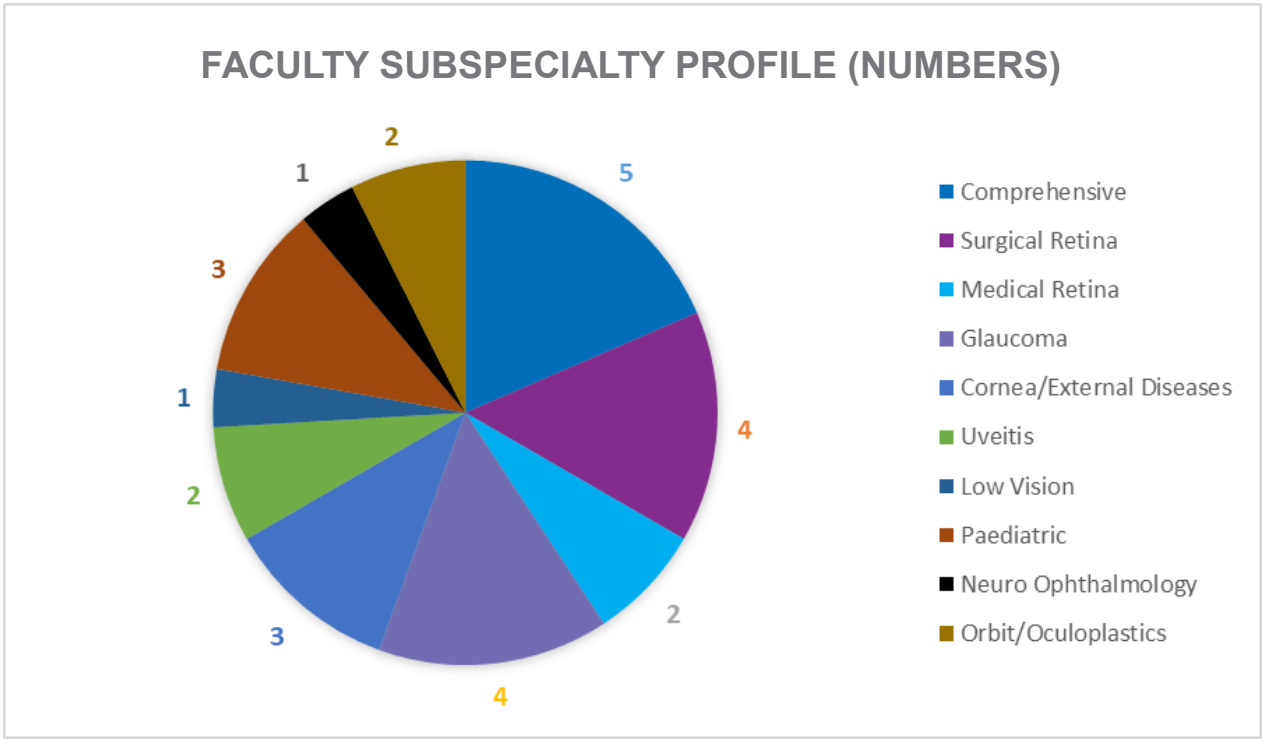
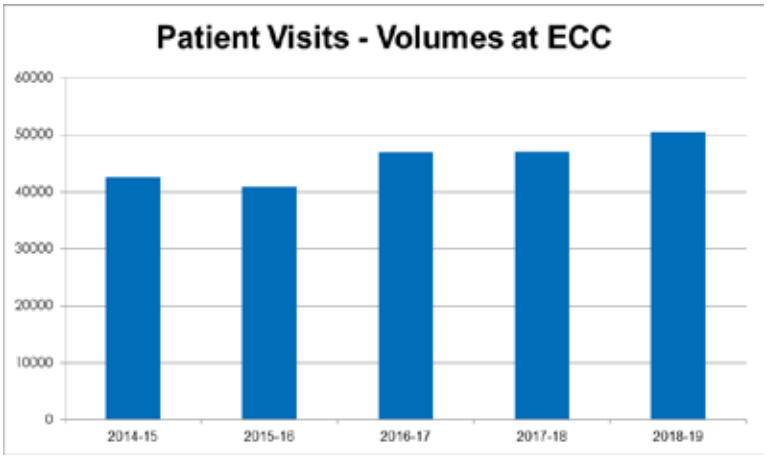
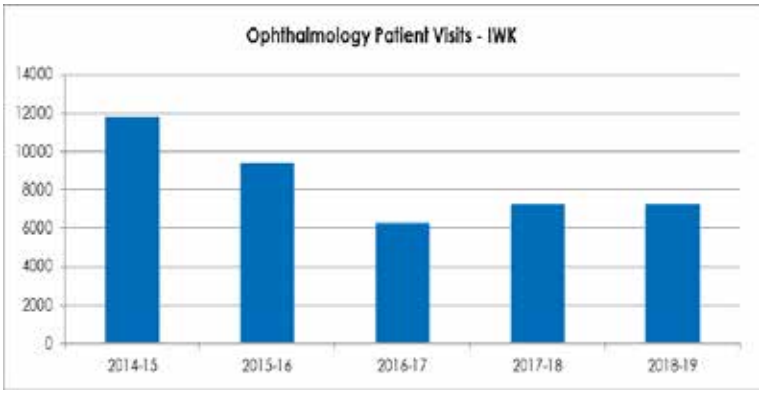
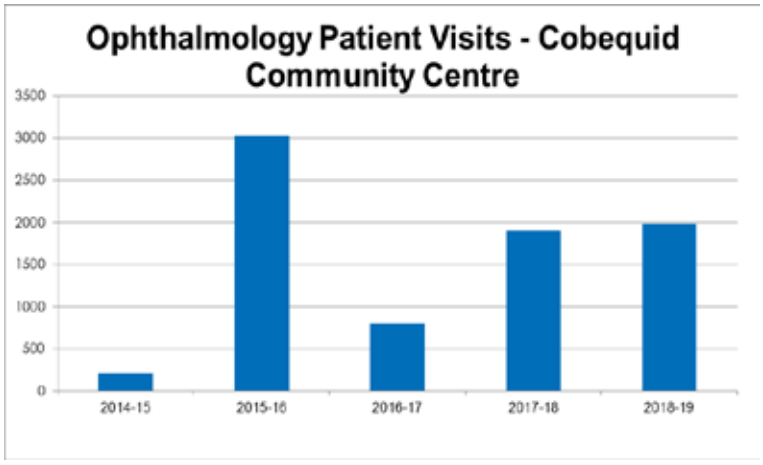
The clinical services delivered by the Department occur at the Eye Care Centre (QEII Health Sciences Centre - VG site – Nova Scotia Health Authority) for adult ophthalmology, at the paediatric ophthalmology Clinic located at the IWK Health Centre, at the ophthalmology clinic located at the Cobequid Community Centre (both adult and paediatric services) and in all private offices in town, where community based faculty members provide most of their ambulatory clinical care.





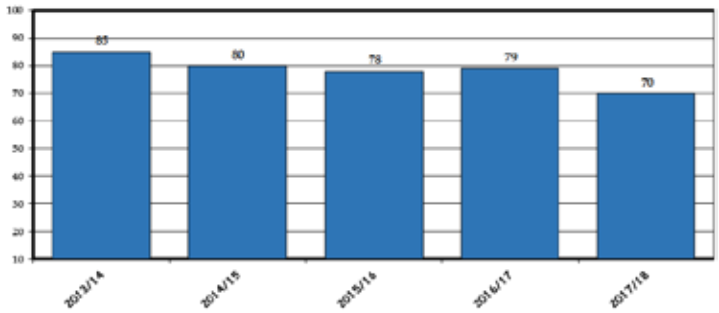


The drop in volumes over 2015-16 and 2016-17 occurred when one of the paediatric ophthalmologists was ill and then relocated. A new member was recruited in the autumn of 2017.

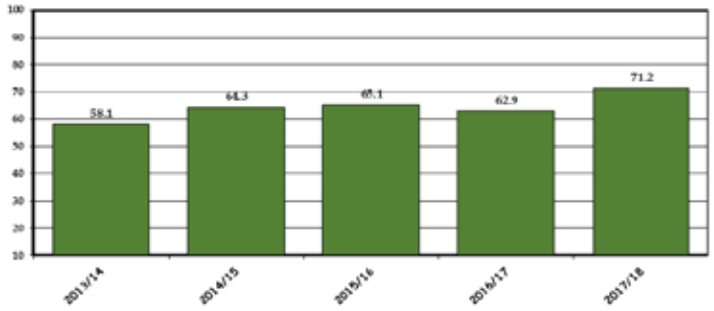


During 2015-16, increased volumes at Cobequid occurred when we relocated a large number of clinics to that center during the flooding at the VG-Eye Care Centre

The Department has been taking steps to address the wait time for elective surgery, particulary cataract surgery. In 2016, we increased the daily surgical output for cataract surgery from 14 cases per operating room to 16 cases by reducing turnaround time through increased efficiencies in the OR. The increased output is having a positive impact on wait time for elective cases. The number of patients receiving cataract surgery within the National benchmark of 16 weeks increased from 58% (2013/2014) to 71% (2017/2018). Additionally, there was a corresponding decrease in median days waiting for surgery (Figure 6). Wait time for other elective surgeries performed at DOVS is under control for retina, glaucoma, and paediatric ophthalmology. We also reduced the wait time for orbital/oculoplastic procedures through the addition of a second surgeon to the service. Long wait times for cornea transplants is due to the lack of donor tissue. Through our Eye Bank Director, Dr. Christopher Seamone, we have engaged with the tissue bank to identify possible ways to increase the number of donor tissue.



Median days waiting for all completed cases



Percentage of completed cataract cases within the national benchmark of 16 weeks

Message from the Postgraduate Medical Education Director

Lesya Shuba, *MD, PhD, FRCSC*
Director, Postgraduate Medical Education

Our postgraduate medical education program had a busy and successful academic year.

All three of our graduating residents successfully completed their Royal College examinations in June 2018 and embarked on different and gratifying professional paths. Dr. Claire Hamilton started a comprehensive ophthalmology practice in Antigonish, NS. Dr. Seamone has now embarked on a busy two-year fellowship in vitreoretinal surgery in Edmonton, Alberta. Dr. Amr Zaki has been doing locums in Halifax over the last year and will be starting a uveitis fellowship in Portland, Oregon in July 2019.

Our Residency Program had a successful CaRMS selection in 2018, matching all three positions in the first iteration. In July 2018 we welcomed the following residents to our program, two of whom are graduates of Dalhousie Medical School:
Dr. Devin Betsch, Dalhousie University
Dr. Harry Dang, University of Ottawa
Dr. Andrew Pollman, Dalhousie University

Dalhousie's on-site PGME accreditation visit by the CFPC and RCPSC ended on November 30th. Last year the Royal College released new accreditation standards to reflect the shift to competency-based medical education. Dalhousie was the first medical school in Canada to be accredited according to these new standards and processes. Dalhousie had an excellent overall result. The institution received a rating of accredited institution. I am also very happy to report that our own program received a recommendation for full accreditation for the next eight years! The surveyors were impressed with the collegial atmosphere and dedication of our faculty to resident education. Thank you all for your continued support.

Left to right: Drs. Lesya Shuba, Robert LaRoche, Amr Zaki, Claire Hamilton and Mark Seamone

Message from the Undergraduate Medical Education Director

Anuradha Mishra, *MD, MEd, FRCSC*
Director, Undergraduate Medical Education

It was a busy and exciting year for our undergraduate medical program. We continue to have a very active and successful visiting elective program for Med 4 students across the country. In response to student feedback and to make the student experience even better, we implemented a daily evaluation system for elective students.

We continue to have a presence in the Med 1&2 longitudinal elective program. As part of their elective, students are required to complete a small project and examples from this year include case reports, patient education material and production of short surgical videos.

Other highlights from the year included participation in Career Day in May 2018 and hosting a booth at the Career Night Fair in November 2018. We always appreciate having an opportunity to meet and discuss ophthalmology as a career choice with students.

In June 2018, the Department participated in the inaugural Pre-Clerkship Residency Exploration Program (PREP). This was a 2-week intensive summer program with a goal of providing early exposure to 40 second-year medical students to 14 different medical specialties and helping them make career decisions. We offered a half-day elective to all the students to observe in either red eye clinic or the ophthalmology OR, offered an ophthalmology skills session and a morning of lectures, as well as panel discussions and seminars about career decision making and work-life balance. Fifty percent of student participants reported an increased interest in ophthalmology as a career, and 9 students cited ophthalmology as a top 3 career choice. We look forward to participating again in 2019.

The Department also continues to support the medical student run Ophthalmology Interest Group. One of the recent highlights was an ophthalmic suturing night at the Surgical Skills Lab which was very well received by the students.

Finally, a thank you to Dr. Alan Cruess for all his hard-work as Undergraduate Chair over the past 4 years. We hope to continue to build on his work and continue to offer a high-quality educational experience for our undergraduate medical school students.

Top left: Undergraduate students practicing suture technique.

Top bottom left: Undergraduate students in simulation laboratory.

Top right top image: Minimally invasive surgical training in simulation lab

Pre-clerkship Residency Exploration Program 1
(PREP)

Award Winning Educators

Clinical Teaching Award – 2018
recipient Dr. Jeremy Murphy

The Clinical Teaching Award is an annual award that recognizes one staff physician's outstanding contributions to the clinical education of ophthalmology residents. This honour is decided upon by the ophthalmology resident group, which nominates and then chooses the recipient each year.

The residents felt that Dr. Jeremy Murphy's dedication and contribution to the clinical teaching goes above and beyond the call of duty. His teaching is comprehensive and thoughtful, with his feedback leaving them wanting to do better.

Award Winning Educators

Surgical Teaching Award – 2018
recipient Dr. Alex Tan

The Surgical Teaching Award is an annual award that recognizes one staff physician's outstanding contributions to the surgical education of ophthalmology residents. This honour is decided upon by the ophthalmology resident group, which nominates and then chooses the recipient each year.

Resident nominations highlighted Dr. Tan's teaching excellence in several areas. Residents felt that few surgeons matched his dedication and ability to provide access to surgical cases. Dr. Tan's encouragement during difficult cases and ability to handle complications with comfort makes performing surgery under his direction challenging and fun at the same time. His positive feedback is very encouraging for the progression of surgical skills. Because of his surgical expertise, patience, and willingness to educate, residents at all levels of training find his surgical instructions irreplaceable.

Grand Rounds

Apr 4/18	Dr. Luis Ospina*	Mitochondrial dysfunction and the eye
Apr 18/18	Dr. Ford Doolittle	Junk DNA will never go away
May 9/18	Dr. Arif Samad	The evolution of macular hole surgery
May 16/18	Dr. Amit Mishra	Acing the diagnosis
May 23/18	Dr. Aishwarya Sundaram	G-force: The not so merry-go-rounds
Jun 6/18	Dr. Danielle Cadieux & Dr. Tom Zhao	Morbidity & Mortality Rounds
Jun 13/18	Dr. Eric Suhler*	Biologic warfare for uveitis: Updates on therapy in 2018
Jun 20/18	Dr. Brennan Eadie	Visual experience and quality of life for patients with glaucoma: Practical considerations
Sept 5/18	Dr. George Talany & Dr. Amit Mishra	Morbidity & Mortality Rounds
Sept 12/18	Dr. William Best	Varicella zoster eye disease and management
Sept 19/18	Dr. Jayme Vianna	What's in a name? New efforts to define glaucoma
Sept 26/18	Dr. Harald Gjerde	Three scary e's: Evisceration, enucleation, and exenteration
Oct 3/18	Dr. Janice Chisholm	Competency based medical education - making the transition
Oct 10/18	Dr. Darrell Lewis	Keratoconus management
Oct 17/18	Dr. Wesley Chan	Masquerade! Many faces of ocular syphilis
Oct 24/18	Dr. Aaron Winter	When you hear hoofbeats, think… Approach to CRVO in young patients
Oct 31/18	Dr. Brian Horsman	Micropulse laser in vascular diseases of the macula
Nov 7/18	Dr. Danielle Cadieux	A practical guide to discharge summaries
Nov 14/18	Dr. Emad Massoud	A nose and two eyes: Traversing the papyrus barrier
Nov 21/18	Dr. Jeremy Murphy	Cataract surgery and non-steroidal anti-inflammatory (NSAID) drugs
Nov 28/18	Dr. Marcelo Nicolela	Clinical tips for effective OCT use in glaucoma
Dec 5/18	Dr. Godfrey Heathcote	Clinico-pathological case studies
Dec 19/18	Dr. Darrell Lewis & Dr. Harald Gjerde	Holiday Rounds
Jan 2/19	Dr. Erdit Celo & Dr. Aishwarya Sundaram	Morbidity & Mortality Rounds
Jan 9/19	Dr. Peter Green	The intersecting worlds of dermatology and ophthalmology: A case based approach
Jan 16/19	Dr. Tom Zhao	Intraocular tumors
Jan 23/19	Dr. Louis Racine*	The visual impact of the ocular surface in cataract surgery
Jan 30/19	Dr. Amit Mishra	Leber Congenital Amaurosis
Feb 6/19	Dr. Aishwarya Sundaram	Missing data
Feb 13/19	Dr. Mishari Dahrab	The ways of the warrior: Applying military strategies to refract children
Feb 20/19	Dr. Cynthia Qian*	Inherited retinal diseases - Imaging and management in the clinic
Feb 27/19	Dr. Graham Dellaire	CRISPR Gene editing - Clinical applications and ethical concerns
Mar 6/19	Dr. Erdit Celo	Lebers Hereditary Optic Neuropathy
Mar 13/19	Dr. Jennifer Gao	High EVP related glaucoma
Mar 27/19	Dr. Rishi Gupta	A short sighted talk: Adventures in myopia

*** Visiting Professor Program**

Visiting Professor Program

Dr. Luis Ospina
Subspecialty: Pediatrics/genetics

Département d'ophthalmologie
Université de Montréal
Mitochondrial dysfunction and the eye
April 4, 2018

Dr. Eric Suhler
Subspecialty: Uveitis

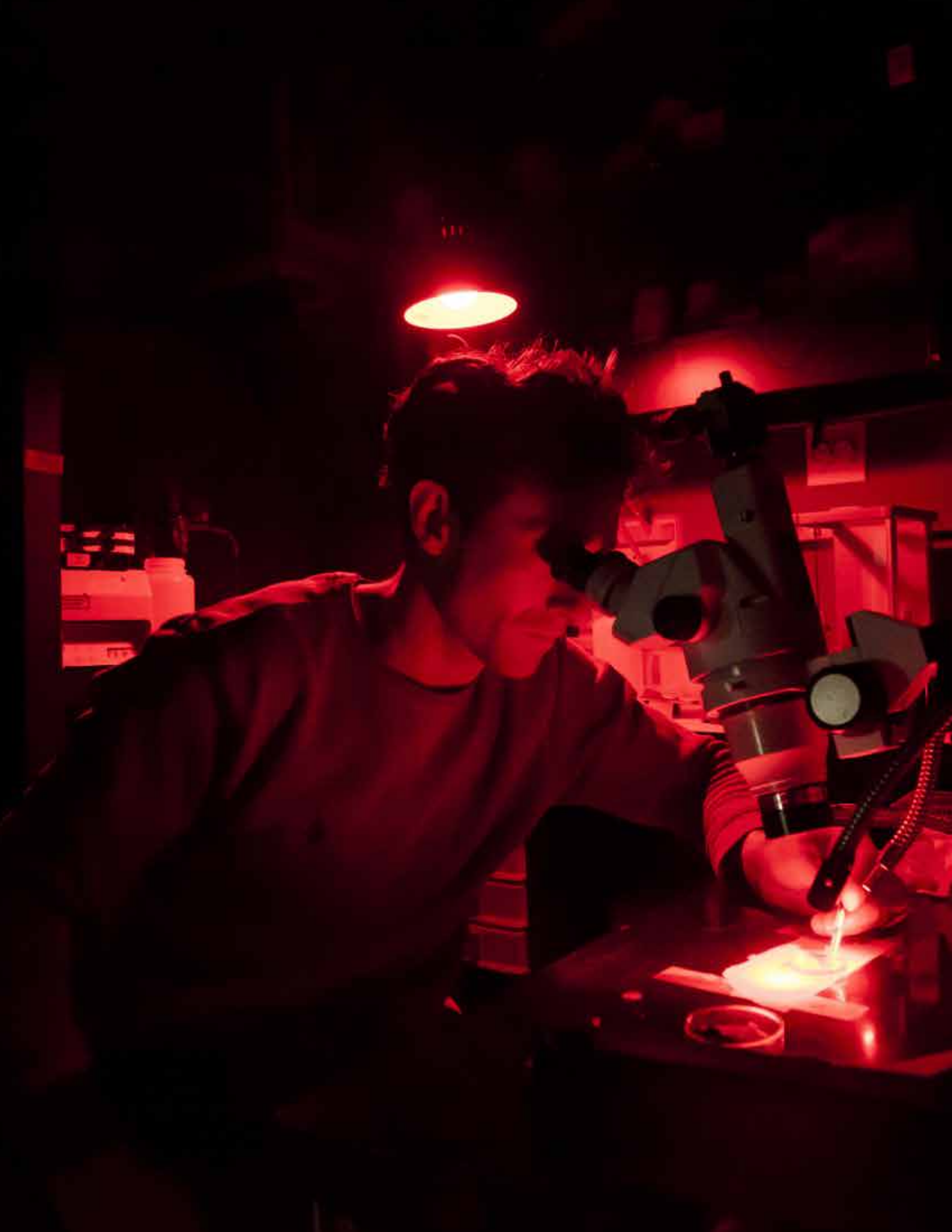
Department of Ophthalmology
Oregon Health & Science University
Uveitis Biologic warfare for uveitis:
Updates on therapy in 2018
June 13, 2018

Dr. Louis Racine
Subspecialty: Cataract/Refractive Surgery

Département d'ophthalmologie
Université de Montréal
Cataract/Refractive Surgery – The Visual Impact of the Ocular Surface in Cataract Surgery
January 23, 2019

Dr. Cynthia Qian
Subspecialty: Retina

Département d'ophthalmologie
Université de Montréal
Retina – Inherited retinal diseases – Imaging and management in the clinic
February 20, 2019



Message from Research Director

Balwantray Chauhan, *PhD*
Research Director

We are pleased to present the Annual Research Report for 2018. 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.

In this report you will find information on the new faces in research and our new and ongoing research activities. 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, Dalhousie Medical Research Foundation 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 our senior administrative team (Leah Wood (on maternity leave), Andrea Titterness, Tomma MacDonald, Carol MacNeil, Jennifer Milligan, Chris Phillips and Susan Smith), who have all contributed to the compilation and development of 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.

Research Profile - Johane Robitaille

Dr . Johane Robitaille attended the Université de Laval, in her native hometown of Laval, QC, for her residency. While at the Université of Laval, Dr. Robitaille decided that she wanted to make research an important part of her career after witnessing her mentor, Dr. Helene Boisjoly, navigate and organize new research collaborations with fellow researchers. Their discussions regarding the intricacies of research and its clinical importance made a lasting impression on Dr. Robitaille and ignited her passion for research. After completing her residency, Dr. Robitaille began a fellowship in Pediatric Ophthalmology and Oculogenetics at Johns Hopkins University, where she continued her research work in genetics. Following her fellowship, Dr. Robitaille chose to work at the IWK Health Care Centre and Dalhousie University because of the ideal research collaborations, clinical environment, and research opportunities afforded by these institutions.

Dr. Robitaille has developed a world-renowned research program in oculogenetics that focuses on developmental retina vascular diseases. One of Dr. Robitaille's main research focuses is to identify genes that cause Familial Exudative Vitreous Retinopathy (FEVR). Her interest in this field started when a 6-week-old patient who was blind because of FEVR presented to her clinic during the first year of her practice at the IWK Eye Care Centre. Further investigations by Dr. Robitaille into the genetic make-up of this patient and his extended family lead to the discovery a FEVR gene in 2002 and her extensive genetic FEVR research program evolved from there.

Dr. Robitaille and her team now have one of the largest databases of FEVR samples in the world. They have published the discovery of two FEVR genes and are working on the publication of three new genes for this disease. Dr. Robitaille's team uses mouse models of FEVR to better understand the disease pathways and to investigate novel therapeutic treatments. Additionally, they use gene sequencing technologies to detect molecular modifiers of FEVR and to help identify patients who will be more severely affected by FEVR. Dr. Robitaille also works with other model systems, including cell culture, yeast, and zebrafish, to examine molecular and pathological connections, discover genes and investigate treatments in other diseases that affect retinal vascular development such as retinopathy of prematurity (ROP).

Research Day

On April 9, 2018, faculty and students attended the 29th Annual Department of Ophthalmology and Visual Sciences Research Day, a full-day symposium at the Westin Nova Scotian. This event showcased the current basic science and clinical research carried out in our department and in collaboration with departments both within and outside Dalhousie.

The Keynote Lecturer, Dr. Wallace Alward, from the University of Iowa, delivered two excellent presentations entitled “A Thirty Year Journey with a Glaucoma Family” and “Changing the Way We Teach” and was recognized by Dean David Anderson as the *Dalhousie 150 years Ophthalmology Guest Faculty*.

Congratulations to the 2018 Research Day Award winners:

Resident Category

1st Prize: Dr. Harald Gjerde “The utility of a fzd4-/- zebrafish model in the screening of novel treatments for familial exudative vitreoretinopathy (FEVR)”

2nd Prize: Dr. William Best “Dalhousie medicine – Undergraduate ophthalmology education – Targeted needs assessment”

Junior Trainee Category

1st Prize: Delaney Henderson “Characterizing longitudinal in vivo changes of RGC in a model of experimental glaucoma”

Senior Trainee Category

1st Prize: Brennan Eadie “Optical coherence tomography parameters distinguishing post-acute phase ischemic and glaucomatous optic neuropathies”

10th Annual Atlantic Eye Symposium

The 10th Annual Atlantic Eye Symposium was held on September 21 & 22, 2018, at the NEW Halifax Convention Centre. The 4th Annual Ophthalmic Allied Health Personnel Education Day was held in conjunction with the Atlantic Eye Symposium. We had another outstanding Symposium, highlighted by an impressive list of guest speakers:

Dr. Richard Allen, Baylor College of Medicine, University of Texas, Anderson Cancer Center, Oculoplastic Surgery

Dr. Kathleen Digre, University of Utah, Neuro-Ophthalmology

Dr. Darrell Lewis, Royal Victorian Eye and Ear Hospital , Cornea

Dr. Parag Majmudar, Chicago Cornea Consultants Ltd., Cornea

Dr. Bryce Ford, University of Calgary, Glaucoma

Dr. Pradeep Ramulu, Johns Hopkins, Glaucoma

Dr. Robert Devenyi, University of Toronto, Donald K. Johnson Eye Institute, Retina

Dr. Brennan Eadie, Dalhousie University, Glaucoma

Dr. Christopher Sales, Weill Cornell Medicine, Cornea

Dr. Tamer Mahmoud, Oakland University, Retina

Dr. Harry Quigley, Johns Hopkins, Wilmer Eye Institute, Glaucoma

Dr. David Sarraf, UCLA Stein Eye Institute, Retina

Many people contributed to the success of the Symposium, and we thank the organizing Committee for its efforts to ensure another excellent educational event. Organizing Committee Members include: Drs. Arif Samad, Marcelo Nicolela, Chris Seamone, Curtis Archibald, Dan Belliveau and Ms. Laura Irons.

Dr. Kathleen Digre, University of Utah, delivered the inaugural Dr. Aditya Mishra Lecture in Neuro-Ophthalmology during the recent Atlantic Eye Symposium. Dr. Charles Maxner chaired the session.

Form & Function

The Dalhousie University Department of Ophthalmology and Visual Sciences hosted the 8th Biennial Form & Function in Ocular Disease Symposium on October 19-20, 2018. This multi-disciplinary clinical and basic science symposium featured local and guest faculty who are world-class leaders in diverse areas of ophthalmology and vision research ranging from vision restoration in retinal disease to ocular surface health. This year's guest faculty included:

James Fujimoto, Ph.D., Massachusetts Institute of Technology
History, evolution and future prospects of optical coherence tomography

Brenda Gallie, M.D., University of Toronto
Zero deaths from rare cancer in baby eyes: A global pilot project

John Dowling, Ph.D., Harvard University
Reconstructing the human fovea

Joseph Demer, M.D., Ph.D., University of California, Los Angeles
Glaucoma as a repetitive strain injury to the optic nerve

Jennifer Hunter, Ph.D., University of Rochester
Seeing the retina at work through the living eye

Gordana Sunaric Mégevand, M.D., Clinical Eye Research Centre Memorial A. de Rothschild
A journey through the gaze of an artist: Genius, sickness or both?

Albert Jun, M.D., Ph.D., Johns Hopkins University
What the Fuchs! Everything you wanted to know and more about Fuchs endothelial corneal dystrophy

Ernst Tamm, M.D., University of Regensburg
To live or let die: Growth factor signaling in glaucoma and beyond

Cynthia Toth, M.D., Duke University
A revolution in live 3D information: OCT-guided retinal surgery

The symposium also provided the opportunity for trainees to present their research. Trainee award winners were selected from a pool of applicants who are pursuing research endeavors at various Canadian academic institutions. Congratulations to the 2018 trainee award winners:

Tareq Yousef, B.Sc., Dalhousie University
Melanopsin immunoreactive neurons in the fish retina

Syed Mohammad, B.Sc., University of Ottawa
Impact of head tilt on optical coherence tomography image orientation

Delaney Henderson, B.Sc., Dalhousie University
Characterizing longitudinal in vivo changes of RGCs in a model of experimental glaucoma

Harald Gjerde, B.Sc., M.D., Dalhousie University
The utility of a fzd4-/- zebrafish model in the screening of novel treatments for familial exudative vitreoretinopathy (FEVR)

Resident Research

NAME	YEAR	SUPERVISOR	PROJECT TITLE
Dr. William Best	PGY 5	Dr. Daniel Belliveau	Dalhousie medicine undergraduate ophthalmology education: Targeted
Dr. Aaron Winter	PGY 5	Dr. Alon Friedman	Pilot study into the utility of fluorescein angiography-based computer algorithm assessment of retinal vascular health in
Dr. Wesley Chan	PGY 4	Dr. Jai Shankar	Transverse venous sinuous stenosis on magnetic resonance imaging in patients with idiopathic intracranial hypertension
Dr. Harald Gjerde	PGY 4	Drs. Johane Robitaille, Jason Berman, Chris McMaster	The utility of a FZD4 knockdown zebrafish model in the screening of novel treatments for familial exudative vitreoretinopathy (FEVR)
Dr. Tom Zhao	PGY 4	Dr. Francois Tremblay	Photoswitch compounds as a chemical visual prosthesis in an acquired model of retinal degeneration
Dr. Danielle Cadieux	PGY 3	Dr. Anuradha Mishra & Mark Goldszmidt	A grounded theory study of self-directed learning approaches to operative education in senior surgical residents at
Dr. Amit Mishra	PGY 3	Dr. William Baldridge	Effects of cannabinoids on retinal ganglion cell signaling in the mouse
Dr. Aishwarya Sundaram	PGY 3	Drs. Christopher Seamone and Dan O'Brien	Settle plate testing to measure air quality testing in a tertiary care ophthalmology department
Dr. Erdit Celo	PGY2	Dr. Meanie Kelly	Effects of cannabinoid receptor agonists on ocular inflammation in an endotoxin-
Dr. Erdit Celo	PGY2	Dr. Robert LaRoche	Design and validation of a new simulated strabismus surgery model
Dr. Erdit Celo	PGY2	Dr. Jayme Vianna	Appraising the quality of meta-analysis in the glaucoma literature
Dr. George Talany	PGY2	Drs. Rishi Gupta, Anu Mishra, **Chambers**	The effect of preoperative animated videos on patients undergoing cataract surgery—Anxiety, satisfaction,
Dr. Devin Betsch	PGY1	Drs Rishi Gupta, Andrew Orr	A family affair: two cases of familial optic disc pits
Dr. André Pollmann	PGY1	Drs. Darrell Lewis, Rishi Gupta	Structural integrity of hydrophobic acrylic intraocular lens with eyelets (enVistaTM) in an experimental model of transscleral

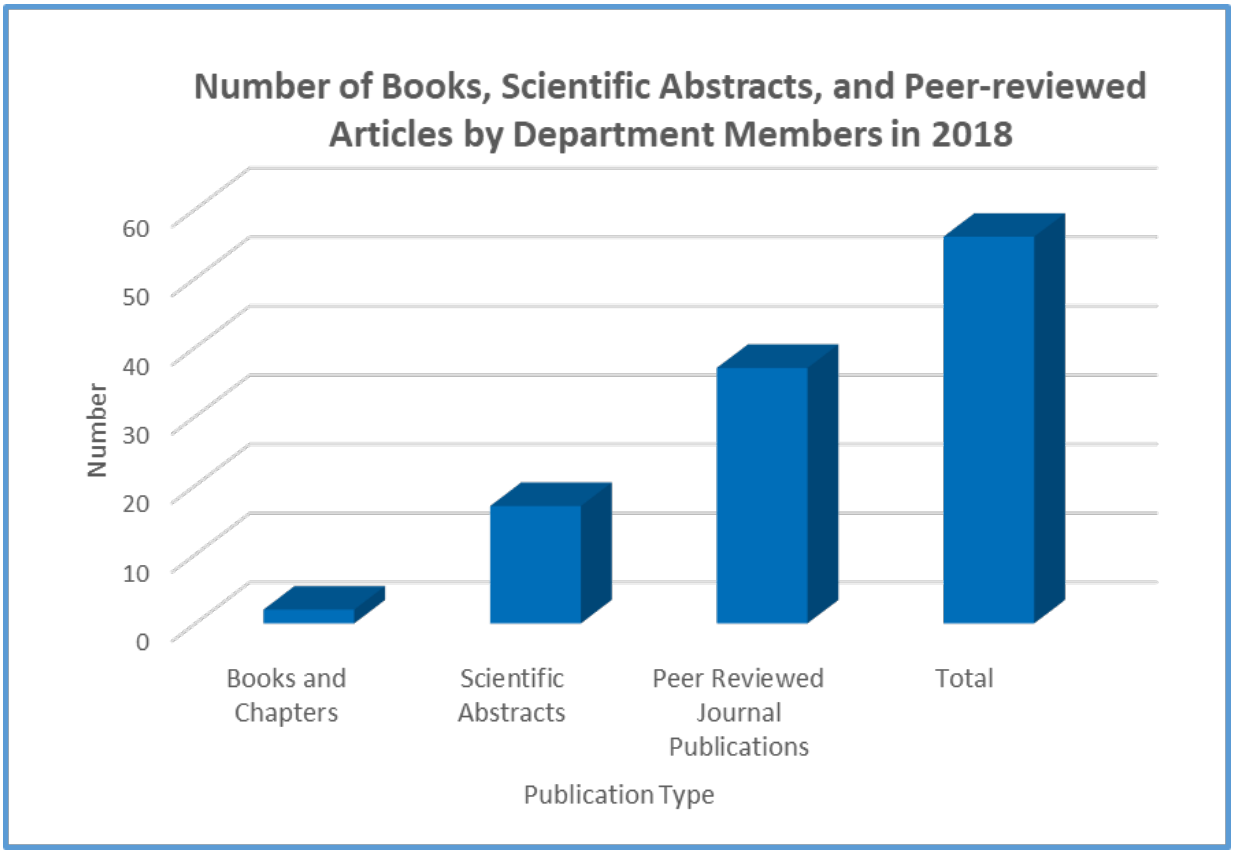
Trainee Research

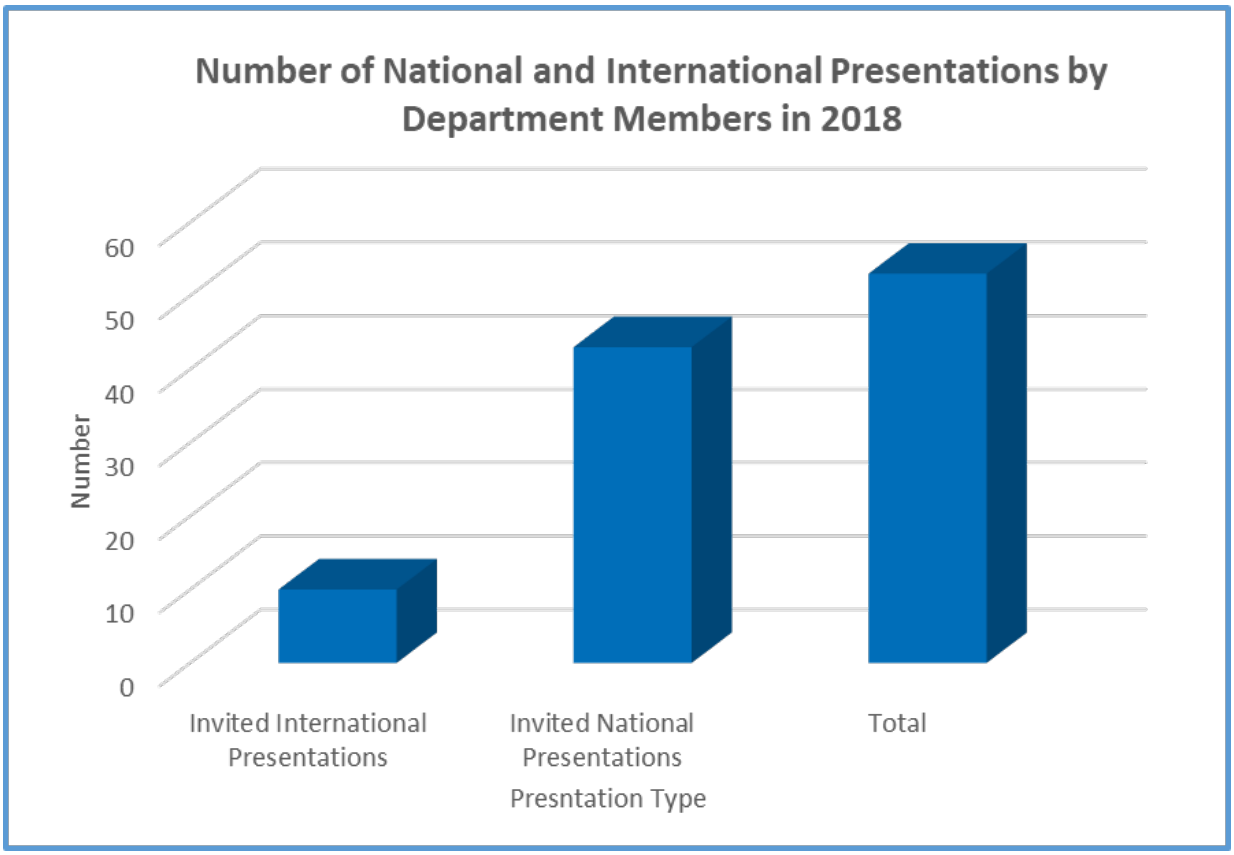
Name	Program	Supervisor(s)	Project Title
Jessica Carr	MSc Clinical Vision Science	Dr. William Baldridge	Calcium Dynamics of Ganglion Cell Layer Neurons in rd1 Mice
Skye McIntosh	BSc Neuroscience	Dr. William Baldridge	Halibut Retinomotor Movement Before and After Metamorphosis
Mark Saldhana	BSc Neuroscience	Dr. William Baldridge	Melanopsin in the Zebrafish Retina
Tareq Yousef	PhD Medical Neuroscience	Dr. William Baldridge	Melanopsin Neurons in the Teleost Retina
Elyse Duggan	BSc, Medical Sciences	Dr. Balwantray Chauhan	Comparisons Between Optical Coherence Tomography Angiography and Matched Immunohistochemistry in the Mouse Retina
John Gobran	BSc Pharmacology	Dr. Balwantray Chauhan	Effects of 3D Stratification of Retinal Ganglion Cells in Sholl Analysis
Delaney Henderson	MSc, Medical Neuroscience	Dr. Balwantray Chauhan	Characterization ofAAV2-CAG-GCaMP6f as a Tool for Functional Imaging
Kazunori Hirasawa	Postdoctoral Research Fellow	Dr. Balwantray Chauhan	Explore the Structure-Function Relationship Among VF, OCT, and OCT-A
Douglas Iaboni	BSc Medicine	Dr. Balwantray Chauhan	Characterization of retinal ganglion cell subtype expression of yellow fluorescent protein in the Thy1-YFP line H trans-
Syed Mohammad	BSc Medicine, University of Ottawa	Dr. Balwantray Chauhan	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
Brooklyn Rawlyk	BSc Medical Sciences	Dr. Balwantray Chauhan	Impact of an Elevated, Sustained Intraocular Pressure on RGCs in a Murine Model of Glaucoma
Corey Smith	Fellowship	Dr. Balwantray Chauhan	Imaging and Visualizing Retinal Blood Flow
Justine Sy	MSc Clinical Vision Science	Dr. Balwantray Chauhan	Functional Retinal Ganglion Cell Activity After Light Induced Damage in Mice
Emma Courtney	BSc Medical Sciences	Dr. Melanie Kelly	Cannabinoids in Ocular Indications
Po Shan Margaret Luke	Postdoctoral Fellowship	Dr. Melanie Kelly	Cannabinoids in Ocular Disease or Injury
Jon Sung Yam	Summer Student	Dr. Melanie Kelly	Cannabinoids in Ocular Indications

Trainee Research

Name	Program	Supervisor (s)	Project Title
Sara Vander Ende	Master Student	Dr. Johane Robitaille Dr. C McMaster	Discovering Genes for Familial Exudative Vitreoretinopathy
Elizabeth Cairns	Postdoctoral Fellow	Dr. Johane Robitaille Dr. C McMaster	Development of Novel Therapeutics for the Treatment of Rare Ocular Developmental Vascular Disorders
Harald Gjerde	Ophthalmology Resident	Dr. Johane Robitaille Dr. J Berman	Evaluating the Utility of Zebrafish Models in Developing New Treatments for Familial Exudative Vitreoretinopathy
Sonia Manuchian	Masters Student (Orthoptics)	Dr. Johane Robitaille	Assessing the Binocularity of ROP Patients Treated with Laser Versus Anti-VEGF Therapy
Jonah Brodeur	BSc Medical Sciences	Dr. François Tremblay	Change in Intrinsic Activity of Retinal Ganglion Cells During Induced Retinal Degeneration
Heather Gerrie	BSc Biological Sciences	Dr. François Tremblay	In-Vivo Evaluation of Vision Restoration with Photoswitch BENAQ
Mike Craig	MSc Clinical Vision Science	Dr. François Tremblay	Interocular Inhibition: An Opportunity to Determine how Binocular Integration is Taking Place Within Various Visual Areas of the Occipital Cortex
Lianne Esmores	MSc Clinical Vision Science	Dr. Francois Tremblay	Short- vs. Long-term Retinal Challenges by Antiepileptic Vigabatrin
Ben Smith	Post-Doctorate Physiology and Biophysics	Drs. François Tremblay & Balwantray Chauhan	Dendritic Retraction and Associated Physiological Responses in Retinal Ganglion Cells in Experimental Glaucoma
Faisal Jarrar	Medicine	Dr. Jayme Vianna	Comparison of OCT and Disc Photos to Detect Glaucoma Progression
Jack Quach	BSc Medical Sciences	Dr. Jayme Vianna	Asymmetry of Peripapillary Retinal Blood Vessels Positions Between Right and Left Eyes
Jacklyn Stewart	BSc Medical Sciences	Dr. Jayme Vianna	The Effect of Age and Descent on Retinal Layer Thickness in Normal Eyes
Herman Stubeda	Medicine	Dr. Jayme Vianna	Comparison of Visual Field Criteria to Diagnose Glaucoma

Publication Facts and Figures





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Gjerde H, **Mishra A** (2018). Clinical Images: Contact lens-related Pseudomonas aeruginosa keratitis in a 49-year-old woman. *CMAJ*, 190(2), E54. [Case Report - Published] DOI: 10.1503/cmaj.171165.

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David Forner, MD; Derek Wilke, MD, MSc; Matthew Rigby, MD, MSc; Sidney Croul, MD; **Anuradha Mishra**, MD; Emad Massoud, MB, MSc; David B Clarke, MDCM, PhD; Nathan Lamond, MD (2018). Cavernous sinus involvement in human papillomavirus associated oropharyngeal squamous cell carcinoma: case report of an atypical site of distant metastasis. *Journal of Otolaryngology- Head and Neck Surgery*, 47(32). [Case Report - Published] DOI: 10.1186/s40463-018-0280-0.

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Zangalli CES, Reis ASC, **Vianna JR**, Vasconcellos JPC, Costa VP (2018). Interocular Asymmetry of Minimum Rim Width and Retinal Nerve Fiber Layer Thickness in Healthy Brazilian Individuals. *Journal of glaucoma*. [Published] PubMed ID: 30199465.

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Scientific Abstracts

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Lewis DR, Stewart RM, Chan E. Quantifying risk factors for Descemet Stripping Automated Endothelial Keratoplasty dislocation. [Poster] The Association for Research in Vision and Ophthalmology (Honolulu, HI, USA), April 2018.

Haomin Luo H, Julian Weichsel, Stuart Keith Gardiner, Juan Reynaud, Christy Hardin, Cindy Albert, **Jayme R Vianna**, Glen Sharpe, Victoria R Lanoe, Jack Quach, Shaban Demirel, Brad Fortune, **Balwantray C Chauhan**, Claude F Burgoyne, Hongli Yang. Automated Segmentation of the Anterior Lamina Cribrosa Surface (ALCS) within Optic Nerve Head (ONH) Optical Coherence Tomography (OCT) B-scans. [Poster] 2018 ARVO Annual Meeting (Honolulu, USA), April 2018.

Hongli Yang, Haomin Luo, Christy Hardin, Cindy Albert, Danielle Millay, **Jayme R Vianna**, Glen Sharpe, Galen Williams, Shaban Demirel, Brad Fortune, Stuart Keith Gardiner, **Balwantray C Chauhan**, Claude F Burgoyne. The Relative Ability of Optical Coherence Tomography (OCT) Structural Parameters to Detect Structural Abnormality in Glaucoma Suspect and Glaucoma Eyes. [Poster] 2018 ARVO Annual Meeting (Honolulu, USA), April 2018.

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Grewal PS, Lapere SRJ, **Gupta RR**, Greve M. Macular Buckle Without Vitrectomy For Myopic Macular Schisis - A Canadian Case Series. [Poster] 2018 Canadian Ophthalmology Society Meeting (Toronto, ON), May 2018.

Gjerde H, **Chan W**, **Lewis D**R, **Samad A**, **Rafuse P**. Complications of ocular self-tattooing: A case report. [Poster] Canadian Ophthalmological Society (Toronto, ON, Canada), June 2018.'

Hussain A, Armstrong D, Harvey JT. Nasal pepsinogen and pH in Primary Acquired Nasolacrimal Obstruction. [Poster] Canadian Ophthalmological Society (Toronto, Ontario), June 2018.

Iaboni D, **Seamone M**, **Gupta RR**. Surgical Repair of a Persistent Full-Thickness Retinal Fold through the Fovea Secondary to Hypotony. [Poster] 2018 Canadian Ophthalmology Society Meeting (Toronto, ON), June 2018.

Hutnik C, Crichton A, Ford B, **Nicolela M**, **Shuba L**, Bir Ct, Sogbesan E, Damji K, Dorey M, Saheb H, Guo H, Klar N, Gozdzik D, Hodge W. SLT repeatability, the Canadian multicenter RCT. [Poster] 2018 COS Annual Meeting (Toronto, ON, Canada), June 2018.

Topouzis F; **Nicolela M**; Lerner F; Bell K; Tatham AJ; Denis F; Goldberg I; Ridolfi A; Hubatsch D. The additive intraocular pressure-lowering effect of twice -daily brinzolamide 1%/brimonidine 0.2% fixed-dose combination in patients with glaucoma or ocular hypertension receiving prostaglandin analog: A 6-week, double-masked, randomized study. [Poster] World Ophthalmology Congress 2018 (Barcelona, Spain), June 2018.

Thorne M, **Maxner C**. Cavernous sinus masses: a unique case and review of the literature. [Poster] Canadian Neurological Sciences Federation (Halifax, NS), June 2018.

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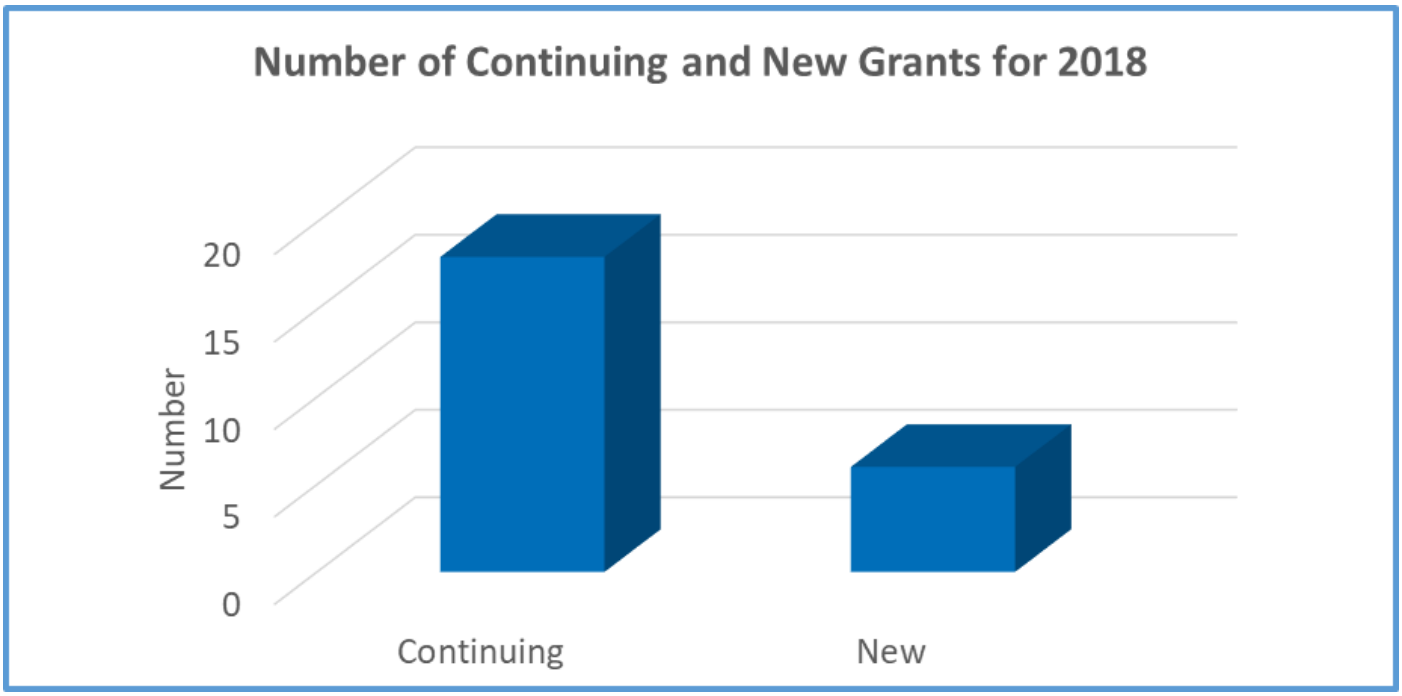
Other Publications

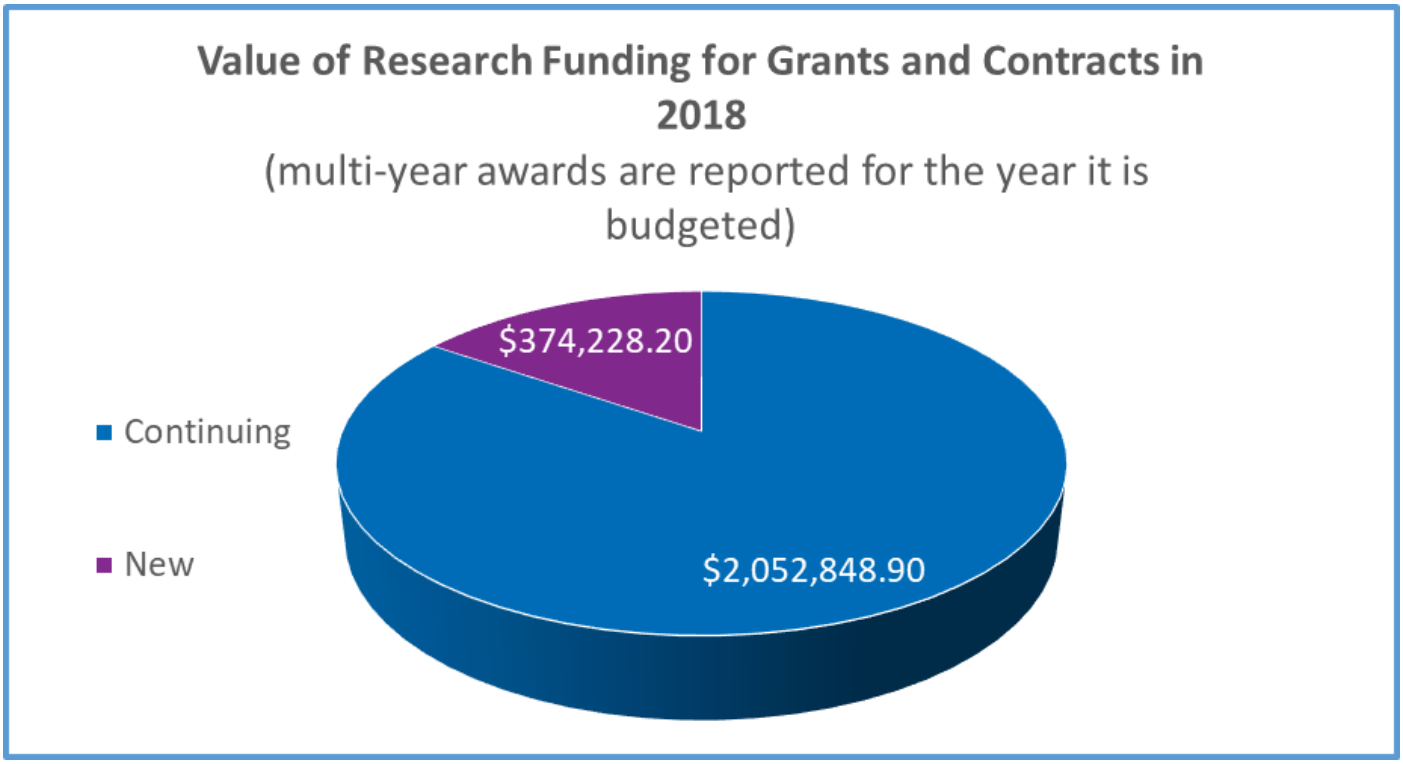
Mishra AV, **Seamone ME**, **Lakosha H**, **Gupta RR** (2018) *The Road Less Travelled* - Canadian Retina Society Website [Online Resource]

Wood L, Bottomley B, **Vianna J**, **Eadie B**, **Gjerde H**, Hutchison D, **Dyachok O**, **Smith S** (2018) *Glaucoma Facts and Future Directions* - Dalhousie University Department of Ophthalmology and Visual Sciences [Video]

Eadie B, **Nicolela M** (2018) *Assessing Function in Glaucoma* - Glaucoma Australia [Online Resource]

Research Funding Facts & Figures





New Research Grants

1. Oystreck D, Cameron, R, van Iderstine S, **Tremblay F**, LaRoche GR (2018 - 2019). Development, enhancement and gamification of vision tests in virtual reality [Grant] - Innovacorp's Early Stage Commercialization Fund - $50,000.

2. Tremblay F, Chauhan, BC (2018 - 2019). Dendritic retraction and associated physiological responses in retinal ganglion cells in experimental glaucoma [Grant] - Glaucoma Research Society of Canada - $19,372.

3. Chauhan BC (2018 - 2023). Optic nerve changes in glaucoma (unrestricted funding) [Grant] - Heidelberg Engineering - $650,000.

4. Eadie B, **Nicolela MT** (2018 - present). Evaluation of the Ability of Optic Coherence Tomography to Distinguish Glaucomatous from Ischemic Optic Neuropathy [Grant] - Glaucoma Research Society of Canada - $10,000.

5. Chauhan BC (2018 - 2023). Novel imaging targets for detecting early progression of glaucoma [Grant] - CIHR - $730,576.

6. Torres LA, Chauhan BC, Vianna JR (2018 - 2019). Influence of Bruch's membrane opening area on the diagnostic performance of optical coherence tomography [Grant] - Glaucoma Research Society of Canada - $18,741.

Continuing Research Grants

1. Tremblay F, **Chauhan BC** (2017 - 2018). Dendritic retraction and associated physiological responses in glaucomatous neuropathy: an CSLO and MEA study [Grant] - Glaucoma Research Foundation of Canada - $19,947.

2. Chauhan BC (2017 - 2019). Modelling the deep optic nerve head of patients with glaucoma [Grant] - NSHRF - $24,927.

3. Baldridge WH (2017 - 2022). Modulation of horizontal cells in the vertebrate retina [Grant] - NSERC - $130,000.

4. Chauhan BC (2017 - 2022). Calcium dynamics in retinal ganglion cells [Grant] - National Science and Engineering Council - $140,000.

5. Chauhan BC (2017 - 2020). Detecting the earliest progression of glaucoma with optical coherence tomography angiography [Grant] - Alcon Research Institute - $230,000.

6. McMaster C, **Robitaille JM** (2016 - 2021). A Treatment for the Inherited Childhood Blinding Disorder Familial Exudative Vitreoretinopathy [Grant] - CIHR - $750,000.

7. Chauhan BC (PI), **Tremblay F** (Coll) (2016 - 2021). Structural and functional changes in the retina and optic nerve in experimental glaucoma [Grant] - CIHR - $672,760.

8. McMaster C, **Robitaille JM**, Berman J, Hoffman E, Kanneboyina Nagaraju (AGADA Biosciences Inc), Dalhousie University Industry Liaison and Innovation, the Centre for Drug Research and Development and AGADA Biosciences Inc (2016 - 2021). A Scientific and Clinical Hub for Orphan Drug Development [Grant] - Atlantic Innovation Fund - $4,505,000.

9. Shuba LM, **Nicolela MT** (2016 - 2018). 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 el [Industry Contract] - Aerie Pharmaceuticals Inc. - $118,475.

10. **Cruess A**, **Gupta RR** (2016 - 2020). Safety and Efficacy of Abicipar Pegol (AGN-150998) in Patients With Neovascular Age-related Macular Degeneration. (SEQUOIA) [Industry Contract] - Allergan - $506,315.

11. Nicolela MT (2015 - present). The Efficacy and Safety of Bimatoprost SR in Patients with Open-angle Glaucoma or Ocular Hypertension [Industry Contract] - Allergan Inc. - $404,862 (USD).

12. Nicolela MT. (2015 - present). Additive effect of twice-daily brinzolamide 1% /Brimonidine 0.2% fixed dose combination as adjunctive therapy to a prostaglandin analogue [Industry Contract] - Alcon Research Ltd. - $50,900.

13. Chauhan BC (2015 - 2020). Alcon Research Institute Award and Matching Funds from QEII Foundation [Grant] - Alcon Research Institute - $225,800.

14. Cruess A, **Gupta RR** (2015 - 2020). Peripheral Diabetic Retinopathy (DR) Lesions on Ultrawide-field Fundus Images and Risk of DR Worsening Over Time. (Protocol AA) [Grant] - National Eye Institute/National Institutes of Health (NEI/NIH) - $124,700.

15. Tremblay F (2015 - 2020). Determinants of Signal Characteristics in a Retinal Network: Contribution of Local Field Potentials and Spike Trains [Grant] - NSERC - $120,000.

16. Dickinson J, **Cruess A**, **Gupta RR** (2015 - 2020). A Multicenter, Prospective Epidemiologic Study of the Progression of Geographic Atrophy Secondary to Age−Related Macular Degeneration (PROXIMA B) [Industry Contract] - F. Hoffmann-La Roche Ltd. - $169,812.

17. Cruess A, **Gupta RR** (2015 - 2019). A Two-Year, Randomized, Double Masked, Multicenter, Three-Arm Study Comparing the Efficacy and Safety of RTH258 versus Aflibercept (Eylea®) in Subjects with Neovascular Age-Related Macular Degeneration (HAWK) [Industry Contract] - Alcon Research Inc. - $488,774.

18. Cruess A, **Gupta RR**, **Dickinson J** (2015 - 2018). A Phase III, Multicenter, Randomized, Double-Masked, Sham-Controlled Study to Assess the Effiacy and Safety of Lampalizumab Administered Intravitreally to Patients with Geographic Atrophy Secondary to Age-Related Macular Degeneration. (CHROMA GX29176) [Industry Contract] - Hoffmann-La Roche Ltd. - $348,680.

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