# PROGRESS REPORT 2010-2011

## Department of Geomatics Engineering

Schulich School of Engineering
University of Calgary

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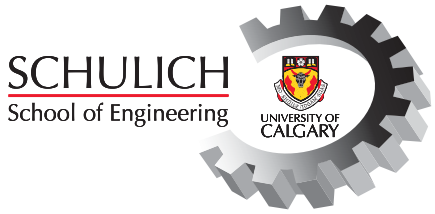
UCGE Number 50042

GEOMATICS ENGINEERING

SCHULICH School of Engineering
UNIVERSITY OF CALGARY

# PROGRESS REPORT
# 2010/2011

# DEPARTMENT OF
# GEOMATICS ENGINEERING




**May 2011**

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*Elham Charkhand*
*Asim Irfan Chaudhry*
*Eunhyuk Chung*

*Trent Philip Connery*
*Stephanie Rae De Boer*
*Jevon Luke Joseph Desautels*
*Garret Ralph Dillabough*
*Jesse Montana Dupont (Distinction)*
*Kathy Escalante (Internship)*
*Alexander Filstein (Internship)*
*Justin Tyler Flemmer*
*Amy Jonnette Hamilton*
*Kathryn Brenda Hannah (Distinction)*
*Michelle Hua*
*Henry Fang Hy (Internship)*
*Jennifer Michelle Innes*
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*Shuang Du*
*Wei Gu*
*Sonam Jamtsho*
*Erin Kahr*
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*Anshu Pahadia*
*Tracy Timmins*
*Da Wang*
*Peng Xie*
*Mohammadreza Zaheri*
*Zhan Zhang*

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***DOCTOR OF PHILOSOPHY***

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*Ki In Bang*
*Yong Bian*
*Mohammed Dabboor*
*Lynn Raaflaub*
*Yigiter Yuksel*

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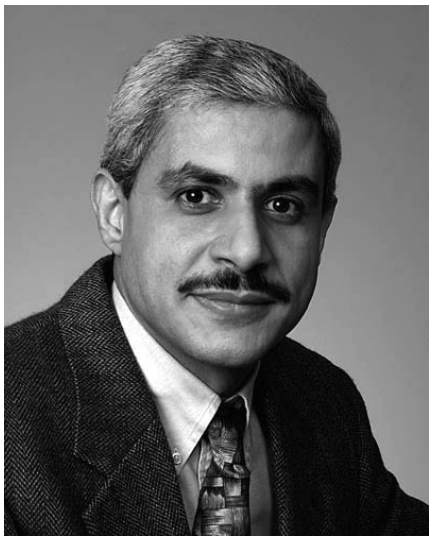
# HIGHLIGHTS 2010/2011

As usual, 2010/2011 has been a busy and productive academic year. Before listing the main highlights of this period, I would like to start by thanking all the faculty and support and technical staff for their services, contributions, and continued commitment to the Department. Also, I would like to thank our undergraduate and graduate students for their achievements and dedication. This year, we had 62 students finishing their undergraduate and graduate degrees (43 BSc, 13 MSc, and 6 PhD). On behalf of the department, I would like to congratulate our graduates and wish them all the best in whatever endeavor they undertake and hope that they will promote the department wherever they are.

- APEGGA ranks Geomatics as one of the top four engineering programs in terms of securing employment for graduating students.
- Graduate program has been showing significant growth. The highest number we have ever had.
- The direct research funding for this report year is more than $4.9million dollars.
- Faculty members and students received several prestigious national and international awards
- Dr. Guy Gendron started his term as the Dean of the Schulich School of Engineering.

Similar to previous years, our graduating fourth year students have been quite successful in securing employment in different areas of Geomatics. In March, an APEGGA survey indicated that Geomatics ranked as one of the top four engineering programs – among Oil & Gas, Chemical, and Mechanical, in terms of securing employment for graduating students. The internship program has 16 students. These are good signs that show the potential employment in Geomatics. Also, the graduate program has been showing significant growth. This year, we had a total of 145 graduate students, who were enrolled in Geomatics Engineering. This is the highest number of graduate students we ever had in the Department. Such growth is expected to increase given the fact that all our faculty members have been in the department since at least the fall semester of 2008, which leads to greater continuity and experience in graduate/undergraduate teaching, student supervision, securing research funding. The direct research funding for this report year is more than $4.9million dollars.



The Department is pleased to share with you that our faculty members and students received several prestigious national and international awards. A detailed listing of these awards is included in this report. In addition, several faculty members continue to assume leadership roles on various boards and in professional societies (e.g., Institute of Navigation – ION, International Society of Photogrammetry and Remote Sensing – ISPRS, International Association of Geodesy – IAG, International Union of Geodesy and Geophysics – IUGG).

Continued on next page

Over the last year, Tecterra Inc. (established to accelerate geomatics technology commercialization in Canada) initiated several funding rounds to support university-lead research projects. The Department has been quite successful in this regard. This funding is expected to have a positive impact on the growth in the number of graduate students. Also, Tecterra has provided funding to several activities in the Department including the visits of two international scientists (Prof. Dr.-Ing. Wolfgang Förstner, University Bonn, Germany and Dr. Jan Skaloud, Senior Research Fellow and lecturer at Ecole Polytechnique Federal Lausanne, Switzerland).

In our continuous efforts to increase the first year engineering students' awareness of Geomatics Engineering, we will have a series of public presentations to highlight the role of Geomatics Engineering in different fields. The first talk of this series will be given by Ed Parsons – Google's Geospatial Technologist – this fall.

Over the last year, we had a change in the School's leadership. Dr. Guy Gendron started his term as the Dean of the Schulich School of Engineering this summer. I would like to acknowledge the outstanding leadership of Dr. Anil Mehrotra, the Interim Dean, over the last year. Dr. Gendron has served as the Dean of the Faculty of Science and Engineering at Laval University since 2007. This appointment brings a demonstrated leadership at a decanal level and an outstanding commitment to excellence in teaching and research. We would like to welcome Dean Gendron to the University of Calgary and we are looking forward to working with him in propelling the Schulich School of Engineering, in general, and Geomatics Engineering, in particular, to the forefront of national and international academic institutes.

Dr. Ayman F. Habib, PEng.
Professor and Head

**Department Publications during 2010-2011**

| | |
|---|---|
| Refereed Journals | 56 |
| Conference Proceedings | 68 |
| Book Chapters | 6 |
| Scholarly Presentations and Seminars | 53 |
| Technical Reports, Technical Notes, & Research Reports | 13 |
| Articles Online and in Magazines | 1 |

For more information, visit our on-line copy at
http://www.ucalgary.ca/engo_webdocs/Reports/PR_2010-2011.pdf

Geomatics Engineering
Faculty Members at the Annual Retreat
June, 2010

Left to Right: Y. Gao, Q. Hassan, D. Marceau, D. Lichti, S. Skone, N. El-Sheimy, E. Cannon, G. Lachapelle, S. Liang, A. Habib, X. Wang, W. Teskey, JW Kim, K. O'Keefe, M. Petovello and A. Hunter.
Missing: M. Barry, M. Collins, M. Sideris

## MESSAGE FROM THE DEAN

In my first six months as dean of the Schulich School of engineering, I have been struck by the high calibre of the Calgary engineering community, and the support for the engineering school throughout the city. Part of this is due to the remarkable people within the school. The geomatics department, for example, is known both locally and internationally for its impact and achievements. It is evident that the department has a global reach and solid support at home. The undergraduate and graduate programs are world-class, and both are producing highly successful graduates. As the university sets its sights even higher, programs that are expanding and excelling – such as the geomatics graduate program – will play a key part. I look forward to working with you on this exciting leadership role. Thank you for making me feel warmly welcomed in this top engineering school.

Guy Gendron, PEng, PhD
Dean, Schulich School of Engineering

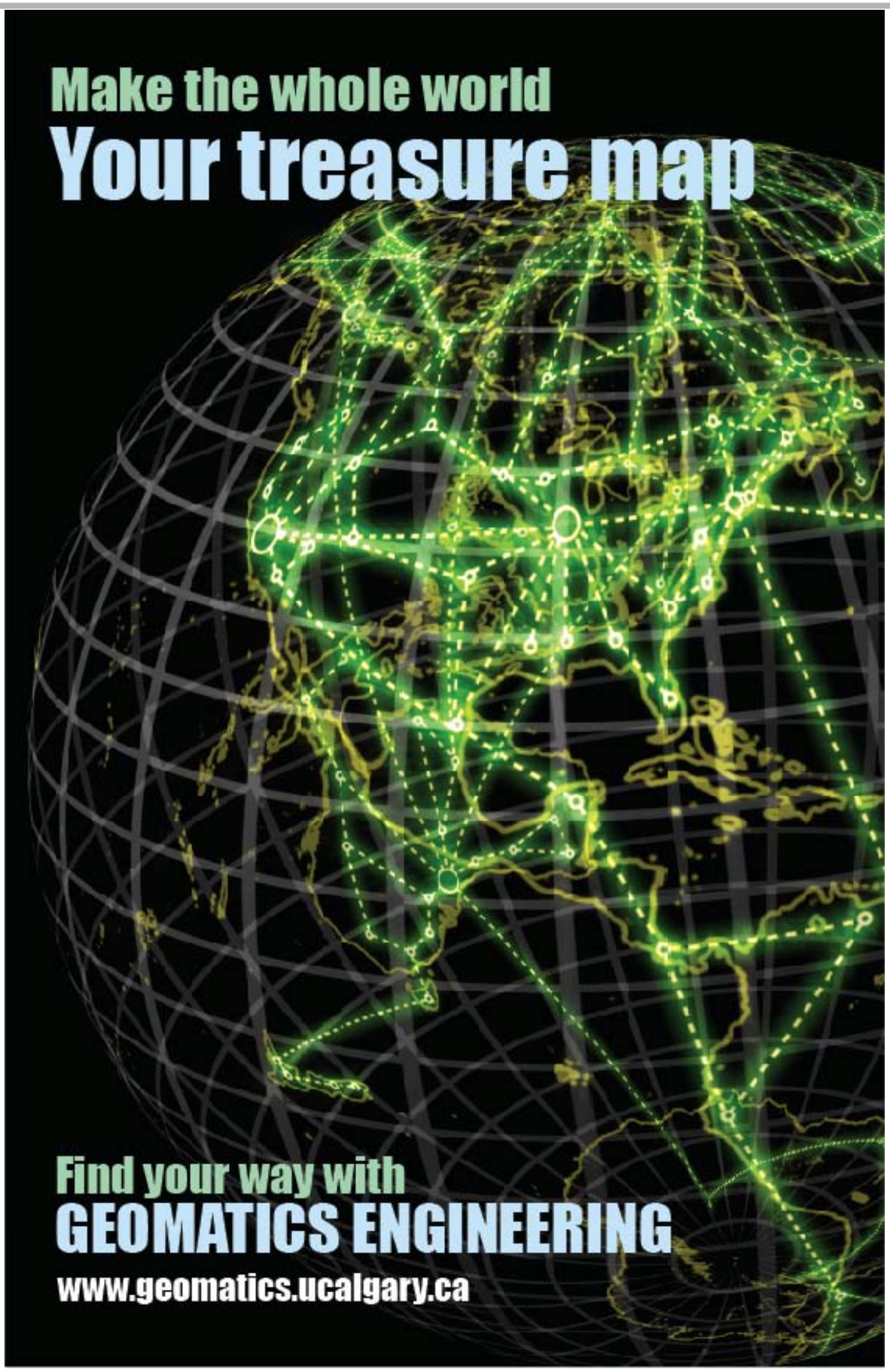
# Top ten reasons to become a geomatics engineer

1. Never get lost again (unless you want to).
2. You know where 48°48'13.9" 2°07'14.8" is.
3. You get how GPS works.
4. You'll be a better pool player.
5. What you do will always be "mysterious" to others.
6. You will be able to "find your way out of a paper bag".
7. You really can help save the environment.
8. Be the fastest snowboarder on the hill.
9. The whole world becomes your treasure map.
10. Never have to worry about finding a job.

**Find your way with**

**GEOMATICS ENGINEERING**

**www.geomatics.ucalgary.ca**


Make the whole world
Your treasure map
Find your way with
GEOMATICS ENGINEERING
www.geomatics.ucalgary.ca

## AWARDS AND RECOGNITION

**Dr. Elizabeth Cannon** began her appointment as President of the University of Calgary effective July 01, 2010. She becomes the first female president of the University of Calgary. Dr. Elizabeth Cannon was Dean of the Schulich School of Engineering from 2006—2010; the Head of the Geomatics Department from 2004-2006; and a professor in the Department of Geomatics Engineering.

The CanX-2 team at the University of Calgary won the Alouette Award for their contributions to the CanX-2 nanosatellite mission. This team is led by Professors **Susan Skone** and **Elizabeth Cannon** and includes Professor **Kyle O'Keefe**, MSc candidate **Erin Kahr**, MSc graduate **Lance de Groot** and undergraduate student **Michael Swab**. The CanX-2 mission was led by the University of Toronto with various academic, industry and government partners participating. The University of Calgary led the GPS radio occultation payload development and implementation for low-cost global atmospheric/Ionospheric monitoring.

Mr. **Mohammadreza Zaheri**, MSc student, won the Track C Best Paper Award at the IEEE/ION PLANS 2010 conference held in Indian Wells/Palm Springs, California. His paper, co-authored by Dr. Ali Broumandan and Professor Gérard Lachapelle, was on Detection Performance Comparison of Polarization and Spatial Diversity for Indoor GNSS Applications.

Mr. **Jared Bancroft**, PhD candidate, Professors **Mark Petovello** and **Gérard Lachapelle**, and Messrs Bill Gelatka and Lloyd Bobb, U.S. Navy, received the Casey Baldwin Award for the best paper published during 2009 in the Canadian Aeronautics and Space Journal. The paper, on "Temporal GPS Positioning for Determining the Relative Motion of a Suspended Object in Flight" was the result of a collaborative project between the PLAN Group and the U.S. Navy.

**Nishad Wijesekara** won the Best Poster Award at Annual Scientific Conference–Canadian Geomatics Conference 2010 AND ISPRS COM I Symposium. The title of the poster was "Impact of Increased Urbanization in the Calgary Region on the Hydrological Processes in the Elbow River Watershed in Southern Alberta". This poster was co-authored by A. Gupta, C. Valeo, J. G. Hasbani and D. J. Marceau.

APEGGA congratulated **Dr. Bill Teskey** in appreciation for his personal contributions to the engineering profession, Bill Teskey has earned the prestigious designation of Fellow by Engineers Canada.

The following awards were received by the PLAN Group researchers at the ION GNSS 2010 Conference held in Portland OR in September 2010. Two student sponsorship awards were received by **Ahmed Kamel** and **Shashank Satyanarayna** and the following three papers won 'Best Session Presentation Awards: **M.G. Petovello, K. O'Keefe, B. Chan, S. Spiller, C. Pedrosa**, Demonstration of Inter-Vehicle UWB Ranging to Augment DGPS for Improved Relative Positioning. **C. Miller, K. O'Keefe, Y. Gao**, Operational Performance RTK Positioning when Accounting for the Time Correlated Nature of GNSS Phase Errors, and **E. Kahr, K. O'Keefe, S. Skone**, Orbit Determination for the CanX-2 Nanosatellite using Intermittent GPS Data.

## AWARDS AND RECOGNITION, continued

**Dr. Ai Broumandan** received the Bradford W. Parkinson Award at the Institute of Navigation-sponsored GNSS 2010 conference held in Portland, OR, for his doctoral thesis on the Enhanced Narrowband Signal Detection and Estimation with a Synthetic Antenna Array for Location Applications.

Teaching assistants awards were handed out by the Dean of the Schulich School of Engineering. The recipients in our department were: Geomatics Excellence Awards to **Scott Fraser** and **Axel Ebeling**. Geomatics Effectiveness Awards to **Axel Ebeling, Feng Xu, Billy Chan, Jacky Chow, Tracy Timmins, Ossama Al-Fanek Feng Tang, Pejman Lotfali Kazemi, Rajesh Tiwari, and Ehsan Mohammadi.**

**Dr. Mark Petovello** was named to Avenue Magazine's 2010 List of Top 40 Under 40.

**Dr. Mark Petovello** was this year's recipient of the Teaching Excellence Award for third and fourth year courses in Geomatics Engineering, chosen by the Engineering Students' Society.

**Dr. Elizabeth Cannon,** member of the PLAN Group in the Department of Geomatics Engineering and President of the University of Calgary, was elected to the (U.S.) National Academy of Engineering, for her innovative use of GPS data for a wide range of applications and for pioneering the field of geomatics.

**Dr. Susan Skone** was appointed to Associate Dean of Research in the Schulich School of Engineering.

**Dr. Mark Petovello** received the Schulich School of Engineering Departmental Early Research Excellence Award, the SSE Departmental Teaching Excellence Award, and the SSE Outstanding Teacher Award.

**Dr. Ayman Habib** is the recipient of the 2011 ASPRS Photogrammetric (Fairchild) Award.

**Mr. Garth Wanamaker** is the recipient of the Schulich School of Engineering Donna Geekie Service Award.

The Geomatics Engineering 4th year students won the 2011 Schulich School of Engineering Design Fair - Best Poster Award. The winning group's project was "University of Calgary Hotel Alma 3D Scanning". The group leader was **Andrew Moody** and the other group members were **Adam Jahraus**, **Leslie Leung**, and **Brian Yee**. The advisors were **Drs. Derek Lichti** and **Ayman Habib**.

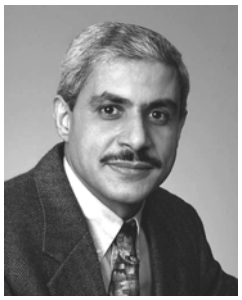
**Dr. Michael Collins** was the recipient of the Professor Excellence Award for Geomatics presented by fourth year students at the Graduation Banquet.

**Dr Michael Collins** was elected a fellow of Engineers Canada.

**Dr. Steve Liang** was named AITF-Microsoft Scholar in Open Sensor Web.

# PERSONNEL

## Faculty



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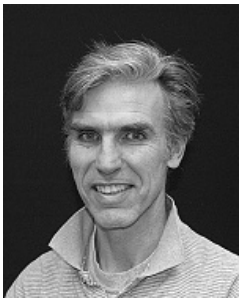

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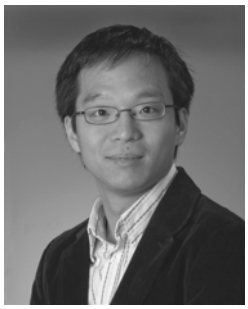

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## Professors Emeritus

**Dr. J.A.R. Blais**, Ph.D. (University of New Brunswick), P.Eng. Estimation, spectral analysis, information theory and systems numerical methods, reference systems and gravitation.

**Dr. E.J. Krakiwsky**, Ph.D. (Heiskanen Award; The Ohio State University), P.Eng. Least squares estimation and statistical testing, network design, satellite positioning, automatic vehicle location and navigation systems.

**Dr. A.C. McEwen**, Ph.D. (University of London), C.L.S., N.L.S., Cadastral studies, survey law, land registration systems, international land and maritime boundaries surveys for aboriginal land claims.

**Dr. K.P. Schwarz**, Dr.-Ing. (Summa cum laude; Technical University of Berlin), P.Eng., Geodesy, inertial techniques, airborne gravimetry, kinematic positioning and attitude determination by GPS/ INS, multi-sensor systems, real-time applications.

## Adjunct Professors

**Dr. Anil Gupta**
Alberta Environment

**Dr. Richard Klukas**
UBC Okanagan

**Dr. Don Leckie**
Natural Resources Canada

**Dr. Bryan Mercer**
Intermap Technologies Corp.

**Dr. Aboelmagd Noureldin**
Royal Military College of Canada

## Support Staff Administrative

**Marcia Inch,** Administrative Manager

**Monica Barbaro,** Administrative Assistant

**Julia Lai,** Administrative Assistant

**Lu-Anne Markland**, Graduate Program Administrator


*LtoR: Kathy Hamilton, Kirk Collins, Monica Barbaro, Ayman Habib, Julia Lai, Lu-Anne Markland, Marcia Inch and Garth Wanamaker*

## Support Staff Technical

**Garth Wanamaker,** BSc, Technical Manager

**Kirk Collins,** BSc, Dipl.Surveying & Mapping Technology, Survey Technician

**Kathy Hamilton**, Network Technician Certificate, Computer Technician

## Post Doctoral Fellows/Research Engineers/Associates/Assistants

Walid Abdel-Hamid
Positioning, Navigation and Wireless Location

Hamid Assilzadeh
Positioning, Navigation and Wireless Location

James Badger
GIS and Land Tenure

Jared Bancroft
Positioning, Navigation and Wireless Location

Daniele Borio
Positioning, Navigation and Wireless Location

Ali Broumandan
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Sameh Nassar
Positioning, Navigation and Wireless Location

Cillian O'Driscoll
Positioning, Navigation and Wireless Location

Elena Rangelova
Earth Observation

Valerie Renaudin
Positioning, Navigation and Wireless Location

Dina Reda Salem
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Christina Semeniuk
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Stefan Steiniger
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Bas Straatman
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Zainab Syed
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Sendo Wang
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Zaman Tasnuva
Earth Observations

Suzanna Vieira
GIS and Land Tenure

Thomas Williams
Positioning, Navigation and Wireless Location

Bruce Wright
Positioning, Navigation and Wireless Location

Yuan Xin Wu
Positioning, Navigation and Wireless Location

## Guest Lecturers

### Special Lecture Series

**Mr. Ron Holdway**
Canadian Aeronautics and Space Institute
*The Amazing Story of Canada in Space—Global Success on a Shoestring Budget*

**Dr. Lucieer**
University of Tasmania
*Surface to Satellites: Studying Changing Ecosystems on Sub-Antarctic Islands and Antarctica Using Very High Resolution Satellite Imagery and Unmanned Aerial Vehicles (UAV's)*

**Dr. Jan Skaloud**
Swiss Federal Institute of Technology Lausanne
*Optimizing Computational Performance for Real-Time Mapping with Airborne Laser Scanning.*

**Prof. Mark Zhodzishsky and Dr. Andrey Veisel**
Topcon Positioning Systems
*Accurate Positioning with GNSS Technology of Topcon*

**Dr. Demoz Gebre-Egziabher**
University of Minnesota
*Using a Kinetic Model of Human Gait in Personal Navigation Systems*

### Visiting Scientists

**Dr.Yongxiang Cai**
Yangtze University

**Dr. Robert Sleep**
Alberta Sustainable Resource Development

**Dr. Robert Magai**
Alberta Environment

**Dr. Mohd. Kamal**
University of Saskatchewan

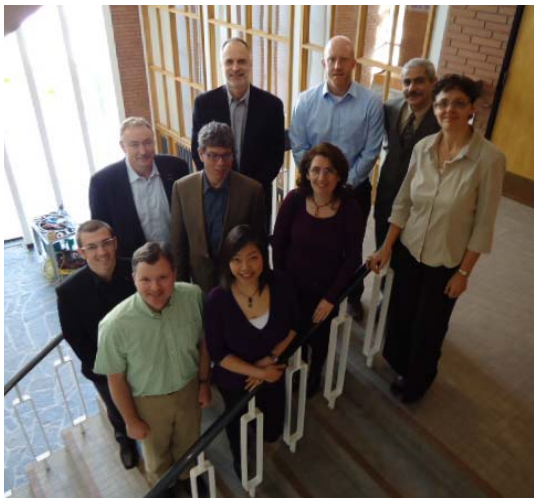
# ADVISORY COMMITTEES AND STUDENT AWARDS

## Geomatics Engineering Advisory Committee (GEAC)

It is the responsibility of the Geomatics Engineering Advisory Committee to ensure that the undergraduate, graduate and research programs meet the needs of the country and are kept up to date with society and the rapidly changing technologies.

The 34th annual advisory committee meeting was held on Thursday, March 17, 2011. The agenda included a review of 2010-2011, a discussion of the challenges facing the Department in terms of financial constraints, space shortages, student recruitment, and opportunities for growth and change for the future.

| Advisory Committee 2011 | |
|---|---|
| **Name** | **Affiliation** |
| **David Parker, Chair** | WorleyParsons Geomatics (Peru) |
| **Nadia Namini** | The City of Calgary |
| **Sandra Czuj** | Alberta Advanced Education and Technology |
| **Zoltan Biacs** | Qualcomm |
| **Stephen Green** | Focus Surveys Limited |
| **Grant Chevallier** | Chevallier Geo-Con Ltd. |
| **Tim Crago** | North West Geomatics |
| **Fraser Smith** | Topcon Positioning Systems |
| **Rita Cheng** | Itres |
| **Victoria Hoyle** | Apple |
| **Kevin Magowan** | CDL Systems Ltd |
| Representatives of the U of C - A. Habib, K. O'Keefe, D.J. Marceau | |



**Geomatics Engineering Advisory Committee**
Back L to R, Kevin Magowan, Stephen Green, David Parker, Zoltan Biacs, Fraser Smith, Ayman Habib
Front L to R, Kyle O'Keefe, Rita Cheng, Nadia Namini, Danielle Marceau

## Geomatics Engineering Liaison Committee (GELC)

The Geomatics Engineering Liaison Committee met on February 2, 2011. The committee was established to develop an effective and permanent relationship between the Land Surveyors' Associations and the University of Calgary. The committee consists of up to two delegates each from the Land Surveying Associations in Alberta, British Columbia, and Saskatchewan and the Association of Canada Lands Surveyors, a representative of the Federal Government, a member at large, as well as the Associates Head and faculty who teach cadastral courses in the Department of Geomatics Engineering at the University of Calgary.

This year's meeting focused on changes in the CBEPS syllabus, CBEPS accreditation, improvements to ENGO 501 (Field Surveys), and updates from the professional associations.

| Geomatics Engineering Liaison Committee 2011 | |
|---|---|
| **Name** | **Affiliation** |
| **Arlin Amundrud** | Member at Large |
| **Marie Robidoux** | Member at Large |
| **Bronwyn D. Denton** | Association of British Columbia Land Surveyors |
| **Paul Dixon** | Association of Canada Lands Surveyors |
| **Victor Hut** | Alberta Land Surveyors Association |
| **David Thomson** | Alberta Land Surveyors Association |
| **Jill Burridge** | Saskatchewan Land Surveyors Association |
| **Peter Sullivan** | Surveyor General |
| Representatives of the U of C were K. O'Keefe (Chair), A. Habib, M. Barry, A.J. Hunter. | |

## Student Awards Night

Student Awards Night was held on Wednesday, March 16, 2011. Awards night is an opportunity to publicly recognize the many accomplishments of our graduate and undergraduate students. It also provides an occasion for an informal meeting between members of the profession, students, faculty and other university representatives.

The number of awards available for our students continues to rise, thanks to the commitment of the Geomatics community to our program and to our students.

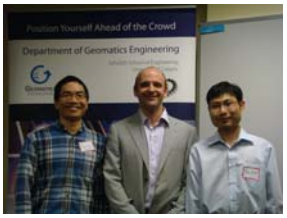

***Geomatics Engineering Student Award Winners 2011***


*Ayman Habib and Sara Saeedi*


*Bruce Winton and Katey Cairns*


*Gerard Lachapelle and Shashank Satyannanyana*


*Kyle O'Keefe, Victoria Mantey and Kathleen Ang*




*Feng Xu, Mark Petovello and Tao Lin*


*Andrew Hunter and Roman Abdoullaev*

## Graduate Awards

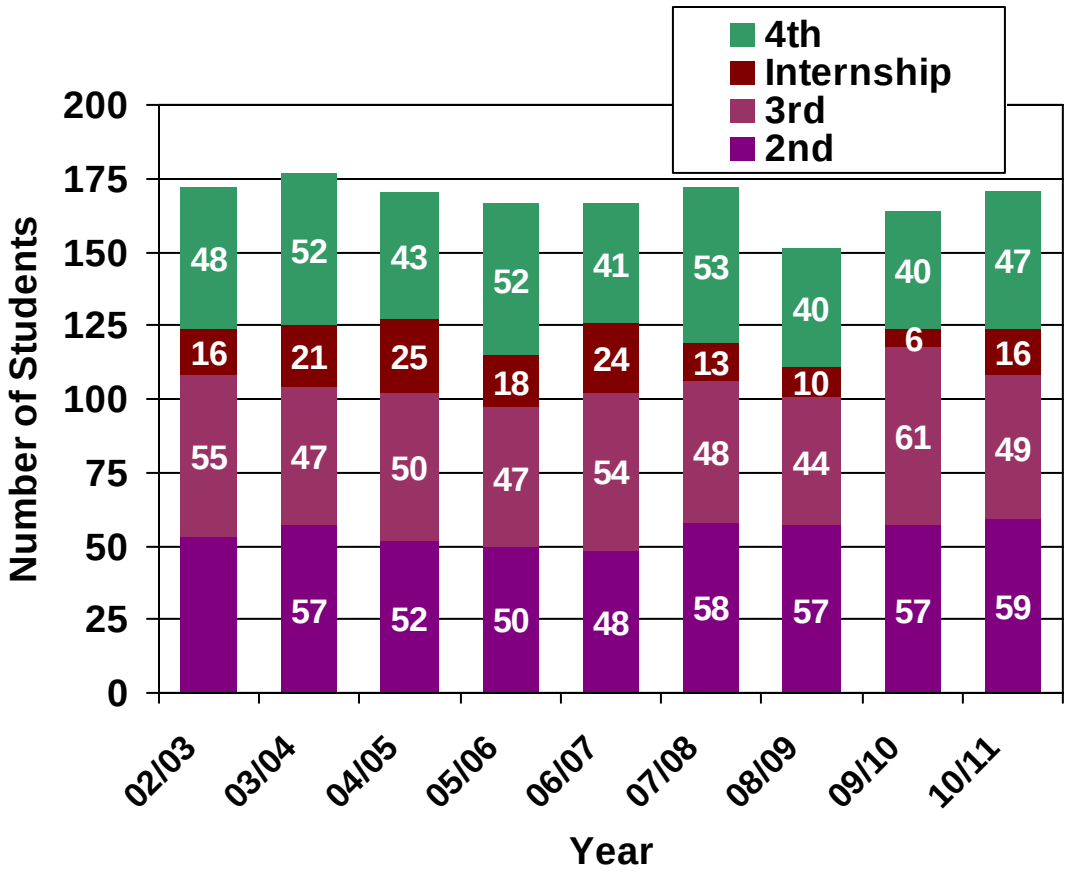
| Recipient | | Awards |
|---|---|---|
| Ivan Detchev<br>Wesley Teskey | Ahmed El-Ghazouly | Alberta Innovates — Technology Futures Award |
| Mohamed Tamazin | | C. F. Gauss Award |
| Tang Feng | | China Council Scholarship |
| Ephraim Danso | | Eratosthenes Award |
| Sinem Elmas Ince | | F.R. Helmert Award |
| Kwangbae Kim | | Helmut Moritz Graduate Scholarship |
| Chih-Yuan Huang<br>Aiden Morrison<br>Jacky Chow | Erin Jennifer Kahr<br>Fang Wang | iCORE Scholarship |
| Sara Saeedi | | Innovation in Mobile Mapping Award |
| Pratibha Anantharamu | | Institute of Navigation (ION) Alberta Section Graduate Award |
| Tao Lin | Feng Xu | Institute of Navigation (ION) Graduate Award |
| Shashank Satyannanyana | | Institute of Navigation (ION) National Graduate Award |
| Pratibha Anantharamu | | Jacques Cartier Award |
| Shashank Satyannanyana | | KIS94 Graduate Scholarship |
| Ivan Detchev | | Len Bolger Memorial Scholarship |
| Nishad Wijesekara | | L.R. (Dick) Walker Newby Award |
| Jared Bancroft<br>Aiden Morrison | Landon Urquhart | NSERC PGS D2 Scholarship<br>NSERC CGS D3 Scholarship |
| Ki In Bang | Ana Kersting | North West Group Scholarship |
| Ossama Al-Fanek<br>Billy Chan<br>Scott Fraser<br>Anshu Pahadia<br>Wesley Teskey | Yong Bian<br>Ivan Detchev<br>Martin Ma<br>Navdeep Sekhon<br>Nishad Wijesekara | Queen Elizabeth II Awards |
| Herve Lahamy | | Werner Graupe International Fellowship in Engineering |

## Undergraduate Awards

| Recipient | Awards |
|---|---|
| Marc Joseph Campagne | A.D. (Denis) Hosford Scholarship |
| Michelle Hua | Alberta Land Surveyors' Association Scholarship |
| Emanuel Hilary F. Lys | British Columbia Land Surveyors Foundation Award |
| Andrew Pearce | British Columbia Land Surveyors Foundation<br>H.R. Goldfinch Memorial Award |
| Stephanie A. Spiller | Bradley Groat Memorial Bursary in Geomatics Engineering |
| Hyun Ha | Cannon-Lachapelle Family Scholarship |
| Luxi Li | David Scovill Memorial Bursary |
| Kyle Ken Loung Chau | E.J. Krakiwsky Bursary |
| Chenlu Qiao | Focus Intec Geomatics Bursary |
| Adam Abukar Hussein<br>Luxi Li<br>Tanmaya Varma | Geomatics Engineering '25th Anniversary' Bursary |
| Konrad James Paley | Green MacPhee Endowed Scholarship in Geomatics Engineering |
| Kyle Ken Loung Chau | Institute of Navigation Alberta Chapter Bursary |
| Luxi Li<br>Tanmaya Varma | Institute of Navigation (ION) Undergraduate Bursary |
| Amy Jonnette Hamilton | J.H. Holloway Scholarship in Geomatics Engineering |
| Paul Abday | Jim Van Dam Scholarship |
| Towfique Ahmed | John Deyholos Memorial Award |
| Matthew L. Herasymiuk | KIS-97 Undergraduate Scholarship |
| Samuel Jeffrey Rondeel | L.R. (Dick) Newby Memorial Award |
| Luxi Li | Leica Geosystems Ltd. Scholarship |
| Kathryn Anne Cairns | McElhanney Scholarship |
| Jesse Montana Dupont | Midwest Surveys' Jerry J. Simpson Memorial Scholarship |
| Kathleen Danielle Ang<br>Victoria Dawn Mantey | Novatel Inc. Scholarships in Geomatics Engineering |
| Kyle Ken Loung Chau | Ray Lowry Memorial Bursary |
| Jevon Luke Joseph Desautels | Saskatchewan Land Surveyors' Association Award |
| Tanmaya Varma | Scott Anderson Memorial Award in Geomatics |
| Kathryn Anne Cairns | Stephen P. Williams Memorial Award |
| Roman Anvarovitch Abdoullaev | Worley Parsons Geomatic Solutions Bursary |

# UNDERGRADUATE STUDIES

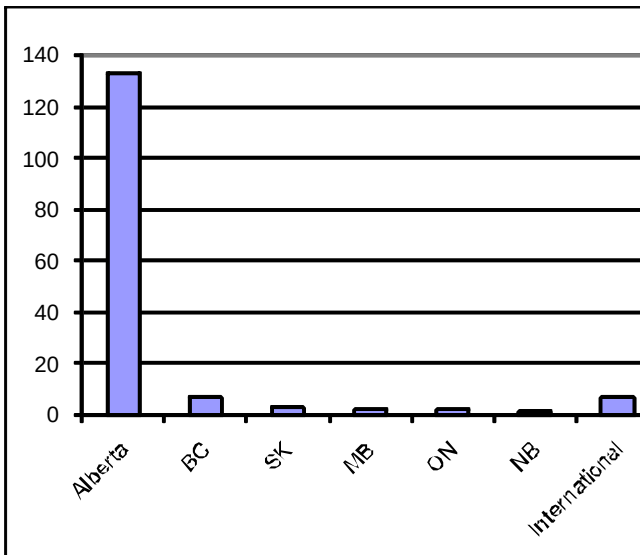
## Enrollment




During the 2010/11 academic year, 155 undergraduate students (171 including internship) pursued studies in Geomatics Engineering at the University of Calgary.

Our quota for students is presently at 177, and our student numbers are close to that figure.

## Student Enrollment by Geographic Region




The figure to the left shows a breakdown of student enrollment by geographic region. Students from Alberta remain the largest group, and numbers from the other groups remain fairly constant from year to year.


*Undergrad Class Visit Switzerland*
*May 2010 with Dr. Steve Liang*

# COMMON CORE CURRICULUM

The common curriculum for engineering students is shown in the adjacent table.

Students choose their department at the end of the first year and begin studies specific to that department in of second year.

## Common Program for All Engineering Students

| Year 1 | Course Number | Course Name |
|---|---|---|
| | AMAT 217 | Calculus for Engineers and Scientists |
| | AMAT 219 | Multivariable Calculus for Engineers |
| | CHEM 209 | General Chemistry for Engineers |
| | ENGG 200 | Design and Communication |
| | ENGG 201 | Behaviors of Liquids, Gases and Solids |
| | ENGG 202 | Engineering Statics |
| | ENGG 225 | Fundamentals of Electrical Circuits and Machines |
| | ENGG 233 | Computing for Engineers I |
| | MATH 211 | Linear Methods I |
| | PHYS 259 | Electricity and Magnetism |
| | COST -1 | Complementary Studies Course |
| **Year 2 (Fall)** | | |
| | AMAT 307 | Differential Equations for Engineers |
| | ENGG 319 | Probability and Statistics for Engineers |
| | ENGG 325 | Electric Circuits and Systems |
| | ENGO 333 | Computing for Geomatics Engineers |
| | ENGG 349 | Engineering Mechanics II |
| | PHYS 369 | Acoustics, Optics and Radiation for Engineers |
| **Abbreviations** | | |
| | AMAT | Dept. of Mathematics & Statistics |
| | CHEM | Dept. of Chemistry |
| | COST | Complementary Studies Course |
| | ENGG | Faculty of Engineering |
| | ENGO | Dept. of Geomatics Engineering |
| | PHYS | Dept. of Physics |

# Undergraduate Curriculum in Geomatics Engineering

| Year 2/Winter | Course | |
|---|---|---|
| | AMAT 309 | Vector Calculus for Engineers |
| | ENEL 327 | Signals and Transforms |
| | ENGO 343 | Fundamentals of Surveying |
| | ENGO 351 | Introduction to GIS |
| | ENGO 361 | Least Squares Estimation |
| **Year 3/Fall** | **Course** | |
| | ENGO 103 | Survey Block Week |
| | ENGG 407 | Numerical Methods in Engineering |
| | ENGO 421 | Coordinate Systems |
| | ENGO 431 | Principles of Photogrammetry |
| One of: | ENGO 443 | Geodetic and Engineering Surveys |
| or | ENGO 451 | Design and Implementation of GIS |
| | COST-2 | Complementary Study |
| **Year 3/Winter** | **Course** | |
| | ENGO 419 | Geomatics Networks |
| | ENGO 423 | Geodesy |
| | ENGO 435 | Remote Sensing |
| | ENGO 455 | Land Tenure & Cadastral Systems |
| | ENGO 465 | Satellite Positioning |
| | COST-3 | Complementary Study |
| **Year 4/Fall** | **Course** | |
| | ENGO 500 | Geomatics Engineering Project |
| | ENGO 501 | Field Surveys |
| | ENGG 513 | Role and Responsibilities of the Professional Engineer in Society. |
| | TE-1 | Technical Elective |
| | TE-2 | Technical Elective |
| | TE-3 | Technical Elective |
| **Year 4/Winter** | **Course** | |
| | ENGO 500 | Geomatics Engineering Project |
| | COST-5 | Complementary Study |
| | COST-6 | Complementary Study |
| | TE-4 | Technical Elective |
| | TE-5 | Technical Elective |
| | TE-6 | Technical Elective |

## Technical Electives in Geomatics Engineering

| Course | |
|---|---|
| BSEN 395 | Business Law for Strategic Decision Makers |
| BMEN 509 | Intro to BMEN Imaging and Applications |
| BMEN 513 | Photogrammetric Techniques |
| ENGO 531 | Advanced Photogrammetric and Ranging Techniques |
| ENGO 545 | Hydrography |
| ENGO 551 | Special Topics in GIS |
| ENGO 559 | Digital Imaging and Applications |
| ENGO 563 | Data Analysis in Engineering |
| ENGO 567 | High-Precision Surveys |
| ENGO 579 | Survey Law and Practice |
| ENGO 581 | Land Use Planning |
| ENGO 583 | Environmental Modelling |
| ENGO 585 | Wireless Location |

## GEOMATICS ENGINEERING STUDENT SOCIETY (GESS)

President—Katey Cairns

VP Finance—Adam Hussein

VP Academic—Miranda Airries

VP Events—Kris Locking

VP External—Alex Liddell

2nd Year Rep—Andrew Salmon

3rd Year Rep—Ryan Horton

4th Year Rep—Amy Hamilton

Webmaster—Adam Thomas

Athletics Commissioner—Duncan Ernst

Career Day Commissioner —Tasha Wong Ken & Tan Varna

Frosh/Engg Week Commissioner — James O'Neill

Back Row: Miranda Airries, Katey Cairns, Alex Liddell, Tasha Wong Ken, Middle Row: Adam Thomas, Duncan Ernst, Tan Varna, Ryan Horton, James O'Neill, Front Row: Kris Locking, Adam Hussein, Missing: Amy Hamilton, and Andrew Salmon

# GEOMATICS ENGINEERING SURVEY CAMP AT KANANASKIS

An important part of the undergraduate degree program in Geomatics Engineering is the field camp (ENGO 501). This two week camp is held at the Kananaskis Centre for Environmental Research, prior to the start of the Fall Session. It gives incoming fourth year students the opportunity to apply the knowledge and experience gained in the different areas of geomatics to an integrated practical project.

The Department of Geomatics Engineering would like to thank the following companies for their participation in the annual Survey Camp Equipment Day, or for the generous loan of equipment over the duration of Survey Camp:

*Butler Survey Supplies Ltd.*
*Spatial Technologies*
*Bill Lovse from Terramatic Technologies*


***Survey Camp 2010***

# ENGINEERING INTERNSHIP PROGRAM

This program offers an optional cooperative educational work experience for all students who have completed their third year of engineering. Participants spend 12 to 16 months in paid jobs, with companies, gaining valuable geomatics experience.

| Student Name | Placement Company | Faculty Mentor |
|---|---|---|
| Colborne, Erin | CDL Systems Ltd. | Naser El-Sheimy |
| Fung, Janna Nicole | CDL Systems Ltd. | Yang Gao |
| Ahmed, Towfique | Aerotec, LLC | Ayman Habib |
| Hanna, Alexander Matthew | CAP Management Services | Andrew Hunter |
| Campagne, Marc Joseph | Intermap Technologies Corporation | Danielle Marceau |
| Starratt, Pamela Jane | Mentor Engineering Inc. | Kyle O'Keefe |
| Leedham, Bryan James | NovAtel Inc. | Mark Petovello |
| Chan, James C.H. | Trusted Positioning Inc. | Susan Skone |
| Al-Emrani, Omar Faisal Hazaa | TransCanada | Xin Wang |
| Gauthier-Mathieu, Jean-Sebastien | Measurement Sciences Inc. | Michael Collins |
| Hoang, Bryan | McElhanney Land Surveys Ltd. | Mike Barry |
| Wcislo, Dominika | ExxonMobil Corporation | Quazi Hassan |
| Bal, Hartej Singh Harry | Telecommunications Systems Inc. | Andrew Hunter |
| Normandeau, Stephan Robert | Husky Energy Inc. | Steve Liang |
| Park, Junyoung | McElhanney Land Surveys Ltd. | Bill Teskey |
| D'Mello, Alfred Benedict | National Energy Board | Gerard Lachapelle |

# ENGO 500 GROUPS 2010/2011

The objective of the ENGO 500 group project course is the development of skills in cooperative research, report preparation and seminar presentation. Students plan and execute a project that must conform with professional requirements. The project must have design, measurement, analysis and presentation components. Submission and defense of progress reports and a final report are required.

| Project Title | Group Members | Supervisor |
|---|---|---|
| Earth Observation | Stephanie de Boer, Kathy Escalante, Alex Filstein, Chase Van de Brand | Collins |
| Web 2.0 Software Development | Elham Charkhand, Jesse Dupont, Phil Wei | Liang |
| Terrestrial Laser Scanning | Adam Jahraus, Leslie Leung, Andrew Moody, Brian Yee | Lichti/ Habib |
| Terrestrial Photogrammetry | Trent Connery, Tyler Klashinsky, Konrad Paley, Hitomi Shiratate | Lichti/ Habib |
| GNSS Software Development | Paul Abday, Amy Hamilton, Drew Stodalka, Curtis Wazney, Blair Oversby | Gao |
| GNSS Software Development | Michelle Hua, Duong Le, Allen Lee, Emanuel Lys | Gao |
| GNSS Software Development | Miranda Airriess, Ovidiu Andrei, Justin Flemmer, Eric Ng | O'Keefe |
| GIS and Land Tenure | Katey Cairns, Asim Chaudhry, John Lee, Quang Trinh | Hunter |
| GIS and Land Tenure | Jevon Desautels, Duncan Ernst, Kris Locking, Jen Nord | Barry |
| High-Precision Conventional Terrestrial and GNSS Network | Roman Abdoullaev, Paul Chung, Henry Hy, Andrew Pearce | Petovello |
| High-Precision Conventional Terrestrial and GNSS Network | Alex Amies, Mike Blois, Stephanie Spiller, | Lachapelle |

# GEOMATICS ENGINEERING CAREER DAY

On Thursday, February 03, 2011, the Geomatics Engineering Student's Society and the Department of Geomatics Engineering hosted their fifteenth annual Career Day. Career Day provides a forum for both companies and students to interact and discuss topics and career opportunities in the Geomatics industry. Several guest speakers made presentations on various topics throughout the day. In addition to these presentations, students and company representatives participated in the Industry Showcase, which was introduced to provide all participants with an opportunity to discuss careers in Geomatics.

The Geomatics Engineering Student's Society would like to thank all participants and sponsors for making this year's Career Day a success.

*Kristopher Locking, Natasha Wong Ken, Tan Varma,and Jasen Stein*

## Career Day Participants 2011

| | |
|---|---|
| Aerotec LLC | Alberta Land Surveyors' Association |
| Altus Geomatics | Association of BC Land Surveyors |
| Applanix | CDL Systems |
| CAP Engineering | Explore Surveys |
| Challenger Geomatics | IBI Geomatics |
| Focus Corporation | Midwest Surveys |
| McElhanney Land Surveys Ltd. | MMM Geomatics |
| Millennium Geomatics | NovAtel |
| NavCom Technology | Trimble/Applanix |
| TECTERRA | Stewart, Weir & Co. Ltd. |
| Stantec Geomatics Ltd. | Spatial Technologies |
| Universal Surveys Group | |

# GRADUATE STUDIES

## Enrollment

The number of graduate students remained fairly steady with a total of 143 students (131 full-time, 12 part-time.) During the academic year 2010/2011 students were either enrolled in the graduate program or finishing their theses. 80 were working towards their PhD degree, 55 towards their MSc degree and 8 towards their MEng degree. Students originated from 14 different countries. There were 19 students that graduated during the reporting period, 6 with a PhD degree, and 13 with a MSc . Details are given in the following tables.

**Full-time PhD Students 2010/2011**

| Name | Supervisor | Name | Supervisor |
|---|---|---|---|
| Abdizadeh, Mohammad | Lachapelle | Lari, Zahra | Habib |
| Afzal, Muhammad | Lachapelle | Li, Ren-Yu | Liang |
| Akpanekong, Aniekan | Barry | Lin, Tao | Lachapelle |
| Al-Fanek, Ossama | Skone | Li, Tao | Petovello/Lachapelle |
| Ali, Abdelrahman Saad | El-Sheimy | Maghsoudi Mehrani, Yasser | Collins |
| Amjadiparvar, Babak | Sideris/Kim | Mazaheri Tehrani, Habib | Collins |
| Anantharamu, Pratibha | Lachapelle | Mirkhosravi, M Hossein | Hunter |
| Atteia Allah, Ghada | Collins | Melgaard, Tor Egil | Lachapelle |
| Attia, Mohamed | El-Sheimy | Mousavi, Ali | Hunter |
| Baek, Jin | Kim | Moussa, Adel Mohamed | El-Sheimy |
| Bancroft, Jared | Lachapelle/Cannon | Nicholson, Natalya | Skone/Cannon |
| Bang, Ki In | Habib | Poncos, Valentin | Collins |
| Bian, Yong | Mercer | Pooyandeh, Majeed | Marceau |
| Chang, Hsiu-Wen | El-Sheimy | Raaflaub, Lynn | Valeo |
| Chen, Hsiang ( Shawn) | Liang | Rao, Vyasaraj, Guru | Lachapelle |
| Chow, Jacky Chun Kit | Teskey/Lichti | Renaudin, Erwan | Habib |
| Dabboor, Mohammed | Braun | Roux, Lani | Barry |
| Daneshmand, Saeed | Lachapelle | Sadrieh, Nima Seyed | Lachapelle |
| Detchev, Ivan | Habib | Saeedi, Sara | El-Sheimy |
| Du, Shuang | Gao | Satyanarayana, Shashank | Lachapelle |
| Ebeling, Axel | Teskey | Saylam, Kutalmis | Habib |
| Eid, Hassan Elsaid | El-Sheimy | Sheta, Bassem Ibrahim | El-Sheimy |
| ElGhazouly, Ahmed Adel | El-Sheimy | Shi, Jun bo | Gao |
| El-Sharkawy, Ahmed | El-Sheimy | Steiner, Harald | Habib |
| Ghafoori, Fatemeh | Skone | Taghvakish, Sina | Braun |
| Hassan, Essam Hassan | Habib | Tang, Feng | Sideris/Gao |
| He, Zhe | Lachapelle/Petovello | Teskey, Wesley | El-Sheimy |
| Huang, Chih-Yuan ( Alek) | Liang | Umana-Diaz, Alejandra | Collins |
| Ibrahim, Sherif Mohamed | Lichti | Urquhart, Landon | Skone |
| Jafarnia Jahromi, Ali | Lachapelle/Nielsen | Wang, Da | O'Keefe |
| Kadry, Mahmoud Halfez | El-Sheimy | Wang, Fang | Marceau |
| Kamel, Ahmed Mohsen | Lachapelle/Nielsen | Wijesekara, Gayan Nishad | Marceau |
| Kersting, Ana Paula | Habib | Xie, Peng | Petovello |
| Kiavarz-Moghaddam, Hamid | Marceau | Xu, Feng | Gao |
| Kim, Kwangbae | Kim | Yuksel, Yigiter | El-Sheimy |
| Kwak, Eunju | Habib | Zhang, Chengqian | Collins |
| Lahamy, Herve David | Lichti | Zhao, Xing (Bob) | El-Sheimy |

## Full-Time MSc and MEng Students 2010/2011

| Name | Supervisor | Name | Supervisor |
|---|---|---|---|
| **MSc Students** | | | |
| Ahmed, Tanvir | Lichti | Mosstajiri, Tina | Kim |
| Akther, Shammi Musa | Hassan | Ong, Richard | Lachapelle/Petovello |
| Aminian, Behnam | Lachapelle/Petovello | Ortiz, Andres | Hunter |
| Asiedu, Kwame | Barry | Pahadia, Anshu | Lachapelle/Williams |
| Canaz, Sibel | Habib | Phillips, Andrew | Liang |
| Chan, Billy Cheuk Wai | Petovello | Qi, Xiaojuan | Lichti |
| Chan, Ting On | Lichti | Rahman, Kazi Mahmudur | Hassan |
| Danso, Ephraim | Barry | Rezel, Rohana Deshapriya | Liang |
| Denbina, Michael William | Collins | Sekhon, Navdeep | Hassan |
| Detchev, Ivan | Habib | Shafiee, Mahsa | Lachapelle |
| Dhital, Anup | Lachapelle | Shunnar, Thaer | Barry |
| Du, Shuang | Gao | Siddharth, Siddharth | El-Sheimy |
| Fraser, Scott | Marceau | Sokhandan Asl, Negin | Lachapelle |
| Gu, Wei | Wang | Susi, Melania | Lachapelle/Renaudin |
| Haddad, Oday | Skone | Swab, Michael | Skone/O'Keefe |
| Huang, Bei | Gao | Tamazin, Mohamed Essam | Lachapelle |
| Ince, Elmas | Sideris | Timmins, Tracy L. | Hunter/Barry |
| Jamtsho, Sonam | Lichti | Tiwari, Rajesh | Skone |
| Kahr, Erin | O'Keefe | Wang, Baijie | Wang |
| Kersting, Juliano | Hunter | Wang, Da | O'Keefe |
| Keshvadi, Mohammad | Lachapelle/Broumandan | Wang, Fei | Wang |
| Knoechel, Ben Charles | Liang | Wang, Jing | Wang |
| Luo, Ping | Petovello | Xie, Peng | Petovello |
| Ma, Martin | Lachapelle | Zaheri, Mohammadreza | Lachapelle/Broumandan |
| Miller, Chase | O'Keefe/Gao | Zaman, Tasnuva | Sideris |
| Mohammadi, Ehsan | Hunter | Zhang, Zhan | Blais |
| Molero, Richard | Barry | Zheng, Botao ( Shirley) | Marceau |
| **MEng Students** | | | |
| Al-Sadat, Mazen Abdullatif | El-Sheimy | Li, Bo | O'Keefe/Marceau |
| Alsubaie, Naif Muidh | El-Sheimy | Liakopoulos, Alexandros | Kim/Sideris |

## Part-time Graduate Students 2010/2011

| Name | MEng | MSc | PhD | Supervisor |
|---|---|---|---|---|
| Anwar, Morshed Sk. | | | 1 | Marceau |
| Bobye, Micheal James | | 1 | | El-Sheimy |
| Ching, Kwan Kit ( Stephen) | 1 | | | Lachapelle |
| Egbulefu, Irene Folashade | | 1 | | Barry |
| Kent, Steve | 1 | | | Blais |
| Morin, Kristian Walker | | | 1 | Lichti |
| Radons, Charlene Marcia | 1 | | | Skone/O'Keefe |
| Troyer, Brady Ross | 1 | | | Lachapelle |
| Wang, Min | | | 1 | Gao |
| Wu, Qiang | | | 1 | Hunter |

## External Convocants Supervised by ENGO Faculty

| Name | Degree | Date | Graduate Thesis Title | Co-Supervisor | Dept/Institution |
|---|---|---|---|---|---|
| Salwa Abdelkader Mostafa Ahmed | PhD | *Dec 10* | Digital Video Watermarking for Multimedia Security Applications | El-Sheimy | Port Said University |
| Vahid Dehghanian | PhD | *Apr 10* | Generalized Diversity Gain of a Mobile Antenna | Lachapelle | ENEL University of Calgary |
| Niamh O'Mahony | PhD | *Nov 10* | Search-Control Strategies for GPS Acquisition | Lachapelle | University College Cork, Ireland |
| James Curran | PhD | *Oct 10* | Weak Signal Digital GNSS Tracking Algorithms | Lachapelle | University College Cork, Ireland |
| Jakob Jakobsen | PhD | *Oct 10* | Kinematic GNSS | Lachapelle | University of Copenhagen |
| Nicola Linty | MSc | *Aug 10* | Codeless Tracking Algorithms for GNSS Software Receivers | Borio/ Lachapelle | Politecnico di Torino |
| Leslie Montloin | MSc | *Aug 10* | Impact of Interference Mitigation Techniques on a GNSS Receiver | Borio/ Lachapelle | École Nationale de l'Aviation Civile, Toulouse |
| Leïla Kleiner | MSc | *Jul 10* | Ambiguities resolution with GPS and GLONASS Measurements in Obstructed Environment | Renaudin/ Lachapelle | École Polytechnique Fédérale de Lausanne |
| Antonio Angrisano | PhD | *Apr 11* | GNSS/INS Integration Methods | Petovello | Parthenope University of Naples |
| Xingwang Yu | PhD | *Jun 11* | Multi-frequency GNSS Precise Positioning | Zhang/Gao | Geomatics/Wuhan University |

# Graduate Studies Convocants 2010/2011

| Name | Degree | Date | Graduate Thesis Title | Supervisor |
|---|---|---|---|---|
| Richard Bryan Ong | MSc | Jun 10 | *Reliability of Combined GPS/GLONASS Ambiguity Resolution* | Lachapelle/ Petovello |
| Charles Edward Miller | MSc | Sept 10 | *Practical Considerations of Temporal Correlation in RTK GPS Surveying using a Modified Kalman Filter* | O'Keefe |
| Da Wang | MSc | Sept 10 | *Performance Evaluation of GPS L1/L2 Positioning with Partial Availability of L2C Signals* | O'Keefe |
| Peng Xie | MSc | Sept 10 | *Improving Carrier Phase Reacquisition Time Using Advanced Receiver Architectures* | Petovello |
| Tracy Timmins | MSc | Sept 10 | *Modelling Spatial Dependence in Multivariate Regression Models of Grizzly Bear Health in Alberta, Canada* | Hunter/Barry |
| Ivan Denislavov Detchev | MSc | Sept 10 | *Implementation of a Close Range Photogrammetric System for 3D Reconstruction of a Scoliotic Torso* | Habib |
| Ki In Bang | PhD | Sept 10 | *Alternative Methodologies for LiDAR System Calibration* | Habib |
| Lynn Raaflaub | PhD | Nov 10 | *Hillslope, Canopy, and Proximity Influences on Duff Moisture Spatial and Temporal Variability* | Valeo |
| Shuang Du | MSc | Nov 10 | *Integration of Precise Point Positioning and Low-cost MEMS IMU* | Gao |
| Jared Bancroft | PhD | Dec 10 | *Multiple Inertial Measurement Unit Integration for Pedestrian Navigation* | Lachapelle/ Cannon |
| Mohammed Dabboor | PhD | Dec 10 | *New Segmentation Algorithms for Dual- and Full Polarimetric SAR Data* | Collins/Braun |
| Sonam Jamtsho | MSc | Dec 10 | *Geometric Modelling of 3D Range Cameras and their Application for Structural Deformation Measurements* | Lichti |
| Anshu Pahadia | MSc | Dec 10 | *GPS/INS Integration Aided with Gyroscope-Free IMU for Pedestrian Applications* | Lachapelle/ Williams |
| Wei Gu | MSc | Dec 10 | *Optimization of Static and Mobile Facility Location Selection: Method and Case Study* | Wang |
| Mohammadreza Zaheri | MSc | Dec 10 | *Enhanced GNSS Signal Detection Performance Utilizing Polarization Diversity* | Lachapelle |
| Zhan Zhang | MSc | Jan 11 | *A Study on Canonical Expansion of Random Processes with Applications in Estimation Problems* | Blais |
| Yigiter Yuksel | PhD | Mar 11 | *Design and Analysis of Inertial Navigation Systems with Skew Redundant Inertial Sensors* | El-Sheimy |
| Erin Kahr | MSc | Apr 11 | *In-Orbit Performance of the CanX-2 Nanosatellite's Commercial GPS Receiver* | O'Keefe |
| Yong Bian | PhD | Apr 11 | *Polarimetric and Interferometric SAR Statistical Analysis and Signal Processing* | Mercer |

# Graduate Seminars 2010/2011

| Speaker | Topic |
|---|---|
| Zhe He | Analysis of Pedestrian Activity Effects on Standard/High Sensitivity GPS Tracking Loops |
| Ehsan Mohammadi | Positioning and Route- finding for Indoor Location Based Services |
| Ahmed Kamel | Design and Testing of an Intelligent GPS Tracking Loop for Interference Mitigation and High Dynamic Applications |
| Mohamed Tamazin | Investigation of the Benefits of Combined GPS/GLONASS for High Sensitivity Receivers |
| Navdeep Sekon | Remote Sensing Based Boreal Phenology |
| Sina Taghvakish | Harvest Detection Using PolSAR Data |
| Hassan Eid | Feature Extraction from Integrated Data |
| Sinem Ince | Geoid Investigation as a Vertical Datum in the Great Lakes Area |
| Majeed Pooyandeh | An Agent-Based Model to Simulate Stakeholders Interactions in the Context of Land-Use Intensification, Climate Change, and Water Resource Management in the Elbow River Watershed in Southern Alberta |
| M. Haris Afzal | Magnetic Field Based Orientation Estimation for Pedestrian Navigation |
| Xing Zhao | MEMS Multi-Sensors Estimation for Personal Navigation System |
| Richard Molero | Evolution Of XML-Based Land Records Database for Uncertain Land Administration Scenarios |
| Shashank Satyanatayana | GNSS Indoor Signal Characterization: Methodologies and Results |
| Vyasaraj Guru Rao | Investigating the Benefits of IRNSS Over the Indian Subcontinent |
| Pratibha Anantharanu | Antenna Array Calibration Using GNSS Signals |
| Hatef Keshvadi | Analysis of GNSS Beamforming and Angle of Arrival estimation in Multipath Environments |
| Behnam Aminian | GPS Doppler Aided INS for Indoor Navigation |
| Wes Teskey | Movement Disorders Assessment and Attenuation Using Inertial Sensors |
| Nima Sadrieh | GNSS Spatial Diversity Performance Analysis At Signal Processing, Measurement and Position Level |
| Billy Chan | Collaborative Vector Tracking of GNSS Signals with Ultra-Wideband Augmentation in Degraded Signal Environments |
| Fatemeh Ghafoori | Investigating the Impact of Ionospheric Scintillations on GPS Receiver Carrier Tracking Loop Performance |
| Tao Li | Real-time Ultra-tight Integration of GPS L1/L2C and Vehicle Sensors |
| Ping Luo | Collaborative GPS Signal Acquisition and Tracking Using an Open-loop Structure |
| Hervé Lahamy | Real-Time Hand Gesture Recognition Using Range Cameras |
| Martin Ma | Applying the Fast Fourier Transform to Real-time Acquisition with a Software Receivers |
| Yasser Maghsoudi | Analysing Polarimetric Radarsat-2 Data for Forest Mapping |
| Ossam Al-Fanek | Computerized Ionospheric Temography Using EOF and Spherical Cap Harmonics |
| Jing Wang | GIS, Spatial Analysis, Spatial Data Mining |
| Erin Kahr | Intermittent Operation of the CanX-2 Nanosatellite GPS Receiver |
| Thaer Shunnar | Data Mining for Fraud Detection in Land and Property Transactions |
| Sonam Jamtsho | Geometric Modelling and Aplication of the 3D Time-of-Flight Camera |
| Yigter Yuksel | INS Design Using Skew Redundant Inertial Measurement Units |
| Rohana Rezel | Extending Collaborative Recommendation Techniques to Geospatial Contexts |
| Lani Roux | Land Transactions in Social Housing in the Western Cape of South Africa: A Case study of Phumla |
| Junbo Shi | Analysis of the Integer Property of Ambiguity and Characteristics of Code and Phase Clocks in PPP Using a Decoupled Clock Model |
| Zhan Zhang | A Study on Canonical Expansion of Random Process with Applications in Geomatics Engineering |
| Sherif Ibrahim | Classification of Road Feature from Mobile Terrestrial Laser Scanner Point Cloud |
| Yong Bian | Interferometric and Polarimetric SAR Signal Processing |
| Oday Haddad | WASS Integrity Investigation for Canadian Latitudes |
| Ahmed El-Ghaouzly | Multi-resolution Spectral Techniques for DGPS Errors Analysis and Mitigation |
| Mohammed Dabboor | A New Probabilistic Distance for Unsupervised Classification of Full Polarimetric SAR Data |
| Ossama Al-Fanek | Computerized Ionospheric Tomography Using GNSS |
| Ana Kersting | Quality Assurance and Quality Control of Airborne Multi-Sensor Systems |
| Anshu Pahadia | GPS/INS Integration Aided with Gyro-Free IMU for Pedestrian Application |
| Mahammadreza Zaheri | Enhanced GNSS Indoor Signal Detectability Using Polarization Diversity |
| Jared Bancroft | Multiple Inertial Measurement Unit Integration for Pedestrian Navigation |
| Rajesh Tiwari | Validation of Ionospheric Scintillation Forecast Model WBMod for CANGIM Network |
| Chase Miller | Operational Performance of RTK Positioning When Accounting for the Time Correlated Nature of GNSS Phase Errors |
| Shuang Du | Integration of Single Point GPS and Low Cost MEMS IMU |
| Hassan Eid | Building Extraction and Recognition from LIDAR Data |
| Da Wang | Performance Evaluation of GPS L1/L2 Positioning with the Partial Availability of L2C Signals |

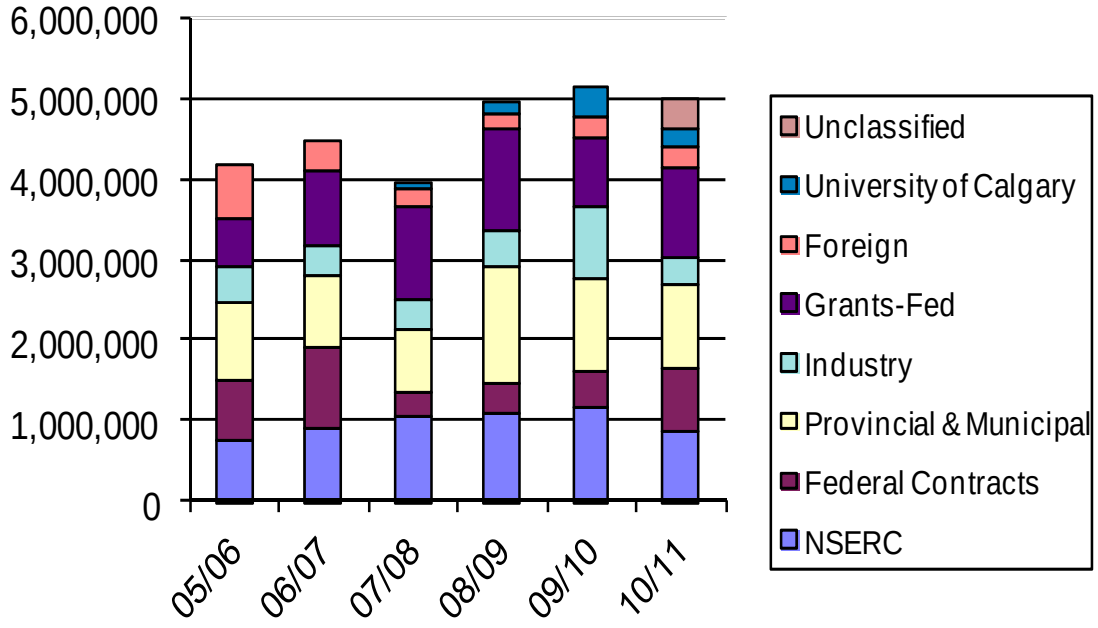
# RESEARCH

## Research Statistics

Research is an integral part of Department activities. It allows individual faculty members to stay at the leading edge of their area of specialization and to apply their knowledge to current problems in industry and government. It also provides funding for research associates and graduate students. It thus supports the education of highly trained future engineers and the teaching activities of the Department.

Direct research funding for this report year was at $4,991,852.

**Direct Research Funding by Source**
**2004/05 to 2010/11**

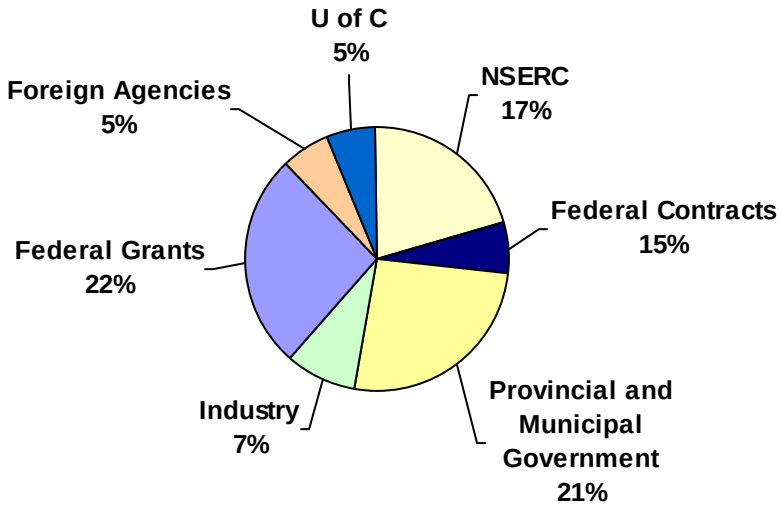


**Research Grants and Contracts for the Period**
**April 1, 2010 – March 31, 2011**

| Source | Amount |
|---|---|
| Contracts—Federal | $764,978 |
| Foreign | 257,213 |
| Grants—Federal | 1,109,123 |
| Industry | 345,707 |
| Provincial and Municipal Government | 1,041,486 |
| NSERC | 856,921 |
| Unclassified | 391,037 |
| University of Calgary | 225,387 |
| **Total Research Support** | $4,991,852 |

The figure on the previous page shows direct research funding for the last seven years and the one below shows the research funding by source for 2010/2011

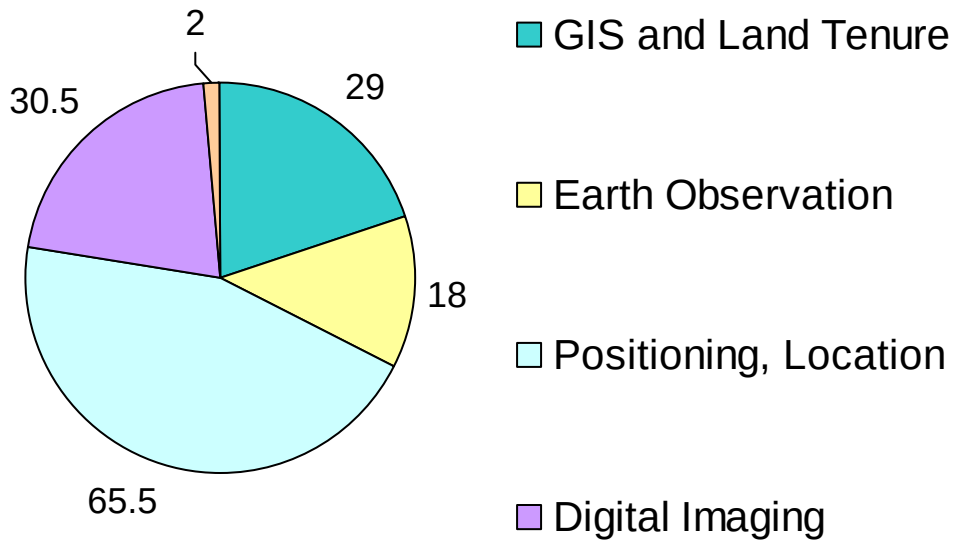
## Direct Research Funding by Source 2010/11



## MAJOR RESEARCH AREAS

| Positioning, Navigation and Wireless Location |
|---|
| M.E. Cannon, N. El-Sheimy, Y. Gao, G. Lachapelle, K. O'Keefe, M. Petovello, S. Skone, W. Teskey |
| **Earth Observation** |
| M. Collins, Q. Hassan, J.W. Kim, M. Sideris |
| **GIS and Land Tenure** |
| M. Barry, A. Hunter, S. Liang, D. Marceau, X. Wang |
| **Digital Imaging Systems** |
| A. Habib, D. Lichti |

**Graduate Student Distribution by Area**
**May 2010—April 2011**




Note: One student has 2 specializations

Research projects being conducted in the above major research areas are listed in tables on pages 38 to 42.

The number of graduate students working in each area is indicated in the above figure. Some factors in the distribution of students are: the number of faculty members per research area, and the number of new faculty members in the department that are currently in the early stages of recruiting students and building their research groups.

## Projects in Positioning, Navigation and Wireless Location

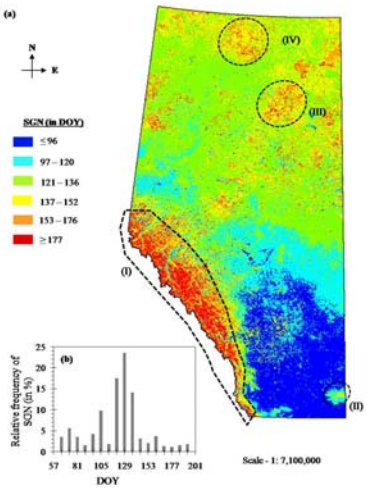
| Project Name | Contract Type | Faculty Investigators |
|---|---|---|
| Accuracy of the Differential Global Positioning System (DGPS) | Federal | G. Lachapelle |
| Adaptive and Flexible GNSS Technology Development for Automotive Systems | NSERC<br>Provincial<br>Industry | G. Lachapelle<br>K. O'Keefe<br>M. Petovello |
| Adaptive Integration Techniques for Low-cost Integrated Navigation Systems | NSERC | N. El-Sheimy |
| Advanced Carrier-phase GNSS and Integration with Ground-Based RF-ranging Systems | NSERC | K. O'Keefe |
| Advanced GNSS Signal Processing Techniques for Indoor Location | NSERC | G. Lachapelle |
| Alpine Canada Alpine Sponsorship Agreement | Industry | G. Lachapelle |
| Autonomous Navigation, Attitude Determination and Atmospheric Profiling for Nanosatellite Missions | NSERC<br>Industry<br>Federal | S. Skone |
| Canada Research Chairs Program | Federal | N. El-Sheimy |
| Collaborative Signal Tracking for Improved Satellite Navigation | Provincial | M. Petovello |
| Development of Reconfigurable GNSS Software Receivers | Federal | M.E. Cannon<br>G. Lachapelle<br>M. Petovello |
| Feasibility Study and Development of Post-Mission Processing of Inertial and Gravity Data for Improved Position and Azimuth Determination | Foreign | N. El-Sheimy |
| General Research in Wireless Location | Foreign | G. Lachapelle |
| Global Differential GNSS Positioning and Navigation | NSERC | Y. Gao |
| GNSS Software Receiver Development and Ultra-Tight Integration with Inertial Sensors | NSERC | M. Petovello |
| GPS-Electronic Monitoring Applications Study | Provincial | G. Lachapelle |
| GPS Location Technologies for Personal Digital Assistants | Provincial<br>Industry<br>NSERC | M.E. Cannon<br>G. Lachapelle<br>M. Petovello |
| GPS Location Technologies for Personal Digital Assistants NSERC CRD 2009 AAET Industry Sponsored Collaborative Project - "Enhancements of Personal Digital Assistant Location" | Provincial | M.E. Cannon<br>G. Lachapelle<br>M. Petovello |
| iCORE Chair in Wireless Location | Provincial | G. Lachapelle |
| Integration of Kinematic GPS with Emerging Inertial Measurement | NSERC | M.E. Cannon |

## Projects in Positioning, Navigation and Wireless Location, continued

| Project Name | Contract Type | Faculty Investigators |
|---|---|---|
| Integration of Satellite AIS with EO Based Maritime Security Services SCUTUM | Foreign | K. O'Keefe<br>G. Lachapelle |
| Intelligent Structural Monitoring | Industry | W. Teskey |
| Investigation of Canadian WAAS Integrity Under Ionospheric Storm Conditions | Federal | S. Skone |
| Investigation of Potential Interference with GNSS and High Voltage Power Lines on GNSS | Provincial | G. Lachapelle |
| Mitigation of Atmospheric Effects on GNSS | NSERC | S. Skone |
| Multi-Sensor Navigation Systems | Federal | N. El-Sheimy |
| Multi-Sensor Systems for Tracking and Mobility Applications | Federal | N. El-Sheimy |
| Multi-Vehicle Tracking Using GNSS Integrated with Ultra-wideband Range and Onboard Orientation Sensors | NSERC<br>Industry | K. O'Keefe<br>M. Petovello |
| NSERC Discovery Grant Supplement | NSERC | N. El-Sheimy |
| Tecterra Research Support | Provincial | N. El-Sheimy |
| Tecterra Internal Funding | U of C | N. El-Sheimy |
| Ultra-Tight Software HSGPS/INS Receiver Phase III | Federal | G. Lachapelle<br>M. Petovello |
| Use of GPS and UWB Measurements to Improve Relative Positioning | U of C | M. Petovello |

## Projects in Earth Observation

| Project Name | Contract Type | Faculty Investigators |
|---|---|---|
| Analysis of the Polar Ocean Circulation from Altimetry-derived Gravity and Bathymetry, and Its Relationship to the Climate Change (II) | Foreign | J.W. Kim |
| Feasibility Study and Development of Post-Mission Processing of Inertial and Gravity Data for Improved Position and Azimuth Determination | Foreign | N. El-Sheimy<br>J.W. Kim<br>M. Sideris |
| Field Verification of MODIS-based Leaf Area Index | Industry | Q. Hassan |
| Forest Landscape Information System | NSERC | M. Collins |
| GEOIDE NCE Project SII-PIV-50: A Geoide-based Vertical Reference Frame for Height Modernization in North America | Federal | M.G. Sideris |
| Geomagnetic Field Modeling from On-Board LEO Attitude Control Magnetometer | NSERC | J.W. Kim |
| Geotechnical Subsurface Modeling by Soft Computing Method | Foreign | J.W. Kim |
| Monitoring Agricultural Land Management Activities from Space | Federal | M. Collins |
| Multi-Satellite Determination of Global and Regional Geoid and Sea Level Changes | NSERC | M. Sideris |
| Review of the Scientific Literature on Determining Seasonal Accumulation of Snow Depth and Snow Equivalent Water Primarily Using Remote Sensing-Based Techniques. | Provincial | Q. Hassan |
| Relation Between Climate-Driven Biophysical Variables and Boreal Forest Productivity in Alberta | U of C | Q. Hassan |




Map of $NWDI_{2.13\mu m}$ based SGN predictions for the entire province of Alberta; and (b)

## Projects in Digital Imaging Systems

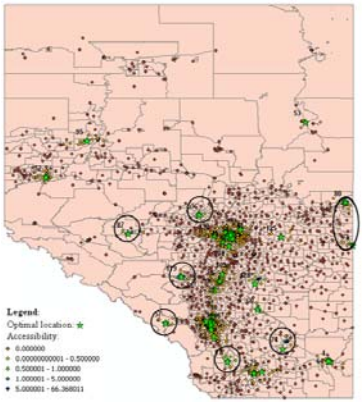
| Project Name | Contract Type | Faculty Investigators |
|---|---|---|
| A Comprehensive, On-Line Terrestrial Laser Scanning Bibliography | Foreign | D. Lichti |
| A Laser Scanning Facility for Rapid Three-Dimensional Measurement | Provincial Federal | D. Lichti |
| Development of Innovative Tools for LiDAR Mapping | Federal | A. Habib D. Lichti |
| Development of Innovative Tools for Quality Assurance, Quality Control, and Object Recognition for Terrestrial and Airborne LiDAR Mapping | Industry | A. Habib D. Lichti |
| Development of Innovative Tools for Quality Assurance, Quality Control, and Object Recognition for LiDAR Mapping | Federal | A. Habib D. Lichti |
| Draft Scanner Calibration Software Design Document | Industry | D. Lichti |
| Geometric Modelling of 3D Laser Cameras for Biomedical Applications | NSERC | D. Lichti |
| Innovation Tools for Ground-Based LiDAR Mapping | Unclassified | A. Habib D. Lichti |
| Integration of Multi-Sensory Data for Realistic Reconstruction of 3D Urban Environments | NSERC | A. Habib |
| Structural Health Monitoring System and Methodology for Bridges and Road Network | NSERC | A. Habib D. Lichti |
| Three-Dimensionalizing Surveillance Networks | Federal | A. Habib |

## Projects in GIS and Land Tenure

| Project Name | Contract Type | Faculty Investigators |
|---|---|---|
| A Model-Based Decision Support System to Quantify the Impact of Air Emissions from the Oil and Gas Activities in Central Alberta on Air Quality and Human Health | U of C | D. Marceau |
| A Scenario Planning Model to Forecast Land Use Intensification and Mitigation Measures of Alberta Woodland Caribou | Unclassified | D. Marceau |
| Canada Research Chairs Program | Federal | N. El-Sheimy |
| Development of an Agent Based Model to Assess the Industry-Induced Impacts on Woodland Caribou Habitat Selection and Use in Alberta Accelerate Internship Program | Federal | D. Marceau |
| Enhanced Cyclic Solvent Process (ECSP) for Thin Heavy Oil Reservoirs | Industry | X. Wang |

## Projects in GIS and Land Tenure

| Project Name | Contract Type | Faculty Investigators |
|---|---|---|
| GeoCens: Geospatial Cyberinfrastructure for Environmental Sensing | Federal | S. Liang |
| Incorporating Domain Knowledge in Spatial Clustering | NSERC | X. Wang |
| Intelligent Data Mining for Wormhole Reservoir Characterization | NSERC Industry | X. Wang |
| International Project Grant | U of C | X. Wang |
| John Holmlund Chair in Land Tenure and Cadastral Systems | Industry | M. Barry |
| Land Transactions in South African Town and Cities | U of C | M. Barry |
| Local Climate Change Visioning Tools and Processes for Community Decision-Making | Federal | D. Marceau |
| Multi-Sensor Systems for Tracking and Mobility Applications | Federal | A. Hunter |
| Municipal Policy for Geospatial Information Management, Access and Use | Municipal | A. Hunter |
| Online Geospatial Data Cleaning and Clustering | Federal | X. Wang |
| Schulich Chair in Geospatial Information Systems and Environmental Modelling | U of C | D. Marceau |
| Sense-Able GIS: An P2P-Based Interoperable Spatial Sensor Web Architecture | NSERC | S. Liang |
| Spatial Dynamic Modeling for Environmental Recourse Management | NSERC | D. Marceau |
| TrafficPulse SII-PIV-89 | Federal | A. Hunter<br>S. Liang |
| TrafficPulse: A Participatory Mobile Urban Sensor Web for Intelligent Green Transportation | Municipal<br>Unclassified | S. Liang |
| Using Data Mining Methods to Optimize Steam Injection Processes for Alberta Oil Sands Production | U of C | X. Wang |
| Water and Environment Hub Project | Federal | S. Liang |




*Accessibility measurement on the optimal clinic configuration*

# LICENSES AND PATENTS

Barry, M., Talking Titler Object Manager; Surveyor General of Canada. 4 licences, UN-Habitat 4 licences, Lagos State Government, Nigeria, Director of Land Regularization, Nigeria, 4 licences , University of Cape Town, 30 licences, Kwame Nkrumah University of Science and Technology, 30 licences.

Cannon M.E., G. Lachapelle, M.G. Petovello, Combined Code and Carrier Navigation using GPS and GLONASS (C3NAVG2™) - Software for Precise Differential GPS/GLONASS Navigation.

Ellum, C., and N. El-Sheimy, BUNDLE Software— software package that performs self-calibrating Photogrammetric Bundle™ adjustments and terrestrial network adjustments. Licensed by University Technologies International.

Franke, J., D. Lichti M. Stewart, (2009) A System and Method for Measurement and Mapping a Surface Relative to a Reference. South African patent 2005333891.

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Hunter, AJS., N. El-Sheimy, G. Stenhouse, B. Wright (2007) Multi-sensor Systems for Animal Tracking Applications.

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Julien, O., C. Macabiau, M. E.Cannon and G. Lachapelle (2008) BOC Signal Acquisition and Tracking Method and Apparatus, European Patent # EP 1598677B1. United Stated Patent # 7,916,771 issued in March 2011.

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O'Keefe, K., G. MacGougan, D. Chiu (2008) System and Methods for Real Time Kinematic Surveying using GNSS and Ultra Wideband Ranging, U.S. Bureau of Patents.

Ong, R., G. Lachapelle and M.G. Petovello PLANSoft™ (2010) C++ software for GPS/GLONASS carrier phase kinematic positioning.

Petovello, M.G., M.E. Cannon and G. Lachapelle, SAINT™- software for the integration of GPS and inertial measurement units.

Petovello, M.G. and G. Lachapelle (2006) A new method of Doppler Removal and Correlation for Software GNSS receivers. Patent #7,679,551, U.S. Bureau of Patents, Issued March 2010.

Schwarz, KP and N. El-Sheimy, KINGSPAD (KINematic Geodetic System for Positions and Attitude Determination) Software. A GPS/INS Integration Software for Navigation and Mapping Applications (www.kingspad.com). Licensed by University Technologies International.

Shin, E. and N. El-Sheimy, AINS™—Aided Inertial Navigation Software, Matlab Tool Box for GNSS/INS Integration using EKF, UKF, and Backward Smoothing. Licensed by University Technologies International.

Sideris, M., FFTGEOID™ - Geoid Determination Software licensed by the Hydrographic and Oceanographic Department, Japan Coast Guard, through University Technologies International.

Skone, S., TECMODEL Software, Licensed by University Technologies International.

Yang, Yong and N. El-Sheimy, Inertial Simulator—An Inertial Navigation Simulation Tool, 2007. Licensed by University Technologies International.

# ACADEMIC AND PROFESSIONAL SERVICES

**M. Barry**

- John Holmlund Chair in Land Tenure and Cadastral Systems
- GIM International Magazine Editorial Team
- Director, Federation Internationale des Geometres (FIG) Foundation
- Federation Internationale des Geometres (FIG) Special Task Force on Africa
- Canada Representative, Federation Internationale des Geometres (FIG) Commission 7
- Canadian Institute of Geomatics (CIG) Certification Committee
- Geomatics Engineering Liaison Committee
- The University of Calgary Faculty Association (TUCFA), Geomatics Department Representative
- The University of Calgary Faculty Graduate Scholarship Committee

**M. Collins**

- APEGGA, Board of Examiners
- APEGGA Committee on Aboriginal Affairs
- Associate Editor, International Journal of Remote Sensing
- Reviewer for several technical journals
- Reviewer for NSERC grant proposals

**N. El-Sheimy**

- Canada Research Chair in Mobile Multi-sensor Geomatics Systems
- Scientific Director, Tecterra
- President, Technical Commission I, International Society for Photogrammetry and Remote Sensing (ISPRS)
- Vice Chair, the IAG WG SC4.1 "Mobile Multi-Sensor Systems"
- Technical Program Chair, Co-Chair and Member, Organizing Committee for a number of national and international conferences
- Member of the Editorial Board of Journal of Survey Review, Coordinates, and Journal of Applied Geodesy

**Y. Gao**

- Advisory Board, Association of GNSS Technology and Application in China
- Board of Directors, International Association of Chinese Professionals in Global Positioning Systems
- Chairman, IAG Sub-Commission 4.5 “High Precision GNSS”
- Special Examiner, Board of Examiners for Canada Land Surveyors
- Associate Editor, IEEE Transactions on Vehicular Technology
- Editorial Board, Journal of Global Positioning Systems
- Reviewer for refereed journals and grant applications
- Session chair and program committee members for international conferences

**A. Habib**

- Professor (Status only), Department of Civil Engineering, University of Toronto
- Adjunct Professor, National Cheng Kung University, Taiwan
- Associate editor for the Geomatica Journal for the area of Photogrammetry
- Member of the Editorial Advisory Board for The Global Magazine for Geomatics GIM International, GIM International
- Member of the Editorial board of the Korean Journal of Civil Engineering
- Member, International Editorial Board of the Korean Journal of Geomatics
- Member, Editorial Board of the Brazilian Journal of Cartography (RBC) in the field of Photogrammetry and Remote Sensing
- Member, American Society for Photogrammetry and Remote Sensing (ASPRS)
- Chair, ISPRS Working Group I/3 "Multi-sensor and multi-platform inter-calibration"
- Member, ASPRS LiDAR Committee
- Special Examiner for the Canadian Board of Examiners for Professional Surveyors (CBEPS) in the area of Remote Sensing

**Q. Hassan**

- Member, Canadian Remote Sensing Society
- Member, International Society for Environmental Information Sciences
- Reviewer for several technical journals
- Reviewer, IEEE International Geoscience and Remote Sensing Symposium
- Member, Centre for Environmental Engineering Research and Education
- Member for several committees in the Schulich School of Engineering
- Editorial Board Member, Applied Remote Sensing Journal
- Reviewer, NSERC Collaborative Research and Development grant application
- Organizer for several technical conferences

**A. Hunter**

- Academic Member Canadian Board of Examiners for Professional Surveyors Education
- Department Rep Internship Advisory
- Department Rep Building Committee
- Member Learning and Instructional Development Subcommittee
- Organizing member of local chapter of the Open Source Geospatial Foundation (OSGeo)

**J.W. Kim**

- Member, Canadian Geophysical Union
- Member, American Geophysical Union
- Member, IEEE GSRS (Geoscience and Remote Sensing Society)
- Member, Korea Remote Sensing Society
- Member, Korea Soc. of Env. Geology

**G. Lachapelle**

- Editorial Board, GPS World
- Editorial Board, International Journal on Navigation and Observations
- Review of papers for numerous journals and review of grant proposals and academic promotion applications worldwide.

**S. Liang**

- Secretary, the ISPRS Technical Commission I on Image Data Acquisition - Sensors and Platforms
- Co-Chair, the ISPRS Intercommission Working Group on Geo-Sensor Networking and GeoGRID (ICWG IV/II)
- Reviewer for several international journals, books, and research grants
- Chair and co-chair for several international workshops
- Scientific Committee Member, Spatial Knowledge and Information 2011
- Member, Canada Institute of Geomatics, ACM, and APPEGA

**D. Lichti**

- Chair, International Society for Photogrammetry and Remote Sensing Working Group V/3 Terrestrial Laserscanning and 3D Imaging
- Editorial Board Member, Journal of Spatial Science
- Guest Editor, The Photogrammetric Record Special Issue
- Guest Editor, Remote Sensing Special Issue
- Member: Canadian Institute of Geomatics, Spatial Sciences Institute (Australia)
- Journal reviewer: Computers and Geosciences, IEEE Sensors, ISPRS Journal of Photogrammetry and Remote Sensing, ASCE Journal of Surveying Engineering, Sensors, Survey Review

**D. Marceau**

- Associate Head of Graduate Studies, Department of Geomatics Engineering
- Member of the Tecterra Scientific Advisory Committee
- Chair of the Post-Graduate Studies Committee, Schulich School of Engineering
- Member of the Steering Committee of the Graduate Faculties Council
- Member of the *Commission on Geospatial Analysis and Modeling*, *International Cartographic Association*
- Member of the International Editorial Board of the *International Journal of Society Systems Science*
- Member of the Program Committee of the *4th ICA Workshop on Geospatial Analysis and Modeling*
- Member of the Program Committee of the *Joint Workshop on Geovisualization and Spatial Analysis* of the *Commission of Geovisualization and the Commission of Geospatial Analysis and Modeling of the International Association of Cartography*
- Member of the International Editorial Advisory Board of *The Open Environmental Engineering Journal*
- Member of the International Editorial Board of the International Journal of GIS and Spatial Analysis/Revue internationale de géomatique

**K. O'Keefe**

- Associate Head, Undergraduate Studies
- Vice-chair, Alberta Section of the Institute of Navigation
- Member, Institute of Navigation, Canadian Institute of Geomatics, Canadian Aeronautics and Space Institute
- Member, Faculty Undergraduate Studies Committee
- Faculty Representative, U of C Engineering Endowment Board
- Editorial Boards, GPS Solutions, Journal of Geodetic Science
- Member, IAG WG 4.5.1 Network RTK, WG 4.5.4 Data Processing of Multiple GNSS Signals
- Reviewer, IEEE Aerospace and Electronic Systems, IEEE Oceanic Engineering, GPS Solutions, International Journal of Navigation and Observation, Journal of Geodesy, Navigation

**M. Petovello**

- Associate Editor, NAVIGATION: Journal of the Institute of Navigation
- Contributing Editor, Inside GNSS magazine's GNSS Solutions column
- Co-Editor, U.S. Institute of Navigation Red Book on Integrated Navigation
- Member, Editorial Board of book titled "Ubiquitous Positioning and Mobile Location-based Services in Smart Phones"
- Chair, Institute of Navigation Alberta Section since Dec 2009
- Track Chair, 2010 Institute of Navigation GNSS Conference
- Member, U.S. Institute of Navigation, APEGGA, IEEE, CIG
- Reviewer for seven different technical journals

**M. Sideris**

- Associate Dean, Faculty of Graduate Studies
- Member, Board of Directors of The University of Calgary Faculty Association (TUCFA)
- Chair, Research Development and Policy Committee (RDPC)
- President, International Association of Geodesy (IAG)
- Member, Executive Committee of International Union of Geodesy and Geophysics (IUGG), Bureau and Executive Committee of the IAG
- Fellow of the IAG and of the International Geoid Service (IGeS)
- Member of several IAG special study groups, commissions, and working groups
- Member, Editorial Board, Journal of Geodesy and Cartography
- Reviewer for the Journal of Geodesy, Geophysical Journal International, Journal of Geodynamics, Geomatica and Journal of Geophysical Research
- External reviewer, NSERC and European Granting Councils

**S. Skone**

- GeoScan Iridium Steering Committee
- Chair, Canadian Navigation Society
- CASI Executive Council
- CIG Hydrography Committee
- Associate Editor, Canadian Aeronautics and Space Journal

**W. Teskey**

- Member, Faculty of Engineering Academic Appeals Committee
- Canadian representative to Commission 6 (Engineering Surveys) of the International Federation of Surveys (FIG)
- Member, Publications Committee, Journal of Surveying Engineering

**X. Wang**

- Program Committee. The 8th International Conference on Fuzzy Systems and Knowledge Discovery (FSKD 2011) and The 7th International Conference on Natural Computation (ICNC 2011). Shanghai, China
- Conference Chair. RSKD2011, Banff, Canada
- Program Committee. The 15th Pacific-Asia Conference on Knowledge Discovery and Data Mining, Shenzhen, China
- Conference Chair. The First International Workshop on Spatial Information Modeling, Management and Mining (SIM3) in conjunction with DASFAA2011. Hong Kong, China
- Program Committee. The 24th Canadian Artificial Intelligence Conference (CAI 2011). St John, Canada
- Reviewer, IEEE Trans on Knowledge and Data Engineering (TKDE), Pattern Recognition, IEEE International Conference on Data Mining (ICDM 2007) AGG 2009, Geomatica, Journal of Advanced Transportation
- Committee member, Faculty Gender and Diversity in Engineering Committee (GDEC)
- Member, Canadian Artificial Intelligence Association
- Member, The Association of Chinese Professionals in Geographic Information Systems

*Dr. Ayman Habib takes a Pie.*
*Pi-Throw is a charitable event put on by ESS.*

# PUBLICATIONS

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