Concordia University
Arts and Science
Department of Physics

CONCORDIA PHYSICS

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Our Department is on a Roll:
Thank you Dr. Vo-Van!

Alexandre Champagne, Chair, Department of Physics

Dr. Truong Vo-Van

Welcome to this new and stimulating academic year in our Department of Physics. This is my first newsletter as Chair of the Department of Physics. I would like to first sincerely thank my predecessor, Dr. Truong Vo-Van. Under his leadership, and with the help of all members of our Department, Concordia Physics has seen a true renaissance over the last several years. Our student enrollment and research activities have more than double over the last 6 years.

Dr. Vo-Van is currently on sabbatical to pursue his research in thin-film and solar energy physics. He recently indicated that as of June 2016 he will be retiring. He has completed 40 years of teaching, research and university administration, Bravo! Dr. Vo-Van will remain an active researcher as an emeritus professor in the coming years. When I was a student, I once heard the following quote: “People do not care how much you know, until they know how much you care”. Dr. Vo-Van’s work truly embodies this quote, and we thank him for his ever contagious positive attitude, his expert leadership, and especially for his heartfelt generosity towards all members of our Department.

In the year ahead, our Department has several ongoing projects to continue improving the teaching we provide to our students and research activities we carry out. After mostly focusing on jump starting their research during their first year at Concordia, our two most recent faculty hires (Drs. Claudine Gauthier and Christophe Grova) are now teaching our B.Sc. students. We have a new course in 2015-16, PHYS 298 “Intro to Astronomy”, which is being developed by Dr. Mario D’Amico, with the aim to make physics accessible to all students at Concordia. On the research front, our Department is a member of a team which recently received a $8M research infrastructure grant. The PERFORM center with whom we partner in Medical Physics Imaging, has now receive the final approval from the Government of Québec to take MRI scans of humans for research purposes. There are many other news included in this issue.

Our students continue to impress us with their initiatives and successes. We congratulate both the High Altitude Project Team and the Space Concordia Team for their recent accomplishments. Read on for details.

In This Issue

Dr. Alexandre Champagne

Faculty Profile

Dr. Laszlo Kalman: A Decade of Biophysics at Concordia

Laszlo Kalman joined the Department of Physics in 2005 (with Dr. V. Zazubovits) with the mandate to introduce biophysics as a new research direction and specialization at the graduate and undergraduate levels, respectively. This role also required him to establish links with the Departments of Chemistry & Biochemistry and Biology, where he holds adjunct faculty positions since 2006. He is also a fellow of the Science College that gives a minor degree in interdisciplinary studies and opportunities to perform undergraduate research. Prior to joining Concordia University he held postdoctoral and faculty research associate positions at the Department of Chemistry and Biochemistry at Arizona State University and a junior assistant professor position at the Department of Biophysics, Szeged, in his native Hungary.

Dr. Kalman's research field in the broadest sense is biological energy conversion. More specifically, his research interests revolve around the early events of photosynthesis: how plants and photosynthetic bacteria convert light energy into electrochemical potential energy. His group cultivates and harvests photosynthetic bacteria, uses enzymes isolated locally with biochemical methods and tunes the energetics of the embedded molecules to modify the chemical reactions leading to the generation of electric potential. The group uses wide variety of equipment (mostly optical devices: time resolved laser flash photolysis system, ultrasensitive spectrophotometers, Dual Polarization Interferometer and spectroelectrochemical workstations) to quantitatively characterize the light-induced processes. This approach requires understanding of the structure and function relationship of these enzymes at the atomic level and not only helps understanding how natural photosynthesis works but also hold promise to develop artificial solar energy converters for future energy production. "Photosynthesis has already made life possible on our planet once; it may get another call to contribute to the sustainable production of next generation energy sources"- Kalman says.

Even though the enzymes the group works with are extremely complex, in many cases simple physics concepts, such as Coulomb or charge-dipole interactions, can be applied to describe the processes surprisingly well. This gives opportunity to trainees with wide range of preliminary background to engage in the research the group can offer. Partly for this reason 30 undergraduate, 6 graduate, and 2 postdoctoral projects were completed in the Kalman lab over the past decade. He recently presented the latest results of his group as an invited symposium and plenary speaker at the 16th International Congress on Photosynthesis (held once in every three years) and at the 40th Annual Midwest/Southeast Photosynthesis Conference, respectively.

The Kalman Biophysics Group: Charles Protheroe , Dr. Laszlo Kalman, and Dr. Sasmit Deshmukh. The group has hosted numerous undergraduate interns and has available positions for both Summer internships and course research projects.

Editor's note: Dr. Kalman is an exceptionally dedicated mentor to all of our students, and you should feel free (really!) to approach him if you need any advice about pursuing research (at any level) in physics and biophysics.

Student Organized Event
High Altitude Balloon Launch

The Concordia University High Altitude Project completed its first annual Balloon Launch Event on June 22-23, 2015. The two-day event consisted of a seminar series and two tethered balloon launches on the Loyola Campus.

One of the primary goals of our program is to increase the retention of female undergraduate physics students at Concordia by providing them with a network of mentors. As a result, each undergraduate participating in the program worked one-on-one with a physics graduate student during the 2014-2015 academic year. Various projects included the design and construction of the balloon's payload, assembly of the payload's sensors, an outreach program to neighboring schools, and a social media campaign.

B.Sc. Physics students Alexandra DeFord, Amanda Spilkin, Nadia Gileva, and Victoria Avgoustis assemble the balloon's payload and sensors.

At our event, three local physicists were invited to present a seminar series concerning their career trajectories and ongoing research. We were pleased to welcome Dr. Tami Pereg-Barnea from McGill University, Dr. Clara Santato from École Polytechnique de Montréal, and Mirjam Fines-Neuschild from Université de Montréal. In addition, our group was joined by a student intern from Vanier College, and 50 children from Concordia's CPE, Les P'tits Profs, attended our morning launch.

During our launches, the on-board sensors collected data including outside temperature, pressure, altitude, and acceleration. We now plan on executing an unmanned balloon launch in 2016, with the goal of reaching the near-space environment (~ 35,000 m). In order to track and recover our payload, we will integrate an on-board GPS transmitter. We are also currently exploring projects which can extend the research capacities of our payload. As a result, we encourage any student groups interested in collaborations to contact us at haballoon.conu@gmail.com

Filling of the weather balloon during the launch.

The High Altitude Project is supported by the Department of Physics and gratefully acknowledges the financial contribution of the Office of the Vice-Provost, Teaching and Learning. We would also like to extend a special thanks to Dr. Truong Vo-Van, Dr. Pablo Bianucci, Dr. Valter Zazubovits, Dr. Laszlo Kalman, and Wentworth Brookes for their valuable contributions of equipment and expertise.

Aerial shot of Concordia's Loyola campus taken from the onboard camera.

Follow us on twitter

@HighAltProject

Editor's note: Female B.Sc. and graduate students who would be interested in joining the project should contact the team at haballoon.conu@gmail.com

Fall 2015 Physics Colloquiums*

***presentation titles are not final, but only indicative**

Room: L-CC 116, Mondays @ 3pm

Open to all

September 14: Laser cooling of solids: principles and recent achievements
Galina Nemova, Polytechnique de Montréal.

September 21: Tip-enhanced Raman spectroscopy – chemical , structural and functional surface imaging below the diffraction limit of light
Andreas Ruediger, INRS-EMT.

September 28: Illuminating the brain: basis of functional Near Infra-Red Spectroscopy (fNIRS) Christophe Grova, Concordia University.

October 5: Solid-state nuclear magnetic resonance (SS-NMR) spectroscopy to study membrane systems, Isabelle Marcotte, UQAM.

October 15: Light-induced biophysical processes in photosynthetic bacteria
Péter Maróti, University of Szeged, Hungary (*Thur. 3pm, room CC-115)*

October 19: Topological Insulators
Ion Garate, Université de Sherbrooke.

October 26: Epitaxial growth of semiconductor nanostructures
Zetian Mi, McGill University.

November 2: From nanosecond to second: bridging the time gap in the atomistic dynamics of complex materials with the kinetic activation-relaxation technique, Normand Mousseau, Université de Montréal.

November 9: Ultra-fast optical imaging applications
Rafik Naccache, INRS-EMT.

November 16: MRI methods for radiation oncology treatment planning
Ives Lévesque, McGill University.

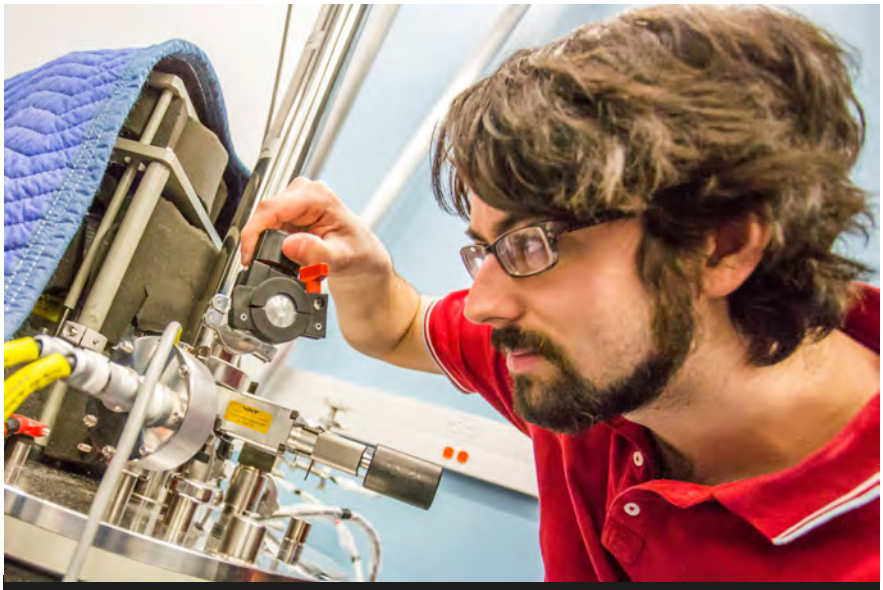
November 23: Monte Carlo based dose planning and radiation dosimetry
Shirin Abbasi Nejar Enger, McGill University.

November 30: Radio-frequency quantum optics
Stéphane Virally, Université de Sherbrooke.

December 7: Two-dimensional material applications
Mohamed Siaj, UQAM.

Research Activities & News (part I)

for a complete list of recent publications, see the Faculty web pages.



PhD student Marc Collette at work.

Dr. **Pablo Bianucci** graduated two M.Sc. students (Ms. Tabassom Hamidfar and Kathleen McGarvey-Lechable) who are now both pursuing PhDs in his research group. He was invited to give a plenary talk at the Canadian-American-Mexican Graduate Student Physics Conference in Oaxaca, Mexico in September 2015.

Dr. **Alexandre Champagne** is a co-applicant on a $8M project recently funded by the CFI, the Québec government, and partners, titled *New Initiative for Quantum Information Science and Technology – NIQUIST*. The principal investigator of the grant, Prof. Bertrand Reulet (CERC Chair, U. de Sherbrooke), hosted Dr. Champagne for a research sabbatical in 2014-15. Dr. Champagne recently gave an invited talk at the summer school for the RQMP (Regroupement Québécois sur les Matériaux de Pointe), and has been invited to speak at the upcoming *Graphene Canada* international conference held in Montreal in October. PhD student **Marc Collette** recently presented a poster at ICSI-9 (International Conference on Silicon), May 2015, Montreal.

Dr. **Mariana Frank** recently gave two invited research talks. The first one was titled: “Supersymmetry After Run I at the LHC” at the University of Helsinki in June 2015, and the second one was titled “Higgs Triplet Model with vector-like leptons” and given at the Austrian Academy in Vienna also in June 2015. PhD student **Sahar Bahrami** attended the *2015 CERN-Fermilab HCP Summer School* in Switzerland this summer, and gave a talk titled “Neutrino Dark Matter in the Higgs triplet model” at the American Physical Society division meeting (particles and fields) in Ann Arbor, Michigan in August 2015.

Dr. **Claudine Gauthier** has recently recruted a new PhD student (Avner Fitterman) for 2015-16. She spent most of her summer at the Max Planck Institute in Germany to pursue her research and develop strategic partnerships. Among other contributions, she recently published several peer-reviewed publications, including two as first author in *Neurobiology of Aging* and *Neuroimage.*

Dr. **Christophe Grova** has recently recruited a new MSc student (Aude Jegou) for 2015-16, and recruited a second postdoctoral researcher (Dr. Umit Aydin). He gave an invited talk on Sept. 5th 2015 at the *International Conference on Basic and Clinical Multimodal Imaging* in the Netherlands. He is the corresponding author of a recent publication in the journal *Brain topography.*

Dr. **Calvin Kalman** has been invited as a guest of honour to attend the 51st Canadian Undergraduate Physics Conference. His PhD student Mandana Sobhanzadeh (co-supervised at University of Calgary) has scheduled her PhD defence for October 2015.

Research Activities & News (part II)

for a complete list of recent publications, see the Faculty web pages.

Dr. **Laszlo Kalman** recently presented the latest results of his group as both an invited symposium and plenary speaker at the 16th International Congress on Photosynthesis (held once every three years) and at the 40th Annual Midwest/Southeast Photosynthesis Conference.

Dr. **Sushil Misra** is currently supervising a visiting research intern (David Niegemann) from Germany (DAAD/RISE program). He recently completed a half-year research sabbatical during which he spent 3 months as the *Weston Visiting Professor* in the Department of Chemical Physics at the Weizmann Institute of Science in Israel.

Dr. **Panagiotis (Takis) Vasilopoulos** spent part of the summer continuing his collaboration on two-dimensional materials with the group of F. M. Peeters in Antwerp, Belgium. He gave an invited talk tat the Conference *NANOTEXNOLOGY* 2015 in Thessaloniki, Greece in July 2015. Working in close collaboration with his postdoctoral researcher (Dr. **Muhammad Tahir**), the two of them recently published three journal publications on two-dimensional materials. Two papers were published in *Physical Review B,* and one in the Journal of Physics Condensed Matter. Drs. Vasilopoulos and Tahir also published one additional paper each with other collaborators. (Editor's note: Congratulations to Dr. Vasilopoulos for achieving a remarkable h-index of 35)

Dr. **Truong Vo-Van's** group. Afaf Almoabadi, a MSc student, presented the paper "Layered and nanotubular vanadium pentoxide thin films for electrochromic applications" at the Photonics North Conference in June 2015 in Ottawa. Afaf defended successfully her thesis this Summer. Results from her research on nanostructured electrochromic films have been published (Journal of The Electrochemical Society) and another paper is being prepared. Vinh-Son Tran, PhD student, will present the remarkable optical properties of vanadium dioxide at the OSA Frontiers in Optics and Laser Science Conference this October in San Diego. This work, focusing on light polarization control, has been done jointly with Prof. Alain Haché at Université de Moncton. Drs. Simona Badilescu and Stefan Stoenescu are working on nanocellulose-electrochromic thin films with an industrial partner, and Dr. Nicoleta Herascu is exploring the potential of carbon nanopearls in supercapacitance applications.

Dr. **Valter Zazubovits** was an invited speaker at the *12th International Conference on Hole Burning, Single Molecule and Related Spectroscopies: Science and Applications* in August 2015. He recently recruited a new co-supervised M.Sc. student (Gareth Melin) for 2015-16.

Interested in doing a project for PHYS 497 (Specialization Research) or simply curious about our research?

Please visit our department website to learn about faculty research interests and programs, and contact them for a lab visit or a discussion (in case of theoretical work).

Note that a tour of a few research laboratories will be offered at 3pm during the Fall Open House (Nov. 7th). Everyone is welcome.

Congratulations to the Rocketry Division of Space Concordia!

The team (which includes BSc Physics students) placed second in the Space Dynamics Laboratory Payload Challenge at the 10th Intercollegiate Rocket Engineering Competition in Green River, Utah in June.

Back Page Bulletin Board

New study room for BSc Physics students

Ever wished we had a study room right next to your teacher's office? Now we do! Room **SP 365.14** is open from 9 am—5 pm Monday to Friday for your convenience.

The 2015 Lorraine Gosselin Graduate Award

We are happy to announce that the 2015 Lorraine Gosselin Graduate Award in Physics was awarded to PhD student **Kathleen McGarvey-Lechable**. This $5000 award is given once a year to an incoming graduate student on the basis of academic excellence, research accomplisments and leadership skills. We are very grateful to Ms. Gosselin for her passion for physics and the support she provides our students. Congratulations to Kathleen!

Professional experience and Co-op

Want to get work experience in Physics and a summer income? The Co-op program may be for you. If you are interested please contact Dr. **Pablo Bianucci** (pablo.bianucci@concordia.ca), our Co-op Program Director, for more information.

Physics + PERFORM

Physics is a major player in the PERFORM Center. Want to know more about Biomedical Physics research at Concordia? (or maybe you just need a workout?) Walk across the Sherbrooke Street to visit the PERFORM Center or visit them online: http://www.concordia.ca/research/perform.html

No one undertakes research in physics with the intention of winning a prize. It is for the joy of discovering something no one knew before.

Stephen Hawkins

Contact Us

Give us a call for more information on physics at Concordia!

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