This newsletter is being sent to all EngSci alumni in our data base and to high schools students who have applied for admission to Engineering Science in the Fall of 2006 as a way to strengthen our EngSci alumni relationships and to communicate the excitement and opportunities that await our prospective and future alumni!

Engineering Science is one of U of T’s flagship programs and is ranked among the top undergraduate engineering programs in the world. Under the leadership of Professor Yu-Ling Cheng, who served the Division as Chair from 2000-2005, the program has flourished and grown to the point where EngSci is now the largest program in the Faculty.

When I started my five-year term as Chair in July, 2005, I inherited an ambitious academic plan for the Division that charts the way forward such that EngSci remains at the forefront of engineering education. In that academic plan was the following vision statement:

"Engineering Science will be a premier innovator in engineering education. Our graduates will have the knowledge, skills, vision, and judgment to be leaders among global citizens and among their generation of engineers."

You will notice that the vision statement refers to our desire to instill a sense of “global citizenship” in our students. In EngSci, we believe that a first-rate academic program provides students not only with technical skills but also with a fundamental sense of responsible global citizenship. Engineering Science students already have a particularly cohesive culture and propensity to take on leadership and community service roles. Therefore, our aim is to build on our students’ inherent altruism and pro-activity to foster a mature understanding of their role as participants in the broader community.

This notion of global citizenship was behind the development of our slogan “Engineering Science – Engineers for the World” that appears on our new banners outside of EngSci’s home base at U of T, the Bahen Centre. With this slogan, we want to send a clear message that our goal is to educate students who will go out into the world and do what they can to make it a better place than it is today.

I hope you enjoy reading the first issue of Options. Please feel free to send me your comments and suggestions for future issues.

William R. Cluett, Professor and Chair
In June 2005, Professor Yu-Ling Cheng completed her five year term as Chair of the Division of Engineering Science. The following are Professor Cheng’s thoughts on the Division, its culture and community, and the future of global engineering.

“During my years as the Chair of Engineering Science, I came to appreciate the many facets of EngSci students. Aside from their academic brilliance, thirst for knowledge and capacity for hard work, EngSci’s distinguish themselves through their sense of community.

AROUND THE WORLD

EngSci’s are well-known for their willingness to help each other learn and to make EngSci a better place. This sense of community extends well beyond the walls of the Bahen Centre. EngSci’s play prominent roles in nearly every Faculty and University level student organization, and many yearn to make a positive impact globally.

I cherish our students’ idealism, and I applaud Professor Cluett’s “Engineers for the World” (E4TW) concept to encourage our students’ efforts for the global good. As engineering educators, I believe we should help our students develop the perspective and skills that would help them recognize and solve global problems that they so clearly want to address.

I look forward to seeing how Engineering Science will continue in this effort. EngSci’s want to make a positive global impact, the Division aspires to delivering the best engineering education possible. I have no doubt both will rise to the challenge.”

On February 10, 2006 the Division of Engineering Science held its Sixth Annual Engineering Science Dinner at Hart House. One of the highlights of the evening was the presentation of the “Spirit of EngSci” (SoES) Award and the “Engineers for the World” (E4TW) Award. Both awards are made in recognition of a student’s non-academic contributions within the University (SoES) and within the broader community (E4TW). The recipients below embody the passion, enthusiasm and commitment to service and leadership that exemplifies what it means to be an EngSci.

SoES Award Winner
Roger Mong
Physics 0T6

SoES Award Winner
Mabel Lai
Physics 0T6

E4TW Award Winner
Richard Wiltshire
MSE 0T5 + MEY

E4TW Award Winner
Sarah Hugh
Biomed 0T6
Considering the tradition of excellence within the Engineering Science program, it seems only fitting to open my statement with words of congratulations. To our alumni, I offer congratulations for rising to the challenge and continuing to excel after graduation. To our prospective students, congratulations on your excellence to date, and I’m sure you will have a bright future in Engineering Science!

I speak to you today as both a fourth year student in the Physics Option of Engineering Science, and as the current Chair of the Engineering Science Club. I am immensely proud of the community that I represent, so it is my hope to use examples from my personal experiences to give you a sense of the diverse and talented student body that I am privileged to be a part of.

My story begins as a fresh high school graduate in September of 2002. I arrived at the University of Toronto supremely confident in my abilities, having proven myself a good student, a good musician, and a good athlete – but meeting my fellow EngScis was a startling reality check. I always knew that there were people smarter and more talented than myself, but I never realized that they would all coalesce into one undergraduate program! It was inspiring, but at the same time, a solid blow to the ego.

Everything fell into place when I stopped fixating on my marks and starting learning purely for the joy of knowledge. When I broadened my horizons beyond pure schoolwork and took on the role of a first year class representative, I discovered myself in the midst of a brilliant, supportive and enthusiastic student community. I was ecstatic. Never before had I been in an environment where everybody around me wanted to learn, where everybody craved knowledge - where everybody laughed at math jokes.

Prospective students frequently ask me, “What is Engineering Science?” After four years of consideration, I have arrived at the following answer. Engineering Science is a difficult program. It isn’t for everyone. It’ll test you. It’s a challenge. But first and foremost, Engineering Science is an opportunity to learn with, and learn from, the best and brightest student body at the University of Toronto. For it is undeniable that the strength of the Engineering Science program stems primarily from the strength of its students.

We are student leaders, varsity and intramural athletes, musicians, artists, volunteers. We are the students who sit in lecture and ask questions that are “beyond the scope of the class”, students who won’t back down from any challenge, students who will take fulfillment over ease, knowledge over marks, and strive for perfection, no holds barred. Each time I reflect upon my classmates, I am reminded just how lucky I am to be able to call them my peers.

We, the students of Engineering Science, are the leaders of tomorrow. The Engineering Science program brings the best and brightest together and fosters our skills, and when we graduate, we will use what we have learned from the program and from each other to make the world a better place.
Second year Engineering Science student William Li was honoured on October 20, 2005 by the class of 5T6 as the recipient of their prestigious 5T6 Award of Merit for leadership and community involvement.

The Award of Merit is given to a student who successfully completes their first year in any undergraduate Engineering program. In addition to having excelled in their academic studies, the recipient must demonstrate qualities of character and leadership through involvement in extra-curricular activities, either within the University, or the community at large. William was selected for his outstanding academic performance and his dedication and commitment to improving his community.

William attended Gordon Graydon Memorial Secondary School in Mississauga. In high school he was involved in a number of projects and initiatives including school plays, musicals, sports and numerous clubs. At the city level William was a member of the Mississauga Mayor’s Youth Advisory committee and also chaired a 6-weeklong annual festival called Mississauga Youth Week.

William continued this tradition of excellence and dedication to the community upon joining EngSci, as an academic and community leader in the class of 0T8, in spite of the challenges the intensive curriculum posed.

“Because EngSci is such a rigorous program, it can be challenging to get involved in extra curricular activities and keep up with school,” William notes. “That said, a substantial portion of EngSci’s find time to be involved in school. It is inspiring to be part of such a motivated and multifaceted group of students, and it drives me to push myself further.”

The Class of 5T6 honoured William’s dedication and drive, in particular for his work with a city-wide event titled “The Cause” that took place on July 17, 2005 at Dundas Square in downtown Toronto.

“The Cause” is an event to promote civic participation, volunteerism, and leadership among youth in Toronto. The event was designed to help high school and university students find their cause, discover what they are passionate about, and match them with community organizations in need of volunteers.

“We had 50 organizations participate,” notes William, “and, in all, 4000 youth from across the Greater Toronto Area participated. I hope that this event enabled some of them to find their cause, and that they are making a positive impact today.”

William was recently elected to the executive of Engineers Without Borders. “This is an organization that I believe combines my excitement for engineering ingenuity and a passion for changing the world for the better.”

While William’s extra-curricular achievements are exceptional, he is equally outstanding in his academic achievements. William maintains an impressive academic average and continues to be involved in student tutoring and research projects within the Faculty.

“I plan to select the Biomedical Option in Engineering Science next year. My goals include being part of the growing wave of biomedical engineering, whether it be in academic research here at the University of Toronto, in commercializing new treatments and technologies at the new MaRS Discovery District, or perhaps both.”

William exudes the qualities of a global engineer and the Division is proud to honour him as one of its outstanding young students and leader within his community.

“I was very humbled and honoured to be this year’s recipient,” says William reflecting on the award ceremony. “To be selected by alumni for such a prestigious award, which could have been won by so many of our excellent students, is truly a privilege.”
TV Ontario’s program BIG IDEAS undertook a project in 2005 to showcase outstanding lecturers among university and college teachers in Ontario in their Best Lecturer Competition. The call for nominations was advertised through various student newspapers across the province and on TVO and over 250 nominations were submitted. A three-judge panel created a shortlist of 30 professors and two U of T Engineering professors – Professor Parham Aarabi, Chair of our Computer Option, and Professor Michael Collins, Chair of the Infrastructure Option – made the cut. Based on a taped lecturer and biography, the lecturers were evaluated and the list was cut down to 10 finalists with Professor Collins being among this final group.

At 28 years old, Parham Aarabi is one of the youngest faculty members in Engineering at U of T. In fact, Professor Aarabi was only 24 when he began teaching at U of T in 2001, after completing his doctoral degree at Stanford University in only two years. Aarabi is a graduate of Engineering Science.

Letters of support from Aarabi’s students played a role in his selection for The Mac Van Valkenburg Early Career Teaching Award. He is the inaugural recipient of this international honour, given by the Institute of Electrical and Electronics Engineers’ (IEEE) Education Society.

Professor Aarabi is a member of the Edward S. Rogers Sr. Department of Electrical and Computer Engineering at the University of Toronto and holds a Canada Research Chair in Multi-Sensor Information Systems.

Professor Aarabi and Collins are both exemplary educators and reflect the caliber and quality of the faculty involved with teaching EngSci students at U of T. The Division is very proud of their work and would like to congratulate them both on this outstanding achievement. The following profiles will provide you with more insight into these two professors.

Professor Collins was nominated by his students who cited the “passion [he has] for his subject”. Says Collins, “The fact that TVO held this competition is praiseworthy. It raises the profile and importance of teaching at the university. The quality of the student experience is founded primarily on teaching, and I have always found teaching to be very stimulating for my research.”

Professor Collins received his B.E. from the University of Canterbury in New Zealand and his Ph.D. from the University of New South Wales in Australia. Collins holds the Bahan-Tanenbaum Chair in Civil Engineering and was selected as a University Professor at U of T in 1999, a designation made only to the University’s most eminent professors.
Engineering Science has always represented the most cutting-edge disciplines in the engineering field through an innovative, educational experience. The 2005/2006 school year marks the beginning of a brand-new engineering science curriculum, designed to reflect both changes at the high school level, as well as the growing educational needs of the engineering science graduate.

In the first 2 years, the EngSci curriculum covers a range of topics in math, physical & life sciences, technology, design and the humanities. Our semesters are themed, using 4 of the major cornerstone focuses in math & science: Matter and Motion, Systems and States, Fields and Waves, and Atoms and Molecules. The semester begins with an overture lecture, designed to introduce these themes to our students and demonstrate how the themes relate to the semester ahead. This broad base provided in years 1 & 2 gives our students a very comprehensive foundation in engineering science, and an excellent preparation for any one of our upper-year options in years 3 & 4. The upper-year options focus on emerging, multi-disciplinary fields that will prepare our students for the new challenges in engineering, working in industry or research. Our curriculum is an integrated experience; one in which our students will see links between courses, professors working together on curriculum and a true dedication to their educational experience.

Our new curriculum also includes an exciting new experience we like to call Praxis – see Jason Foster’s story on this innovative model of design education!

In a move that exhibits sincere dedication to the student experience, the division recently created a brand new position, titled “Lecturer, Curriculum, Teaching and Learning”. I took on this exciting new role in December, through a cross-appointment with the University of Toronto’s Faculty of Education - making this position the first of its kind in Canada. In this position, I am responsible for promoting horizontal and vertical integration in the curriculum, promoting innovative ideas in teaching & learning, and the development of new upper-year options. I have the opportunity to work with both students and professors in evaluating and improving the academic experience. I also conduct research in engineering education, designed to improve our understanding of teaching & learning in engineering – here at U of T and around the world.

I look forward to working with all of our EngSci’s, both past and present, in advancing the future of Engineering education at U of T.
Design, in the form of AER201 Engineering Design, has always been the centerpiece of the Engineering Science foundation years. Our graduates all have vivid memories of this course, and in particular of the exhilaration of seeing their prototypes function for the first time. When the foundation curriculum was being revised, one of the central goals was to expand and enhance the role of design.

The term “praxis” describes activities that lie at the intersection of philosophy and practice. Where philosophy may be seen as too abstract, and practice as being too pedantic, praxis represents an integrative middle ground. Within engineering curricula, theory-based courses may be seen as too abstract while design courses run the risk of becoming exercises in construction. The new Engineering Science Foundation Curriculum includes a sequence of four Praxis courses in which our students integrate engineering theory with design practice, and start down the path towards becoming an engineering designer.

A central tenet of the Praxis approach to engineering design is the importance of credibility. A credible engineering design is one that is supported by theory, experience, experiment, and exploration. Students in high school, and even grade school, can and do develop working designs. However they can only use exploration and experiment to show credibility. Engineering Science graduates use engineering theory and experience, in addition to experiment and exploration, to develop highly credible engineering designs. By promoting the notion of credibility, the Praxis sequence integrates the Engineering Science Foundation curriculum; students apply the materials learned in other courses to enhance the credibility of their Praxis work in design, communications, and experimentation.

In Praxis I, students are exposed to the basics of engineering design and credibility. This exposure takes place in the context of structural design, and is strongly linked to the theories the students learn in their introductory Civil Engineering course. Praxis II asks the students to first identify a core need of an external community, and to then design and prototype a means to meet that need. With two terms of Foundation Curriculum to draw upon, the students are made responsible for identifying links to their other courses. Praxis III turns the design model introduced in Praxis II on its head. In Praxis III, the students start by identifying promising technologies that have yet to leave the laboratory or concept stage. This identification stage is followed by an integration stage and the development of a prospective market. Praxis III culminates in the students "pitching" their ideas to local venture capitalists and technology transfer organizations.

Praxis IV works hand-in-hand with AER201 Engineering Design. The Praxis course continues to discuss issues of credibility, communication, and experimentation, while Engineering Design has the students design and prototype a working mechatronic system. Key to both courses is the concept of design integration. In Engineering Design students integrate electrical, mechanical, and control systems, to develop their working prototype. In Praxis IV the focus is on integrating perspectives from within, and beyond engineering, in the context of a complex engineered system.

To ensure that out students experience a complete, comprehensive, and integrated design experience, the Division recently created a new position titled “Lecturer in Engineering Design Education”. I joined Engineering Science in this capacity in the Fall of 2005. My position is cross-appointed with Civil Engineering, where I work closely with the newly-appointed NSERC Chair in Engineering Design. For the moment, my focus is on the design, implementation, and delivery of the Foundation Praxis courses. At the same time I am working with student design teams and design-focused faculty, both from within and outside of Engineering Science, to develop an integrative vision for design education within the Division and across the Faculty.