



# Department of Biology Newsletter

Friday, November 28, 2014

UNIVERSITY OF VICTORIA

Amanda McLaughlin

## *Nonlinear dendritic integration of electrical and chemical synaptic inputs mediates fine-scale neural correlations*

For some time, the retina was thought to work much like a camera; with individual cells in the retina thought to capture one pixel worth of information, and send that information to the appropriate cells in the brain. However, if this were the case, due to the limited bandwidth of the optic nerve (the bundle of cable-like projections connecting the retina to the brain), our visual acuity would be poor. Many labs in the last couple decades have therefore been identifying what kind of computations the retina itself is making, prior to sending this information to the brain. In other words, how is the retina transmitting so much information to the brain, with so few cables?

In this paper, our lab discovered that this one-to-one communication between cells in the retina and cells in the brain, is only the first type of information the brain is receiving about the visual world. We found that within a subpopulation of ganglion cells (Hb9+ direction-selective ganglion cells), cells communicate amongst each other, in order to drive different patterns of activity in the network. This means that the brain is not only learning about the visual world based on signals from individual cells, but that it can also be provided with additional clues, based on the pattern of activity of the whole population of ganglion cells. Specifically, we demonstrated that if two cells send signals at the same time (which we call a correlated signal), versus signals that are out of sync, the brain can tell whether the retina is seeing one object or two, and also what the contrast of that object is. If these cells were not communicating with each other, only one of these pieces of information could be correctly transmitted.

However, to know that additional processing was being done in the retina was not sufficient. We needed to find out how the ganglion cells were communicating with others to drive these patterns of activity. Cells in the retina (and in the brain) typically communicate with each other using chemical signals, however in some cases, cells in the brain use electrical signals to communicate with each other instead. We discovered that our subpopulation of ganglion cells actually uses both chemical and electrical signalling. As such, these cells send signals to the brain using chemical signals, but communicate amongst themselves using electrical signalling. Electrical signalling is much faster than chemical signalling, and as such, an electrical signal from one cell can quickly spread to its neighbors, and can influence the message that is communicated by the neighboring cells to the brain.

Amanda's paper was published on Nature Neuroscience, December issue.

<http://www.nature.com/neuro/journal/v17/n12/full/nn.3851.html>

### Inside this issue:

AMANDA MCLAUGHLIN

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OPPORTUNITIES



Amanda McLaughlin  
PhD Candidate,  
Department of Biology  
Photo by Heather Down

## Upcoming Seminars

### Biology

**Karyn Suchy**

PhD Candidate  
Department of Biology  
University of Victoria

*"The importance of estimating crustacean zooplankton production in coastal marine ecosystems"*

Friday, November 28, 2014 at 2:30 pm CUN 146

### Biochemistry Microbiology

**Dr. Christopher Loewen**

Department of Cellular and Physiological Sciences  
University of British Columbia

*"Molecular tethers between endoplasmic reticulum and mitochondria, and ER and plasma membrane control lipid traffic and cell polarization"*

Friday, November 28, 2014 at 1:30 pm ECS 124

### Division of Medical Sciences

**Dr. Bernard Jasmin**

Professor and Vice-Dean of Research, Faculty of Medicine  
University of Ottawa

*"RNA-binding proteins and post-transcriptional events controlling expression of synaptic proteins at the neuromuscular junction: Insights for designing novel therapeutics"*

Friday, November 28, 2014 at 12:00 (noon) MSB 160

### Biology

**Dr. Declan Ali**

Department of Biological Sciences  
University of Alberta

*"Factors involved in the development of excitatory synapses: a zebrafish perspective"*

Co-sponsored by



Friday, December 5, 2014 at 2:30 pm CUN 146

## Calendar

### Important Dates:

**Monday, December 1**

Deadline to apply to graduate for Spring 2015 Convocation

**Wednesday, December 3**

National Day of Remembrance and Action on Violence Against Women. Classes and exams cancelled from 11:30 am to 12:30 pm

**Friday, December 5**

Senate meets



## Workshops

### Pathways to Success/ Career development workshops for grad students

Friday, November 28

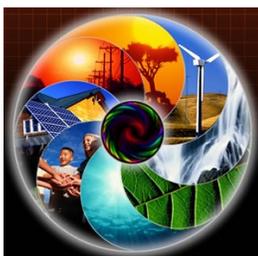
Using LinkedIn for Your Work Search 1:30 to 3:00 pm

McPherson Library 129

Learn more and register: [uvic.ca/coopandcareer/pathways](http://uvic.ca/coopandcareer/pathways)

## What can you do with your degree?

Sign up for these sessions to learn about career options in a range of industries.



If you have an event or story you would like to share in the Biology Newsletter, please e-mail:

[biology@uvic.ca](mailto:biology@uvic.ca) or [bioclerk@uvic.ca](mailto:bioclerk@uvic.ca)

## Provost's Diversity Research Forum

### Privilege and Prejudice: Assumptions in Learning

The Provost's Diversity Research Forum welcomes courageous conversations that explore assumptions, privileges and prejudices behind learning in all its forms. Through theatre performances, engaging keynote speakers, innovative panel discussions and facilitated conversations, many concepts of difference will be explored: gender, gender identity, sexuality, cognitive abilities, social class, poverty, religion, ethnicity, race, mental health, Indigenous issues, global worldviews, and the complex interactions between them.

Keynote speakers:

**Drew Hayden Taylor** is a prolific and awards-winning Ojibway writer known for his imaginative plays, witty comedies and poignant dramas. His novel *Motorcycles & Sweetgrass* (2010) was a finalist in the Governor General's literary Awards

**Joe Guppy** is a well-known writer/performer on the Seattle comedy show *Almost Live*. He is now a psychotherapist in private practice who works with adults and couples, and leads workshops on creativity, communication, sexuality, anger management, suicide prevention and more.

Everyone welcome— Students, faculty, staff and community members. Registration is FREE.

All rooms are accessible: First Peoples House and Student Union Building.

Sponsors include: Campus Security Services, Human Resources, Office of the Research Services, and Student Affairs.

For more information visit [uvic.ca/diversityforum](http://uvic.ca/diversityforum) or contact [diverse@uvic.ca](mailto:diverse@uvic.ca)



University  
of Victoria

## Summer Graduate Course

### Summer Graduate Course at Friday Harbor Laboratories, WA, USA

Fish Swimming: Kinematics, Ecomorphology, Behaviour and Environmental Physiology

July 20 to August 21, 2015

5 weeks: M-F 8-5; S 8-12

FHL/FISH 528 B (9 credits)



Instructors: Dr. Paolo Domenici (CNR, Italian National Research Council, Italy)

Dr. John Steffensen (University of Copenhagen, Denmark)

Course description: Fish swimming is a multidisciplinary area of research that encompasses biomechanics, physiology, ecology and behaviour. Knowledge of fish swimming is relevant both for students interested in mechanism of locomotion, and those interested in locomotor adaptations to the environment.

Subjects:

1. The kinematics and performance of swimming in fish using various locomotory modes
2. The ecomorphology of fish locomotion
3. Locomotor strategies
4. Metabolic aspects of fish swimming
5. The effect of various environmental factors on fish swimming

These topics will be treated in lectures and laboratory sessions. Students will learn technique of video analysis, kinematics, energetics and respirometry. The first half of the course will have an emphasis on lectures and explanations of technique for studying fish swimming in the laboratory. In the second half of the course, emphasis will be placed on laboratory work.

Students will pursue independent research projects. Enrolment will be limited to 15 graduate students.

For additional information contact: [paolo.domenici@cnr.it](mailto:paolo.domenici@cnr.it) or [jfsteffensen@bio.ku.dk](mailto:jfsteffensen@bio.ku.dk)

Information for applicants (including tuition and financial aid) can be found at:

<http://depts.washington.edu/fhl/studentSummer2015.html#SumB-3>

<http://depts.washington.edu/fhl/studentApplicationInfo.html>

[http://depts.washington.edu/fhl/stu\\_index.html](http://depts.washington.edu/fhl/stu_index.html)

<http://depts.wahisngton.edu/fhl>

## Doctoral and Master's scholarships

### 'Predicting the "root-priming effect" from plant functional traits'

Project description: I am offering a scholarship of \$20,000 x 3 years for a PhD. project, or \$16,000 x 2 years for 2 M.Sc. projects, all focusing on the "root-priming effect". The project is based on manipulation of stable isotopes to study the effect of root exudates on soil organic matter mineralization. This project aims to highlight the interaction between the chemical quality of humus and plant functional traits that control the mineralization of soil organic matter. So far, this issue has been treated only from a biochemical perspective and we would be the first to do so in an ecological context. The practical benefits are many, especially in agriculture, forestry, and mitigation of greenhouse gas emissions. Students will be co-directed by Dr. Eric Paterson of the James Hutton Institute in Aberdeen (<http://www.hutton.ac.uk/>) and will have 1-2 research internships in Scotland. We are looking for motivated students with good academic records, prior research experience, and proficiency in English.

### 'Predicting annual allowable cut in a changing world'

Project description: We are looking for four MSc Students (scholarships of \$16,000 x 2 years and 2 PhD students (scholarships of \$20,000 x 3 years) to start this project as soon as possible. Seven researchers, based at 3 universities and the Quebec Ministry of Forestry, Wildlife and Parks, were recently awarded an NSERC strategic project grant. Our project will study effects of global changes (e.g., climate, atmospheric CO<sub>2</sub>, air pollution) and their interactions with various silvicultural treatments on the nitrogen cycle and performance of spruce-moss forests. The project will be implemented in collaboration with the Office of the Chief Forester of Quebec, the OURANOS research consortium, and the engineering firms WSP Canada Inc. This last partner is providing scholarships for our students to participate in practical training courses for forest planning. We are looking for motivated students with good academic records and prior research experience. Students would benefit from advantages and opportunities offered by the Centre CEF, the Centre SEVE, and the Consortium for Research on the Boreal Forest.

French is the working language of Quebec, but applicants with limited French proficiency can still undertake graduate studies at francophone universities in the province.

Interested individuals should contact: Robert Bradley (Professor)

Departement de biologie

Universite de Sherbrooke

Sherbrooke, Quebec

Canada J1H 1E6

or Email: [Robert.Bradley@USherbrooke.ca](mailto:Robert.Bradley@USherbrooke.ca)

## Student Job Opportunities

### Marine Biological Laboratory/ Grass Fellowship in Neuroscience

Independent summer research opportunities Woods Hole, Massachusetts, USA.

Application deadline: December 5, 2014

Apply at: [www.grassfoundation.org](http://www.grassfoundation.org)



Did you know the Uvic Retirees Association puts out a quarterly newsletter? Visit their link below for more information  
<http://web.uvic.ca/retirees/newsletters.html>

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