

BENCHMARKS



(L-R) Mark Gillingham, Steve Taylor, Colin Power and Mark Simms

Engineering Innovation The Cathexis Way

What do you get when you combine four ambitious engineers with a drive to succeed? You get Cathexis, defined as the concentration of mental energy on an object or idea, or as Sigmund Freud defined it, the psychic analog to an electronic current. Either way you choose to read it, it is a company that is fast becoming a high-tech leader.

Steve Taylor, president, says the idea to start a company grew out of the term six robotics project. "Our experience working on this project made us want to pursue the entrepreneurial side of engineering. Working on our own project, on our own schedule, really appealed to us."

Receiving a lot of positive support from Lloyd Smith and Mike Wrinch, co-founders of Intrignia Solutions, the company changed from an idea to an incorporated entity made up of Mark Simms, Colin Power, Steve Taylor and Mark Gillingham, all recent graduates of Memorial's undergraduate engineering program in electrical and computer engineering.

Since they began, the company has made a few changes, shifted gears a few times, until they found something they really wanted to pursue. "Originally we were more robotics based," says Steve. "Now we are looking at radio frequency identification (RFID) technology. We have researched what is available and have identified a market with tremendous potential and no local competitors."

An existing application of RFID technology would be the CD theft prevention system at department stores such as Walmart. Cathexis' RFID technology, however, goes a step further by having an integrated circuit embedded in the label, which contains digital memory that can be programmed or re-programmed using radio signals. As Steve points out, "You can tag something like your computer monitor, and then extract the data associated with it from a handheld reader. You can also link up that data with a central database, which would enable you to access that information over the web. The applications are numerous."

Cathexis cont'd on page 7

Inside this issue	News	3
	Feature	8
	Research Profiles	10
	Spotlight	12
	Notables	13
	Faculty News	13
Alumni News	16	

Message from the Dean

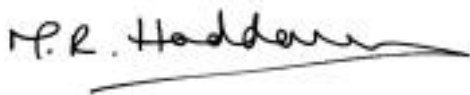
It is a great pleasure and an honour for me to address Benchmarks' audience as the interim dean of the Faculty of Engineering and Applied Science. Dr. Seshadri has resigned his post as dean to pursue a Canada Research Chair in the faculty. I would like to convey my sincere thanks, as well as the faculty's, to Dr. Seshadri for his major contributions to the faculty during his tenure as dean.

I would also like to recognize my colleagues, Dr. John Quaicoe, associate dean (undergraduate studies) and Dr. Ray Gosine, acting associate dean (graduate studies and research). I feel we have a very strong team who are dedicated to making lasting changes that will benefit the faculty for many years to come.

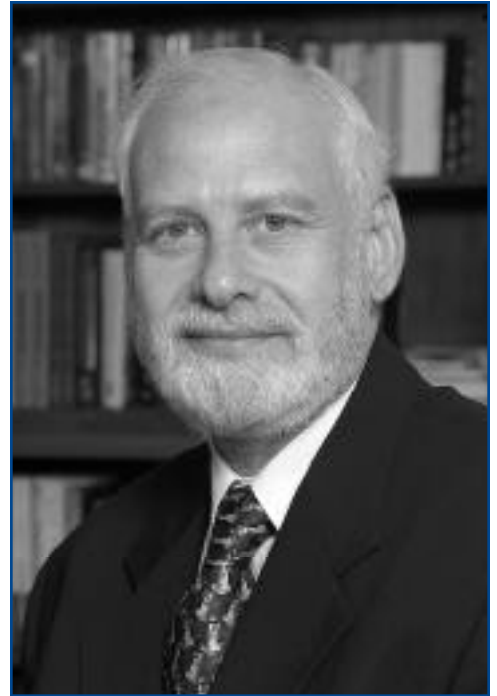
We have come a long way in the past few years. We have introduced new programs, opened new research facilities, and created new courses to respond to developing industries both locally and nationally, but we have more to do yet. I would like to commit to working together with the faculty, staff and co-op coordinators to achieve our goals.

Engineering education is a dynamic process, but we must remember to move forward. This might involve collaborating with other faculties and universities to create interdisciplinary programs and joint graduate programs. The next few months are going to be exciting with new challenges to face. The academic program review will be an opportunity for us to identify the strengths, opportunities, weaknesses and threats that face the faculty. We can use this experience to start a realistic strategic planning exercise.

Other opportunities and challenges that we have to take advantage of are the Atlantic Innovation Fund and the Canada Research Chairs program. This will help to give us a leading edge on research and help foster innovative thinking. There is no shortage of opportunities; it is simply a matter of ensuring we take full advantage of them whenever possible. I look forward to working with you all to build an even stronger engineering program here at Memorial.



Dr. M.R. Haddara, Interim Dean



MESSAGE

At the Top of Their Class

This year in Memorial's Faculty of Engineering and Applied Science, 29 women graduated out of a class of 130. That's 22% of the graduating class as compared to 16% in 2001. The number of women pursuing engineering has been increasing since the 1980's, but there is still a long way to go before reaching what Dr. Mary Williams terms 'critical mass'. This means that if 33% of a group is women, then whenever two or more of that group work together, there is a better chance that at least one of them will be a woman. It is only at this point, that female engineers will no longer be considered a minority.

"If we do nothing, we will continue to have a very slow increase and it will take years and years before we actually achieve a good representation. Instead, we should continue to be active on all fronts. We have to pick the influence point and keep working on that," says Dr. Williams.

For a long time, many organizations such as WISE have been encouraging people to see that women are under-represented in science and engineering. More active recruitment in high schools, where the critical decisions are made for university, is needed. This will help to ensure that students are aware of engineering as an option, and it will also give them a better understanding of what an engineer does. Sending undergraduate engineering students out into the high schools to talk about what they do and why it is exciting has shown to be the most effective recruitment tool.

The female students who do consider engineering as an option have a lot of things in common. They are all strong in math and sciences, they find the job opportunities promising, and they have a curiosity for how things work and fit together. Like all students, they find the engineering program challenging and long. But as Kelly Joy points out, "When you think about most other university students, they don't have two years of work experience by the time they graduate. This gives us an advantage and it is more beneficial in the long run." When asked about their experience here at Memorial, they each had a lot to say:

Lisa Holden, B.Eng. (mechanical): "I enjoyed the work terms, met a lot of great friends who made it easier to deal with the challenges of doing engineering. We were all in it together and we helped each other along."

Sarika Wadhawan, B.Eng. (electrical): "Sometimes you doubt your abilities when the program you are doing is so new, like differential equations where math is all symbols and no longer numbers. It feels like starting over. But as you learn, your confidence grows."

Cecilia Mok, B.Eng. (computer): "I took a leap of faith and decided to give engineering a try. Discovered it was for me and felt at home almost immediately."

Kelly Joy, B.Eng. (mechanical): "I put a lot of time into doing well in my courses and on my work terms. My success means a lot to me."



Engineering Graduates - (L-R) Lisa Holden, Kelly Joy, Karen Horwood and Sarika Wadhawan.

Karen Horwood, B.Eng. (civil): "The best part of engineering is that I found something I really like doing."

As for being aware that they were in a minority, none of them found this to be an issue. For Cecilia Mok, the only female student in the graduating computer engineering class, it was a little intimidating at first.

"There was a bit of an adjustment. But I learned a lot along the way and never felt any prejudice towards me."

According to Dr. Williams, "Our students are typical of students all across the country, they are not explicitly aware of the gender factor in their own experience. First of all, because they are busy trying to do engineering, which is a full time job whether you are male or female. Secondly, because they have been women all their lives, and chances are they have always been the smart one. The biggest challenge is getting them to understand what the baseline is and how they are different from the baseline."

For many of the graduates, they plan on pursuing involvement with WISE now that they are finished school. They all recognize the importance of encouraging and promoting engineering to young women. As Cecilia Mok points out, "There was no barrier to prevent me from studying engineering, but in my experience it certainly was not encouraged. I would like to change that. If I can show people that I did it, then they can see that it is achievable for them too."

Update: Formula MUN

The 2002 racing season has come to a close for the Formula MUN racing team. They have been actively competing in Detroit at the Formula SAE World Championships for several years and 2002 was certainly no exception. The team was very optimistic before the May competition and they proved to be strong competition for some of the more recognized of the 140 teams from the United States, Canada and around the world.



Leader of the Opposition Danny Williams was on hand to officially christen the Formula MUN 2002 car.

Currently, the team is actively marketing themselves at public events and trying to raise awareness of the project. While this helps them to get their name out, it also allows them to give back to their sponsors through advertising. The team has also begun the design of the 2003 car, much of which is ready for manufacturing. Between all of this hard work the team members do find time to have some fun, conducting driver training whenever possible.

Throughout the coming year the team will complete the design and manufacturing stages for the 2003 car and move into the testing phase. This testing phase will be critical as the team has made the decision to move to an updated engine and management system to help ensure the competitiveness of the new design.

Formula MUN would like to thank all of its sponsors. This project would not be possible without their support and assistance. For more information on the team, check out their web site at www.engr.mun.ca/_raceteam

Cryptography: The Art of Making and Breaking Ciphers

Cryptographers from around the world descended on Memorial University for the ninth annual Workshop on Selected Areas in Cryptography, held on August 15 and 16, 2002. Starting at Queen's University as a small workshop, the annual event has grown considerably to include this year about 80 attendees with 25 paper presentations from all over the world.

Cryptography, according to Dr. Howard Heys, conference co-chair and professor in the Faculty of Engineering and Applied Science, is the practice of taking information in its usual readable form and scrambling or encoding it so that others will not be able to read the information. It is often used to provide confidentiality by scrambling messages or authentication by verifying or confirming that the person you are doing a transaction with is really that person, and its applications are growing.

"A lot of research is taking place in the field of cryptography. Many new application areas are emerging such as wireless communications data transfer. As new technologies continue to emerge, people will start to think more about the security implications," says Dr. Heys.

The themes for this year's conference included the design and analysis of symmetric key cryptosystems, block and stream ciphers and hash functions, subjects common to the work of cryptographers. The conference also included a new theme focusing on cryptographic solutions for mobile and wireless network security. Invited speakers included Steve Babbage from Vodafone, speaking on security algorithms for mobile telephony, and David Wagner from the University of California, Berkeley, discussing cell phone security. This is a new area of research for cryptographers and one that is becoming more significant as problems with network security increase and become more publicized.

"Because of the nature of wireless technology, there is a preference to build ciphers, the algorithms that encode data, in a particular way. Unfortunately, these standards are often created in closed rooms without a 'public' viewing. What happens then is that people come along who are good at breaking ciphers, look at these standards, and then break them. The design of ciphers needs to be more of an open process."

"There are two sides to cryptography: making ciphers and breaking ciphers. There is often no way to design a cipher and know definitively that it is secure. The only way to prove it is to allow it to stand the test of time," adds Dr. Heys.

But since the technology to break ciphers is often keeping pace with the technology to make them, cryptographers face a battle of make and break at every new turn. The best way to ensure the longevity of a cipher is to keep well ahead of those who are out to break it.

Get ready for NECEC 2002!

The twelfth annual Newfoundland Electrical and Computer Engineering Conference (NECEC) 2002 will be held at the Holiday Inn in St. John's on Wednesday, November 13. The conference is hosted by the Newfoundland and Labrador Section of the Institute of Electrical and Electronics Engineers (IEEE) and provides an opportunity for professionals in electrical, electronic, computer engineering and information technologies to present their work to the growing technical community within the province.

Professionals, researchers and students working in these areas are invited to submit abstracts for presentation at the conference. Abstracts should be about 100 words and should be sent by e-mail, plain text only, to Dennis Peters at dpeters@enr.mun.ca.

One of the invited speakers this year will be Dr. Mohamed El-Hawary, President of IEEE Canada and Associate Dean of Engineering at Dalhousie University. Dr. El-Hawary will be known to many in the local electrical and computer engineering community since he is a former faculty member at Memorial. The organizing committee is very pleased to welcome him back this year. Further information about the conference and breaking news about other invited speakers can be found at the conference web-site <http://www.ieee.nfld.net/NECEC02>.

First round of AIF projects announced

(Excerpted from the Gazette, July 11, 2002)

Four Memorial University-led projects received the nod from the Federal Government to the tune of almost \$22 million as the first round of the Atlantic Innovation Fund (AIF) was announced at a news conference July 2, 2002. Gerry Byrne, minister of state for the Atlantic Canada Opportunities Agency (ACOA), announced that 47 projects in Atlantic Canada have been selected for funding under the program. Dr. Axel Meisen, president of Memorial described the announcement as "magnificent" and expressed thanks to Mr. Byrne. "These awards are unique in the history of Atlantic Canada, both in terms of the magnitude of the awards and in terms of their focus. In short, I believe that these awards will enable us to build new internationally competitive enterprises based on research and development – something for which we never had the resources before," said Dr. Meisen.

Memorial University of Newfoundland will receive \$21.6 million to undertake four projects and C-CORE located on Memorial's St. John's campus will receive \$6 million. The \$300-million Atlantic Innovation Fund is a five-year Government of Canada initiative that is administered by ACOA. It is designed to build the economy of Atlantic Canada by increasing the region's capacity to carry out leading edge R&D that directly contributes to the development of new technology-based economic activity in the region. Specifically, the fund is aimed at increasing the R&D being carried out in Atlantic research facilities leading to the launch of new ideas, products, processes and services.

AIF projects at Memorial

- A project led by Dr. Joseph Brown, associate director, Ocean Sciences Centre, will provide essential research to enhance the establishment of a commercial Atlantic cod aquaculture industry in Newfoundland and assist in the continued development of the Atlantic halibut aquaculture industry in Atlantic Canada. The project will receive \$4,100,000 from AIF over a five-year period, in addition to funding from other public and private sources, including the Canada Foundation for Innovation.

- The Pan-Atlantic Petroleum Systems Consortium (PPSC), including Memorial, Dalhousie University, and the University of New Brunswick, intends to harness the physical and human resources of member universities to provide an integrated and comprehensive response to the research and specialized skill requirements of the petroleum industry in Atlantic Canada.

- The Ocean Sciences Centre will undertake a project designed to use biotechnology to improve the broodstock characteristics of key aquaculture finfish species, notably Atlantic salmon. The project team, under the direction of Dr. Garth Fletcher of the Ocean Sciences Centre, will use innovative biotechnology to investigate and improve the mechanisms of disease resistance in Atlantic salmon.

- The Electronic Rural Medicine Strategy (TERMS) is a project of the Office of Professional Development (OPD) at the Faculty of Medicine, Memorial University of Newfoundland. OPD will work with development partner, ZeddComm, to complete the design, development, and delivery of online professional development training tools and resources for physicians. These online courses and an accompanying Web portal are intended to address the professional development needs of rural/remote physicians and specialists throughout Canada.

- C-CORE, located on Memorial's St. John's campus, has developed significant expertise in providing industry relevant technical solutions to the challenges of working in cold oceans and other harsh environments. C-CORE will receive \$6 million to migrate its expertise and technology to develop technical solutions to industry-identified problems in other natural resource sectors such as mining, forest products and terrestrial gas pipelines.

Memorial University and INCO: Partners in Progress

(Excerpted from the Gazette, June 27, 2002)



On hand for the announcement were (L-R) Edward Roberts, chair of Memorial's Board of Regents; Dr. Axel Meisen, president of Memorial; Scott Hand, chairman and CEO of Inco; Roger Grimes, premier; and Sandra Kelly, provincial minister of Youth Services and Post-Secondary Education.

Inco's \$20 million investment in Memorial University is an example of the kind of partnership the company hopes to form with the people of Newfoundland and Labrador, said Inco chairman and CEO Scott Hand. When Inco and the province agreed that the Voisey's Bay development would proceed, Inco also agreed to transform the Thomson Centre into the Inco Innovation Centre, a commitment of \$10 million to renovate the building, and another \$1-million annually to operate it. "This will bring together Inco's world-leading expertise in exploration, mining and processing technologies and outstanding post-secondary students, including many at the graduate school level, for training in these disciplines," explained Mr. Hand. "The work done at the Innovation Centre will provide a basis for these students, as their skills grow, to work at our facilities in Labrador and Argentina. Thus we hope to keep some of the province's best educated young people in Newfoundland and Labrador." During a speech to the St. John's Board of Trade on June 12, Mr. Hand said his company and the people of this province "will be great partners." He said that through the Innovation Centre, Inco, as an acknowledged leader in global mining technology, will "transfer that knowledge and expertise through a homegrown training program that we believe will encourage young people to pursue their careers and lives in the province." I know that is a goal of the people of the province. Give young people a reason to stay and work in this province. Our goal is a trained and skilled workforce. Again, our goals are aligned. I believe Memorial will become an international centre for mining and metal technology."

OGDP Lecture Series Continues

The Oil and Gas Development Partnership (OGDP) Lecture Series continued this past year with discussions on reservoir management and North America's hydrocarbon future.

On April 8, 2002, Dr. Khalid Aziz, professor of petroleum engineering at Stanford University spoke about "New Trends in Reservoir Management." Those in attendance had the chance to learn how a reservoir is managed and new technology that is optimizing oil and gas production and making the industry more efficient and economical.

Dr. Judith Dwarkin, senior vice-president, Global Energy and Communications, Canadian Energy Research Institute (CERI) was also at Memorial on June 25, 2002 to speak on "Canada's Role in North America's Hydrocarbon Future." Dr. Dwarkin highlighted Canada's potential contribution to the North American energy mix, pointing out some challenges that may come up along the way, most notably the issue of gas recovery.

The lecture series will continue on Wednesday, October 9, 2002 with Mr. Brian Maynard, Deputy Minister of the Department of Mines and Energy, who will address the Newfoundland – Nova Scotia boundary dispute. The lecture will take place in the engineering lecture theatre (EN-2006), located off the main lobby of the S.J. Carew (Engineering) Building. All are invited to attend.



(L-R) Dr. Khalid Aziz chats with Dr. Axel Meisen and Mr. Gordon Carrick, Vice President Offshore Development and Operations, Petro-Canada.

Dean's Award for Exemplary Service

The Faculty of Engineering and Applied Science is developing an award to recognize the outstanding contribution of members of the administrative and technical support staff, in support of its overall goals. This award will honor staff members who demonstrate a high degree of excellence in carrying out their duties and contribute to making the faculty a welcoming community for students and employees. All limited appointment and full-time permanent staff who have a minimum of one year of continuous service are eligible for this award. The first award is to be presented by the end of fall 2002.

News Briefs

- Congratulations to engineering students, Steve Reddy, Anita Naidu, Leanne Kelland, Steve Holden, Pradeep Bobby, Trevor Goodland, and Ian Royle, and Dr. Kelly Hawboldt for their times in the annual Tely 10 road race. For some it was their second or third time running the course, for others it was their first. Everyone should be very proud of a good race!
- The computer engineering discipline went through an accreditation process in early 2002. Beginning with the graduating class of 2002, the program has been accredited for three years to June 30, 2005, to coincide with the accreditation period of other accredited programs in the Faculty of Engineering and Applied Science. The first computer engineering class of 22 students graduated in spring 2002.
- The Office of Continuing Engineering Education offered a five-day course in Nondestructive Evaluation and Testing of Onshore and Offshore Structures/Machinery from June 3-7, 2002. The five-day course examined current engineering concepts for evaluating and testing the integrity of onshore and offshore structures and machinery. The course was intended for engineers, material scientists, project managers, technical personnel, and anyone else who required a background on the fundamentals and application of nondestructive evaluation and testing. Course instructors for the program included: Professor Bill Drover, Shell Chair for mechanical engineering at University College, London, Dr. Feargal Brennan, manager, NDE Centre, University College, London, and Dr. Michael Smith, NDE projects manager, TSC Inspection Systems Ltd. There were 25 registered participants in the course.

INCA: Update on projects

Many research projects have been ongoing at INCA over this past year. A novel modular robotics platform was implemented for the C-SCOUT (AUV). Termed, Distributed Embedded Modular Architecture (DEMA), this control system is very robust and allows for easy expansion of system capabilities. It consumes much less power than a PC based system and is well suited for harsh environment robotics. This new control system was commissioned in late July 2002 and is undergoing tank trials at Memorial and IMD. Future plans for the C-Scout project include extensive tank trials, hydrodynamic testing, and further enhancements to the autonomous capabilities of the C-SCOUT.

Trials with MUN medical students have been ongoing since May 2002 for the ANAKIN project. These trials assist in the development of ANAKIN using student feedback. Once the trials are complete ANAKIN will be returned to the lab for a reconditioning and durability assessment. The training software will be reviewed and the search for commercial partners will continue.

The RAVEN project is continuing with the development of an autonomous aerial vehicle. Applications for this plane could consist of oil spill monitoring, over fishing surveillance, pipeline inspection, forest fire reconnaissance, etc. To date, the plane has been constructed and research has begun into payload capacities and instrumentation. Plans were to have the plane flying autonomously with a digital camera payload by the end of the summer 2002.

Cathexis cont'd from page 1

Cathexis is taking their technology and going after the fast developing hydrocarbon sector, as well as small/medium size enterprises where they feel they can have a significant effect on their bottom-line and operational efficiency. The services they offer include asset management and personnel/asset location.

"Our asset management service allows a company to pull data on a labeled object, using a wireless link and without any user intervention. This allows managers to track inventory as it moves around a plant or in and out the door. All the information that is necessary for maximizing a plant's efficiency is available," says Steve.

"Personnel/asset location technology merges the basic ID badge with a RFID system that is implanted inside the card. A possible application would be for the offshore industry during evacuations. This technology would enable the evacuation manager to ascertain whether everyone was off the rig or whether someone was still on board. There are also numerous benefits for security control of equipment on an industrial site."

Support for Cathexis has been tremendous throughout the university community and is steadily increasing. Dr. R. Seshasri, Dr. Siu O'Young and Dr. Claude Daley of the Faculty of Engineering and Applied Science donated the use of facilities and resources. Tremendous support and encouragement also came from Dr. Ray Gosine, Dr. Brian Veitch and Dr. Neil Bose. Roger Power and Bob Richards of the Gateway program have also been instrumental in helping the company to develop. "As our venture coach, Roger Power has been there for us every day, whenever we had a question. Together they have helped us develop as a company and given us the necessary business training to succeed. We were also the recipients of the Gateway's Most Promising New Venture award," says Steve.

So what does the future hold for Cathexis? With the help of an IRAP grant, they will be moving forward with R&D and expanding their industry contacts. They have also hired their first employee, a co-op engineering student for the fall semester. "We are very optimistic about the future. Right now we are trying to tell people who we are and what we do. Ultimately, we would like to partner with a company to help them with their technical needs, while at the same time gaining an industrial setting in which to prove our technology. We are just getting started, but there is a lot in store for us yet!"

Becoming Leaders

Success guide for female scientists released

Becoming Leaders: A Handbook for Women in Science, Engineering and Technology is a practical guide to help women advance their careers and develop their leadership potential. Written by Dr. Mary Williams, NSERC/Petro-Canada Chair for Women in Science and Engineering and recently-named director general of the National Research Council's Institute for Marine Dynamics, and Carolyn J. Emerson of Memorial University, the handbook is the culmination of five years of research, networking and a lot of listening.

Back in the summer of 2000, the CWSE and Women in Science and Engineering (WISE) Newfoundland and Labrador co-hosted a national conference titled *New Frontiers, New Traditions: A National Conference for the Advancement of Women in Engineering, Science and Technology*. The organizers took note of how well participants responded to the sessions that took a practical look at ways to help women advance in their careers. As part of the conference, Petro-Canada proposed creating a legacy from the conference and thus, the idea of a handbook that could include a lot of information raised during the conference and research collected over the past few years, was born.

"We choose to call it a handbook because for an engineer a handbook is something that contains very useful information and is used quite often as a quick reference guide. You pick it up to find out something you need to know. You are also confident in the fact that the information it contains is grounded in solid research," says Dr. Williams.

The handbook is a validation of women's experiences working in the fields of science, engineering and technology. It takes ideas that a lot of women have learned along the way, and strategies they might have developed on their own, and shares those tips and strategies with a larger audience. The book is simply laid out so that it's easy to find a relevant section, e.g., work-life balance, proactive diversity practices for managers, personal networks and mentors, tenure strategies for new university faculty, and career skills and strategies. All sections have been reviewed by women for whom a particular topic was important. As Ms. Emerson points out, "We have continually been proofing the book against women's own experiences, as well as the background research."

Those who will benefit most from the book include women in the early stages of their careers, senior university students, managers, deans, directors, and the list goes on. There is also a chapter for children and families of women scientists and engineers. "The audience extends beyond to all places where women are working or studying," adds Ms. Emerson. "Ultimately, science and engineering will benefit from the diversity of vision and values that clearly impact all of our lives. Society will also benefit from a greater diversity in the field of science and technology."

"Making sure that women are becoming leaders will be beneficial for both women and the organizations."

Many topics are touched upon in the handbook and a lot of information has been integrated from various fields. Dr. Williams and Ms. Emerson have tried not to repeat information that is already available, but have instead worked to highlight information that is specific to women in science and engineering. Dr. Williams points out, "People say that women are making progress and that is indeed true, but the fact remains that right now women are still in the minority in many areas of science and technology and they are substantially in the minority in positions of leadership. Making sure that women are becoming leaders will be beneficial for both women and the organizations."



Becoming leaders is the focal point of the book. For Dr. Williams, "The handbook is a tool to help people gain the information they need to succeed. In the title there is a message. We want to invite women to consider themselves as leaders. We want to plant that idea. As soon as they pick up the book and read it, we have achieved something."

"We know we have a very useful product and a valuable resource and we are confident that a lot of individuals and organizations will be interested," says Ms. Emerson.

Becoming Leaders had its cross-borders debut at the 12th International Conference of Women Engineers and Scientists attended by 600 delegates from 44 countries, July 27-31 in Ottawa. The strong CWSE and WISE Newfoundland and Labrador contingent collaborated on five presentations, including standing-room only sessions on the handbook and demonstration workshops developed from the handbook. Memorial Engineering alumnae Joanna Barnard, Jane Kieley and Karen Muggerridge were facilitators and co-presenters with Mary Williams and Carolyn Emerson in these enthusiastically received sessions. Other WISE delegates at the conference included Lisa Anthony, Pamela Harris, Faye Murrin and Sherry McHugh.

Strong interest in the handbook led to an active WISE booth area, staffed by engineering graduate student Angela Tate, engineering technologist Caroline Koenig, and others, and the 'sold out' sign went up on the last day of the conference. Building on the positive response from representatives of associations, universities, government, and industry, *Becoming Leaders* distribution is forecast to be strong. "Inviting", "well-written", "easy to read", "excellent resource", and "couldn't put it down" are among the comments received. Plans are already underway for the book to make its next debut at the Society of Women Engineers conference to be held in Detroit in the fall of 2002. For information on the handbook including ordering details, go to www.mun.ca/cwse or call 737-7960.



Autonomous Underwater Vehicles Redefining Environmental Monitoring

Autonomous underwater vehicles (AUVs) have the potential to redefine the way we perform environmental monitoring in deep water. Considerable work is being done to modify existing technology and help researchers better assess the extent and behaviour of offshore discharges. Vanessa Pennell, a graduate student in the Faculty of Engineering and Applied Science, was part of a research team, involving Memorial University, Applied Microsystems Ltd. and International Submarine Engineering in British Columbia, that was conducting sea trials on an AUV specially outfitted to take samples of a released chemical.



Working on modifications to an AUV are (L-R) Dr. Neil Bose, Faculty of Engineering and Applied Science and Dr. Chris Williams, Institute for Marine Dynamics.

“Using an existing AUV, owned by the Department of National Defence, we equipped it with a mass spectrometer and then released it into Burrard Inlet, off the coast of Vancouver Island. We then put a chemical in the water, dimethyl sulfide, because we needed something for the mass spectrometer to detect and this is a chemical found naturally in the environment,” says Ms. Pennell.

The mass spectrometer, designed by the University of South Florida and sold to Applied Microsystems Ltd. in British Columbia, is arguably the most versatile of chemical sensors. It can measure atomic mass units to assess what chemicals are present in a sample of water. The chemical passes into the mass spectrometer through a thin membrane, which has very low detection limits for dissolved gases and volatile organic compounds. Once inside the chemical is analyzed and the shape of the discharge plume can be mapped out. The tracer chemical was dumped into the water to create a plume, or tunnel of liquid, within the water. “This is similar to what happens when produced water, or re-injection water, is dispersed off an offshore platform,” adds Ms. Pennell. “The level of hydrocarbon concentration in the water is regulated by organizations like the Canada Newfoundland Offshore Petroleum Board (CNOBP). Being able to accurately

measure the presence and quantity of hydrocarbons is, therefore, very advantageous to all involved.”

Using the mass spectrometer, the AUV was able to successfully detect the presence of hydrocarbons in the water over the course of the sea trials, which lasted three days. This was very optimistic news for all involved. “We were very pleased that the trials went so well. This means that we can use this technology to detect chemicals in the ocean, even at very low levels.”

This was the first time that a mass spectrometer was used on an underwater vehicle to analyze a plume of chemical. Ms. Pennell points out that complications can arise when trying to collect samples from the ocean because it is such a dynamic environment and it changes from hour to hour. However, the advantages of using AUVs, in combination with a mass spectrometer or some other form of chemical sensor, for environmental monitoring are significant. They can be used for dangerous expeditions, such as detonating undersea mines, or recovery exercises because they do not require a human support team nearby. This also means that they do not need to be

launched from a support vessel, and therefore, do not disturb the area in which they are collecting data. “It is an exciting time to be involved in underwater vehicle research. The potential for future environmental monitoring applications is incredible for all industries that operate in deep water,” says Ms. Pennell.

Ms. Pennell is currently completing her master’s thesis on the use of AUVs for environmental monitoring using a mass spectrometer. Once completed she hopes to be involved in AUV research for monitoring discharges from offshore oil platforms.

“Vanessa’s work was part of a five year NSERC strategic project on offshore environmental engineering using autonomous underwater vehicles that started in 1999. More plans are underway to develop AUVs and their systems into highly reliable environmental monitoring tools for the oceans,” says principal investigator, Dr. Neil Bose.

Building Automated Monitoring Systems for Aquaculture

The Faculty of Engineering and Applied Science, in partnership with C-CORE, has been working hard for many years to develop industrial automation and intelligent system technology. Their involvement in this area of research recently turned into a multidisciplinary project funded through the AquaNet Network of Centres of Excellence, to develop an intelligent monitoring system for aquaculture. The data collected from the project could be used to improve the management of an aquaculture production or fish farm.

“What we are doing in essence is trying to control how the fish are fed,” says Dr. Ray Gosine, the J.I. Clark Chair of Intelligent Systems and one of the members of the research team. “We are building a system that can take the data from tags implanted in the fish, look at the electrical activity, process the signals, and deduce something about the state of the fish, for example, whether a fish is satiated or hungry.”

Working with Dr. Scott McKinley, Canada Research Chair in aquaculture and the environment at the Global Biotelemetry Institute at the University of British Columbia, Dr. Gosine and the team of researchers are implanting tags in fish, monitoring these same fish for eight-ten weeks and measuring the electromyographic signals from the muscles as these fish move around inside the tank. Lotek Wireless Inc., a world leader in the design and manufacture of fish and wildlife monitoring systems, is also providing significant support for the project.

The significance of this type of project, as pointed out by Dr. Gosine, is the possibility of integrating it into automated fish monitoring and feeding systems. For example, instead of just feeding fish on a regular time interval, a computer could automatically assess the activity of the fish, analyze what is being fed back from the biotelemetry system, and make a decision about whether to turn automatic feeders on or off.

“Fish feed can represent up to 60 per cent of the cost of production of aquaculture, so to utilize this technology would allow farmers to use their feed more efficiently,” adds Dr. Gosine.

The science behind this project is based on Dr. McKinley’s research into fish physiology. The idea is to use information taken directly from a fish to make decisions about its activity or well-being. The way a fish swims, and therefore the type of muscle activity it uses in swimming and hunting for food, is thought to be different from when a fish is swimming and frightened, or simply holding its station in the water. The differences in the muscle signals can be compared and much information about fish behaviour has already been gained from doing so.

What is innovative about this AquaNet project is the research and development associated with building a system that can extract this information automatically and then use this information to the benefit of the Canadian aquaculture industry. As Dr. Gosine points out, “The initial results of the work suggest that

it is feasible to extract information from the electronic tags, transfer it into a computer and have the computer make the decisions automatically.”

At the moment this is done by sending the information by acoustics through the water to a data recorder, saving it to a CD and then inputting the information into the computer. “A possible next step in the project is to move some of the processing that happens on the computer, onto the tag itself, so that the tag could send back if the fish is hungry or not to a receiver that would be located on site. There are technical advantages to this. Mainly, we would not need to send back as much data, but could instead send back the essential information and filter out anything else that is unnecessary



Working on the AquaNet project are (L-R) C-CORE Research engineers Holly Williams and Dean Rowsell, and Dr. Ray Gosine of the Faculty of Engineering and Applied Science

“To be able to take the signals and show which ones came from a satiated fish and which ones came from a hungry fish is really quite remarkable.”

Work has been ongoing on this project for the past year and plans are underway for another round of data collection that will look at the muscle activity and swimming patterns of fish before, during and after being fed.

For Dr. Gosine the challenge will be to build an automated system that can identify more patterns in the signals and allow a wider range of fish activity to be analyzed.

The Gateway to Success

By John Cutler

All those long hours in the lab can pay off—literally. Your research projects could have commercial potential and could be the basis for your own business. But taking your technology and turning it into a business can be a difficult process if you don't know where to start.

Intrignia Solutions are (L-R) Raymond Pretty, Jamie King and Sheldon Andrews.



The Enterprise and Entrepreneurship Gateway, a new mentoring program known simply as the Gateway, is designed to provide budding business people within the university community with counseling advice and direction to the various resources, programs and services that can meet their business start-up needs.

"The Gateway is a common point of entry that connects clients with the right resource at the right time," said Dr. Bob Richards, Chair of Youth-focused Technological Entrepreneurship, a key partner in the project's development. "The supportive, mentoring structure of the Gateway can help clients navigate their way through a sea of business development resources and connect with the most appropriate resource."

The program is aimed at technologically-able youth entrepreneurs with a university affiliation such as undergraduate and graduate students, faculty, staff, and alumni. The university is its own community and can be a relatively isolated environment of research laboratories and academic faculties. Potential entrepreneurs currently within this environment often need direction and guidance to help make their discoveries and ideas commercially viable.

"Taking technology from a research lab and turning it into a commercial product proved to be a significant challenge for our company," said Jamie King, an engineering graduate student and co-founder of Intrignia Solutions. "The Gateway has been instrumental in the commercialization of Intrignia and a tremendous source of advice and encouragement."

Since its launch in November 2001, the Gateway has helped 65 clients from various faculties with ideas involving tourism, robotics, Internet applications and consumer electronics. The Gateway provides an environment that welcomes new ideas while simultaneously challenging clients to think critically of their business potential in order to increase their opportunity for success. To learn more about the Gateway visit our Web site at: <http://www.business.mun.ca/gateway> or call (709) 737- 8855.

Adventuring beyond the classroom

Ajay Sancheti, a term four electrical engineering student, is no stranger to adventure. This past December he left St. John's for a five-month adventure that took him through Japan, China, Nepal, India, London, Paris, Italy, Turkey, Greece, Bulgaria, the Czech Republic, Germany and Switzerland. Accompanying him on his travels was his younger brother, Sushil, a first year engineering student.

Traveling by train, boat, and occasionally plane, they spent most of their time exploring Eastern Asia. Their favorite place by far was Nepal, where they got the opportunity to trek through the Himalayas to the Mount Everest base camp. They also took a boat ride up the Yangtze River, the controversial site of the Three Gorge dam. Ajay says, "We saw the project they are working on first hand. It was a real eye opener because usually you only ever hear about things that are going on in other parts of the world and you can't really imagine the effect it must have on people until you are actually there and can see it. It was astronomical to see the number of people they are going to relocate."

Traveling through Eastern Europe was also an incredible experience for Ajay and his brother. "It was amazing to see countries that have only recently shaken communism. Many of the communist buildings are still standing, but they are surrounded by buildings with a post-communist, artistic flair. It was interesting as well to see how people deal with their past. In one place we went, they took all their communist statues and put them in a park by themselves outside the city," adds Ajay.



(L-R) Ajay and Sushil Sancheti near the Mount Everest Base Camp.

Overall, the trip was an incredible experience. They got to experiment with new food and languages and visit such historical sites as the Great Wall of China and Tiananmen Square. For anyone thinking of doing the same, Ajay's one tip would be "Stock up on peanut butter and jam and you will be amazed at how much money you can save!" Next on the agenda is a trip to the east side of the Mediterranean. But that will have to wait, at least until the semester is over!

Notables

- Dr. Ian Jordaan, Faculty of Engineering and Applied Science, was awarded the P.L. Pratley Medal from the Canadian Society for Civil Engineering for his collaboration on a paper titled "A probabilistic approach to analysis of ice loads for the Confederation Bridge." A simulation method was developed, in which ice loads were calculated corresponding to individual interactions associated with ridges in the ice floes that transverse the strait. Many of the described techniques were derived from work related to the Beaufort Sea oil exploration. The P.L. Pratley Medal was established in 1987 and is awarded annually for the best paper on bridge engineering.

- Dr. John Quaicoe, Faculty of Engineering and Applied Science, was awarded the Outstanding Engineer Educator Award from the Institute of Electrical and Electronic Engineers (IEEE) Canada. The award was presented to Dr. Quaicoe in recognition of his "contributions to engineering education, commitment to student learning and growth, and sustained accomplishment as an effective and caring educator." The award is presented annually to an IEEE member who has shared his/her technical and professional abilities through teaching and in so doing has made an outstanding contribution to the electro-technology profession.

- Dr. Vlastimil Masek joined the Faculty of Engineering and Applied Science on Sept, 1, 2002. He comes to Memorial from ABB Corporate Research in Västerås, Sweden, where he was a research scientist for the past two years. His background is in mechanical and control engineering. He began his engineering career at the University of Pilsen, Czech Republic, continuing on to receive a master's and doctorate degree from the University of Electro-Communications in Tokyo, Japan. His research interests include novel transducer design and signal processing, parallel robots, nondestructive clamp-on methods, to name just a few.

- Dr. Faisal Khan joined us on August 1, 2002. Dr. Khan has been a visiting research professor in Memorial's Faculty of Engineering and Applied Science since July 2000. During his time at Memorial he has co-supervised two research projects, one that was internationally funded, and completed three risk-based remediation studies of petroleum hydrocarbon contaminated sites. Before coming to Memorial, Dr. Khan was an assistant professor at the Birla Institute of Technology and Science in Pilani, India. His research interests include process safety and hazard assessment, environment and safety risk assessment, risk-based contaminated site modeling and remediation, among others.

- Dr. Thormod Johansen joined the faculty on September 1, 2002. He has been working in the petroleum industry since 1981 in the areas of reservoir engineering and software development. His academic background is founded in pure and applied mathematics having graduated with a PhD from the University of Oslo in Norway. His research interests include reservoir simulation and characterization, and well flow and well performance simulation. His is a candidate for a Canada Research Chair in petroleum reservoir engineering and characterization.

Faculty News

New Associate Dean for Undergraduate Studies



Dr. John Quaicoe has been a teacher in the Faculty of Engineering and Applied Science for the past 20 years. In his time here he has been the chair of the electrical engineering discipline, acting associate dean (research and graduate studies), and the recipient of numerous, distinguished teaching awards. Now he is getting ready to take on his next challenge. As of September 1, 2002, Dr. Quaicoe will be the new associate dean (undergraduate studies).

The responsibility of being the associate dean is one that Dr. Quaicoe is taking quite seriously. Some of his plans for the undergraduate program include providing services to students, particularly in the first year of the program, to help them make the adjustment to university life, increasing student retention, and making the engineering curriculum more flexible, so that students can take more courses from outside engineering.

"I would also like to see the undergraduate program expanded beyond five programs to provide even more opportunities for students. Interdisciplinary programs for undergraduate students are something we should be seriously considering. We need to consider programs that can be combined with other faculties, like business and science," he says.

Dr. Quaicoe takes on the position of associate dean at a time when the engineering program is already undergoing many changes – and more are being considered. Some issues that he will be working on include the debate about the length of the undergraduate program, new programs such as process engineering, and new faculty positions to complement these new programs.

When asked how he feels about his new position, he says, "We have exceptional engineering students here at Memorial. I am looking forward to working with them to help make their program more successful and rewarding."

Dean of Engineering Steps Down to Pursue Research



It has been nine years since Dr. Rangaswamy Seshadri (Sesh) accepted the position of dean in the Faculty of Engineering and Applied Science. In 1993 he came to Memorial from the University of Regina where he was dean of engineering for four years. He brought with him a lot of ideas and a determination to lead the faculty into new areas of research. When asked about his greatest achievement, he says, "leading the faculty to pursue new directions and establish strong linkages with the private sector, improving research productivity and funding."

Dr. Neil Bose, faculty of engineering and applied science, would agree with this statement. He was part of the search committee that hired Dr. Seshadri. Looking back at his role within the faculty he adds, "Sesh came along at a time when the faculty had to move into a greater concentration on research. For us to move forward, research had to become something that the majority of faculty members did. Sesh changed the atmosphere in the faculty. He balanced the emphasis on the undergraduate program with an emphasis on research. He built a strong research environment within the faculty, supported people and started a number of initiatives to drive this new outlook."

"Dean Seshadri brought energy, vision and openness to innovation and change that was first and foremost focused on the interests of the students and the quality of the program," says Hal Stanley, chairman and CEO of the Canada Newfoundland Offshore Petroleum Board (CNOBP).

In his time at Memorial, Dr. Seshadri has been instrumental in introducing many new programs, driving research opportunities and building strong linkages with the industrial community. Some of the programs he has helped to introduce include oil and gas options for undergraduate students, the computer engineering program, manufacturing and robotics options within mechanical engineering, and the modernization and expansion of the ocean and naval architectural program to include offshore structures, submersibles and recreational boats. He has also built upon the faculty's research capabilities with the establishment of numerous externally funded research chairs, the introduction of research facilities, such as the Manufacturing Technology Centre (MTC), Medical Engineering Centre, and the Instrumentation, Control and Automation (INCA) Centre.

The academic program has also benefited from his guidance. A strong Canadian Engineering Accreditation Board (CEAB) accreditation for all undergraduate programs has gone a long way to create tremendous credibility for Memorial's engineering program.

Summarizing upon his talent as the dean, Dr. Jaap Tuinman, former Vice-President (Academic) says, "He was skilled at persuasion, with great and sound

ideas and the requisite tenacity. He marshaled external (community and industry) and internal (faculty and administration) support in surprising ways. As a result of this, he leaves a very fine Faculty of Engineering and Applied Science behind."

Now the time has come to pursue research interests. Dr. Seshadri is Memorial's nominee for the Canada Research Chair (CRC) in Asset Integrity Management, a growing area of research that is focused upon the identification of potential failure modes inherent in engineering plant systems and equipment, and the development of appropriate failure avoidance strategies. This new appointment is pending approval from the Canada Research Chair program. Speaking about this new opportunity, Dr. Seshadri says, "I am looking forward to this next challenge in my career. After nine years with the faculty it is time for me to move on. I am very optimistic about the future of the faculty. There are a lot of emerging industries on the horizon and Memorial has a big part to play. I would like to thank everyone who has made my job here such a memorable one."

"The Faculty will do well to identify a successor who can accomplish as much for engineering as Sesh has over the past nine years," says Dr. Evan Simpson, Vice-President (Academic).

New Associate Dean for Graduate Studies and Research

Dr. Ray Gosine, J.I. Clark Chair of Intelligent Systems for Operations in Harsh Environments, has been appointed the acting associate dean (graduate studies and research). Dr. Gosine, a graduate of Memorial's undergraduate program in electrical engineering, has been a faculty member in the Faculty of Engineering and Applied Science since 1994. In that time he has been an active member of the faculty supervising numerous graduate students, helping to establish research facilities and leading research projects. Dr. Gosine has long been a strong proponent in formulating new initiatives to strengthen engineering graduate and research programs, as well as promoting engineering and engineering education.

Interim Dean

Dr. Mahmoud Haddara has been appointed the interim dean of the Faculty of Engineering and Applied Science effective July 16, 2002. Most people will know Dr. Haddara as the associate dean (graduate studies and research), a position he has held since 1998. He has been a faculty member at Memorial since 1986, teaching in the ocean and naval architectural engineering program.

Before coming to Newfoundland, Dr. Haddara worked in various academic appointments at the Kuwait Institute of Technology. He began his academic career at Ain Shams University in Cairo, Egypt, graduating with a bachelor's degree in mechanical engineering. He went on to pursue naval architecture at the University of California, Berkeley, graduating with master's and doctorate degrees.

During his time at Memorial he has made numerous contributions to engineering education and participated on many committees that have sought to advance the academic program. He has also worked extensively with organizations outside the university. Most recently, he traveled to Jordan where he was hired by the World Bank as a consultant to advise the Jordanian Accreditation Council on accreditation practices in North America and Europe. He also gave a workshop over two days to the deans of engineering in Jordan. Best of luck to Dr. Haddara in his new position.

A True Leader Amongst Us



Congratulations to Dr. Mary Williams, NSERC/Petro-Canada Chair for Women in Science and Engineering (Atlantic Region) and professor of engineering and physics, who was appointed Director General of the National Research Council of Canada's Institute for Marine Dynamics (IMD). Dr. Williams came to Memorial in 1997, having worked as a research officer with the IMD since 1982. In her time at Memorial, she has become a highly regarded faculty member in the ocean and naval architectural engineering discipline and the department of physics and physical oceanography, researching the forces of ice on ships and offshore structures, and the engineering properties of ice. In her role as NSERC/Petro-Canada Chair for Women in Science and Engineering, she has had great success in promoting science and engineering and making more people aware of the underlying issues. When asked about her new appointment, Dr. Williams said, "I will still be a part of the Memorial community. I plan to use this connection to encourage more extensive collaboration between Memorial University and the Institute for Marine Dynamics." Dr. Williams' position commenced on September 4, 2002.

Editor's Message

What makes for a well-rounded education? Is it what you learn in the classroom or what you learn outside? Students in the Faculty of Engineering and Applied Science get to experience both worlds. They get to apply what they learn in class to their work term placements.



They get to see if it makes sense when applied to the real world. As noted by this year's graduating female students, it is an opportunity that enriches their educational experience and has the added benefit of making them more employable upon graduation.

For those of us who may have received a more traditional education, often the challenge of applying what we learned did not come along until after graduation. This tradition is changing as more people recognize the benefit of experiential learning. More and more programs have a co-operative or exchange component, and others are combining multiple disciplines to create a collaborative learning environment. The face of education as we thought we knew it is changing. And it is changing for the better.

So as we gear up for the start of another fall semester, I like to think of it as another chance for a fresh beginning, full of new opportunities and adventures. Best of luck to us all!

A handwritten signature in black ink, appearing to read "Tracey Mills".

Tracey Mills

Sent to:



Alumni News

Sara Kirke Award

Mona El-Tahan (M.Eng. 1980), president and CEO of CORETEC Inc., received the first Sara Kirke Award for Canada's Leading Woman High Tech Entrepreneur. The award was presented by John Reid, president of the Canadian Advanced Technology Alliance (CATA) and Andy Wells, mayor of St. John's, Newfoundland.

The Sara Kirke Award is a national competition, created by Mayor Wells at the TechAction Town Hall Meeting in St. John's in 2001. A panel of judges from across Canada reviewed the entries. The award is accompanied by a \$5,000 donation in the recipient's name to the Heart and Stroke Foundation, from the Canadian Advanced Technology Alliance.

The inscription on the award reads: Presented to Mona El-Tahan, for outstanding technological innovation and corporate leadership - leadership that has significantly expanded the frontiers of Canada's advanced technology industry. Mona El-Tahan has demonstrated consistent innovation and leadership skills, resulting in the creation and international acceptance of significant world-class products and the establishment and development of a major advanced technology company that has withstood the test of time. Congratulations to Mrs. Mona El-Tahan!

Conference Alert

Attention all electrical and computer engineers, the 12th Annual Newfoundland Electrical and Computer Engineering Conference (NECEC) 2002 will be held on Wednesday, November 13, 2002 at the Holiday Inn in St. John's.

The conference is a great opportunity for professionals in electrical, electronic, computer engineering and information technology to present their work to the growing technical community within the province.

For more information please visit:
<http://www.ieee.nfld.net/NECEC02>

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