

# opt!ons



ENGINEERING SCIENCE — UNIVERSITY OF TORONTO



## OPEN FOR DISCUSSION...

### A Message from the Chair

Almost one year has passed since we published our inaugural issue of this Engineering Science newsletter called *Opt!ons*. Much has happened here in EngSci and I want to share some of the excitement with you.



### Enhancing the Student Experience

Starting on the back page, you will see several new faces. We have hired Anne Marie Kwan as our second student counselor. Anne Marie will look after the first and second year students and will also be helping me with admissions to provide a seamless transfer for high school students into EngSci. This will allow Jane Chung to focus on our growing number of third and fourth year students. Lindsay Cunliffe is our new External Relations Officer and she will be helping me with student recruitment as well as alumni and industry relations. Pamala In is our third new hire as she takes over the all-important frontline position of Program Assistant.

I am happy to announce that Professors Gabriele D'Eleuterio and Kim Pressnail have extended their terms as Associate Chairs. Gabe will continue to be involved in our new curriculum development and the evolution of our Options, while Kim will continue to support student services and help me with the development of new staff in this area.

### Peer Review

For much of 2006, our energies were directed towards preparing for a major accreditation visit that was held in November. Simply by the nature of the Engineering Science Program, accreditation will always present some challenges

as we seek to define the new frontiers for engineers. The accreditation visitors had high praise for our students (as always!) but also for the increased strength of our Program's design content, much to the credit of Jason Foster, our Lecturer in Engineering Design, and Professor Paul Gauvreau, the Faculty's NSERC Chair in Design Engineering, through the Praxis series of courses.

### Looking Ahead

Over the past year, we have been very busy rolling out our new Years 1 and 2 Foundational curriculum with tremendous support from Lisa Romkey, our Lecturer in Curriculum, Teaching and Learning. We have also started to turn our attention to the Option Years 3 and 4 by developing a set of criteria for what qualifies as an Option and a curriculum template for what elements should be shared by students in all Options, as well as brainstorming on new Options.

In closing, I hope all alumni have received my invitation to attend our Annual Engineering Science Dinner being held on March 24<sup>th</sup>. I would like this dinner to become a special annual event for both our alumni and our current students, so please join us!

William R. Cluett, Professor and Chair  
Division of Engineering Science

# AERO SPACE

Zoe Szajnfarber (OT6) and Bruce Cameron (OT5), both graduates from the Aerospace Option, are currently studying in the Technology and Policy Program (TPP) at the Massachusetts Institute of Technology (MIT). Having completed EngSci, both have found they had a running start for what they are doing now. Upon graduation, Bruce hopes to return to Canada to work in system architecture in either the aerospace or oil sectors. Eventually, Zoe would love to be involved in setting the direction for future work in space exploration.



## WHAT MADE YOU CHOOSE THE TPP AT MIT?

**Zoe (Z):** During my Professional Experience Year (PEY) at MDA Space Missions, I was involved in the post-Columbia accident return to flight activities. I realized I was going to have a very frustrating career if I didn't gain some understanding of the socio-political context in my field and its interaction with technical decisions. The TPP at MIT offered me exactly this.

**Bruce (B):** It provided a unique opportunity to explore disciplines that share boundaries with engineering, such as economics, management and public policy. The program's flexibility and breadth helped balance the focus and depth of my aerospace curriculum.

## HOW DID ENGSCI PREPARE YOU FOR YOUR STUDIES AT MIT?

**Z:** EngSci gave me the theoretical background and confidence in my technical abilities to get up to speed quickly in areas outside my expertise. This has proved invaluable in my technology and policy work thus far.

**B:** Engineering Science's focus on drawing parallels across different areas of inquiry has gone a long way to helping me thrive in a research environment. Being in a relatively new research area, I don't have the luxury of pre-requisite coursework for preparation, but I did have the confidence from having tackled really tough problems during EngSci, and I understood the qualities that would make the knowledge useful.

## WHAT YOU ARE ENJOYING THE MOST AT MIT?

**Z:** The peer group is second to none. I am surrounded by students who are technically proficient enough to be accepted at MIT, but also those who are passionate about contributing positively to our world.

**B:** My research has focused on a methodology for integrating stakeholder requirements into the system architecture for NASA's return to the moon in 2020. One of the most enjoyable parts of the program is the access that we have been given to government

institutions as part of a variety of research initiatives, and the corresponding feedback we've received from those institutions.

## WHAT ARE YOUR LONG TERM CAREER GOALS?

**Z:** Eventually, I'd love to be involved in setting the direction for future work in space exploration. For now, I'm trying to get as many different experiences in the space sector as I can. This summer, I will work at the European Space Agency as part of the Advanced Concepts Team. Maybe this will be the type of "dream" work I am looking for!

**B:** I would like to run an engineering company. My research focuses on strategic decisions made to position a firm in the market, but I don't think I will truly understand this until I try it myself.

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ZOE AND BRUCE WITH THE DIRECTOR OF THE TECHNOLOGY AND POLICY PROGRAM, DAVA J. NEWMAN



# OUT OF AFRICA

## *an Engineers for the World experience*

BY HANS HESSE, 0T7

The sun is high over Katimba Village in rural Malawi, where the Masinda Cassava Starch Cooperative Society lies amid fields of cassava trees. The members of the cooperative are busy at work grinding and filtering cassava root into starch. A worker yells “Madzi!”, but the call for water goes unanswered. The small diesel water pump has broken down. With the raw cassava roots decomposing, my Malawian coworker, Alfred Aidi, steps into action. He takes the front tire off of an old bicycle, cuts a strip from the tube, and proceeds to make an improvised repair to the pump. The fix is temporary, but it will last until a complete repair can be done another day. That kind of resourcefulness would have been useful during my second year design project.

The challenges are many for those living in Malawi, a landlocked country in southern Africa in which over 80% of the population works in agriculture, mainly as subsistence farmers. The rains can be erratic, the job opportunities paltry, and the markets distant. Yet, the Masinda plant, initiated by the International Institute of Tropical Agriculture (IITA), is helping to overcome these challenges. The prospect of selling to Masinda encourages farmers to grow cassava, a highly drought-resistant crop, thus increasing food security. Further, rural farmers working at Masinda gain valuable technical and soft skills, in addition to improving their incomes, and other farmers gain a nearby market for their cassava.

Over the past summer I had the incredible opportunity of working with



IITA at Masinda as part of an Engineers Without Borders Canada overseas placement, helping to improve the capacity and sustainability of the plant.



During my time with IITA, I assisted the senior engineer in designing an improved cassava grating machine and a starch drying system, and also produced an assessment of the plant that outlined potential avenues for improvement. It became clear that technical improvements had to be matched by improvements in the workers’ human capital. IITA continues to do leadership and business training for the workers so they will gain the skills necessary to ensure the plant operates sustainably.

Working effectively overseas required adapting an Engineering Science background to fit an entirely new environment. Integrating into the local community was essential to understand the context of the project and its opportunities. Fortunately I was warmly received by the Yatimu family, with whom I stayed for a large part of my placement. While living with them, I was able to experience and learn about Malawian culture—the daily rhythms, the challenges, and the joys. I look back fondly at the kindness of the people I met and the vibrancy of Malawian culture.

Four months overseas is not enough to alleviate poverty in a developing country, but it opened my eyes to the possibility. I saw that people like Alfred Aidi have the talent and the heart to make development happen; I saw that a Westerner can help overseas if he is willing to listen and learn; and I saw first hand how our choices as Canadians—from the clothes we wear to the party we vote for—affect people thousands of kilometers away. I even saw how you can fix a water pump with an old bicycle tube.

The transition from high school to university is never easy, but combining that with a move half way across the country is even more difficult. Elizabeth Han, pictured at left, and Vicki Komisar are second-year students that made both of these transitions appear effortless. Vicki graduated from Western Canada High School in Calgary as a star on the school swim team and with the Bow River Swim Association. Elizabeth attended Holy Heart of Mary High School in St. John's and was honoured with the prestigious Arbor and Shaw Scholarships upon entrance to U of T.



## making the TRANSITION

### WHAT MADE YOU DECIDE TO COME SO FAR AWAY FROM HOME TO TORONTO FOR ENGINEERING SCIENCE?

**Vicki (V):** I can study biomedical engineering at a university that is leading the country in that field. The two years of foundation gives me a lot of versatility, just in case I change my mind.

**Elizabeth (E):** The Biomedical Option seemed to be the perfect synergy of my interests in life sciences and design, both of which are about not only doing well, but doing "good", which is very important to me.

### HOW DID YOU HEAR ABOUT ENGSCI?

**V:** A friend said that the grueling curriculum and non-traditional options would be "ideal" for nerds like me.

**E:** I was involved in several math and science programs where EngSci was frequently mentioned as one of the most challenging and unique undergraduate disciplines in Canada.

### WHAT WAS THE MOST CHALLENGING ASPECT OF MAKING THE TRANSITION FROM HIGH SCHOOL?

**V:** I think leaving home amplified the challenges of an already-stressful aca-

ademic program. Holidays like Easter were tough – but they also inspired some of us to start our own traditions in celebrating such occasions while away from our families.

**E:** Modifying my work and organizational habits to help juggle the course load with extra-curriculars.

### WHAT DID YOU ENJOY MOST ABOUT YEAR 1?

**V:** Not only did I meet and befriend many different individuals with a broad variety of talents, I experienced the euphoria of pulling successive all-nighters to finish projects or cram for tests with one of the most dedicated and colourful peer groups I have ever encountered.

**E:** Academically, I enjoyed being challenged right off the bat, as well as having the opportunity to get a holistic perspective on engineering with the foundation courses. I also loved living in residence at New College, where there was always something fun on the go.

### WHAT ARE YOU ENJOYING MOST ABOUT YEAR 2?

**V:** I'm more accustomed to life in Toronto and in EngSci (or lack thereof), I am less daunted by being away from home.

**E:** Having settled into life at **Skule™**, I love participating in the various traditions and mischief that make ours the most spirited Faculty on campus. Over the last year, our class has also become tightly-knit and it's just a great community to be a part of.

### WHAT IS YOUR FAVOURITE THING ABOUT TORONTO?

**V:** Toronto is an extremely diverse and vibrant metropolis that deservedly carries the "Centre of the Universe" epithet; and I have really enjoyed becoming acquainted with many of the different people and different cultures presiding in a city that sleeps even less than I do.

**E:** The eats! My current non-EngSci related goal is to try all the restaurants on Spadina Avenue before May, and so far it is meeting with about the same rate of success as my EngSci-related goals.

### WHAT DO YOU MISS MOST ABOUT YOUR HOMETOWN?

**V:** Where I'm from, the hockey team has won a Stanley Cup within the last 40 years. Go Flames!

**E:** It has to be the ocean, although I am beginning to express an appreciation for large, freshwater lakes.



## INTERVIEWED: PROFESSOR SERGEI DMITREVSKY !

**TELL US A BIT ABOUT YOUR BACKGROUND?** Shortly after I graduated, I worked for Canadian Radio Manufacturing Corporation which became a part of the Philips System and part of Motorola. I was a Microwave Systems Engineer. I worked for two years and then realized I wasn't learning anything more and went back to school to start graduate work.

**WHAT TACTICS DO YOU USE TO MOTIVATE YOUR STUDENTS?** I aim to lecture slightly above their level. And I do not hesitate to chastise them for not knowing what they should know by virtue of their scholarly background.

**WHAT HAS MOTIVATED YOU TO CONTINUE TEACHING?** In Canada there are no real alternatives for high-tech employment. Here (at U of T) I have laboratories at my disposal. A lot of engineering students are forced out of Canada to find work in industry.

**WHAT DO YOU FIND MOST REWARDING ABOUT BEING A PROFESSOR?** The whole environment. Using the jargon, it is an intellectual environment. This is primarily felt from my students. Once in awhile, a student asks a relevant question. That makes things interesting for me!

**WHERE DO YOU SEE THE FIELD OF ENGINEERING GOING IN THE FUTURE?** Until the advent of the general availability of the computer, engineering was essentially dealing with phenomena in terms of first order linear approximations. I think now this has been taken over by the computer techniques and the big thing now is real understanding and instruction of basics. To point in the right direction for certain problems, it requires a very thorough understanding of basics.

**WHAT DO YOU THINK CAN BE DONE TO GARNER MORE INTEREST IN STUDENTS TO PURSUE AN ENGINEERING OR SCIENCE DEGREE?** We do not need more engineers, especially if we are producing good engineers.

**YOU HAVE BEEN TEACHING AT U OF T FOR ALMOST 40 YEARS. HOW MUCH LONGER DO YOU THINK YOU WILL TEACH?** I'll stay at U of T as long as they tolerate me.

One of the goals of the Engineering Science curriculum is to provide our students with an interdisciplinary education. One of the ways that we are doing this is through the team-teaching efforts such as in MAT185 Linear Algebra. Professor Mike Lorimer (pictured at left), from the Department of Mathematics, and Professor Gabriele D'Eleuterio, from the University of Toronto's Institute for Aerospace Studies, have team taught this course for many years as a way to expose students to different personal, research and teaching perspectives.

Beneficial for students, team-teaching does require key elements to make the relationship between the professors work. Mutual respect; the enjoyment of learning from each other; and a common philosophy towards teaching are all required. "No egos are allowed," Prof. Lorimer said.

To effectively teach the students, these professors meet

## THE BEAUTY OF MATH



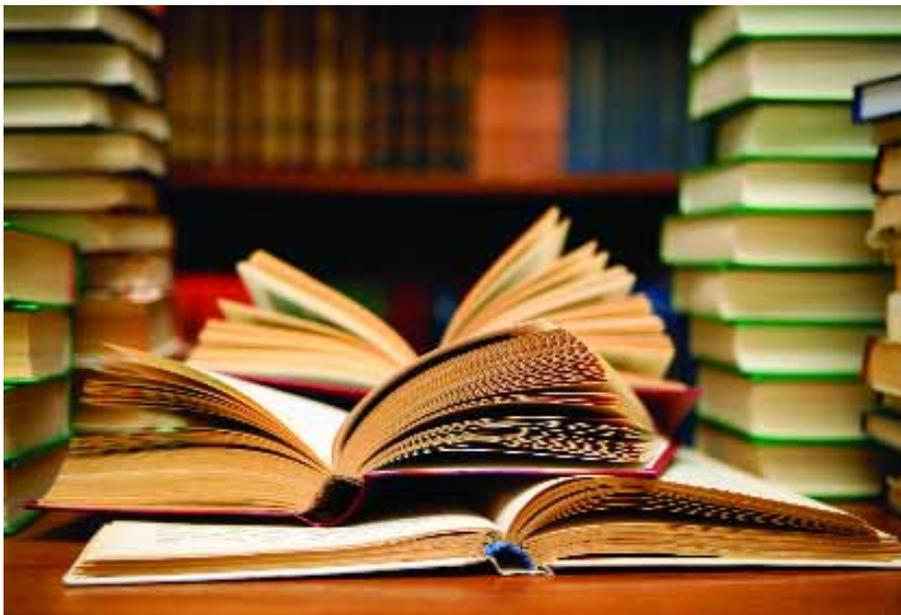
weekly to ensure that both sections are at the same place. "We alter the pace to ensure each class arrives at the same place each week," Prof. D'Eleuterio explains. Tests and exams are created together to ensure they are challenging, but fair. Both professors enjoy learning from each other during the semester as they work through "what works best."

Both speak very highly of the EngSci students. "At their best, they stimulate you to do your best with their curiosity and insightful questions," says Prof. Lorimer. "They enjoy both the beauty of mathematics and the elegant applications."

It is easy to see why these two professors work so well together when they are asked of their favourite teaching moment. Lorimer explains, as D'Eleuterio smiles alongside in agreement, that the best moment is "when the student understands the concept and a big smile of satisfaction and accomplishment beams forth."

# ENGSCI: CURRICULUM INTEGRATION

BY LISA ROMKEY



When the new foundation curriculum, introduced in September 2005, was created by Professors Yu-Ling Cheng and Gabriele D'Eleuterio, it was obvious that curriculum integration was a key factor in its design and intended implementation. Through the introduction of new courses, and the movement of existing courses, the new curriculum attempts to align courses and demonstrate to students how many key concepts are relevant in multiple disciplines. However, curriculum integration is about more than an alignment of courses; it requires active demonstration methods between courses and faculty members.

The purpose of curriculum integration is to help students form connections between topics, fostering a better understanding of course concepts and an ability to apply particular ideas to a variety of contexts. During their undergraduate experience, students traditionally learn a number of topics simultaneously in different courses. Students must then actively extend their existing cognitive networks or construct new networks in which to hold this new information. Students can more easily and effectively assimilate new information if topics presented simultaneously in different

courses are closely related. So, for example, to promote curriculum integration, faculty members might consider coordinating topics across different subjects to help students build stronger links between their courses.

In Engineering Science, we are developing various practices to strengthen curriculum integration. First, curriculum mapping has been an integral method of providing the Division with an in-depth understanding of what is being taught in our undergraduate courses, and how our students perceive their learning objectives. Through summer placements and work-study positions, current 2<sup>nd</sup> year students have been creating detailed curriculum maps and giving their input on where they see connections, or the potential for connections, between courses.

Our new Praxis course is an excellent example of curriculum integration at work. While Praxis includes design, experimentation and communication – 3 components that could remain distinct – instructors have taken an active role in integrating the components to provide a unique experience for our students. Engineering communications experts work with both the laboratory instructors on the development and marking of the formal written lab report, and the design instructors on the written,

graphical and oral presentation of student design.

Another project we are working on in 2007 is the idea of “joint tutorials” between courses. The idea is that two course instructors, representing different disciplines in the same semester, come together for a 1-2 hour period during the semester to present a particular topic from their perspective. This semester, an “electric circuits” and “linear algebra” professor will come together to discuss a topic meaningful to both of their classes, and in the process we hope that students will come away with improved understanding in both subject areas.

Curriculum integration is starting to catch on in universities around the world, through innovations that include joint first year courses in calculus and physics, communication-across-the-curriculum initiatives, and even the elimination of individual “courses” all together. We believe that through curriculum integration, we have endless opportunities to reinforce our students’ understanding of engineering concepts and their ability to apply ideas to increasingly complex problems.

Aristotle once said that "education is the best provision for old age." Well, you are no doubt at least a little bit older than when you attended **Skule™** and we hope your EngSci education has proven Aristotle correct!

My name is Lindsay Cunliffe and I am the Division's new External Relations Officer. I am looking forward to developing new activities and connections for our alumni. I would like to take this opportunity to recap what's been happening over the past few months on the alumni front.

An alumni panel event was held on September 19, 2006 which brought young alumni together with current EngSci students to convey their early industry and graduate school experiences.

On December 6, 2006, Engineering Science and Civil/Mineral Engineering hosted a joint reception for alumni of all three programs living in British Columbia. The event was held at the Emily Carr Institute of Art and Design in Vancouver. Professor Paul Gauvreau, the Faculty's

## ALUMNI & AFFINITY

BY LINDSAY CUNLIFFE



NSERC Chair in Design Engineering, was the guest speaker.

The Faculty kicked off a mentorship program on January 16, 2007 where current students are paired up with alumni giving students a meaningful way to gain guidance and wisdom from those who have gone before them. For alumni, it is a great way to stay connected to the university and to EngSci itself.

The highlight of this spring will be our 7<sup>th</sup> Annual Engineering Science Dinner. The focus of this event will be on bringing our alumni back to **Skule™** and having them connect with our current students. The date for the evening is March 24, 2007. We will begin with a reception/open house in the Bahen Centre, the current home-base for EngSci, followed by dinner at Hart House.

If you would like more information on the dinner or would like to talk about other ways to get involved, please do not hesitate to contact me directly at 416-978-8634 or e-mail at [engsci@ecf.utoronto.ca](mailto:engsci@ecf.utoronto.ca).

## 7<sup>th</sup> ANNUAL ENGINEERING SCIENCE DINNER

SATURDAY, MARCH 24, 2007

OPEN HOUSE AND RECEPTION, 5:00PM  
Bahen Centre, 40 St. George Street, 2nd Floor

DINNER, 7:00PM  
Hart House, 7 Hart House Circle

To register for this event, please visit:  
<https://www.apsc.utoronto.ca/apsc/skule/engsci/>

DO YOU KNOW WHERE THIS PICTURE IS TAKEN? COME FIND OUT ON MARCH 24!



OFFICE OF THE CHAIR

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