



SCHULICH
School of Engineering

DEPARTMENT OF
GEOMATICS
ENGINEERING

Geomatics News

WINTER 2015 · Volume 12, Issue 2

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COMING EVENTS

ENGO Switzerland Trip
May 5-15, 2015

June Convocation 2015
Schulich School of Engineering
Tuesday, June 9, 2015
2:00 pm
Jack Simpson Gynasium,
Kinesiology Complex

ENGO 501
Geomatics Field Surveys
Kananaskis Field Station
August 17-26, 2015

Message from the Head

Dear Reader

Another academic year has successfully concluded. The busiest day of the winter semester was perhaps 12 March. It began with the semi-annual meeting of the Geomatics Engineering Advisory Committee (GEAC). The new GEAC members this year are Victor Hut, Sandy Kennedy and Chris Tucker.

Following the GEAC meeting was the announcement event for a substantial purchase negotiation and donation from Trimble Navigation. The deal brought new GNSS receiver hardware, total stations and a V10 imaging rover to the Department's survey stores. This equipment replaces aging total station technology and greatly increases the number of GNSS receivers. It will give all students the chance to use modern equipment, enhancing their learning experience and maximizing their employability. Every student in our department will benefit from this equipment. Please keep reading this newsletter to learn more.

The day wrapped up with the annual the Geomatics Engineering Awards Night. This is a very special occasion when we recognize the excellent undergraduate and graduate students in our department. This event would not be possible without the many donors and sponsors, whom I thank for their generosity and foresight for their contributions to recog-

nize academic excellence.

The annual meeting of the Geomatics Engineering Liaison Committee (GELC) took place at the end of January. Like GEAC, GELC serves a very important role in providing advice on developments in Geomatics and on the future directions for our degree programs. I thank the members of both GEAC and GELC for devoting their time to serve on these committees and for their valuable input.

April saw the retirement of one of the university's most distinguished professors, Gérard Lachapelle. After holding leadership positions in government and industry, Gérard's career at the University of Calgary began with his appointment to Professor in 1988. He served as Department Head from 1995 to 2003 and, since 2001, has been Canada Research Chair/Informatics Centre of Research Excellence Chair (iCORE) in Wireless Location. He is a world-renowned expert on Global Navigation Satellite Systems (GNSS) and

integrated navigation systems, cellular telephone and emergency system location. Over his career he has made substantial and significant scientific and technological contributions in these areas and to the training of highly qualified personnel (HQP) at the University of Calgary. We are very pleased that he will continue his affiliation with the Department as both Professor Emeritus and Faculty Professor.

Finally, it is with great sadness that we learned of Professor Emeritus Alec McEwen's passing this spring. In recognition, the University's flag was lowered to half-mast on the day of his service and a notice was posted on the University's In Memoriam site: <http://www.ucalgary.ca/facultyandstaff/faculty-staff/memoriam/alec-mcewen>. Please read on for more about Alec. His contributions to the Department and the Profession will not be forgotten.

Derek Lichti
Professor and Head



IN MEMORIAM:
Prof. Alec McEwen
Professor Emeritus,
Schulich School of Engineering



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AWARDS & RECOGNITIONS

- Congratulations to graduate students, Bingjie Wei and Xiaodong Sun, from the Intelligent Geospatial Data Mining Lab, who were awarded 3rd place in the Advanced Energy Analytics competition. This competition challenges groups of students to identify a real-world energy analytics problem and develop a software-based solution, using existing/available data that they can access. The competition was sponsored by IBM and the Advisory Committee on Analytics and Visualisation.
- Congratulations to graduate students, Abdulla Al-Rawabdeh, Vimalkumar Bhandari, Rakesh Kumar, Mohammed Hani and Bingjie Wei for participating in the 2015 UCalgary 3 Minute Thesis heats where they spoke about their research in an engaging manner in 3 minutes or less.
- Kristal Turner, our graduate program administrator, suggested to the Faculty of Graduate Studies to launch its first-ever GREAT administrator Week, February 23-27, bringing together graduate students, staff and faculty to express appreciation to all the graduate administrators at the University of Calgary.
- Prof. Naser El-Sheimy was awarded one of six Strategic Project Grants from the Natural Sciences and Engineering Research Council of Canada (NSERC). The grant aims to develop and demonstrate that UAVs can achieve accuracies similar to traditional manned airborne mapping systems, at a fraction of the cost – using low-cost GPS, navigation systems, cameras and laser scanners.

STUDENT AWARDS NIGHT



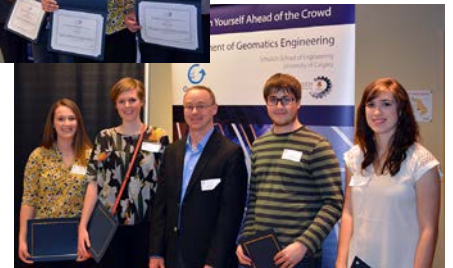
Graduate student winners with Prof. Danielle Marceau

A fun evening was had by all at the annual Geomatics Department Award Night, Thursday, March 12. We had record student and donor attendance as we celebrated all the achievements of both the undergraduate and graduate students. Congratulations to all the winners and thank you to all the donors for contributing to the success of the Geomatics students and we look forward to seeing everyone again next year!



Left: Undergraduate student winners with Prof. Gérard Lachapelle

Right: Undergraduate student winners with Prof. Derek Lichti



Geomatics Engineering Liaison Committee (GELC)

Wednesday, January 28, 2015

This year's meeting was a productive one. The Department gave an overall update to the GELC committee regarding our undergraduate program and received updates from the different provincial associations that were represented. A part of the discussion was the upcoming CEAB accreditation and CBEPS processes, both taking place Fall 2017.

Left to Right: Al Jamieson, Prof. Derek Lichti, Bronwyn Denton, Paul Dixon, Prof. Michael Barry, Prof. Kyle O'Keefe, Mark Hatcher, Prof. Elena Rangelova



Left to Right (back row): Chris Tucker, Daniel Boudreault, Victor Hut, Sandy Kennedy, Nathan Pugh, Michael Szarmes

Left to Right (front row): Barbara Ball, Prof. Danielle Marceau, Landra Trevis, Prof. Derek Lichti

Geomatics Engineering Advisory Committee (GEAC)

Thursday, March 12, 2015

GEAC is a collaborative effort between the UofC Geomatics Engineering program and Geomatics industry professionals, with the mandate of improving the quality and knowledge of Geomatics graduates, and better preparing them for careers within industry.

Updates on the undergraduate and graduate programs were given, along with an evaluation of the Technical Electives program. GEAC met with student representatives to answer questions about industry and provide guidance for career paths. Overall, this collaborative effort has improved the Geomatics program and will continue to play an integral role in ensuring we educate and prepare future Geomatics graduates.

Department Activities

Capstone Design Fair 2015

Wednesday, April 8, 2015

First Place Winners

(due to a calculation error)



Road Sign Detection Using LiDAR Data

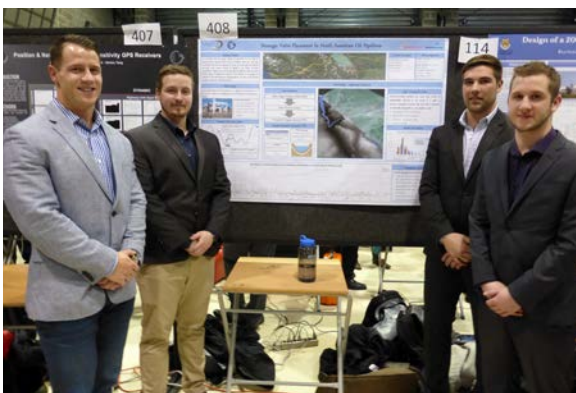
Left to Right: Sarah DeMong, Nicole Beier, Raymond Khuu and Andrea Bordieanu (not present in the photo)



Behavioral Context Detection Using Smart Phones

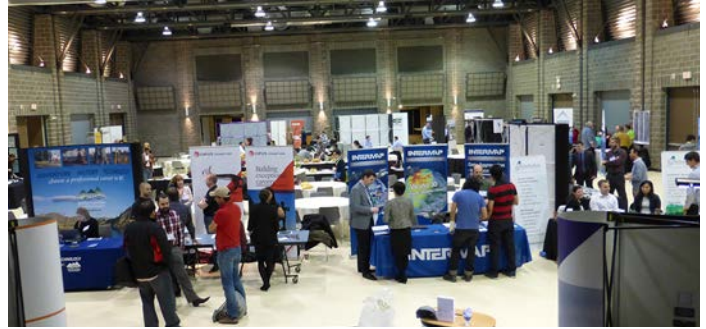
Left to Right: Rafael Canelon, Luis Rodriguez Mendoza, Jean Vianney and David Krawczuk (not present in the photo)

Second Place Winner



Valve Placement Strategies in Oil Pipelines

Left to Right: Jordon Colebrook, Nicholas Weir, Gerald Andreuk and Thomas Howat



Geomatics Exposition 2015

Thursday, January 29, 2015

The Geomatics Engineering Students' Society (GESS) presented the 18th Annual Geomatics Exposition. The event hosted 90+ students from the undergraduate program, 20+ graduate students and 100+ representatives from diverse companies. The full day event offer students to explore potential industry opportunities and network with potential employers.



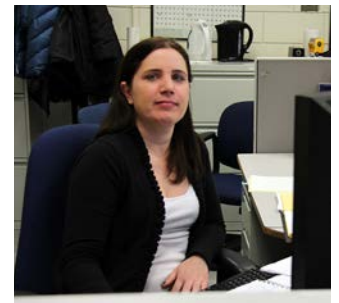
China Days

Friday, March 6, 2015

As part of the University of Calgary's 2015 China Days held from February 14 to March 11, the department held its own celebration with great food, traditional music and a short documentary. The event was organized by the Chinese students with assistance from the office staff.

Congratulations Kristal!

Kristal Turner will be missed after 2 years as the Graduate Program Administrator. We wish her the best as she pursues a new role with the SSE Engineering Student Centre, International Admissions Team.



Department Outreach

APEGA Science Olympics

Sat, February 21 • Stampede Park, Big Four



Once again a team of staff and students attended APEGA's Science Olympics to promote the department to hundreds of students from the CBE, grades 1-12. Aside from discussing the benefits of a Geomatics degree or working in the field, the CBE students were also encouraged to experiment with Prof. Licthi's Range Camera. There were plenty of crowds and smiles from the young students.

A huge thanks to all the graduate students who volunteered to give up part of their Saturday to help out the department at the event. We appreciate your constant willingness to help promote the department!



Calgary Youth Science Fair

Sat, April 18 • Olympic Oval, University of Calgary

The department had another strong presence at this year's Calgary Youth Science Fair by providing demonstrations to students, parents and teachers. Once again we demonstrated Prof. Derek Lichti's range camera but new this year was the hover craft from the Mobile Multi-Sensor Systems Research group. Our booth dominated the Science Lab with a constant flow of students curious to know more about Geomatics Engineering.

The mission of the Calgary Youth Science Fair Society is "to promote an appreciation for scientific principles and method in the youth of Calgary by means of an annual science competition". Every year approximately 800 students, grades 5 - 12, from schools in and around Calgary gather to take part in Canada's largest science fair.



Evolution of Positioning and Navigation Research in the Department

Dr. Gérard Lachapelle, Professor Emeritus and Faculty Professor

The Department of Geomatics Engineering is now in its 36th year, having started in September 1979 as a surveying engineering division of the department of Civil Engineering. One area of constant focus and continued success has been its activities in positioning and navigation research. Several factors have contributed to these accomplishments. In the '70s, Canadian research and applications of the Navy Navigation Satellite System, also known as Transit, became highly successful thanks to efforts headed by Professor Edward (Ed) Krakiwsky at the University of New Brunswick and Alex Hittel at Calgary-based Shell Canada. Ed took his expertise with him when he moved to the University of Calgary to become Chair of the division of surveying engineering. Dr. Klaus Peter Schwarz came to the department at the same time; given his expertise in physical geodesy, Klaus Peter focused his research on inertial and GPS navigation in addition to gravity field estimation and enjoyed sustained successes throughout the rest of his career. For the first eight years of the department, Ed and Klaus Peter were the only two who focused on positioning and navigation. Their high quality research became highly successful and set the tone for the future.

In 1980, I joined Shell Canada's surveying group (Sheltech) to contribute to its GPS development. In 1983, the group formed its own company, Nortech Surveys, to provide navigation and positioning services to industry using GPS and inertial technologies. Its Norstar Instruments Division was created shortly afterwards to develop a GPS receiver; although this development was technically successful, delays in the GPS satellite launch schedule forced Nortech to sell the division to NovAtel in 1988. NovAtel, a telecom company at the time, migrated its expertise to GPS in the '90s and became one of the world's prime manufacturers of high precision GNSS equipment, a source of pride for Alberta. I moved to the University to become a professor in the department at that time and continued to focus on GPS development; I maintained strong links with NovAtel who consistently hired our BSc, MSc and PhD graduates. Dr. Elizabeth Cannon graduated with a BSc in surveying engineering from the Department in 1984 and joined Nortech upon graduation. In 1985, she returned to the University to pursue her MSc and PhD studies with Klaus Peter. Upon completing her PhD in 1991, she became a faculty member in the department thanks to the NSERC Women's Faculty Award Program to encourage the hiring of women in faculty positions in science and engineering across the country; Elizabeth also focused her research on GPS. Dr. Naser El-Sheimy came from Egypt in 1992 to study for his PhD with Klaus Peter. Following his graduation in 1996, he worked in industry for a few years and came back as a faculty member in 1998 to continue research on GPS-inertial positioning and mobile mapping.

In 1998, a number of new positions became available through expansion of the department and Dr. Yang Gao, who had complet-

ed his PhD under Ed's supervision in 1992, joined the department as a faculty member and focused on GPS research as well. In 1995, Dr. Susan Skone came to study for her PhD with Elizabeth, and given her background in atmospheric physics, focused her research on the effect of the atmosphere on GPS. She joined the department upon graduation as a faculty member in 1999 under the NSERC program referred to above. Following my appointment as iCORE/CRC Chair in Wireless Location in 2001 and the high probability that I would not return as a regular faculty member upon completion 14 years later, my position became available and was first filled by Dr. Richard Klukas and then by Dr. Kyle O'Keefe, the latter in 2004. I supervised both Richard and Kyle during their PhD studies in the department, with Susan serving as co-supervisor of Kyle. Richard took a position at the University of British Columbia Okanagan in 2003 where he pursues research in positioning and navigation to this day. When Elizabeth became Dean of the Schulich School of Engineering in 2006, her position became available and was filled by Dr. Mark Petovello, who had completed his PhD under my supervision and that of Elizabeth in 2003. Both Kyle and Mark are also focusing their research on integrated navigation, both indoors and outdoors. Ed retired in 1997 and Klaus Peter in 2001. Since then, six faculty members have focused their research on positioning and navigation.

One may wonder why so many faculty members were hired over the years in the same area. The reasons are excellence of individuals that resulted in the creation of new positions funded by external programs and consistently high demand by the positioning and navigation industry for the high quality graduates from the department. The department accomplishments in positioning and navigation have been and remain truly remarkable. Sustained high quality research by faculty members and graduate students alike, high numbers of awards and recognition, professional involvement in learned societies, research funds raised from industry and governments, and contribution of graduates to the GNSS and navigation industry are impressive metrics. During the 36 years of existence of the department, over 250 MSc and PhD students have completed their studies in this area, with an estimated half working in Alberta and the rest of Canada; students and faculty have won over 80 best paper awards at the (U.S.) Institute of Navigation (ION) annual GNSS conferences since 1990; three faculty members have chaired their annual meetings; two ION Bradford W. Parkinson awards were received by PhD graduates for the excellence of their theses in worldwide competitions; two ION Johannes Kepler awards, two fellowships in the Royal Society of Canada, one NSERC Steacie Fellowship and numerous other awards and accolades from the ION, APEGA, ASTech Foundation, and academic and other institutions worldwide were received by faculty members. The department is right-

continued on page 6

Research Spotlight *cont...*

fully viewed as one of the very best in the world for its positioning and navigation research, together with Stanford University's Aeronautics & Astronautics department and Ohio University's Electrical Engineering department. Faculty members have also held and are still holding several chairs as a consequence of the excellence of their work. An estimated \$40M of research funding has been raised over the years.

Research has consistently focused on improving GNSS and combined GNSS-inertial technology to improve availability, accuracy and reliability performance. Numerous related software packages have been successfully licensed to third parties through University Technologies International (now Innovate Calgary). For the first 20 years, GPS was the focus of research for high precision outdoor use. In the late 1990s, investigations on GLONASS began and were followed by Galileo in 2000. Since the early 2000s, research has included the use of GNSS signals indoors, both unaided and aided by inertial and other self-contained sensors, lately including vision. This includes research at the fundamental signal level using software receivers and advanced integration with above sensors for portable applications. The equipment required to conduct research has evolved accordingly. Numerous patents have resulted from this work. The successful creation of a University of Calgary spin off company, Trusted Po-

sitioning Inc, by Dr. El-Sheimy and his students, which employs department's graduates, is another resounding success.

Faculty members and their graduate students form strong teams, a key to sustained success. MSc and PhD theses have been available on the department's website for over 15 years and faculty members maintain up-to-date websites to promote their research and students. The demand for positioning and navigation graduates from the department has consistently remained high. Past students are involved in industry and academia worldwide. In view of their positive experience during their studies, they remain proud to have received their education from the University of Calgary. They are omnipresent at international events and their introduction as University of Calgary grads is a source of pride for the department and recognition of the excellence of our institution.

The websites maintained by the faculty members involved in positioning and navigation are as follows:

<http://people.ucalgary.ca/~ygao/team.htm>

<http://mms.geomatics.ucalgary.ca>

<http://plan.geomatics.ucalgary.ca>

Department Activities

Professor Gérard Lachapelle Retires After 27 Years

Friday, April 17, 2015

Professor Lachapelle joined the department in 1988 and was the Department Head from 1995-2003. He received the Alberta Innovates/iCORE Chair and a Canada Research Chair in Wireless Location in 2000. Since 1988, he has supervised over 120 graduate students and postdoctoral fellows.

Though he is retiring, he plans to continue his research with his graduate students and postdoctoral fellows for several more years at a slower pace. He is looking forward to dedicating more time to his family and enjoying more hikes in the Rocky Mountains.



Top Photo: Prof. Gérard Lachapelle with President Elizabeth Cannon and his current graduate students.

