



**SCHULICH**  
School of Engineering

DEPARTMENT OF  
GEOMATICS  
ENGINEERING

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DEPARTMENT OF GEOMATICS ENGINEERING

# Geomatics News

TERM Fall YEAR 2017 • Volume 15, Issue 1

Dear Valued Reader,

Happy New Year.

The fall was an extremely busy semester for us. The main event was hosting the members of the visit team from Engineers Canada for our engineering accreditation. We also held several outreach activities to inform first year students about Geomatics Engineering including a popcorn event and Engineering at the Movies. We welcomed our second-year students to the department at an event that featured guest speaker Dr Mark Petovello, currently

on leave and working for Apple, who spoke about how a degree in geomatics can open up a world of career opportunities.

Read about these events inside this newsletter.

The Department has a long history of inviting guest speakers into our classes. Speakers from government and industry give our students a different perspective and provide valuable context for the taught material. The fall semester featured engaging guest presenters who spoke in several of our undergraduate courses.

The Department was able to welcome several prominent, external guest speakers. Dr Kai-Wei Chiang from the National Cheng Kung University in Taiwan, spoke on *Recent Progress on Indoor Mobile Mapping Systems and Their Applications* and Minha Park spoke on *Challenges on Advanced Driver Assist Systems & Autonomous Driving for Geomatics Engineers*.

Derek Lichti  
Professor and Head

## Guest Lectures

- Dr. Kai-Wei Chang presented *Recent Progress on Indoor Mobile Mapping Systems and their applications* on September 12, 2017
- Dr. Mohamed Abousalem presented to ENGO 333 about software development and programming—example showing role of Geomatics in food on Nov 3, 2017



- Brian Ballantyne presented to ENGO 579 on Nov 3, 2017
- Mark Hatcher presented to ENGO 579 on Nov 9, 2017

- Mike Brissette—*Hydrographic Surveying* to ENGO 545 Nov 24, 2017



- Minha Park—*Challenges on Advanced Driver Assist Systems & Autonomous Driving for Geomatics Engineers* on Nov 24, 2017



[schulich.ucalgary.ca/](http://schulich.ucalgary.ca/)

# Late Professor's legacy of precision and passion carries on in newly published research—Article from Utoday October 2, 2017

By Michael Plett, Schulich School of Engineering

Her academic passion was precise measurement of environmental systems, no matter if the question was the range of woodland caribou or, as in this case, determining how much land is required to generate electricity.

As an expert in environmental geocomputation, getting the numbers exactly right was Danielle Marceau's forte—and to have some of the late scholar's final work published in a prestigious scientific journal like *Nature Energy* speaks to the legacy of the respected Schulich School of Engineering geomatics professor.

"It was really with Danielle Marceau's mentorship and support that I managed to make this research successful while I was at the University of Calgary," says Sarah Jordaan, lead author of the paper and assistant professor of energy, resources and environment at Johns Hopkins University's School of Advanced International Studies.

"I'm just delighted that I had here as a mentor while I was back, it really helped me ensure that my scientific research was progressing."

It's high praise for Marceau, who passed away from cancer in the fall of 2016.

Marceau backed Jordaan as she earned her PhD in environmental design in 2010. "And then later, we worked together on this paper when

I was a faculty member in political science at the University of Calgary from 2013 to 2016," explains Jordaan, an assistant professor of energy policy and politics at the time.

Jordaan's study, entitled "Understanding the Life cycle Surface Land Requirements of Natural Gas-Fired Electricity," offers a method for robust estimation of the life cycle land use involved in electricity generated by natural gas, a formula that can be further developed to evaluate other energy sources like nuclear and coal.

The research conducted by Jordaan's team will take the guesswork out of future electricity generation, when it comes to the land-use impact of various power sources, whether renewable or from fossil fuels.

"Not a lot of analytical and technical rigor has gone into developing the method up until now, which inhibits consistent comparisons of different electricity-generation technologies," says Jordaan.

Science can't hinge on assumption—a common one being that renewable energy requires more land than traditional sources—and Jordaan's team focused on how to go from guesswork to a proven formula for land-use impact.

Focusing on the most mature production basin for shale gas in the United States, the Barnett shale in Texas, the researchers looked at electricity generated from natural gas through infrastructure, satellite imagery and well-level production.

"We said, 'Why don't we contribute by developing a method where we are using the same approach for each technological comparison'," says Jordaan.

"These comparisons matter when we examine what the environment tradeoffs are, and the decisions companies might make when they invest in different technologies."

As well as Marceau and former Schulich PhD student Ehsan Mohammadi, Jordaan's eight-person team included researchers from Colorado's Joint Institute for Strategic Energy Analysis and the National Renewable Energy Laboratory.

The former University of Calgary professor credits the Schulich School of Engineering and in particular, Dean Bill Rosehart and Marceau, for pushing her to new challenges in science, technology, engineering and mathematical research (STEM). Her first degree was in physics and computer science from Memorial University in Newfoundland.

"The support and mentorship from Dean Rosehart, Danielle, and Schulich was a positive force in my continuing STEM research," she says.

"It's always an incredible experience to work with the talented and collegial scholars at the University of Calgary."

Credit to Utoday and Michael Plett from the Schulich School of Engineering.

The article can be found on the Utoday publications at:

[http://www.ucalgary.ca/utoday/issue/2017-10-02/late-professors-legacyprecision-and-passion-carries-newly-published-research?utm\\_source=UToday&utm\\_medium=Email&utm\\_campaign=October-2-2017&utm\\_term=Late%20professor%27s%20legacy%20of%20precision%20and%20passion%20carries%20on%20in%20newly%20published%20research](http://www.ucalgary.ca/utoday/issue/2017-10-02/late-professors-legacyprecision-and-passion-carries-newly-published-research?utm_source=UToday&utm_medium=Email&utm_campaign=October-2-2017&utm_term=Late%20professor%27s%20legacy%20of%20precision%20and%20passion%20carries%20on%20in%20newly%20published%20research)



Dr. Elena Rangelova is a recipient of one of the 2017-2018 Open Educational Resource (OER) Grants. The OER is a peer reviewed researched academic content that has been made available via an open license such as [Creative Common License](#).

This will benefit both faculty and students in greater collaborative approaches to teaching and learning and reduced costs for students.

The full article can be found in the October 2, 2017 issue of UToday at:

[http://www.ucalgary.ca/utoday/issue/2017-10-02/2017-18-open-educational-resources-grants-recipients-announced?utm\\_source=UToday&utm\\_medium=Email&utm\\_campaign=October-2-2017&utm\\_term=2017-18%20Open%20Educational%20Resources%20Grants%20recipients%20announced](http://www.ucalgary.ca/utoday/issue/2017-10-02/2017-18-open-educational-resources-grants-recipients-announced?utm_source=UToday&utm_medium=Email&utm_campaign=October-2-2017&utm_term=2017-18%20Open%20Educational%20Resources%20Grants%20recipients%20announced)

Dr. Ruisheng Wang's student Lei Xie received the Zhizhuo Best Poster Paper Award at the ISPRS Geospatial Week Conference for the following paper:

L. Xie and R. Wang, 2017. AUTOMATIC INDOOR BUILDING RECONSTRUCTION FROM MOBILE LASER SCANNING DATA. International Archives of Photogrammetry, Remote Sensing and Spatial Information Science, XLII-2-W7, 417-422.

Dr. Derek Lichti's PhD student, Fengman Jia received the Zhizhuo Best Youth Oral Presentation Award at the ISPRS Geospatial Week Conference for the following paper:

F. Jia and D. Lichti, 2017. A COMPARISON OF SIMULATED ANNEALING, GENETIC ALGORITHM AND PARTICLE SWARM OPTIMIZATION IN OPTIMAL FIRST-ORDER DESIGN OF INDOOR TLS NETWORKS.

ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences, IV-2-W4, 75-82.

Dr. Yang Gao's students Hongzhou Yang (PhD candidate) and Fei Liu (PhD candidate) both received Student Paper Awards from The Institute of Navigation GNSS 2017 (ION). Only 6 papers in total were selected this year for the ION GNSS S Student Paper Awards

Hongzhou Yang's paper is titled: *High Availability of Real-time PPP by Extending SSR Orbit and Clock Corrections*

Fei Liu's paper is titled: *Kinematic PPP Ambiguity Resolution with Aid of Map Matching*

Dr. Kyle O'Keefe's student, Erin Kahr received Best Presentation Award at the ION + GNSS 2017 conference for her paper titled: *Hardware-in-the-Loop Simulation of GPS L1C/A, Galileo E1b and BeiDou B1 Weak Tracking in Highly Elliptical Orbits*

All the ION conference papers can be found at: <https://www.ion.org/publications/browse.cfm>

### Awards announced at the annual Dean's Holiday reception:

- Dr. Xin Wang—Graduate Educator Award
- Dr. Ruisheng Wang—Research Excellence Award
- Dr. Elena Rangelova—Teaching Excellence Award
- Dr. Elena Rangelova—Outstanding Teacher Award
- Dr. Gérard Lachapelle—Distinguished Lifetime Leadership Award
- Dr. Mike Barry—Service Excellence Award
- June Au Yeung (Graduate Program Advisor)—Donna Geekie Service Award
- Hani Mohammed—Teaching Assistant Excellence Award
- Kaleel Al-Durgham—Teaching Assistant Excellence Award

*Congratulations to all!*

# Faculty and Department Events

Dr. Alex Bruton, who is the head of the Geomatics Outreach committee has been working very hard and been involved in multiple different events for the Department and the Schulich School of Engineering.

## Geomatics Student Welcome event

Every year the department likes meet and greet new 2nd year students and welcome back all the students in the upper years of the program. We had Dr. Alex Bruton open and introduce Dr. Mark Petovello, a fellow faculty member who is currently working at Apple. Mark presented on why Geomatics, soft skills that can be used and the potential you have to take that anywhere for jobs.

**A Bit About Me**

- 22+ years at UofC
- BSc: 1994-1998
- PhD: 1998-2002
- Post-Doc: 2002-2007
- Professor: 2007-present (on leave)
- Research focused on positioning and navigation technologies
- Started at Apple Inc in March 2017

**Mark**  
(that with more hair)

**Why Geomatics Engineering?**

- It empowers people with information
- It enables new technology
- It is continually evolving & expanding
- The UofC program opens doors
- We're a close-knit community

**What I Wish I Had Known**

- Good programming is important
- critically
- Details matter but remember the big picture
- What we do matters



## Engineering in the Movies

Partnering with our GESS council, we have kick started a new event series highlighting all the different engineering that we see everyday, even in the movies. We started off the series with Dr. Alex Bruton presenting a 20 minute talk on all the Geomatics engineering that took place in the Apollo 13 spacecraft as well as on the ground and even had actual footage from the flight itself. Afterwards all the guests were invited to watch the Apollo 13 movie and enjoy some pizza and popcorn.

The next movie in the series was on December 6th perfect for Christmas—"Arthur Christmas". This was an animated Pixar movie that highlights many different types of engineering in a fun animated way. For this movie in December we wanted to provide the students with an opportunity to relax before final exams.

## WISE Career Exploration Night

Dr. Alex Bruton attended this event and gave a 10 minute presentation and overview about Geomatics engineering career possibilities to 1st year Science and Engineering students.

## Women in Engineering Night & STEM Research Fair

Dr. Mozhdeh Shahbazi has also been actively representing the Department at many different events including the Women in Engineering Night and the STEM (Science, Technology, Engineering and Mathematical) Research Fair. Both of these events are to attract bright minds to the Science and Engineering fields.

## Upcoming Events

There are many upcoming events for the Department and for the Schulich School of Engineering—we wanted to highlight one of them.

## Engineering in the Movies

We are going to continue the series with movies on February 8th and March 1st.

The movie on February 8th is just before Valentine's day—what engineering could possibly be in a movie for Valentine's day you ask? Dr. Kyle O'Keefe will give a short presentation on the social and economic impact of surveying land cartography and work life balance in the movie "The Englishman Who Went Up a Hill But Came Down a Mountain" starring Hugh Grant, Colm Meaney and Tara Fitzgerald.

For March 1st, we have invited Dr. George Jergas from Civil Engineering to present on non-technical issues, such as Native, Political, Environmental, International and Community consultation that Engineers must consider. The movie/documentary is "Power: One River, Two Nations" We have also invited the University of Calgary Indigenous Student Council to Open and give the Treaty of Acknowledgement and Eya-Hey—Nakoda to help close the event in celebration.

Please watch for the advertisements to come out for these and we welcome you all to attend!

# Undergraduate Research Spotlight

## Research on 3D Models for Sport Climbing: UAVs, Photogrammetry, and the growth of a Geomatics Engineer

By Morgan Moe

While completing my second year of Geomatics Engineering I knew that I wanted a summer project that would expose me to the wide array of geomatics engineering applications. With job prospects appearing limited and narrowly focused, I crafted a project and a set of learning outcomes that would develop my knowledge of unmanned aerial vehicle (UAV) operations, photogrammetry and geospatial information systems (GIS). I was going to learn how to use UAVs to create 3D photogrammetric models of climbing areas in the Canadian Rockies. I approached Dr. Mozhdeh Shahbazi, whose research interests aligned with my project, and she very graciously agreed to mentor me over the summer. The remaining puzzle pieces fell into place as I received a scholarship from Integrated Collaborative Academic Network for Women in Science and Engineering (ICAN-WISE) to support the project.

I undertook professional UAV training, filed a number of the

required Special Operations Flight Certificates to Transport Canada in order to legally fly a UAV for research or commercial purposes, and learned about photogrammetry under the guidance of Dr. Shahbazi. I hiked into a number of climbing sites in the Moose Mountain area of East Kananaskis where I flew the UAV to capture images which I would later process into 3D models. One of the challenges of this project was that most aerial photogrammetry project capture vertical images from the UAV (shooting while looking down at the ground). In order to capture the required amount of detail for the models, I needed to capture images while facing the rock face itself (at close proximity).



*Photo above by Morgan Moe Dr. Mozhdeh Shahbazi (left) and Morgan Moe (right) undertaking professional UAV training with MIR Aviation*

*Photo to right by Morgan Moe—The Dust Bowl crag at the Moose Mountain/Canyon Creek climbing area featuring twenty-seven single pitch sport routes ranging in difficulty from 5.11a to 5.12d. View model on SketchFab <https://skfb.ly/6t9Tr>*

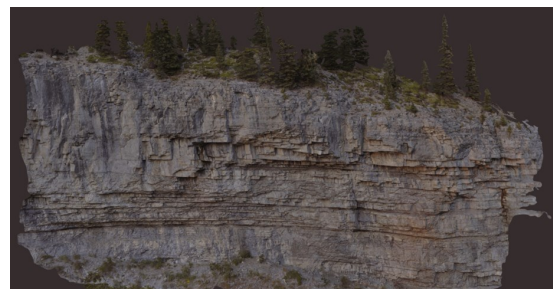


*Photo by Morgan Moe Responsible UAV operation starts with the knowledge of when and where to fly*

This meant that I would need to fly the mission vertically, something that most mission planning software does not easily allow for. In the end I was able to obtain the best results flying the UAV manually, although I expect dynamic 3D mission planning software to be just around the corner!

Pix4D Model (cloud and desktop) was used to perform camera calibration, bundle block adjustment, point cloud densification, and finally to output a 3D textured mesh. The 3D models were then uploaded to Sketchfab, the YouTube of 3D modeling, and embedded into an online map created with ArcGIS.

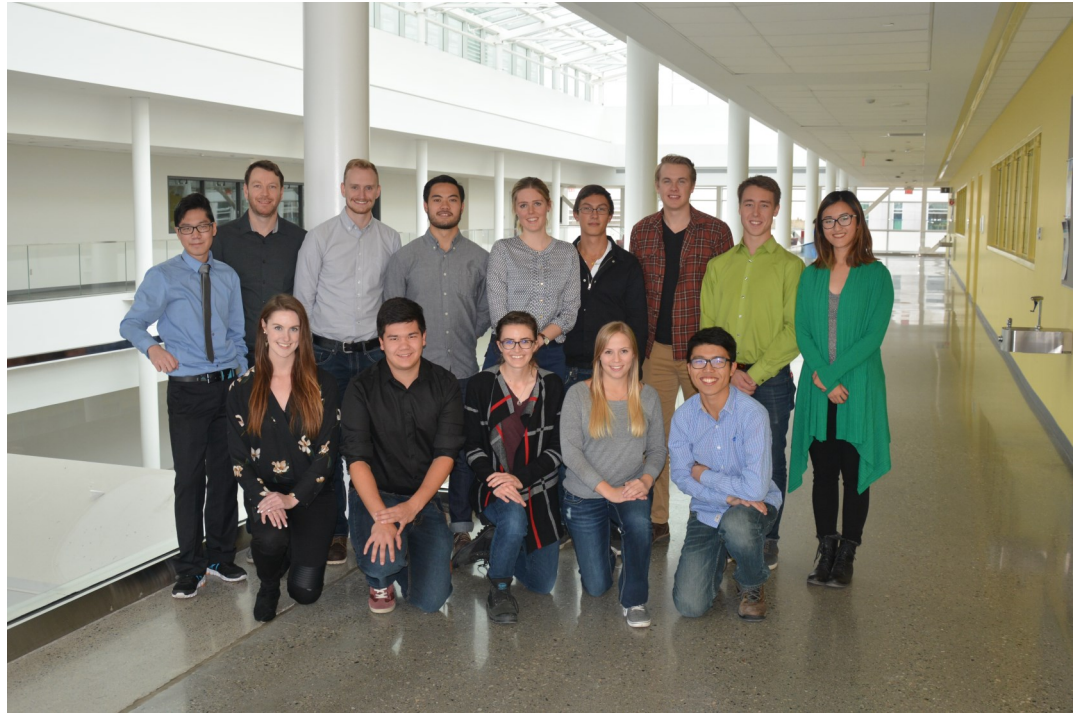
Overall, this project presented many valuable challenges and learning opportunities. I would highly encourage other undergraduates, especially during second year, to pursue summer opportunities with professors that they admire. My project pushed me outside of my comfort zone, encouraged me to learn new things via necessity, and introduced me to a number of opportunities available to geomatics engineers. Dr. Shahbazi was integral to my summer experience; she believed in me and dedicated her time and expertise to both my project and my development as an engineer. It is professors like her that make the University of Calgary, Department of Geomatics Engineering an incredible place to study.



# GESS & G<sup>3</sup> Councils

## 2017/2018 GESS Council

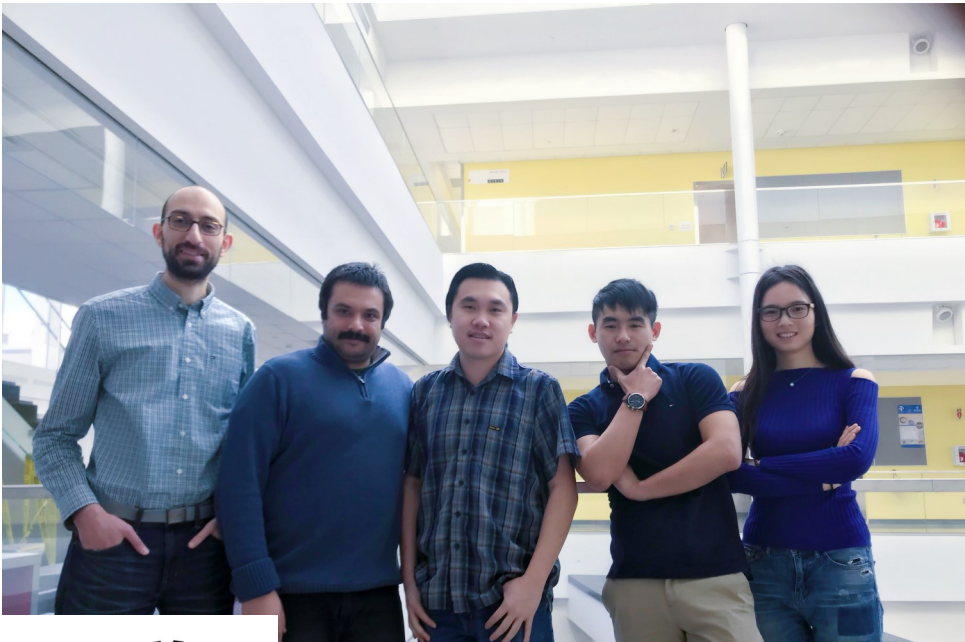
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Jeffrey Plett (Webmaster)  
Mikko Ramos (2nd Yr. Rep)  
Andrew Grab (Events Officer)



Back Row: Michael Ah-Kiow, Steven Schroeder, Jed Kroeker, Nathan Patton, Jennifer Busser, Braeden Kwok, Andrew Grab, Calvin Bochulak, Christine Cao

Front Row: Angela Ellithorpe, Brandon Langton, Sophie Croteau, Miriam Deitz, Mikko Ramos

Missing: Jeff Plett, Kiera Fulton



## 2017/2018 G<sup>3</sup> Council

From Left to Right:  
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Elyar Asl Sabbaghian Hokm  
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