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ICICS FOCUS

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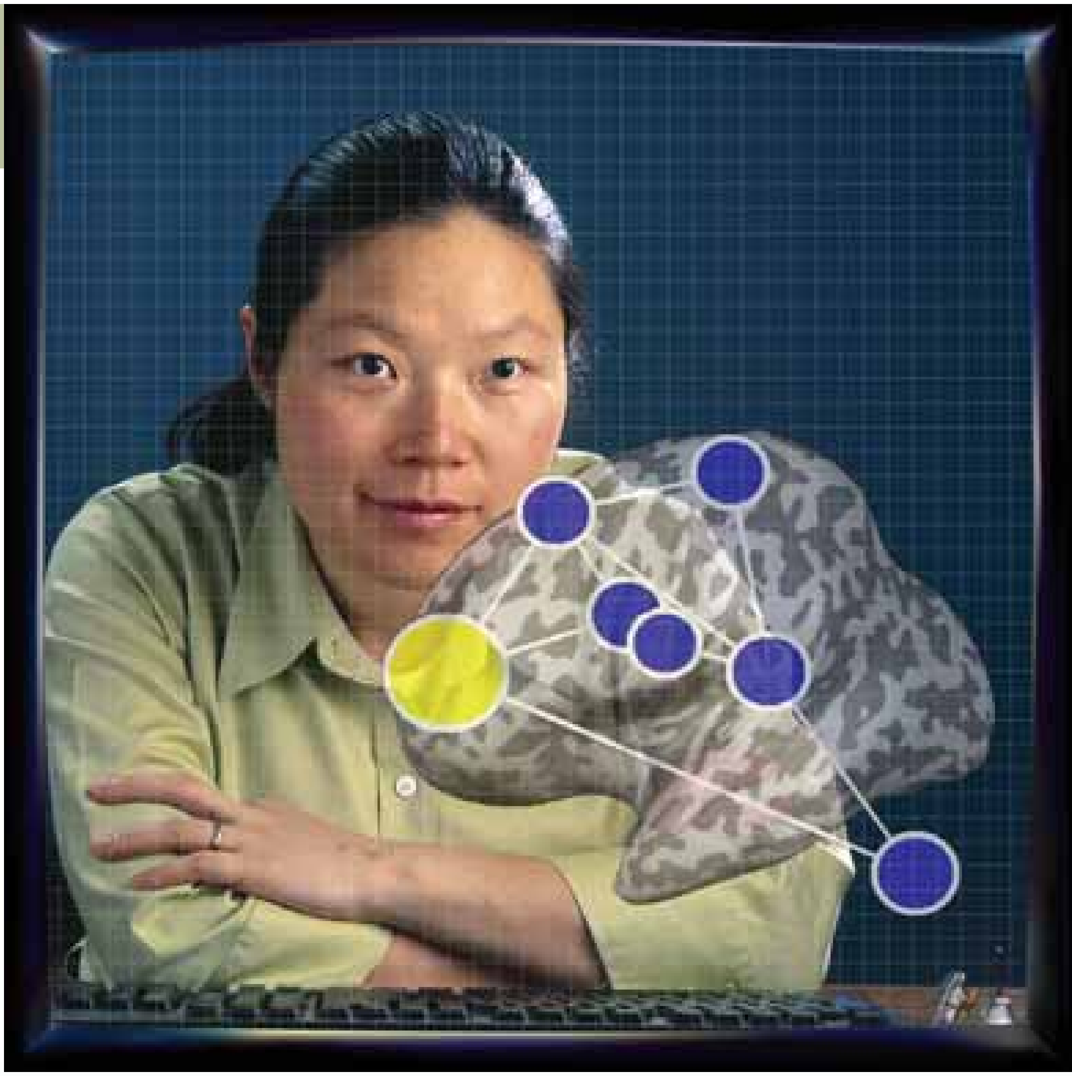
Deterring Cyber Pirates and Detecting Cancer Genes

Electrical and Computer Engineering professor Z. Jane Wang uses a multidisciplinary approach to track digital thieves and cancer genes.

- **Digital Fingerprinting**
- **Biomedical Imaging**
- **Genomic Sequencing**



New ICICS member Z. Jane Wang's research spans broad areas of statistical signal processing, including applications in biomedical imaging, genomic signal processing and statistics, and digital information security. Due to the ease with which digital content can be accessed, retrieved, manipulated, reproduced, and redistributed, the demand for methods that will protect multimedia from piracy continues to escalate as Wang searches for a solution.

Digital Multimedia Forensics

Digital fingerprints are signals embedded in media data to protect digital rights and prevent illegal distribution and usage. Though it does not prevent copying, a digital fingerprint can trace unauthorized use back to a specific identifiable user. For example, the American Academy of Motion Picture Arts and Sciences sends screening copies of nominated films to Academy members for voting purposes.

Continued on page 2

Lassoing Light in Nano-Scale Lasers 3
Using Mathematics to Combat Noise 4
ECE's Data Communications Group 5–6
Optimization Algorithms for Colossal, Complex Problems 7
Passing Notes 10

ICICS Director's Corner

Welcome to the Spring 2006 edition of FOCUS. In this issue you will read about the novel collaborations of ICICS members in the Data Communications Group. Their work in wireless communications addresses the numerous challenges of advanced wireless systems, including balancing the demand for increased data rates and convenience of use with security, privacy and reliability. Specific areas of expertise include the design of novel transmitter/receiver structures for improved performance; ultra-wideband (UWB) systems; the development of emerging global networks; and wireless sensor networks.

As Mathematics head and Information Systems Lab member, Brian Marcus' research in applied mathematics and communications theory aids in the quantification and transmission of digital information and complements the work of the Data Communications Group.

New ICICS and ECE member Lukas Chrostowski works on the fabrication and modulation of "very small lasers" (VCSELs) used in the development of nano-based optoelectronic devices for fibre optics, quantum computing and biomedical applications.

Computer scientist Michael Friedlander's work in scientific computing and optimization involves the design and analysis of algorithms to help solve large-scale problems in applied mathematics and engineering.

ECE member Z. Jane Wang's research in statistical signal processing has applications in biomedical imaging and Parkinson's disease, detection and prevention of cancer, and digital multimedia forensics and security.

We hope you enjoy reading about the exciting and innovative research of these ICICS members.

Rabab Ward, ICICS Director

Wang: ***Continued from page 1***

If one member gives his copy to a friend, who illegally posts it on the internet, then digital fingerprinting can trace each copy back to the Academy member to whom it was originally sent.

However, if several colluders join together to manipulate media content, such as by averaging their copies, the tracing capability of digital fingerprinting is greatly reduced. Wang's challenge is to design collusion-resistant digital fingerprinting by building upon the synergies between a number of engineering areas, including watermarking, cryptography, multimedia processing, signal processing, coding, and information theory.

Biomedical Imaging in Parkinson's Disease

Biomedical imaging is used to study the relationship between brain cell loss and clinical disability in Parkinson's Disease (PD), in order to get a more accurate picture of the disease's progression. Normal and diseased brain functioning differ by altered patterns of dynamic connectivity between brain regions. "We are working to develop models to assess connectivity using fMRI and EEG on PD patients—specifically to isolate the disease effects from compensatory mechanisms, and to determine the effects of medication across several domains, such as brain connectivity, motor activity, and temporal dynamics," says Wang.

This new collaboration between clinicians and scientists is a major joint initiative between UBC, SFU and the University of North Carolina. Most of the research data is collected from UBC's Brain Research Centre, in collaboration with Dr. Martin McKeown, a clinical neurologist and professor in the Faculty of Medicine, and Dr. Janice Eng, Associate Professor, School of Rehabilitation Sciences.

Genomic Signal Processing for Detection and Prevention of Cancer

Microarray technology is at the forefront of the fight against cancer. It allows scientists to analyze the expression of many more genes in a single procedure than has traditionally been possible. Assuming that information about cancer cells is contained in that cell's genetic "expression" (transcription of information in a cell's DNA into messenger RNA), then the ability to assay gene expression on a larger scale can potentially lead to earlier detection of the disease, more accurate classification, and better prediction of outcomes.

"Many universities are promoting the marriage between science and engineering. Genomic systems will be the mainstream of life sciences."

Wang is currently testing a model-driven rather than a data-driven approach to the classification of cancer and normal samples, and identification of cancer biomarkers based on microarray gene expression data. She incorporates engineering and modelling tools to attempt to solve biology problems at the systems level. This new, multidisciplinary approach holds great promise in disease detection and treatment. Collaborators include NIH researchers and Dr. K. J. Liu at the University of Maryland.

"Many universities are promoting the marriage between science and engineering. Genomic systems will be the mainstream of life sciences." This multidisciplinary approach particularly appeals to Dr. Wang. "I always try to find some new area where my expertise can be useful."

Z. Jane Wang can be reached at 604.822.3229 or zjanew@ece.ubc.ca

Lassoing Light in Nano-Scale Lasers

Lukas Chrostowski develops nano-based optoelectronic devices for use in fibre optics, quantum computing, and biomedical applications.

- **Optoelectronics**
- **Nanofabrication of Lasers**
- **High-Speed Modulation**

From laser surgery to supermarket checkouts, lasers have become so ubiquitous that we rarely think about how much we rely upon them. Today, lasers are a critical component of science and technology research, and for new ICICS member Lukas Chrostowski, smaller is better.

Laser Clocking for Cool Switching

"Nano-based optoelectronic devices are important in fibre optics, for future wireless devices and for future high performance computers," says Chrostowski. Building increasingly smaller transistors for greater chip density and computational speed poses fundamental problems. In standard chips, electrical impulses are distributed over a wire grid, and this metal interconnection, which is premium on a chip, heats up. With the power of microchips scaling exponentially as Moore predicted, in five or ten years the temperature of chips would be so high that they would melt. Clearly, alternative switching technologies are necessary.

Along with ICICS colleague Konrad Walus, Chrostowski is developing optical interconnects for a novel computing device based on single electron interactions in quantum dots (semiconductor nanocrystals). Their goals are to replace the wire grid with a laser-based clocking and data interconnect network, and replace current CMOS transistors with single electron devices. Both would be faster and use far less energy.

VCSELs—Very Small Lasers

The nano-scale lasers used in this project, called Vertical Cavity Surface Emitting Lasers or VCSELs, are the cornerstone of Chrostowski's research. VCSELs are 1,000 times smaller than conventional lasers and a million times smaller than tabletop lasers (photo). Thus, they need to be fabricated in a clean room, such as the nanofabrication facility in AMPEL at UBC, using tools such as scanning electron microscopes.

Laser modulation is a key aspect of Chrostowski's work. He and ICICS colleague Nick Jaeger (ECE) are working toward single-wavelength devices capable of being modulated in the 10s of GHz range. A smaller laser cavity has several advantages; for example, it can potentially be turned on and off faster. "The implications are that the operating power is significantly reduced, and you also get higher-frequency operation," says Chrostowski. "A low-resonance frequency laser produces poor noise characteristics, greater distortion and limits how much information you can transmit." The primary advantage of higher frequencies is the ability to transmit more information. For communications applications, the resonance frequency is one of the most important parameters, Chrostowski notes.

Continued on page 8

Using Mathematics to Combat Noise

Mathematics head and ICICS member Brian Marcus uses mathematical tools to help quantify and transmit digital information.

- Information Theory
- Error Correction Coding
- Communications Systems

Whenever and however we communicate information, it is almost always in the presence of noise. A conversation in a crowded room, static on a telephone line, poor cell phone reception, or deep space transmissions interrupted by disturbances are all examples. Brian Marcus is a mathematician and member of the Information Systems Lab—a subgroup of the Data Communications Group.

Marcus works in the area of information theory, which he describes as "a branch of mathematics that quantifies information and designs methods of transmitting it reliably." In communication and data recording applications, methods of transmission that enable the receiver to separate noise from information are critical. "This is one of the most important places where mathematics meets engineering," Marcus notes.

Putting Polynomials to Work

For centuries, mathematicians have pondered solutions to polynomial equations. This led to the development of abstract algebra, which has blossomed into a broad and profound theory over the past 200 years. The last few decades have witnessed many surprising applications of this theory, from aerospace engineering to wireless technology. However, the equations for algorithms that encode and decode data involve algebra that would not have been envisioned centuries ago.

For instance, in error correction, coding redundancy is built into the data to help correct for errors, whether in data transmission or storage. "If we think of data transmission from one point in space to another, then data storage can be thought of as transmission from one point in time to another," Marcus explains. "In either case, we want to improve robustness."

Embracing Entropy

In the realm of information theory, the concept of entropy has to do with how much randomness there is in a signal and how much information is carried by the signal. "Given any kind of information source, whether speech, video or computer data, if there is a lot of uncertainty in what you will see next given what you have observed in the past, then we would say that the information source is very rich," says Marcus. "So, entropy is used as a measure of information richness."

Speech is an example of a rich information source that is very hard to model. That is why current speech recognition software is often error-prone. Although the speech recognition feature on Marcus' cell phone works fairly well, it only needs to recognize a couple of words at a time. To quantify human speech requires breaking it down to the smallest component, the phoneme. However, when we talk, the shift from one phoneme to the next can involve an infinite variety of sounds (consider Eliza Doolittle and Prof. Higgins).

Continued on page 8

ECE's Data Communications Group

ICICS members in the Data Communications Group, Department of Electrical and Computer Engineering, are trailblazing wireless research and design.

Exploring Wireless Frontiers

(L-R): Vijay Bhargava, Brian Marcus, Victor Leung, Robert Schober, Cyril Leung, Vincent Wong, Shahriar Mirabbasi, Lutz Lampe, Dave Michelson

Innovators in wireless technology still have several challenges to overcome. They must balance convenience of use with security and privacy, increased data rates with reliable transmission, and limited bandwidth availability with the need to support the varying demands of different traffic types (audio, video, text, electronic transactions). "Each traffic type has its own characteristics; so one of the things we are trying to do is design systems and networks that will allow us to carry all of these different types efficiently, reliably and securely," says Cyril Leung of the Data Communications Group and PMC-Sierra Engineering Physics Professor in Networking and Communications.

Recognized as international leaders in the field of wireless communications, group members also include ICICS members and ECE colleagues Vijay Bhargava, Lutz Lampe, Victor Leung, David Michelson, Shahriar Mirabbasi, Robert Schober, and Vincent Wong. With more than 70 graduate students, evenly split between the Master's and PhD programs, the Data Communications Group is one of the largest in ECE and one of the most active in ICICS. The group has received infrastructure funding from the Canada Foundation for Innovation and the Province of BC; major funding from the Natural Sciences and Engineering Research Council (NSERC) of Canada, TELUS Mobility, Bell Canada, PMC-Sierra; and strong industry support from across Canada.

Improving the Capacity of Emerging Communication Systems

One aspect of the group's work is design and evaluation of novel transmitter/receiver structures for improving performance in emerging communication systems such as next-generation cellular networks. This research effort is aimed at enabling new, exciting service provider offerings at affordable costs to the customer. Current group activities include Multiple Input Multiple Output (MIMO) techniques, space–time coding, coding techniques for collaborating users, multi-user detection, efficient resource allocation in code-division multiple access (CDMA) networks to support various traffic types, and Quality of Service (QoS) requirements and propagation and channel modelling for wireless communications system design.

Ultra-Fast, Ultra-Wideband Wireless

One major research project involving most members of the Data Communications Group is on ultra-wide bandwidth (UWB) systems which operate in the 3 to 10 GHz frequency band. The project, led by Robert Schober, a Canada Research Chair in Wireless Communications, is funded by government and industry. The major advantage of UWB relative to the existing Bluetooth wireless technology is that it supports much higher data rates, allowing high-speed systems to transmit with extremely low power over distances of five to ten metres. The technology would provide a short-range wireless link for home, office and research applications—virtually eliminating the need for unsightly communications cables.

Designing an Emerging Global Network

"The future amalgamation of wireless and broadband networks will enable multimedia communications regardless of location and mobility," says group member and Telus Mobility Research Chair Victor Leung, whose research is focussed on the development of this emerging global network.

One area of his work is packet-based wireless networks, which allow better management of data transmission, including fluctuating data rates in multimedia transmissions, and more efficient use of bandwidth. "The consensus in the industry is that over the next five to ten years the access and core networks will become all packet-based, and different wireless networks will provide access to multimedia services in a manner that is transparent to the users," says Victor Leung. Anyone who has used Skype or other voice-over-internet protocols (VoIP) to talk to friends around the world has experienced the benefit of packet-based data transmission. Although current mobile phones use digital networks, the technology is still based on circuit switches. "Service providers and equipment manufacturers are now trying to move cellular networks into Voice-over IP technology."

Mobile Ad Hoc and Wireless Sensor Networks

Applications for mobile ad hoc and wireless sensor networks have grown from primarily military to research and civilian use, such as spontaneous networks, security surveillance, fire protection, avalanche detection, and environmental and health monitoring. An NSERC strategic grant project, led by Victor Leung, is supporting the work of several members of the Data Communications Group to develop low-cost, energy-efficient wireless sensors and the networks to support them.

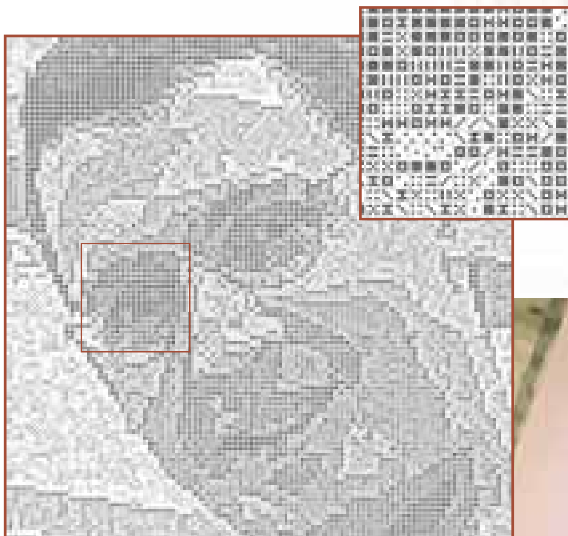
Data Communication Group members can be contacted by visiting http://datacom.ece.ubc.ca

Optimization Algorithms for Colossal, Complex Problems

Computer scientist Michael Friedlander designs, analyses and implements algorithms that solve large-scale optimization problems in applied mathematics and engineering.

- **Constrained and Unconstrained Optimization**
- **Numerical Linear Algebra**
- **Scientific Computing**

The junction of applied mathematics and computer science is the tricky research terrain that new ICICS member Michael Friedlander traverses. This field, called numerical optimization, was developed in the 1940s during WWII to handle complex military logistics. Friedlander is not interested in working out the most efficient way to route military supplies or bomb U-boats, but his fundamental research in algorithms has applications in a wide range of disciplines—from imaging to finance to resource allocation.



Doing the Best with What You've Got

"The first step in my work is to express a problem as a mathematical model that describes the variables involved, the constraints that must be satisfied, and the objective to be achieved," he states. It's all about "doing the best with what you've got" in order to solve real-world problems.

The second step—and Friedlander's favourite part—is trying to solve the resulting optimization problems, which often carry constraints. In optimization, constraints are any factors that limit the ways in which a system can achieve its goal. A good example is the computer-generated face (see inset), which was created using 144 complete sets of dominoes. There are only certain ways that the dominoes can be arranged, so the optimization problem is to find the truest reproduction while following those rules.

Here is where unknowns come into the picture. Sometimes thousands or even millions of unknowns must be juggled to achieve a goal. In nonlinear problems like the ones Friedlander works on, it is only possible to examine a little piece of the puzzle at a time. "When a function is nonlinear, you really don't know how it is going to behave—it's like poking around in a dark room with blinders on," he admits. "Sometimes we don't even know if the problem is solvable." For Friedlander, this kind of mathematics is as much an art as a science and the joy is really in the doing.

Continued on page 8

The program that generated this domino image was written as a class project by graduate students in Friedlander's numerical optimization course.

Chrostowski: ***Continued from page 3***

Laser-Based DNA Detection

Chrostowski is planning to apply the same laser technology for biomedical applications, such as implantable glucose monitors for diabetes patients, and for biomedical microarrays, which use fluorescence and spectroscopy to quantify the presence and amount of DNA in a sample. The essence of a microarray is to measure thousands of cell sites containing tiny volumes of DNA all at once.

What Chrostowski is working on is a cluster of tiny lasers that illuminates the entire array—one VCSEL for each dot of DNA. The advantages of this technique are universal applicability to any organism of interest, quantitative analysis on a per-cell basis, and higher signal-to-noise ratio for more accurate measurements. Hopefully it will be fast, precise, portable, and cost effective.

The challenge of lasers for such biophotonics applications is that they have to be in the 300 to 500 nanometre—or ultraviolet—range and require a new kind of material, gallium nitride. "This is a novel area that is very exciting," says Chrostowski. "It has a multitude of uses in life science and health research, and ultimately could be used in common clinical settings to benefit more people."

Lukas Chrostowski can be contacted at 604.822.8507 or lukasc@ece.ubc.ca

Marcus: ***Continued from page 4***

"This is a natural example of a rich information source that you can only observe in the presence of noise," says Marcus. Mathematicians and engineers alike recognize the example as a classic "hidden Markov chain."

"One outstanding problem is to compute the entropy of a hidden Markov chain as a measure of the richness of an information source," says Marcus. "This is something that I am very excited about now."

Brian Marcus can be contacted at 604.822.2771 or marcus@math.ubc.ca

Friedlander: ***Continued from page 7***

Finding the Quickest Way Down a Mountain

Imagine a constrained optimization problem as a trek through mountainous terrain, where the goal is to reach the bottom of a particular valley as quickly as possible, but only by using certain paths. In algorithmic terms, this is called convergence. Your quest would be easier and more direct if you could start halfway down, with the valley in sight. But choosing your paths becomes much more difficult if you are starting at an arbitrary point somewhere at the top of a mountain range, with no valleys in sight at all.

Friedlander devises methods that can efficiently find feasible paths down to the bottom of the valley without getting get stuck along the way. "With these methods, no matter where you start, they guide you along toward a solution," he says.

Poking Around Plato's Cave

Although Friedlander's specialty is devising and analyzing algorithms, he also enjoys putting his ideas to work on practical problems. Among his current projects is a collaboration with UBC geophysicist and ICICS member Felix Herrmann on models for imaging what lies beneath the earth's surface. Data for these models is gathered indirectly, using methods to drive sound into the earth and then listening for echoes. Like the inhabitants of Plato's allegorical cave, researchers can't actually see direct images, or even hear direct sounds. They build the images they need from echoes and reflections. This turns out to be a huge optimization problem. The geophysical Plato's cave is perfect terrain for Friedlander to put his algorithms to the test.

Michael Friedlander can be contacted at 604.822.5307 or mpf@cs.ubc.ca

Passing Notes: ***Continued from back page***

Kaiser Building Opens

UBC's Vancouver campus now has a central engineering hub. Made possible by $22 million in funding from the provincial government and a $4-million donation from the Kaiser Foundation for Higher Education, the Fred Kaiser Building opened in September and will accommodate expansion of the Departments of **Electrical and Computer Engineering** and **Mechanical Engineering.**

Ian Cumming Retires

ECE professor **Ian Cumming** has retired. He will continue supervising several graduate students and doing some research in his field of synthetic aperture radar (SAR). Cumming also plans to serve the engineering community with consulting contracts. Remote sensing may soon detect him trekking through far-flung mountain ranges.

Logicism Revisited

In *Logicism Renewed: Logical Foundations for Mathematics and Computer Science,* CS professor emeritus **Paul Gilmore** revisits logicism, the theory promoted by Bertrand Russell that mathematics is an extension of logic and therefore largely reducible to it. Using Intensional Type Theory, he provides a unified foundation for mathematics and computer science.

Pioneering CS Professors

Computer Science professors emeriti **Richard Rosenberg, James Varah,** and **Paul Gilmore** have been recognized as Canadian "Pioneers in Computing" by the IBM Centers for Advanced Studies. Along with ninety other Canadian academics, the three professors are considered to have been instrumental in founding and developing the study of computing at Canadian universities.

IBM CAS Student of the Year

Also drawing the attention of the Centers for Advanced Studies, Mik Kersten, a PhD student in the Software Practices Lab supervised by CS professor **Gail Murphy**, has been chosen as the first recipient of what will become an annual IBM "Student of the Year" Award. Kersten was recognized for the breadth of his interactions with IBM.

UBC–IEEE Workshop on Future Wireless Systems

ICICS sponsored the UBC–IEEE Workshop on Future Wireless Systems as part of UBC's Celebrate Research Week. The event was held on March 10, 2006, and featured keynote speakers Dr. Salim Hanna from Industry Canada and Dr. Andy Molisch from Mitsubishi Electric Research Labs (Cambridge, MA).

Canadian President for AAAI

The American Association for Artificial Intelligence has elected its first Canadian president. **Alan Mackworth** of Computer Science commenced a 2-year term in July 2005. The AAAI is a nonprofit scientific membership society devoted to advancing the science and practice of artificial intelligence.

Best Paper Award for Graduate Students

Four graduate students from CS professor **Karon MacLean**'s graduate course in haptics have won a Best Paper Award at the International Conference on Multimodal Interfaces '05. The paper, presented by Peter McLachlan, establishes that workers with a heavy visual workload in a control-room setting can simultaneously make correct judgments about haptic information.

Signal Processing Society Best Paper Award

The IEEE Signal Processing Society has honoured ECE professor **Z. Jane Wang** and co-authors Wade Trappe, Min Wu, and K. J. Ray Liu with a Best Paper Award for their work, "Anti-collusion fingerprinting for multimedia." The award will be presented at the 2006 IEEE Conference on Acoustics, Speech, and Signal Processing (ICASSP) in Toulouse in May.

CS Graduate Wins Alumnus Award

Cullen Jennings (PhD, 2002) has won the UBC Outstanding Young Alumnus Award for 2005. Currently a Distinguished Engineer at Cisco Systems Inc, Jennings is considered a world leader in the field of Voice-over Internet Protocol (VoIP). His open-source VoIP work has encouraged innovation by allowing smaller players to participate in the telecommunications market.

Residual Stress Summit 2005

Mechanical Engineering hosted a successful summit of residual-stress technology researchers in August. Following on the success of the first summit held in Los Alamos in 2003, this past summer's gathering brought together residual-stress technology developers (needing "problems") and users (needing "solutions") to focus on practical applications of research.

Workplace Privacy under Scrutiny

Computer Science professor emeritus **Richard Rosenberg** has received a $27,000 grant from the Office of the Privacy Commissioner of Canada to investigate threats posed to workplace privacy by current and pending technology. Rosenberg will also look at the relevance of the Personal Information Protection and Electronic Documents Act.

First Place Tie for UBC Design Team

Mechanical Engineering students Albert Ng, Thomas Ching Kwan Lau, Laura Neels, Tuan Truong, and Sherwin Wong have tied for first place in the Canadian Design Engineering Network's Undergraduate Engineering Team Design Competition. Their project, "Cytogenetics Laboratory Automation (UBC)", was formally announced a winner at the CDEN conference held in Kananaskis, Alberta in July 2005.

UBC Team Wins Programming Competition

For the third consecutive year, a programming team from UBC **Computer Science** has come in first in the ACM Intercollegiate Regional Programming Competition for the Pacific Northwest Region. Yury Kholondyrev (Master, CS), Dustin Tseng (Undergrad, CS) and Matthew Chan (Master, CS) advance to the World Programming Finals in San Antonio in April.

Passing Notes:

ECE Professors Elected Fellows
ECE professors **Andre Ivanov** and **Resve Saleh** have been elected IEEE Fellows. Dr. Ivanov has also been named Chair of the IEEE-sponsored Test Technology Technical Council for a second term. The Engineering Institute of Canada has elected ECE professor emeritus **Michael Davies** a Fellow for his exceptional contributions to engineering in Canada.

NSERC Special Research Opportunity Grant
Recognizing the timeliness of their work on High Dynamic Range displays, NSERC has awarded **Wolfgang Heidrich** (CS) and Lorne Whitehead (Physics & Astronomy) a $150,000 Special Research Opportunity Grant. The researchers are working on improved video generation and processing techniques for HDR displays, as well as a projector version for use in movie theatres.

ICICS Wins Innovation Award
In recognition of its innovative deployment of a Network Appliance product, **ICICS** has been chosen by a third-party panel of judges to receive a NetApp Innovation Award. The ICICS Unified Network won in the Humanitarian category, for "giving something back to the [ICICS] community." Two of the architects of the system, **Luca Filipozzi** (ECE) and **Michael Sanderson** (CS), attended the awards ceremony in San Francisco in March.

Emulab Comes to UBC
Under the direction of **Charles "Buck" Krasic** (CS), **ICICS** has put together the first Emulation Lab at a Canadian university. The 24-node cluster allows students and researchers to use networked computers in a way that emulates real-world conditions. ICICS has approved funding for an additional 24 computers for the network.

Emulation Lab Researchers Invited to ACM/IEEE Supercomputing '05
The ICICS Emulation Lab is already bearing fruit. Using eight of its networked computers and standard protocols, **Alan Wagner** (CS) and his grad students Brad Penoff and Humaira Kamal applied the techniques and tools of supercomputing in commodity-type IP networks. Their work produced the only Canadian paper to be accepted at SuperComputing '05 in Seattle.

APEGBC Awards
Mechanical Engineering has garnered two President's Awards from the Association of Professional Engineers and Geoscientists of BC. Department Head **Nimal Rajapakse** received the Meritorious Achievement Award for his work bridging theoretical and applied mechanical engineering. Professor **Elizabeth Croft** was given the Professional Service Award for her efforts to increase the number of women graduating from and working in engineering.

HOT Admin Study Funded
Konstantin Beznosov (ECE) and co-PIs **Sid Fels** (ECE), **Lee Iverson** (ECE), and **Brian Fisher** (MAGIC/CS) have been awarded a $459,000 NSERC Strategic Projects Grant for their project "HOT Admin: Human, Organization, and Technology Centred Improvement of the IT Security Administration." The project team will work closely with industrial partners Entrust, SAP, and Recombo to improve IT security systems.

Funding for Wireless Network Project
Victor Leung (PI), **Vikram Krishnamurthy**, **Lutz Lampe**, and **Shahriar Mirabbasi** were successful in the 2005 NSERC Strategic Projects competition. The ECE team has been awarded $200,750 a year for their three-year project "Situation-aware collaborative wireless sensor networks."

Yusuf Altintas Elected SME Fellow
Mechanical Engineering professor **Yusuf Altintas** has been elected to the College of Fellows of the Society of Manufacturing Engineers. The SME is the world's leading professional society serving the manufacturing industry, and election as a Fellow represents recognition by his peers of Dr. Altintas' accomplishments as an educator and researcher.

Continued on page 9

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UBC's Institute for Computing, Information and Cognitive Systems (ICICS) is an umbrella organization that promotes collaboration between researchers from the faculties of Applied Science, Arts, Commerce, Education, Forestry, Medicine, and Science. ICICS supports the collaborative computer-oriented research of more than 150 faculty members and over 800 graduate students in these faculties. ICICS researchers attract approximately $15 million in annual grants and contracts. Their work will have a positive impact on us all in the future.

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