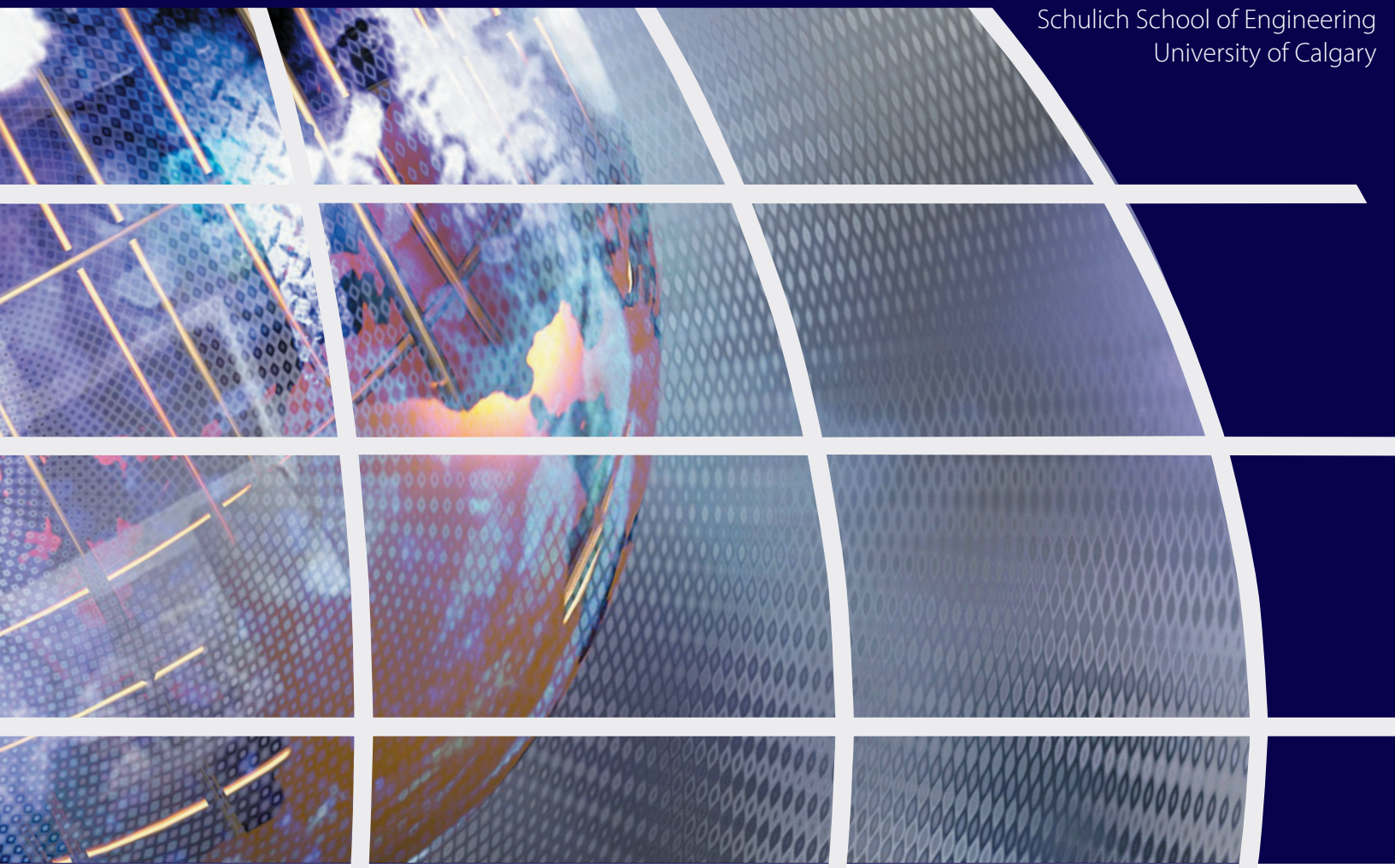
PROGRESS REPORT 2006-2007

Department of Geomatics Engineering

Schulich School of Engineering
University of Calgary



Position Yourself Ahead of the Crowd

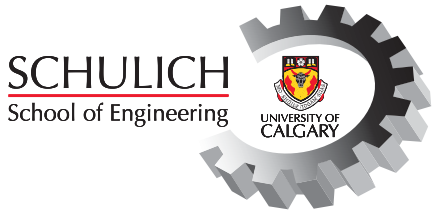
UCGE Number 50038

GEOMATICS ENGINEERING

SCHULICH School of Engineering
UNIVERSITY OF CALGARY

PROGRESS REPORT
2006/2007

DEPARTMENT OF GEOMATICS ENGINEERING



May 2007

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Admitted to the Degree of
BACHELOR OF SCIENCE

Tariq Badar Al-Barwani (Internship)
Jared Brian Bancroft (Internship)
Natin Bansal (Internship)
Rebecca McKillop Broten
Desmond Bik-Sing Chiu (With Distinction) (Internship)
Tricia Maria Christie (Internship)
Ammara Mahmood Cokar (Internship)
Nathan Robert Dennison
Lee Gabriel Falcon
Colin Michael Ferguson (Internship)
Scott Angus Fraser
Christina Mihailova Galabova
Neil James Gibbs
Evan Yu Yang Hsiao (Internship)
Angela Rae Jeffray (With Distinction)
Sidney Pascal Kwakkel
Sheldon Lam
Jennifer Christina Lay (With Distinction)
Andrew Shale Levson
Peter Daniel Lund
Arif Muradali Mohamed (Internship)
Lisa Ellen Monk (Internship)
Jeremy Lee Park (With Distinction) (Internship)
Nikola Paukovic (Internship)
Eric Daniel Pellegrino
Sureshkumar Rajakumar
Tyler Ross Robinson
Daniel Thomas Schafer
Kara Marie Schoenberger
Robert Joseph Schrage
Ranny Jules Shibley
Prakhar Shrivastava
Bruce Ce Tattrie
Jeffery Steven Thompson (Internship)
Brady Ross Troyer
Ryan James Walker (Internship)
John Matthew Ward
Ivy Yau (Internship)
Sarah Soo-Yeon Yoo
Patricia Zuczek (With Distinction) (Internship)

Admitted to the Degree of
MASTER OF ENGINEERING

Jalal Ibrahim Al-Azizi

Admitted to the Degree of
MASTER OF SCIENCE

Shahin Charkhandeh
Seema Phalke
Sanjeet Singh
Balaji Devaraju
Jianning Qiu
Wei Yu

Admitted to the Degree of
DOCTOR OF PHILOSOPHY

Mohamed Mamdouh El-Habiby
Guo Jiang Gao
Jau-Hsiung Wang
Maria Rebeca Quiñonez-Piñón
Matthias Luigi Bruno Weigelt

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HIGHLIGHTS 2006/2007

2006/2007 has been a very prosperous year. I would like to start by thanking our faculty, support and technical staff, and our students for their services, contributions and continued commitment to the Department.

- Four new faculty members
- Recruitment in process for two more faculty members
- Research funding reaches $278,000 per faculty member
- Numerous senior faculty and student awards
- Involvement in high level national and international boards, professional & learned societies
- Record number of convocants

I would like to take this opportunity to welcome our four new faculty members – Dr. Dr. Jeong Woo Kim (Geodetic Earth Observation), Dr. Xin Wang (Geospatial Information Systems), Dr. Andrew Hunter (Land Tenure and Cadastral); and Dr. Steve Liang (Geospatial Information Systems) - We are pleased that they have joined us. Growth is certainly on the horizon for the Department, with three more new faculty to join by 2008 and the additional students and resources to our program from the new Energy and Environment new funding - this will benefit the geomatics sector by providing additional graduates as well as new skill sets.

During 2006-2007, the Geomatics Engineering program continued to flourish. A total of 40 students received their BSc degree, 6 students their MSc degree, 1 student their MEng, and 5 students received their PhD. Undergraduate enrolment reached 48, 54 and 41 in each successive year of the undergraduate program, in addition to 24 students who entered the Internship Program. Demand for our BSc, MSc and PhD graduands remains exceptionally strong, particularly given the growth in the geomatics sector in Alberta.

This year brought a change to leadership in the Department. On July 1st, 2006, Dr. Cannon took the position of the Dean of Schulich School of Engineering, University of Calgary. On December 31, 2006, Dr. Susan Skone completed her 6 months term as Interim Department Head, and Dr. Naser El-Sheimy began a five-year term.

The 2006-2007 fiscal period was another very successful year from a research excellence point of view. Faculty members have continued to secure major research funding. Total direct research funding exceeded $4.4 million, which is approximately $278,000 in average research funding per faculty member. Numerous awards were received by students and faculty members, which are detailed on the following pages. Several faculty members continued to serve in leadership positions on various boards and in learned societies.

The Department is continuing in its commitment to excellence and growth in the undergraduate and graduate programs. Several initiatives are being developed to further enhance our teaching and research programs, so 2007/08 promises to be another exciting year!

Dr. Naser El-Sheimy
Professor and Head

Geomatics Engineering
Faculty Members at the Annual Retreat
May, 2006

Back Row: G. Lachapelle, W. Teskey, D. Marceau, K. O'Keefe, A. Braun
Front Row: I. Couloigner, N. El-Sheimy, A. Habib, M. Tait, E. Cannon, M. Sideris
Missing: M. Barry, M. Collins, Y. Gao, S. Skone, C. Valeo

MESSAGE FROM THE DEAN

Congratulations to the faculty, students and staff in the Department of Geomatics Engineering for another exciting year. The accomplishments of Departmental members over this past year are indeed impressive and are indicative of your strong commitment to excellence. With the Department's achievements in research and the development of academic programs, coupled with the strong demand for geomatics graduates, the potential for even increased impact on the local, national and international fronts is significant. The Department has a rich history and is currently evolving through new faculty appointments, revised curriculum and expanded research thrusts. All of these initiatives are well aligned with the strategic direction of the Schulich School of Engineering, and I look forward to working with you to achieve even greater accomplishments in the future!

M. Elizabeth Cannon, PEng, FCAE, FRSC
Dean, Schulich School of Engineering

AWARDS AND RECOGNITION

Several faculty members received awards in 2006 at the Engineering Faculty Council: **Dr. Ayman Habib**, Geomatics Engineering Research Award; **Dr. Naser El-Sheimy**, Geomatics Engineering Teaching Award; **Dr. Mike Barry**, Geomatics Engineering Service Award; **Dr. Yang Gao**, Schulich School of Engineering Graduate Education Award.

Dr. Klaus-Peter Schwarz, (Professor Emeritus) was conferred the eminent title "Doctor Engineer "Honoris Causa" by the University of Hannover, Germany, on the occasion of its 175th anniversary celebrations.

Wouter van der Wal won the CGU Best Student Presentation Award in June of 2006.

Natalya Nicholson won a Communicator of Excellence Award at the GEOIDE Annual Scientific Conference. This is in recognition of her excellent communication skills in presenting a project overview.

Shahin Charkandeh and **Suren Shanmugam** received Best Poster Presentation awards at the iCORE Summit 2006.

The Third Annual Schulich School of Engineering Graduate Student Research Conference was held May 1 & 2, 2006. There were over 140 student presentations in multi-disciplinary sessions. Geomatics award winners were: **Mohannad M. Al-Durgham, Shahin Charkhandeh, Mwafag Ghanma, Taher Hassan, Wouter van der Wal and Elena Rangelova**.

Jau-Hsiung Wang, and co-author **Dr. Yang Gao** won the Best Student Paper Award for the International Workshop on Artificial Intelligence and Applications at the International MultiConference of Engineers and Computer Scientists (IMECS).

Jianchen Gao, Surendran Shanmugam, Sanjeet Singh, Wei Yu and Chris Goodall won sponsorship awards from the U.S.based Institute of Navigation to present their research results at the international GNSS06 conference.

Professor Gérard Lachapelle, Mr. **Ross Stirling** and **Professor Ken Fyle**, formerly from the University of Alberta, won the 2006 Royal Institute of Navigation Michael Richey Medal for the best research results published in Navigation, the Journal of the Royal Institute of Navigation.

Dr. Yang Gao was selected as the winner of the 2006 INTERMAP Award for his paper "Airborne Kinematic Positioning Using Precise Point Positioning Methodology" published in GEOMATICA.

Dr. Alexander Braun was awarded the Engineering Student Society award *"for excellence in teaching and displaying enthusiasm for engineering to students"* in Geomatics. Dr. Braun was selected by the Third and Fourth year students.

Professor Gérard Lachapelle, CRC/iCORE Chair in Wireless Location, was elected Fellow of the Royal Institute of Navigation during the Annual General Meeting of the latter in London in October 06 in recognition of his fundamental work related to satellite-based navigation.

(Continued on next page)

AWARDS AND RECOGNITION, continued

GNSS06 Best Presentations awards were given to **Gérard Lachapelle, Elizabeth Cannon, Chris Goodall, Saurabh Godha**, and **Cécile Mongredien**.

Dr. Elizabeth Cannon was named Woman of Vision in the science, technology and environment category, Global Television.

Dr. Kyle O'Keefe was named 'Professor of the Year' at the Engineering Graduation Banquet. Dr. O'Keefe was selected for the award by the graduating students.

Professor Gérard Lachapelle received the Alberta Ingenuity Fund Research Excellence Award at the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) Summit Awards Gala.

Dr. Elizabeth Cannon was chosen by the Women's Executive Network as "Canada's Most Powerful Women: Top 100".

Dr. Mark Petovello was awarded the U.S. Institute of Navigation's (ION) Early Achievement Award.

ION President Mr. John Lavrakas (left) and Dr. Mark Petovello at the ION's Annual Awards Banquet in Cambridge, MA.

Geomatics Engineering display at Women in Engineering Day
L to R: Dr. Isabelle Couloigner, Ryan Fox, Dr. Rebeca Quinonez-Pinon, and Dr. Matthew Tait.

PERSONNEL

Faculty

Dr. N. El-Sheimy
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Dr. S.H. Skone
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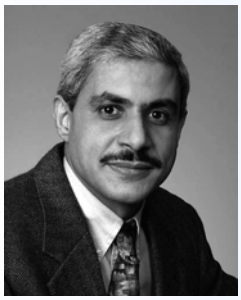

Dr. A.F. Habib
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Dean, Schulich School of Engineering (July 2006)
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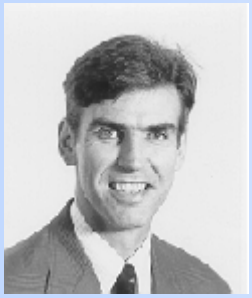

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Email: valeo@geomatics.ucalgary.ca

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.

Ed Scovill, retired SAIT surveying instructor, has generously donated a Troughton & Simms transit to the Department of Geomatics Engineering. Dr. Gerard Lachapelle and Kirk Collins are seen, at the right, recently accepting this equipment from Ed.

In addition the department also received a number of valuable historical surveying texts and a copy of a township plan for the Town of Calgary dated 1895.

The Department wishes to thank Ed for this kind donation.

Adjunct Professors

Dr. Bo Huang
Chinese University of Hong Kong
Dr. Richard Klukas
Okanagan University College
Dr. Bryan Mercer
Intermap Technologies Corp.
Dr. Aboelmagd Noureldin
Royal Military College of Canada
Dr. Bruno Scherzinger
Applanix Corporation
Dr. Nico Sneeuw
Universität Stuttgart

Congratulations to Dr. Kyle O'Keefe and his wife Kim, and daughters Amelia and Cora, on the birth of Samuel David Brian O'Keefe, born on Saturday, March 31, 2007 weighing 8lbs 6.5 oz.

Support Staff Administrative

Marcia Inch, BScHEc, Administrative Manager

Monica Barbaro, Administrative Assistant

Julia Lai, Administrative Assistant

Lu-Anne Markland, Graduate Program Administrator

Julia Millen, BSc, BMus, MA, Program Administrator, SCIberMENTOR Program

Faculty, Staff and Graduate Students
Department Christmas Party, December, 2006

Support Staff Technical

Garth Wanamaker, BSc, Technical Manager

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

Brad Groat, BA, Dipl. in Electronics Engineering Technology, Computer Systems Administrator

Kathy Hamilton, Network Technician Certificate, Computer Technician

Gail Leask, Dipl. in Telecomputer Engineering Technology, Microcomputer Lab Administrator

Research Engineers/Associates/Assistants

Walid Abdel-Hamid
Positioning, Navigation and Wireless Location

Saurabh Godha
Positioning, Navigation and Wireless Location

Lesley Hill
Positioning, Navigation and Wireless Location

Zhi Jiang
Positioning, Navigation and Wireless Location

Martin Lavigne
Positioning, Navigation and Wireless Location

Valarmathy Meenakshisundaram
Digital Imaging Systems

Phillip Mutulu
Gravity Field and Geodynamics

Cillian O'Driscoll
Positioning, Navigation and Wireless Location

Mark Petovello
Positioning, Navigation and Wireless Location

Rebeca Quinonez-Pinon
GIS and Land Studies

John Schleppe
Positioning, Navigation and Wireless Location

Muhammad Soofi
Gravity Field and Geodynamics

Robert Watson
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Yan Wong
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Bruce Wright
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Cheng Zhang
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Nesreen Ziedan
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Katrin Zorn
Digital Imaging Systems

Post Doctoral Fellows

Mohamed El Habiby
Gravity Field and Geodynamics

Dongqing Gu
Positioning, Navigation and Wireless Location

Xiao Ji Niu
Positioning, Navigation and Wireless Location

Yufeng Zhang
Positioning, Navigation and Wireless Location

Mauricio Gende
Positioning, Navigation and Wireless Location

Sameh Nassar
Positioning, Navigation and Wireless Location

Ruifang Zhai
Digital Imaging Systems

Guest Lecturers

International Lecture Series

Mr. Stewart Baillie
Institute for Aerospace Research
Aviation and the Human Element

Dr. C.K. Shum
The Ohio State University
The Role of Space Geodesy in Earth Mass and Global Sea Level Change Studies

Dr. Nico Sneeuw
Geodätisches Institut, Universität Stuttgart
Satellite Geodesy: From Kepler to Formation Flight

Special Lecture Series

Dr. Rifaat Abdalla
York University
An Infrastructure-interdependency-based Framework for Utilizing Network-centric GIS as a Core Technology in Disaster Management

Mr. Qi Chen
University of California, Berkeley
Modeling Ecological Functions and Measuring Vegetation Structure for Complex and Heterogeneous Landscapes

Dr. Suzana Dragicevic
Simon Fraser University
The *Frontiers of GeoSimulations: Modeling Complex Spatial Systems with Geographic Information Systems and Cellular Automata*

Dr. Jacob Flury
University of Texas at Austin
Observation and Modelling of the Earth Gravity Field: From Geodetic Engineering to Earth System Science

Dr. Rossen Grebenitcharsky
TU Delft
Joint Analysis of Historical and Contemporary Leveling Surveys for Land Subsidence Monitoring over the Netherlands

Mr. Andrew Hunter
University of Calgary
Moving to Dynamic Data for GIS

Mr. Steve Liang
York University
Spatial Sensor Web and GeoSWIFT 2.0: An Interoperable and Scalable World-Wide Spatial Sensor Web Service

Dr. Michael Sutherland
University of New Brunswick
Boundaries and Good Governance

Dr. Vincent Tao
Microsoft Virtual Earth
Evolution or Revolution? On-line Mapping and Geomatics

Dr. Monica Wachowicz
Wageningen University and Research Centre, The Netherlands
Looking into the Future of Mobile Information Society: A Geomatics Perspective

Dr. Xin Wang
University of Regina
DBRS+: A Density-Based Spatial Clustering Method in the Presence of Obstacles and Facilitators

Dr. Jeong Woo Kim
Sejong University
Analysis of Geohazards from Geodetic Observations

Dr. Bisheng Yang
University of Zurich
Multi-resolution Representation and Progressive Transmission of Large Volume Datasets in Web GIS

Distinguished Lecture Series

Dr. Heribert Kahmen
University of Technology Vienna
High Precision Positioning & Navigation for Industrial Production Processes

Dr. John Raquet
U.S. Air Force Institute of Technology
Advanced GNSS Receiver Technology

Market Place in Fiji
Photograph by Dr. Caterina Valeo during her research visit on water resource projects in the South Pacific

Visiting Scientists

Dr. Chaminda Basnayake
General Motors

Dr. John D. Bossler
The Ohio State University

Dr. Rene Forsberg
Danish National Space Centre
Copenhagen, Denmark

Mr. Dominique Fortin
Mindready

Mr. Gary Sawayama and Mr.Brad Hlasny
Canada-wide Differential GPS Service of the Canadian Council on Geomatics
Canada-wide Differential GPS Service—The Next 3 Years

Mr. Larry Hothem
U.S. Geological Survey
Experiences with use of GNSS Equipment In The Antarctical *Polar Environments*

Dr. Marco Leupin
Advisor, Berne Switzerland

Dr. Soohong Park
Department of GeoInformatics
Inha University, South Korea

Dr. YoungBum Park
Government of South Korea

Mr. Adrian Tayor, Ms. Susan Watson and Mr. Bob Robinson
Department of National Defense

Dr. Andrei Soloviev
Avionics Engineering Center, Ohio University
Utilizing Batch Processing for GNSS Signal Tracking

Professor Cheng Wang
National University of Defense Technology
Hunan, P.R. China

Dr Roger White
Department of Geography, Memorial University, Newfoundland
Cellular *Automata Modelling at ISEEE*

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 30th annual advisory committee meeting was held on Friday, October 27, 2006. The agenda included discussions on the Schulich School of Engineering expansion, new programs, and opportunities for future growth. The Department Five Year Strategic Plan was highlighted, along with issues related to undergraduate recruitment, and new positions slated for the Department over the next two years. Also included was an in camera meeting with undergraduate students, and a discussion about Career Day.

Advisory Committee 2006

Name	Affiliation
O'Brian Blackall, Chair	McElhanney Land Surveying Inc.
Arlin Amundrud	Global Surveys Group Inc.
Eric Desroche	Intermap Technologies Corporation
Hazen Gehue	SiRF
Ron Hall	Focus Corporation
Irwin Itzkovitch	Earth Science Sector, Natural Resources Canada
Amin Kassam	B.C. Government
Teresa Myrfield	Pacific Land Surveying Ltd.
Robert Parkinson	Agriculture and Agri-Food Canada
Kim Sturgess	Alberta WaterSMART
Gary Zhang	MRF Geosystems Corporation
Representatives of the U of C were S.H. Skone, M.B. Barry, A.F. Habib	

Apparent Temperature in Degrees Kelvin **O**verlaid thermal IR imagery on the corresponding visible photography.
Photo By: Dr. Isabelle Couloigner

Geomatics Engineering Liaison Committee (GELC)

The Geomatics Engineering Liaison Committee met on October 26, 2006 and February 8, 2007. 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 two delegates each from the Land Surveying Associations in the four western provinces and the Association of Canada Lands Surveyors, a member at large, as well as the Associates Heads and Cadastral faculty of the Department of Geomatics Engineering at the University of Calgary.

Discussions centered around new survey content in ENGO 343, ENGO 455, ENGO 579, ENGO 581, ENGO 501(Kananaskis Survey Camp), ENGO xxx(2nd Survey Camp on U of C Campus); and plans for presentations in the Professional Lecture Series at the 2007 Kananaskis Survey Camp.

Geomatics Engineering Liaison Committee 2006	
Name	**Affiliation**
Arlin Amundrud	Member at Large
John Armstrong	Association of British Columbia Land Surveyors
Bryan Bates	Member at Large
Paul Dixon	Association of Canada Lands Surveyors
Victor Hut	Alberta Land Surveyors Association
Robert King	Alberta Land Surveyors Association
Ian Lloyd	Association of Canada Lands Surveyors
Paul Standing	Association of Manitoba Land Surveyors
Roy Pominville	Saskatchewan Land Surveyors Association
Representatives of the U of C were M.B. Barry (Chair), W.F. Teskey, A.J. Hunter.	

Vidyavathy Renganathan and Prakhar Shrivastava conduct a field campaign in Churchill, Manitoba.

Student Awards Night

Student Awards Night was held on Thursday, October 26, 2006. 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.

David Parker presents Buke Chen the Colt Bursary

Ashok Sehgal presents Carina Butterworth the R.M. Hardy Scholarship

Alex Bruton presents Mohamed El-Habiby the CF Gauss Award and FR Helmert Award

Graduate Awards

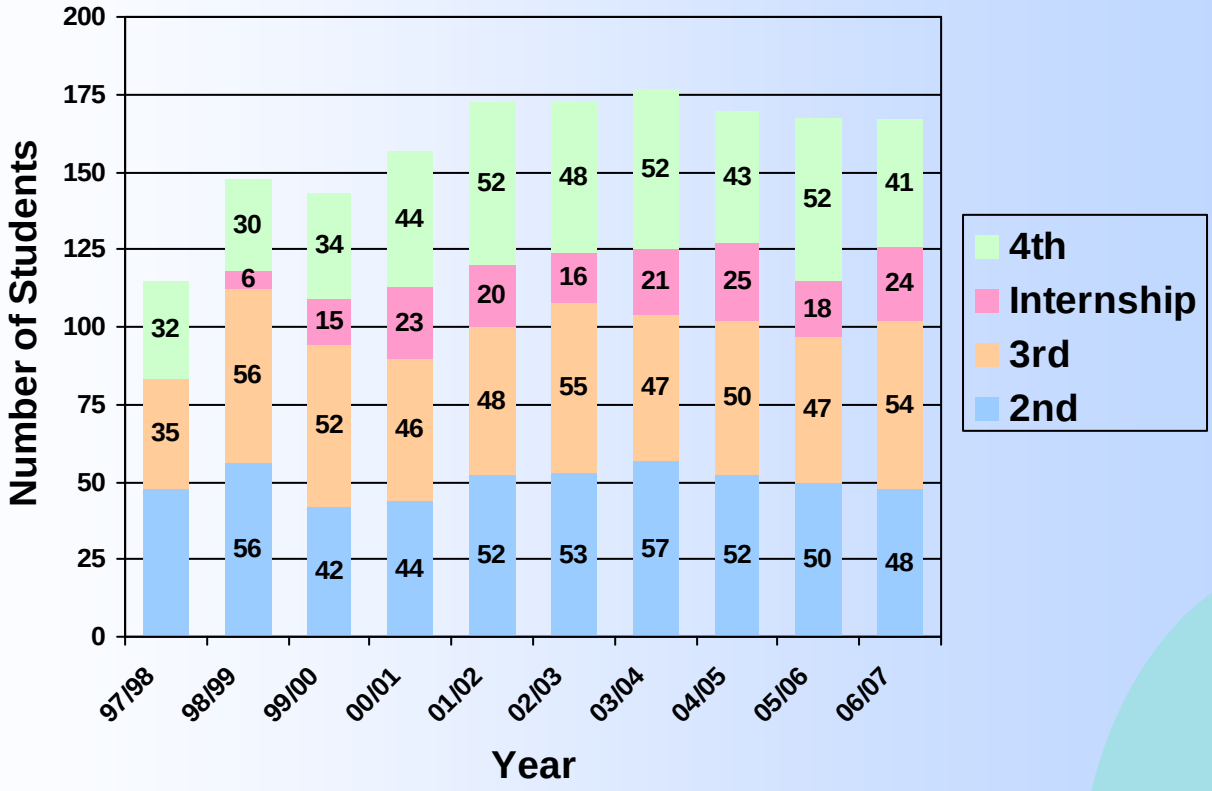
Recipient	Awards
Carina Butterworth	Alberta Provincial Gov't "Persons Case Scholarship"
Chengqian Zhang	AIF Awards
Abdel-Rahman Muhsen	ALSA Graduate Student Scholarship
Carina Butterworth	APEGGA R.M. Hardy Graduate Scholarship
Mohamed El-Habiby	C. F. Gauss Award
Andrew Hunter	Eratosthenes Award
Chris Goodall	Dean's Excellence Award
James Wang	Dean's Special Doctoral Scholarship
Taher Fathy Abbas Hassan	Egyptian Government Scholarship
Mohamed El-Habiby	F.R. Helmert Award
Rita Cheng	Governor Generals Gold Medal Award
Wouter van der Wal	Helmut Moritz Graduate Scholarship
Cameron Ellum	Innovation in Mobile Mapping Award
James Wang	Institute of Navigation (ION) Alberta Section Graduate Award
Jianchen Gao Wei Yu	Institute of Navigation (ION) Graduate Award
Surendran Konovattam Shanmugam	Institute of Navigation (ION) National Award
Natalya Nicholson	Institute of Navigation (ION) Student Section Award
Jianchen Gao	Jacques Cartier Award
Surendran Konovattam Shanmugam	KIS94 Graduate Scholarship
Cameron Ellum	L.R. (Dick) Newby Memorial Award
Priyanka Aggarwal Kerri Robinson Chris Goodall Jennifer He Wei Yu	NSERC IPS Scholarship NSERC IPS Scholarship NSERC Post Graduate Scholarship NSERC Post Graduate Scholarship NSERC Post Graduate Scholarship
Niandry S. Moreno	Organization of American States Scholarship
Mahmoud El-Gizawy Andrew Hunter	Queen Elizabeth II Scholarships
Surendran Konovattam Shanmugam Natalya Nicholson	University of Calgary Silver Anniversary Graduate Fellowship
Natalya Nicholson	SWAAC Graduate Student Award
Ghazi Ali Al-Rawas	Sultanate of Oman Scholarship
Matthias Weigelt	Werner Graupe International Fellowship in Engineering

Undergraduate Awards

Recipient	Awards
Richard Bryan Ong	A.D. (Denis) Hosford Scholarship
Jeremy Lee Park	Alberta Land Surveyors' Association Scholarship
Amy Christine Spiers	Big Rock Brewery Scholarship
Rebecca McKillop Broten	British Columbia Land Surveyors Award
Ben Charles Knoechel	Crape Geomatics Scholarship
Jacky Chun Kit Chow	Cannon-Lachapelle Family Scholarship
Buke Chen	Colt Geomatic Solutions Ltd. Bursary
Arne Ove Hals	David Scovill Memorial Bursary
Grant Walter Powers	E.J. Krakiwsky Bursary
Prakhar Shrivastava	Focus Intec Geomatics Bursary
Jacky Chun Kit Chow Dustin James Engen Sidney Pascal Kwakkel	Geomatics Engineering '25th Anniversary' Bursary
Dustin James Engen Sidney Pascal Kwakkel	Geomatics Engineering Student Society Bursaries
Rebecca McKillop Broten	H. Roy Goldfinch Memorial Award
Eduardo Infante	Institute of Navigation Alberta Chapter Bursary
Dustin James Engen	Institute of Navigation (ION) Undergraduate Bursary
Trevor Paul Phillips	J.H. Holloway Scholarship in Geomatics Engineering
Jeremy Lee Park	Jerry J. Simpson Memorial Scholarship
Jeremy Lee Park	Jim Van Dam Scholarship
Britton William Armstrong	John Deyholos Memorial Award
Ben Charles Knoechel	KIS-97 Undergraduate Scholarship
Jeremy Lee Park	L.R. (Dick) Newby Memorial Award
Amy Christine Spiers	Leica Geosystems Limited Scholarship
Rebecca McKillop Broten	McElhanney Scholarship
Eduardo Infante	Ray Lowry Memorial Bursary
Prakhar Shrivastava	Saskatchewan Land Surveyors' Association Award
Rebecca McKillop Broten	Stephen P. Williams Memorial Award

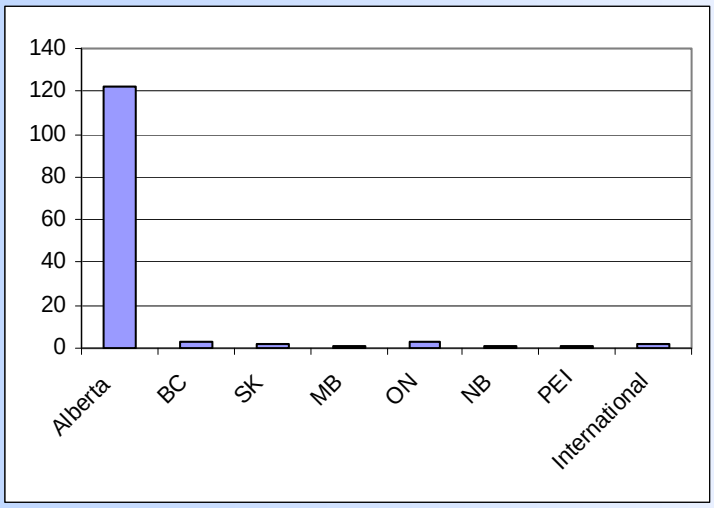
UNDERGRADUATE STUDIES

Enrollment



During the 2006/07 academic year, 143 undergraduate students (167 including internship) pursued studies in Geomatics Engineering at the University of Calgary.

Undergraduate enrollment has remained consistently high, and close to the record number of students the Department achieved in recent years. The program's enrollment has almost doubled in the past ten years, with an average enrollment per year of 48 students in each of second, third and fourth year.



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 has dropped in the past year or two.

Student Enrollment by Geographic Region

Summer BBQ L to R: Jean Gabriel Hasbani, Sk. Morshed Anwar, Niandry Moreno

MapWorld Forum Conference in Hyderabad, India. L to R: Jeffrey Thompson,Sarah Yoo, Sureshkumar Rajakumar, Jeremy Park, Christina Galabova, Sheldon Lam, Nikola Paukovic

Survey Camp 2006

MapWorld Forum Conference in Hyderabad, India L to R: Sheldon Lam, Jeffrey Thompson, Nikola Paukovi Christina Galabova, Sarah Yoo, Jeremy Park, Sureshkumar Rajakumar

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 the second term 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 201	Behaviors of Liquids, Gases and Solids
	ENGG 205	Engineering Mechanics I
	ENGG 233	Computing for Engineers I
	ENGG 251	Design and Communications I
	ENGG 253	Design and Communications II
	MATH 221	Linear Algebra for Scientists and Engineers
	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
	ENCM 339	Programming Fundamentals
	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
	ENCM	Computer Engineering
	ENGG	Faculty of Engineering
	ENGO	Dept. of Geomatics Engineering
	PHYS	Dept. of Physics

Undergraduate Curriculum in Geomatics Engineering

Year 2/Winter	Course #	Course Name
	AMAT 309	Vector Calculus for Engineers
	ENEL 327	Signals and Transforms
	ENGO 343	Fundamentals of Surveying
	ENGO 351	Introduction to Geospatial Information Systems
	ENGO 361	Adjustment of Observations
Year 3/Fall	**Course**	
	ENGG 407	Numerical Methods in Engineering
	ENGO 421	Coordinate Systems
	ENGO 431	Principles of Photogrammetry
	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
	TE-1	Technical Elective
	TE-2	Technical Elective
	TE-3	Technical Elective
	COST-4	Complementary Study
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 #	Course Name
BSEN 395	Business Law for Strategic Decision Makers
ENGO 531	Advanced Photogrammetric and Ranging Techniques
ENGO 532	Photogrammetric Techniques for Reconstruction and Manipulation of Biomedical Data
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 573	Digital Terrain Modelling
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—Coral Bliss Taylor
VP Academic/4th Year Rep—Rob Schrage
VP Events—David Getzlaf
VP Finance/Secretary—Malcolm Richmond
VP External—Kim Yeats
3rd Year Rep—Brandon Ellis
Webmaster—James Badger
Photographer—Dustin Engen
Career Day—Rebecca Broten

L to R: *Kim Yeats, Rob Schrage, David Getzlaf, Brandon Ellis, Coral Bliss Taylor, Dustin Engen, James Badger, Malcolm Richmond*

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.
Cansel Survey Equipment
Spatial Technologies
SAIT Polytechnic

Survey Camp 2006—Group Photo

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.

Name	Placement Company	Faculty Mentor
Abdelrahman, Mahmoud Reda	CDL Systems Ltd.	Yang Gao
Armstrong, Britton William	Intermap Technologies Corporation	Isabelle Couloigner
Assem, Karim Mohamed	Geoseis Inc.	Matthew Tait
Bahan, Kurtis Shawn	Aerotec	Alexander Braun
Clipperton, Benjamin Frederick	Midwest Surveys Inc.	Matthew Tait
Culling, Brandon Jefferson	NovAtel Inc.	Kyle O'Keefe
Doram, Craig	Focus Corporation Ltd.	Bill Teskey
King, Johnathan Andrew	Focus Corporation Ltd.	Bill Teskey
Kwiatkowski, Kristopher Marv	Challenger Geomatics Ltd.	Susan Skone
Lau, Josiah Yin	Intermap Technologies Corporation	Isabelle Couloigner
Lin, Tao	PLAN Group, Geomatics Engineering	Gerard Lachapelle
Madsen, Dale Christopher	Midwest Surveys Inc.	Michael Sideris
Man, Ryan Joseph	Caltech Surveys Ltd.	Gerard Lachapelle
Miller, Max David	POINT Inc.	Kyle O'Keefe
Mosstajiri, Tina	Natural Resources Canada	Daniel Marceau
Ong, Richard Bryan	PLAN Group, Geomatics Engineering	Gerard Lachpelle
Phan, Tram Bich Nu	Applanix Corporation	Ayman Habib
Phillips, Trevor Paul	CDL Systems Ltd.	Michael Sideris
Saleh, Mina	Stantec Consulting Ltd.	Ayman Habib
Side, Amanda Melissa	CDL Systems Ltd.	Susan Skone
Sinclair-Foreman, Nichola Kristiane	University of Calgary	Alexander Braun
Sinha, Anil	Stantec Consulting Ltd.	Yang Gao
Tran, Yee Duy Hoang	Cadastral Group Inc.	Bill Teskey
Wong, Carmen	Intermap Technologies Corporation	Daniel Marceau

ENGO 500

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.

ENGO 500 Special Presentations

GIS Project Management
Joseph Hlady
Colt Geomatics

Land Surveys Project Management
Ron Hall
Focus Surveys Limited Partnership

Project Management:
Kodiak Navigation Solutions
Jim McLellan
Kodiak Navigation Inc.

The Last Major High Accuracy Classical Geodetic Survey Operation Undertaken in Canada:
The 1983 Rogers Pass Survey
Gerard Lachapelle
University of Calgary

Project Management in Navigation Product Development
Jonathan Auld
NovAtel Inc.

Graduate Studies in Geomatics Engineering
Ayman Habib
University of Calgary

ENGO 500 GROUPS 2006/2007

Project Title	Group Members	Supervisor
Multimedia Land Information System	Evan Hsiao Lisa Monk Nikola Paukovic Peter Lund	Mike Barry
3-D visualization of Satellite Data for Geomatics and Oil & Gas Applications	Chris Carback Kara Schoenberger Patricia Zuczek Sureshkumar Rajakumar	Alexander Braun
High Precision Positioning Using a Single GPS Receiver	Arif Mohamed Jeff Thompson Sarah Yoo	Yang ao
Quality Control of LIDAR Data	Ammara Cokar Catherine Be Christina Galabova Daniel Van der Straeten	Ayman Habib
White Water Analysis in Rivers and Streams	Brady Troyer Jared Bancroft Sidney Kwakkel	Gerard Lachapelle
Driving Factors of the Land-Use Dynamics in the Calgary Region Over the Last 20 Years and Impact on Environmental Resources	Ivy Yau Prakahar Shrivastava Scott Fraser Tariq Al Barwani	Danielle Marceau
Design and Prototyping of an Inuit Hunter Tracking System	Andrew Levson Desmond Chiu Jeremy Park Sheldon Lam	Kyle O'Keefe
Determination of an Error Propagation Model for a Terrestrial Laser Scanner	Thomas Penner Tricia Christie Tyler Robison Aubrey Tuttle	Matthew Tait
Multi-Parameter Transformation Method for High-Precision Industrial Surveys	Daniel Schafer Nitin Bansal Rebecca Broten Rob Schrage	Bill Teskey
CanX-2 Satellite for Measuring Atmospheric Properties over Canada	Erin Kahr	Kyle O'Keefe/ Susan Skone

GEOMATICS ENGINEERING CAREER DAY

On Thursday, February 8, 2007, the Geomatics Engineering Student's Society and the Department of Geomatics Engineering hosted their eleventh 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.

Career Day Participants 2007	
Aerotec	Alberta Geomatics Group
Alberta Land Surveyors' Association	All West Surveys Ltd.
Applanix Corporation	Association of BC Land Surveyors
Autodesk	BP
Caltech Surveys Ltd.	Canadian Institute of Geomatics
CDL Systems Ltd.	Challenger Geomatics
Colt Engineering Corporation	Crape Geomatics Corporation
Engineering Internship Program	ESRI Canada Ltd.
The Focus Corporation Ltd.	Fugro Chance Inc.
GEOIDE	Hemisphere GPS
Intermap Technologies	Kodiak Nav Solutions
Maltais Geomatics Inc.	McElhanney Consulting Services Ltd.
McElhanney Land Surveys Ltd.	Midwest Surveys Inc.
Millennium Geomatics Ltd.	Natural Resources Canada
NavCom Technology, Inc.	North West Geomatics Ltd.
NovAtel Inc.	Point Inc.
Saskatchewan Land Surveyors Association	The Silvacom Group
SiRF Technology Inc.	Spatial Technologies
Stantec Geomatics Ltd.	Stewart, Weir & Co. Ltd.
Terramatic Technologies Inc.	Terrapoint Canada Inc.
Tri-City Surveys Ltd.	Trimble Navigation
Usher Canada Limited	UTEC Survey, Inc.

GRADUATE STUDIES

Enrollment

There were a total of 105 graduate students in Geomatics Engineering in 2006/2007 (88 full time and 17 part time). During the academic year 2006/2007 students were either enrolled in the graduate program or finishing their theses. Fifty were working towards their PhD degree, forty-four towards their MSc degree and eleven towards their MEng degree. Students originated from fourteen different countries. There were 11 students that graduated during the reporting period, four with a PhD degree, six with a MSc and one with an MEng. Details are given in the following tables.

Full-time PhD Students 2006/2007

Name	Supervisor	Name	Supervisor
Aggarwal, Priyanka	N. El-Sheimy	Mongredien, Cecile	G. Lachapelle/M.E. Cannon
Al-Fanek, Ossama	S. Skone	Moreno, Niandry L.	D. Marceau
Al-Rawas, Ghazi Ali	C. Valeo	Morrison, Aiden	G. Lachapelle/M.E. Cannon
Ali, Ibraheem	A. Braun/M. Sideris	Nicholson, Natalya	S. Skone/M.E. Cannon
Anwar, Sk. Morshed	D. Marceau	Quinonez-Pinon, Rebeca	C. Valeo
Bang, Ki In	A. Habib	Raaflaub, Lynn Diane	C. Valeo
Bhuiyan, Mohammad Z.	G. Lachapelle	Rangelova, Elena	M. Sideris
Bian, Yong	B. Mercer	Renganathan, Vidyavathy	A. Braun
Broumandan, Ali	G. Lachapelle	Sun, Debo	M.E. Cannon/G. Lachapelle
Dabboor, Mohammed	A. Braun/I. Couloigner	Syed, Zainab F.	N. El-Sheimy
El-Habiby, Mohamed	M. Sideris	van der Wal, Wouter	M. Sideris
Ellum, Cameron M.	N. El-Sheimy	Wang, Fang	D. Marceau
Gao, Guo Jiang	G. Lachapelle	Wang, Jau-Hsiung (James)	Y. Gao
Gao, Jianchen	M.E. Cannon	Wang, Min	Y. Gao
Goodall, Christopher L.	N. El-Sheimy	Weigelt, Matthias	M. Sideris
Hassan, Taher, F. A.	N. El-Sheimy	Whittal, Jennifer	M. Barry
He, Jianxun	C. Valeo	Wijesekara, Gayan Nishad	D. Marceau
Hunter, Andrew J. S.	N. El-Sheimy	Xu, Chen	M. Sideris
Kim, Changjae	A. Habib	Xu, Pei (Patrick)	M.E. Cannon/G. Lachapelle
Konavattam, Surendran Shanmugam	G. Lachapelle/J. Niel-sen	Yang, Yong	N. El-Sheimy
MacGougan, Glenn	K. O'Keefe/R. Klukas	Youssef, Mohamed	N. El-Sheimy/A. Noureldin
Mahfuz, Mohammad Upal	G. Lachapelle	Zhang, Chengqian	M. Collins

Full-Time MSc and MEng Students 2006/2007			
Name	**Supervisor**	**Name**	**Supervisor**
MSc Students			
Abbasiannik, Saloomeh	Lachapelle/Petovello	Macchi, Florence	Lachapelle
Abdolhosseini Moghaddam, Ahmed Reza	Lachapelle/Nielsen	Marji, Qais Kamal	Cannon
Al-Durgham, Mohannad	Habib	Megahed, Dina Reda	Lachapelle
Butterworth, Carina	Tait	Muhsen, Abdel	Barry
Cai, Changsheng	Gao	Muthuraman, Kannan	Lachapelle
Cao, Wei	Cannon/O'Keefe	Narayanan, Ramasamy	Skone
Chandramouli, Magesh	Huang/Gao	Ni, Jingwen	Couloigner
Chang, Yu Chuan	Habib	Osman, Mostafa Abdalla	Lachapelle/Nielsen
Chiu, David Sung–Tat	O'Keefe	Phalke, Seema	Cannon
de Groot, Lance	Skone/O'Keefe	Qiu, Jianning	Lachapelle/Klukas
Devaraju, Balaji	Braun	Robinson, Kerri L	Valeo
Ebeling, Axel	Teskey	Sadeque, Mohammed Zafer	Skone
Gernot, Cyrille	Lachapelle/O'Keefe	Salimi, Nazila	Lachapelle/Nielsen
Gunaratne, Dulini Sakunika	Lachapelle/Nielsen	Shanmugasundaram, Karthik Guruswamy	Lachapelle/Skone
Hasbani, Jean-Gabriel	Marceau	Singh, Sanjeet	Klukas/Cannon
Izadpanah, Ashkan	Lachapelle	Tao, Wenyou	Gao
Jarvis, Anna Marie	Habib	Tsoi, Raymond	Cannon
Jha, Maya Nand	Gao	Yao, Donghua	Lachapelle/Skone
Kieser, Michael .	Marceau	Yu, Wei	Lachapelle/Skone
Lotfali Kazemi, Pejman	Lachapelle		
MEng Students			
Al-Azizi, Jalal I.	Lachapelle	Syed, Imad Muhammad	Tait
Anderson, Teresa	El-Sheimy	Zhang, Hongmin (Holly)	Tait
Khan, Muhammad A	El-Sheimy		

Part-time Graduate Students 2006/2007				
Name	**MEng**	**MSc**	**PhD**	**Supervisor**
Charkhand, Behtash	1			El-Sheimy
Charkhandeh, Shahin		1		Lachapelle/Cannon
El-Gizawy, Mahmoud L			1	El-Sheimy
Galappaththi, Thilanka L		1		El-Sheimy
Garin, Lionel Jacques Joseph			1	Lachapelle
Guo, Libing		1		Huang/Blais
Joseph, Angelo			1	Lachapelle
Kent, Steve	1			Blais
Khodosko,Michale			1	Lachapelle/Cannon
Mao, Gang		1		Lachapelle
Radons, Charlene Marcia	1			Skone/O'Keefe
Shen, Xioabing (Jose)			1	Gao
Srajer, Peter	1			Lachapelle
Vance, Kevin Lorne	1			Lachapelle
Wu, Sally Xia	1			Habib
Zhang, Huasiu (Larry)		1		Blais/Collins
Zheng, Bo			1	Lachapelle
Total	**6**	**5**	**6**	

Matthias Weigelt
successfully defended his PhD thesis.

Rebeca Quinonez-Pinon
successfully defended her PhD thesis.

Graduate Studies Convocants 2006/2007

Name		Degree	Exam Date	Graduate Thesis Title	Supervisor
Shahin	Charkhandeh	MSc	March 30/07	X86-Based Real Time L1 GPS Software Receiver	G. Lachapelle/ E. Cannon
Guojiang	Gao	PhD	January 25/07	INS-Assisted High Sensitivity GPS Receivers of Degraded Signal Navigation	G. Lachapelle
Wei	Yu	MSc	January 8/07	Selected GPS Receiver Enhancements for Weak Signal Acquisition and Tracking	G. Lachapelle/ S. Skone
Jianning	Qiu	MSc	January 5/07	RF Interference Impact on GPS L5 Reception Performance	G. Lachapelle/ R. Klukas
Jalal Ibrahim	Al-Azizi	MEng	December 18/06	n/a	G. Lachapelle
Mohamed Mamdouh	Elhabiby	PhD	December 06/06	Wavelet Representation of Geodetic Operators	M. G. Sideris
Matthias Luigi	Weigelt	PhD	December 04/06	Global and Local Gravity Field Recovery from Satellite-to-Satellite Tracking	M. G. Sideris
Sanjeet	Singh	MSc	October 06/06	Comparison of Assisted GPS and High Sensitivity GPS in Weak Signal Conditions	E. Cannon/ R. Klukas
Maria Rebeca	Quiñonez-Piñón	PhD	November 24/06	Improved Techniques for Measuring and Estimating Scaling Factors Used to Aggregate Forest Transpiration	C. Valeo
Seema	Phalke	MSc	August 31/06	GPS and Galileo Performance Evaluations for Multiple Reference Station Network Positioning	E. Cannon
Jau-Hsiung	Wang	PhD	September 08/06	Intelligent MEMS INS/GPS Integration for Land Vehicle Navigation	Y. Gao
Balaji	Devaraju	MSc	July 11/06	Levelling Network Analysis for the Definition of a Kinematic Vertical Datum in Canada	A. Braun/ N. Sneeuw

Graduate student Natalya Nicholson prepares to launch a weather balloon for CBC's "The Nature of Things."

Graduate Seminars 2006/2007

SPEAKER	TOPIC
Kerri Robinson	Modelling the Role of Aquatic Vegetation on Dissolved Oxygen in the Bow River, Alberta, Canada
Lynn Raaflaub	Spatial variation patterns in the moisture content of the organic layer of the forest floor
Wouter van der Wal	Use of Time-variable Satellite Gravity Data in the study of Postglacial Rebound with Linear and Non-linear Mantle Rheologies
Shahin Charkhandeh	Real Time GPS Software Receiver Using X86 Processor for L1 Signal
Priyanka Aggarwal	Adaptive Particle Filter (APF) of INS/GPS Integration
Niandry Moreno	VecGCA: a vector-based geographic cellular automata model allowing geometric transformations of objects.
Yong Yang	IMU Signal Simulator
Surendran Konovattam	Innovative Acquisition Methodologies for High Sensitivity GPS Applications
Natalya Nicholson	Modeling Atmospheric Water Vapour for Precise GPS Positioning and Meteorology Applications
Donghua Yao	Interference Effect on L2C Acquisition and Tracking
Chen Xu	The Torus Approach in Spaceborne Gravimetry
Mohamed Elhabiby	Wavelet Representation Of Geodetic Operators
Jianning Qiu	RF Interference Impact on GPS L5 Reception Performance
Jianchen Gao	GPS/Low Cost IMU/On-Board Vehicle Sensors Integrated Vehicular Positioning System
Moncton Guo	INS-Assisted High Sensitivity GPS Receivers For Degraded Signal Navigation
Matthias Weigelt	Global and Local Gravity Field Determination From Satellite-to-Satellite Tracking
Wei Yu	Carrier Tracking Loop Performance in the Presence of Noise
Gang Mao	Design of Integrated GPs/eLoran Positioning System
Sk. Morshed Anwar	Conceptualization and Implementation of a Multi-Agent Model to simulate Whale-Watching activities in the St. Lawrence Estuary in Quebec, Canada

Dr. Raquet and his ENGO 699.45 class
'Advanced GNSS Receiver Technology'

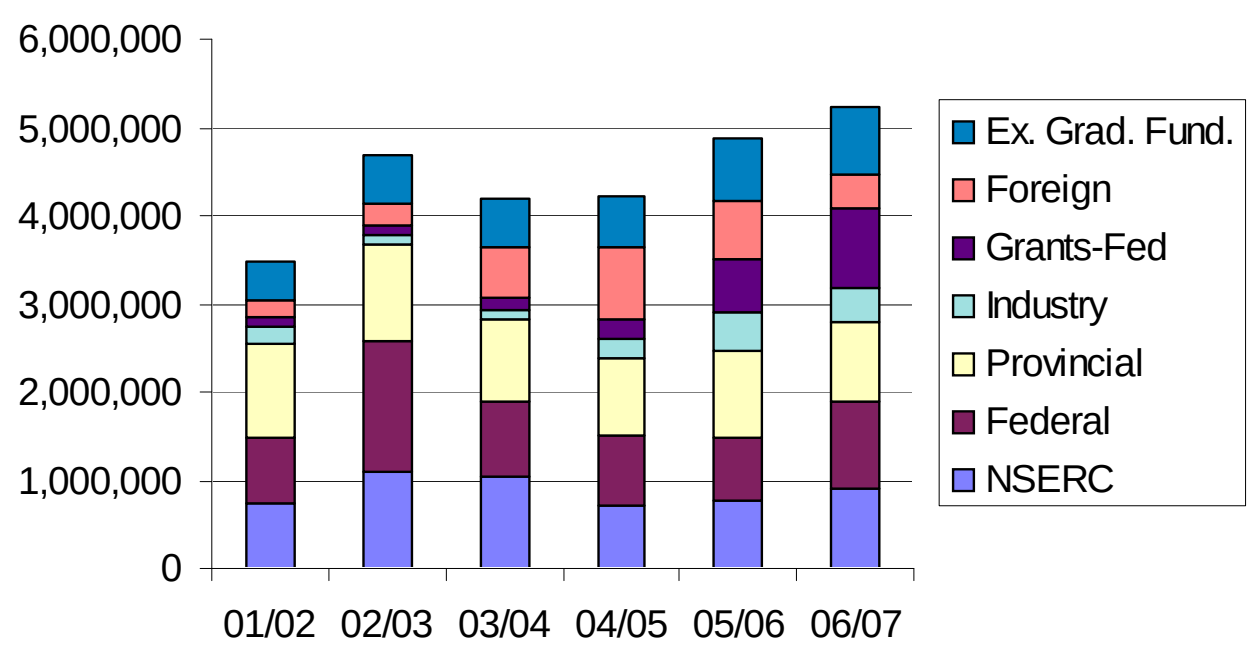
RESEARCH

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 $4,463,892 , the highest level ever achieved by the Department. This amounted to approximately $278,000 per faculty member, based on 16 faculty members.

Direct Research Funding by Source
2001/02 to 2006/07

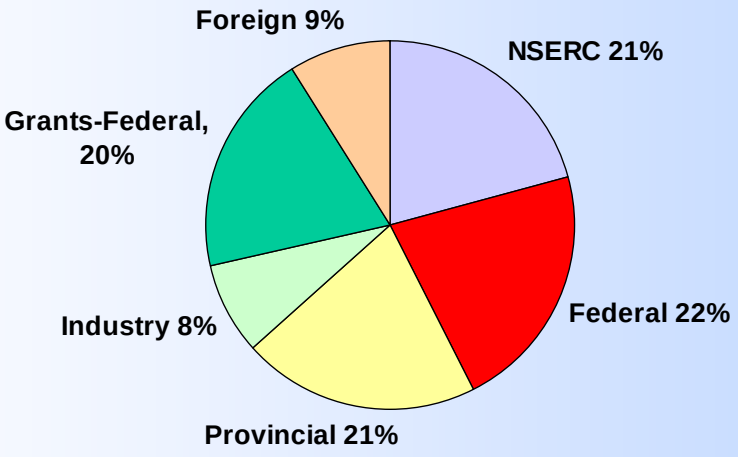


Research Grants and Contracts for the Period April 1, 2006 – March 31, 2007	
Source	Amount
NSERC	$915,060
Federal Government—Other	987,616
Federal – Grants	900,756
Provincial Government	901,986
Industry	368,787
Foreign Agencies	389,688
Direct Research Support	$4,463,892
Research Scholarships	377,266
Equipment Donations	50,000
Other Research Support	$427,266
Total Research Support	**$4,891,158**

In addition to direct research funding, there is other research support available in terms of student scholarships, and in-kind donations. When added to the direct project funding, the total research for the reporting period is increased to $4,891,158.

The figure on the previous page shows direct research funding for the last six years and the one below shows the research funding by source for 2006/2007

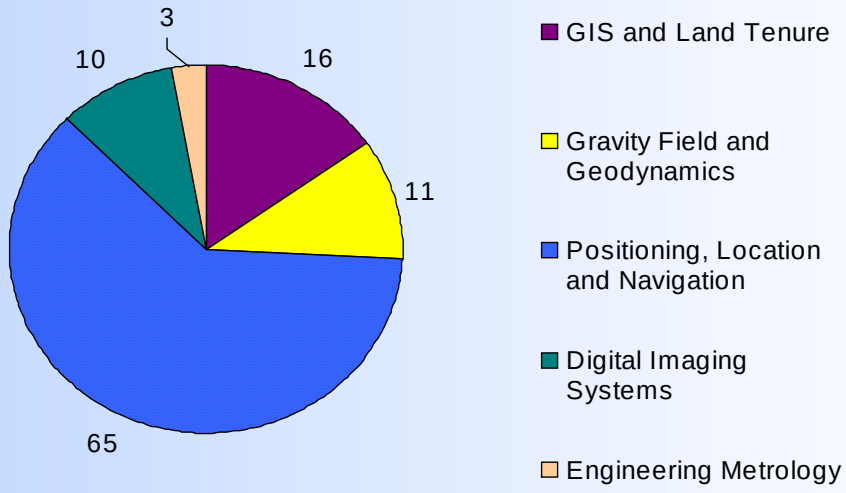
Direct Research Funding by Source 2006/07



MAJOR RESEARCH AREAS

Gravity Field and Geodynamics
A. Braun, M.G. Sideris
GIS and Land Studies
M.B. Barry, N. El-Sheimy, B. Huang, D. Marceau, C. Valeo
Digital Imaging Systems
J.A.R. Blais (Emeritus), M.J. Collins, I. Couloigner, A.F. Habib
Positioning, Navigation and Wireless Location
M.E. Cannon, N. El-Sheimy, Y. Gao, G. Lachapelle, K. O'Keefe, S.H. Skone
Engineering Metrology
M.P. Tait, W.F. Teskey

Graduate Student Distribution by Area
May 2006 – April 2007



Research projects being conducted in the above major research areas are listed in tables on pages 37 to 41.

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
A National System for Water Vapour Estimation Using GPS and its Applications	Federal	Y. Gao S.H. Skone
A Study of Potential Impact of GPS Satellites with Expanded PRN Sequences on Legacy Receivers	Industry	G. Lachapelle
Assessment of the Industry Navigation Software and Hardware	Industry	N. El-Sheimy
ASW-GPS and Ionospheric R&D Support	Foreign	S. Skone G. Lachapelle M.E. Cannon
Carrier Phase Based Global Differential GPS Positioning	NSERC	Y. Gao
CRC in Wireless Location	Federal	G. Lachapelle
CRC In Mobile Multi-sensor Geomatics (M2G) Systems	Federal	N. El-Sheimy
Delivery of the Aided Inertial Navigation System Toolbox for INS/GPS Accuracy Assessment of a car manufacturer Driver Assistance System	Industry	N. El-Sheimy
Dept./Schulich School of Engineering Starter Grant	Provincial	K. O'Keefe
Design & Development of a Precise GPS/INS Vehicle	Foreign	M.E. Cannon
Design & Development of a Precise GPS/INS Vehicle Positioning System - Phase II	Foreign	M.E. Cannon G. Lachapelle S. Skone
Development of a Meteorological Probe for Aircraft	Federal	N. El-Sheimy S.H. Skone
Development of a Real-Time Mobile Mapping System for Forest Fire Fighting	NSERC	N. El-Sheimy
Development of a Two Component Personal Navigation System	Federal	N. El-Sheimy
Development of MEMS-Based Survey System for Drilling Applications	Industry	N. El-Sheimy
Development of Next Generation MEMS-based Surveying System for Drilling Operation	Provincial	N. El-Sheimy
Enhancements of Relative GPS Kinematic Methods for Vehicular Navigation	Industry	G. Lachapelle
Fast Convergence of Precise Point Positioning	Federal	Y. Gao
Geomatics Enhancements with Dual Use of GPS II/III and Galileo: High Accuracy Position with GPS & Galileo	Federal	G. Lachapelle M.E. Cannon Y. Gao N. El-Sheimy R. Klukas

Projects in Positioning, Navigation and Wireless Location, continued

Project Name	Contract Type	Faculty Investigators
GPS Receiver Communication Manager (RCM) Software Development and Testing for Automobile Manufacturer	Industry	G. Lachapelle
iCORE Chair in Wireless Location	Provincial	G. Lachapelle
Indoor Wireless Location with Ultra-Wideband Radios	NSERC	K. O'Keefe
Inertial Aided GPS	Industry	N. El-Sheimy
Integrated Vehicle Navigation of Communication Systems Development	Federal	M.E. Cannon G. Lachapelle
Integration of Kinematic GPS with Emerging Inertial Measurement	NSERC	M.E. Cannon
Intelligent Information Infrastructure for Wireless Multi-Sensor Motes Applications	Industry	N. El-Sheimy
Market Study and Business Model Project for M2G Mobile Mapping	Federal	N. El-Sheimy
Mitigation of Atmospheric Effects on GNSS	NSERC	S.H. Skone
Multi-Sensor Geomatics Systems	Federal	N. El-Sheimy
Multi-Sensor Motes Amplification	Industry	N. El-Sheimy
Multi-Sensor Navigation Systems	Federal	N. El-Sheimy
Multi-Sensor System for Improved Quality of Life	Federal	N. El-Sheimy
Nanosatellite Formation Flying and Inspection Missions	NSERC	M.E. Cannon
Next Generation Direct Geo-Referencing Technology for Airborne Mapping	NSERC	N. El-Sheimy Y. Gao
Observation and Modelling of Radio Frequency Propagation for Improved Wireless Location in Urban and Indoor Environments	NSERC	K. O'Keefe
Performance Analysis of Multiple Global Navigation Satellite Systems	NSERC	G. Lachapelle
Performance Evaluation of CCH RSIM Sites	Federal	S.H. Skone
Precise Manufacture for Sport Application	Industry	G. Lachapelle
Provision of Global Positioning Consulting Services	Federal	G. Lachapelle
Regional Real-Time Water Vapour Estimation Using GPS	Federal	S. Skone G. Lachapelle M.E. Cannon
Signal Tracking and Measurement Infrastructure to Support Wireless Location and Communications Research	Federal	G. Lachapelle M. E. Cannon

Projects in Positioning, Navigation and Wireless Location, continued

Project Name	Contract Type	Faculty Investigators
Space Weather Hazards: Monitoring & Mitigation	NSERC	S. Skone G. Lachapelle
Tactical Outdoor Positioning System (TOPS) - Stage 3	Federal	G. Lachapelle
Ultra-Tight Software HSGPS/INS Phase I	Federal	G. Lachapelle
Water Vapour Estimation Using GNSS (GEOIDE NCE Matching)	Federal	S.H. Skone
Wireless Location	Foreign	G. Lachapelle
Wireless Location in Geomatics with the Emerging GPS II/III and Galileo Systems	Federal	G. Lachapelle M.E. Cannon
Wireless Location with GPS II/III and Galileo	Federal	G. Lachapelle M.E. Cannon

Projects in Gravity Field and Geodynamics

Project Name	Contract Type	Faculty Investigators
Canadian Altimetry Database and Processing System (CADS)	Federal	A. Braun
Climate Variability and its Impact on Hydrology of small Mid-Continent Lakes and Wetlands	Foreign	A. Braun
Combination of Space - airborne and in-situ gravity measurements in support of Arctic sea-ice thickness mapping	Foreign	A. Braun
Dept./Schulich School of Engineering Starter Grant	Provincial	A. Braun
Mapping the ocean surface with geodetic and oceanographic tools	Federal	J.A.R. Blais A. Braun M.G. Sideris
Multi-Satellite Determination of Global and Regional GEOIDE and Sea Level Changes	NSERC	M.G. Sideris
NRCan Contribution to Space Gravimetry GEOIDE Project	Federal	M.G. Sideris
Quantification of Sea Ice Thickness and Surface Water Levels in the Arctic Ocean and Canada Using Satellite Altimetry	NSERC	A. Braun
Risk Reduction Through Continuous Geodetic Monitoring	NSERC	M.G. Sideris
Satellite Altimetry Calibration at Churchill, Manitoba and Hudson Bay	Provincial	A. Braun
Space Gravimetry Contribution to earth monitoring: Hydrology study	Federal	C. Valeo
Space Gravimetry Contributions to Earth Monitoring	Federal	M.G. Sideris A. Braun

Projects in Engineering Metrology

Project Name	Contract Type	Faculty Investigators
Analysis of 1982 and 2006 EDM Measurements	Provincial	W.F. Teskey
Intelligent Structural Monitoring	NSERC	W.F. Teskey N. El-Sheimy
Intelligent Structural Monitoring	Industry	W.F. Teskey
Monitoring deformation in permafrost	NSERC	M. Tait
Re-analysis of EDM Measurements	Provincial	W.F. Teskey

Projects in GIS and Land Studies

Project Name	Contract Type	Faculty Investigators
Design and Implementation of a Preliminary Multi-Dimensional GIS	Provincial	B. Huang
Design and Implementation of an Efficient Mobile GIS for Location Based Service	NSERC	B. Huang
Development of a Cellular Automata Model for the Elbow River Watershed, First Phase	Provincial	D. J. Marceau
Development of a Multi-Agent Model to Facilitate the Sustainable Management of Boat Traffic in the Saguenay-St. Lawrence Marine Park and Marine Protected Area in Quebec	NSERC	D. J. Marceau
Development of a Multi-Agent System to Simulate the Behaviour of Wildlife Species in Relation to Recreational Activities in Banff National Park	Federal	D. J. Marceau
Kananaskis Field Stations	NSERC	C. Valeo
Linking Space & Time to Understand the Dynamics of Landscapes	NSERC	D. J. Marceau
Physical Based Modelling of Urbanizing Catchments under Multi-Seasonal Conditions	NSERC	C. Valeo
Real Time Detection of Oil Spills Using Laser Induced Fluores-cence LiDAR Internet Based Temporal GIS and Mobile Emergency Asset Management	NSERC	Y. Gao
Real Time MCSDSS to Improve Fire Response	Federal	Y. Gao
Reducing the Vulnerability of Water Supply Under a Changing Climate: An Assessment of Storm-water Reuse Measures	Federal	C. Valeo
Reuse Measures	Provincial	C. Valeo
Talking Titler	NSERC	M. Barry
Dept./Schulich School of Engineering Starter Grant	Provincial	D. J. Marceau
Using Multi-media Data to Support Land Tenure Security, Part of the Talking Titler System	Industry	M. Barry

Projects in Digital Imaging Systems

Project Name	Contract Type	Faculty Investigators
Alberta Ingenuity Fund - Allowance	Provincial	M.J. Collins
Alberta Ingenuity Fund - Fellowship	Provincial	M.J. Collins
Calibration & Stability Analysis of Medium-Format Digital Cameras	Foreign	A.F. Habib
CRC In Mobile Multi-sensor Geomatics (M2G) Systems	Federal	N. El-Sheimy
Dept./Schulich School of Engineering Starter Grant	Provincial	B. Huang
Development of LiDAR Aided Mono-Plotting and True Ortho-photo Generation	Federal	A.F. Habib
Development of LiDAR-Aided Photogrammetric Mono-Plotting and True Ortho-Photo Generation System	Industry	A.F. Habib
Development of M2G - A Mobile Multi-Sensor Geomatics System	Federal	N. El-Sheimy
Development of M2G Multi-Sensor Geomatics system	Federal	A.F. Habib
Digital Camera Specifications Standards/Develop Specifications for LiDAR	Provincial	A.F. Habib
Geometric Rectification of Declassified Intelligence Satellite Photographs (DISP)	NSERC	A.F. Habib
Man-made Features Extraction from High Res Imagery in Urban Areas	NSERC	I. Couloigner
Monitoring Air Pollutants Using Thermal IR Camera	NSERC	I. Couloigner
Next Generation Direct Geo-referencing Technology for Airborne Mapping	NSERC	A.F. Habib
Radar Remote Sensing - Aspects of Radar Interferometry & Polarimetry	Provincial	B. Mercer
Real-time Airborne Mapping System	NSERC	N. El-Sheimy
Remote Sensing Evaluation and Assessment of Optimum Acid Gas Flaring	Industry	I. Couloigner
True Orthophoto Generation	Foreign	A.F. Habib
Uncertainty Management of Remote Sensing Based Environmental Modelling	NSERC	M.J. Collins
Vegetation Health Monitoring	Industry	I. Couloigner

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Cannon, M.E., (2006) Bringing Space Down to Earth with the Global Positioning System, Alberta Teacher's Association Science Council Conference, Kananaskis, November 18.

Cannon, M.E., (2006) Presentation at Auto 21 Scientific Conference, Panel, Vancouver, June 14.

Cannon, M.E., (2007) Bringing Space Down to Earth with the Global Positioning System, McGill University, Montreal, Mar 19.

Cannon, M.E., (2007) Educating our Engineers for a Lifelong Career, APEGGA Annual Conference, Luncheon Keynote Presentation, Calgary, April 26.

Cannon, M.E., (2007) Mentoring Pan Discussion, Petro-Canada, Calgary, Mar 7.

Cannon, M.E., (2007) Positioning Geomatics in Alberta: Growing the Opportunities and Impacts, Alberta Geomatics Group (AGG), Calgary, March 13.

Cannon, M.E., (2007) The Schulich School of Engineering: Enginuity in Engineering, Canadian Society of Engineering Management, Calgary, March 12.
Cannon, M.E., (2007) Women's Leadership Panel Discussion, Women's Executive Network, Calgary, February 7.
Cannon, M.E., (2007) GSA Academic Freedom/Commercialization Discussion Panel, Calgary, March 28.
El-Habiby, M., M.G. Sideris (2006) Kernel singularity impact on the wavelet evaluation of geodetic integrals, CGU Annual Meeting, Banff, Alberta, May 14-17.
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Habib, A., (2006) Integration of Photogrammetric and LIDAR Data for Quality Assurance and Quality Control Procedures, Institute of Geomatics, Ryerson University, Toronto, Canada, June.
Habib, A., (2006) LIDAR Aided True Orthophoto and Digital Building Generation System, Terrapoint Canada Inc., AB, October.
Habib, A., (2006) LIDAR: Principles, Quality Assurance, and Quality Control, British Columbia Community of Practice for LIDAR Systems, BC, Canada, October.
Habib, A., (2006) Multi-Sensor and Multi-Primitive Photogrammetric Triangulation, Center for Topographic Information, NRCan, Ottawa, Canada, June.
Habib, A., (2006) Multi-Sensor and Multi-primitive Photogrammetric Triangulation, Department of Civil Engineering, Purdue University, Purdue, USA, August.
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Habib, A., (2006) Standards and Specifications for LIDAR and Medium Format Digital Imaging Systems, BMGS/USGS Meeting at the University of Calgary, AB, Canada, December.
Habib, A., (2007) Calibration and Stability Analysis of Medium-Format Digital Cameras, National Central University (NCU), Taiwan, April.
Habib, A., (2007) Integration of Satellite and Aerial Imagery with LIDAR Data for Co-registration and True Orthophoto Generation, ORFEO Open Seminar on Large Scale Mapping from Optical Remote Sensing, Belgium, March.
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Habib, A., (2007) Jarvis, A., Medium Format Digital Cameras: A Study into the Calibration, Stability Analysis, and Integration with High Resolution Satellite Imagery, Civil Commercial Imagery Evaluation Workshop, USA, March.
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Hill, L., G. Strong, S. Skone, N. Nicholson (2006) Using GPS-derived estimates of PWV to Identify Thunderstorm Signatures, CMOS Congress, Toronto, ON, May.

Lachapelle, G., (2006) Communicating Science in Peer-Reviewed Journals, GEOIDE NCE Annual Conference, Banff, June.

Lachapelle, G., (2006) Finding and Interfacing with External Industrial Partners and Managing Expectations, Institute for Applied Scientific Research, Mount Royal College, November.

Lachapelle, G., (2006) High Sensitivity GNSS and Integration with Other Sensors, Summer School on Highlights in Microtechnology, Neuchâtel, Switzerland, July.

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Skone S., (2006) Exploiting GNSS for Atmospheric Remote Sensing, Meteorological Service of Canada, Climate Modeling Centre, October.

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Licenses and Patents

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Cannon, M.E., G. Lachapelle, and J. Liu, FLYKIN+™ and FLYKINRT+™— software package for cm-level GPS on-the-fly ambiguity resolution positioning. Licensed by University Technologies International, a wholly-owned subsidiary of the University of Calgary

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Gao, Y., iVCAMS3, 2005, Software applied to support the following public events: 1) 2005 North America Solar Challenge 2) 2005 Sea to Sea Bike Tour.

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ACADEMIC AND PROFESSIONAL SERVICES

M.B. Barry

- Canadian Institute of Geomatics (CIG) Certification Committee
- Canada Representative, Federation Internationale des Geometres (FIG) Commission 7
- Director, Federation Internationale des Geometres (FIG) Foundation
- International Centre Africa Program Committee Faculty Services University of Calgary
- Undergraduate Studies Committee

A. Braun

- Research Associate, Arctic Institute of North America
- Member, The International Institute for Infrastructure Renewal and Reconstruction (IIIRR), American Geophysical Union, European Geophysical Union, Canadian Geophysical Union, member at large, Geodesy Section.
- Reviewer, J. Geophysical Research, J. of Geodynamics, Phys. Chem. Earth. Int., J. of Global Positioning Systems, Geomatica, Remote Sensing of Environment, Int. J. of Remote Sensing, J. of Geodesy, Pure and Applied Geophysics, Earth Sciences Research Journal, Hydrological/& Earth System Science.
- Reviewer, National Science Foundation, USA; National Science Board, The Netherlands; Expert Evaluator "5th Framework Program of the European Commission"; Belgium Science Policy, Belgium, NASA Terrestrial Hydrology Program (THP panel member
- Technical Program Committee IPRS/CIG Toronto, Convener CGU in Banff
- Geomatics Engineering Scholarship Committee, Geomatics Merit Advisory Committee
- Appointment, Promotion and Tenure guidelines committee, Schulich School of Engineering
- Academic selection committee, Asst./Assoc. Professor in Geodesy, Chair in Reservoir Simulation
- Schulich School of Engineering Internship Advisory Council

M.E. Cannon

- Canada Foundation for Innovation (CFI) Board of Directors
- Enbridge Income Fund Board of Trustees
- United Way of Calgary Campaign, (Co-Chair of Education Cabinet)
- TELUS World of Science Board of Directors, (Currently Vice-Chair)
- Alberta Ingenuity Fund Board of Trustees
- Alberta Information and Communications Technology Institute Board
- Alberta Science and Research Authority Board of Management
- Advisory Board to the Minister of Natural Resources Canada on Earth Sciences
- Top 40 Under 40 Selection Board

M.J. Collins

- APEGGA, Board of Examiners
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- Associate Editor, International Journal of Remote Sensing
- Reviewer for several technical journals

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- Reviewer, for Several International Journals

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- Special Examiner, Board of Examiners for Canada Land Surveyors
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- Editorial Board, Coordinates
- Editorial Board, Journal of Applied Geodesy
- Chair, the ISPRS IC WG I/V on “Integrated Mobile Mapping Systems”
- Chair, the FIG C.53 WG “Integrated Positioning, Navigation and Mapping Systems”
- Vice Chair, the IAG WG SC4.1 “Mobile Multi-Sensor Systems”

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- Board of Directors, International Association of Chinese Professionals in Global Positioning Systems
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- Special Examiner, Board of Examiners for Canada Land Surveyors
- Editorial Board, Journal of Geographic Information Science
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- Reviewer for refereed journals and grant applications
- Session chair and program committee members for international conferences

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- Member, American Society for Photogrammetry and Remote Sensing (ASPRS).
- 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.
- Session Chair/Moderator for several ISPRS conferences and symposia.
- Reviewer for the journals of PE&RS, Photogrammetric Record, ISPRS, Geomatica, Australian Journal of Spatial Science, Computer Vision and Image Understanding, and IEEE transactions on Aerospace and Electronic Systems.
- Member, British Columbia Community of Practice for Medium-Format Digital imaging Systems
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- Member, Taskforce of Visualization for Transportation, Transportation Research Board, US.
- Program Committee Member for Several International GIS Conferences
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- Member, Canada Institute of Geomatics
- Member, International Society of Environmental Information Sciences
- Member, International Association of Chinese Professionals in Geographic Information Sciences (CPGIS)
- Reviewer for International Journal of Geographical Information Science, International Journal of Remote Sensing, ISPRS Photogrammetry and Remote Sensing, ASCE Journal of Transportation Engineering, Computers & Geosciences, The Very Large Database (VLDB) Journal, TRB

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- Chair, Institute of Navigation Alberta Chapter
- Editorial Board, GPS World
- Editorial Board, GPS Solutions
- Columnist, Inside GNSS
- Member, CCIT Advisory Board
- Editor for Navigation, IEEE Transactions on Aerospace and Electronic Systems
- Associate Editor-in-Chief, IEEE Transactions on Aerospace and Electronic Systems

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- Member of the international editorial board of the Indonesian Journal of Remote Sensing
- Member of the international editorial board of La Revue internationale de géomatique
- French editor for The Canadian Geographer
- Editor for the GIScience section in The Canadian Geographer
- Member of ISEEE (Institute for Sustainable Energy, Environment, and Economy), U. of Calgary
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- Member, Department Awards Committee
- Editorial Board, GPS Solutions
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- Reviewer, IEEE Aerospace and Electronic Systems, IEEE Vehicular Technology, Geomatica, GPS Solutions, Journal of Geodesy, and Measurement Science and Technology

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- Member, Bureau and Executive Committee of the IAG
- Fellow of the IAG and of the International Geoid Service
- Member of several IAG special study groups, commissions, and working groups
- Member, Board of Directors of the Bureau Gravimetrique International
- Reviewer for the Journal of Geodesy, Geomatica and Journal of Geophysical Research
- Member, Editorial Board, Journal of Geodesy and Cartography
- External reviewer, NSERC Grants

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- Lead co-investigator: CHAMP satellite mission
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- CASI Executive Council
- Associate Editor, Canadian Aeronautics and Space Institute Journal

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- Member, Academic Appeals Committee
- Chair of IAG WG4.2.2 'Dynamic Monitoring of Buildings'.
- Member, FIG WG V/3

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- Academic Examiner for Geomatics Engineering, APEGGA
- Member, Publications Committee, Journal of Surveying Engineering

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- Associate Editor, Water International
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- Member, Canadian Geophysical Union
- Member, American Geophysical Union
- Member, Canadian Society of Civil Engineering
- Member, International Association of Hydrological Sciences
- Member, CEERE, ISEEE
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Camel Transport Nigeria Style. . .
Dr. Barry sends his regards while on sabbatical in Africa