INSTITUTE FOR COMPUTING, INFORMATION AND COGNITIVE SYSTEMS •I•C•I•C•S•

ICICS FOCUS

THE UNIVERSITY OF BRITISH COLUMBIA

THE UNIVERSITY OF BRITISH COLUMBIA

Engineering the Growth of ICICS

- **Promoting Technology Transfer**
- **Expanding Interdisciplinary Research**
- **Interdisciplinary Graduate Program**

Nimal Rajapakse feels lucky—and challenged. He has inherited a bustling state-of-the art facility, occupied by exceptional researchers working in custom-designed labs with high-tech equipment that is the envy of colleagues around the world. In the breakneck pace of emerging technology research, however, the challenge is keeping ahead of the pack. "We have a great new building, exceptional facilities and very talented faculty, but now we need to build on that, so that we will always be at the forefront of research," says Rajapakse.

Achievements in Leadership and Research

The former head of Mechanical Engineering at UBC, Nimal Rajapakse knows what it takes to build on strengths. Over the seven years of his tenure in that position, the undergraduate program became one of the most popular on campus, graduate enrolment doubled, research funding increased substantially, and academic staff increased from 29 to 36 faculty members, including four new research chairs. The department was also selected for membership in PACE, an elite partnership that includes General Motors, Sun Microsystems and other industry giants, who provide hardware and sophisticated CAD software to universities around the world.

Continued on page 2

ICICS

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ICICS Director's Corner

As the new director of ICICS, I am pleased to introduce this issue of *FOCUS*. But first, I would like to express my gratitude to my predecessor Dr. Rabab Ward and our colleagues for their work in building ICICS into a research institute of international calibre. I have some large footprints to follow.

Over the next few months, I plan to meet with all ICICS members to seek their input in defining our goals and priorities for the next five years. I welcome dialogues on any issues that members feel are important to the success and growth of ICICS.

I am excited about the opportunities and the challenges, not only because we have such remarkable facilities to work in, but because we have such a strong—and growing—group of interdisciplinary researchers under the ICICS umbrella. Three of them are featured in this issue of *FOCUS*, along with profiles of eight recent members.

Joel Friedman (Math and CS) uses theoretical mathematical tools to investigate fundamental problems in computer science—from the nature of complex networks, such as the Internet or genetic networks, to computational complexity theory.

Boris Stoeber (ME and ECE) is working in microfluidics on a promising array of applications in drug delivery systems, biosensors, bioanalysis, and lab-on-a-chip technology.

Music composer **Bob Pritchard's** multimedia research and performance collaborations with Electrical and Computer Engineering colleagues underscore ICICS' innovative interdisciplinary mandate.

I hope you enjoy this issue of *FOCUS*. I look forward to introducing more exceptional ICICS members and research in upcoming issues.

Nimal Rajapakse, ICICS Director

▸ **Rajapakse:** ***Continued from page 1***

"While my job is to expand research, I still have time to pursue my own work, and as ICICS director I can set an example for others by being a strong researcher and collaborator."

Rajapakse's own research in smart materials and structures has been recognized with several awards and distinctions, including the Meritorious Achievement Award from the Association of Professional Engineers and Geoscientists of BC, and the Horst Leipholz Medal for outstanding contributions to engineering mechanics research from the Canadian Society for Civil Engineering. His newest area of research is computational nanomechanics, multi-scale modelling to link nanoscale to macroscale behaviour. "What attracted me to this job are the people and the commitment to building interdisciplinary research," Rajapakse says. "While my job is to expand research, I still have time to pursue my own work, and as ICICS director I can set an example for others by being a strong researcher and collaborator."

Focus on Fund Raising

Rajapakse also sees his role as a promoter of technology transfer to industry. "To do that effectively we need funding." He notes that 33,000 sq. ft. of new research space and several million dollars of equipment require substantial operating funds.

"We need ongoing funding for technical staff and maintenance," he states. Rajapakse would also like to have ICICS provide seed funding for research groups in order to attract larger funding from industry and government sources. "ICICS should also have funding to help researchers hire the best graduate students," he adds.

Partnerships and New Programs

Given the interdisciplinary nature of ICICS' mandate, one of Rajapakse's aspirations is to offer an interdisciplinary graduate program under the ICICS umbrella, where students can take courses in different departments. He also envisions several short-term training courses for industry and courses to help graduate students acquire entrepreneurial skills.

"We already have the Master of Software Systems program, and I think there is great potential to attract more international students," he says. "There is also potential to offer one- or two-week intensive courses in specialized areas such as mechatronics, which integrates computer science, electrical, computer, and mechanical engineering." As part of his mandate to increase ICICS' profile nationally and internationally, Rajapakse would like to establish formal exchange programs with similar institutes. He already has active research collaborations with universities in Germany—where he holds a Humboldt Fellowship—and Japan, Singapore and Thailand. "I see ICICS building on these and other international collaborations and positions that faculty here hold," he says.

Keeping ICICS Ahead of the Pack

A firm believer in forward planning, one of Rajapakse's first tasks as director will be to host a planning session for ICICS that will establish a set of strategic goals and initiatives. "In high-tech industries, you must be able to think ahead in order to act strategically and proactively, and you must also be ready to take risks," he states. "We need to instil that mindset in students and in upcoming researchers, and we must train them to tailor their expertise to the right opportunities."

Keeping ICICS at the forefront of interdisciplinary technology-based research is a challenge that Rajapakse obviously is well prepared to undertake.

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Microfluids Flow Hot and Cold

Boris Stoeber manipulates minute amounts of liquids for use in bioanalysis, biochips, biosensors, and novel drug delivery systems.

- **MEMS and Microneedles**
- **Minimally Invasive Drug Delivery**
- **Microfluidics and Bioanalysis**

In today's world of microsystem technology, smaller is better. Miniaturized technologies promise to revolutionize healthcare by shortening analysis times, reducing reagent volumes and automating sample preparation and cell analysis. And this would result in lower costs of diagnostics, treatment and medical devices.

ICICS member and mechanical, electrical and computer engineer, Boris Stoeber is riding the crest of this new wave of biomedical applications—with microfluids. Although at micron or sub-micron scales, microfluids don't have waves, or turbulence.

Managing Strange Fluids

Fluids behave somewhat differently at the microscale than they do as we observe in daily life. The absence of turbulence, for example, makes it difficult for two fluids in a micro-channel to mix. At the size of a few microns, electrostatic and other effects of individual molecules come into play, possibly producing complex, non-Newtonian flow behaviour.

Understanding how and why microfluids behave the way they do is essential in order to manipulate these minute amounts of liquids for use in applications such as genetic assays, bioanalysis, minimally invasive drug delivery, and high throughput screening.

Heat Treatment

Stoeber is mastering the art of controlling microfluids using polymer solutions made of synthesized molecules called pluronics. Although they sound exotic, these biocompatible solutions can be found in everything from mouthwash to contact lens solution. The polymer solutions Stoeber works with are thermally responsive—they become solid when heated and liquid when cooled. And these phase changes are reversible.

He has developed a method of mixing microfluids by putting two different fluids in a special micro-mixer which is activated by miniature heating elements. The liquids are heated and cooled as their flow is directed to different branches in the mixer. This mixing can be performed on-chip as one operation among many of an integrated lab-on-a-chip system.

MEMS the Word

In collaboration with ICICS member Karen Cheung (ECE), Stoeber is developing complementary research programs in microelectromechanical systems (MEMS), with an emphasis on microfluidics. His polymer-based flow control strategies will help address current problems with reliability and affordability of lab-on-a-chip applications.

Stoeber, a member of ICICS' Microsystems and Nanotechnology Group, is collaborating with ICICS colleague Mu Chiao (ME) and Urs Häfeli in pharmaceutical sciences on a novel method of drug delivery.

Continued on page 8

Investigating Complex Networks

Mathematics and computer science professor Joel Friedman uses theoretical mathematical tools to explore fundamental problems in computer science.

- Expanding Graphs
- Error Correction Codes
- Computational Complexity

For many, social networking evokes anxiety and discomfort. Milling about with strangers, randomly distributing business cards and trying to connect with as many potential new contacts as possible within a limited time frame is a challenge even for many extroverts. However, a social network has many of the same properties as its biological or technological counterparts and they all pose a multitude of interesting problems.

ICICS member Joel Friedman works at the interface of mathematics and theoretical computer science to investigate the nature of complex networks such as the Internet, genetic mapping and disease networks, and the questions they pose for scientists.

Expounding Expanding Graphs

Graph theory is a mathematical tool used to analyze and model networks. A key area of Friedman's research is on expanding graphs. "Broadly speaking, expanding graphs can be viewed as networks of computers, people, etc. which have relatively few direct links from one computer or person to another, but that still have good connectivity," he explains. (Connectivity is an important measure of the robustness of a network.)

The apparent contradictory qualities—few direct links, or sparseness, coupled with high connectivity—are what make expanding graphs so interesting and useful, particularly in theoretical computer science. Applications of Friedman's work in this area include the design of highly efficient communications networks, error-correcting codes and simulating randomness.

Answering a $1-Million Question

In another direction of his research, Friedman is attempting to solve one of the most difficult conundrums in theoretical computer science. In computational complexity theory, the P versus NP problem asks: if positive solutions to a YES/NO problem can be verified quickly, can the answers also be computed quickly?

The problem is one of seven million-dollar prize questions the Clay Mathematics Institute of Cambridge, Massachusetts (CMI) has challenged mathematicians to solve in celebration of mathematics in the new millennium.

Typically, an NP-complete problem is considered computationally intractable. The CMI website describes the task of finding housing for 100 students out of a group of 400, while eliminating pairs of incompatible students. It is easy to check if a list of 100 students contains any incompatible ones or not (a typical YES/NO problem). But generating the list from scratch is impossible—or that is what Friedman will try to prove—since the CMI site states that "the number of ways of choosing 100 students from 400 applicants is greater than the number of atoms in the universe."

To answer the question, Friedman is taking a novel approach, using an esoteric branch of mathematics called "cohomology." (No, it is not the study of the random complexity of salmon runs on the Pacific Northwest.) "One simple thing that cohomology measures is how many connective components or pieces there are to something," he says.

Complex Network Applications

Friedman notes that using the tools of cohomology and expanding graphs can help impart an intuitive understanding of complex systems. "These tools can be used in some situations where you have a lot of data and want to extract meaningful information," he explains. "They can also be used specifically in networks, to isolate clusters of things that seem to interact a lot with each other, but not with other things."

Joel Friedman can be contacted at 604.822.2413 or jf@cs.ubc.ca

(2) Chad Bennington
Chemical and Biological Engineering
Research: Reaction Engineering in Chemical Pulping Processes

"My research uses chemical reaction engineering to improve the efficiency of pulping and bleaching processes. One goal is to improve product uniformity, increasingly a challenge as ever-larger reactors are used in industry—currently a single continuous chip digester can produce over 2500 tonnes of pulp per day. To investigate the range of conditions that exist inside reactors, I have teamed with Shahriar Mirabbasi (ECE), Mu Chiao (ME), and John Madden (ECE) to develop autonomous flow-following micro sensors that measure conditions inside multiphase reactors. These "SmartChips" will be released into the process, collect process information during their passage, and be retrieved at the reactor exit with their information downloaded for use. Designed to withstand process conditions in pulp digesters (180^{o}C, 2.0 MPa, pH > 13 as well as imposed mechanical stresses) these "SmartChips" will serve as a platform for a variety of sensors, and be deployed in a range of multiphase chemical reactors."

(4) Ryozo Nagamune
Mechanical Engineering
Research: Robust Control Theory and Application

"I am interested in robust and optimal control for engineering applications. The theoretical component of my research includes modelling and system identification, model validation and simplification, controller and estimator design, analysis, and implementation, as well as related optimization and computational algorithms. I am presently working on multiple robust controller synthesis and system identification of multiple model sets. In the area of control applications, my current interest is hard disk drive servo systems, where nanometer-scale precision of the servomechanism is uniformly required for mass production. Other interesting application areas include machine-tool servo mechanisms, MEMS control, biomechanics and robotics. I look forward to collaborating with my ICICS colleagues in these areas."

(1) Tor Aamodt
Electrical and Computer Engineering
Research: Computer Architecture

"My current research ranges from general-purpose microprocessor microarchitecture to architecture and compilers for computing on streaming-data parallel architectures such as graphics processors (GPUs). I look at improving performance through the organization of hardware logic and making programmer-transparent changes to software on a given system via the compiler, as well as making relatively cost-effective computing platforms such as GPUs more useful for general-purpose applications. I am also interested in the impact of future process technologies. For example, ICICS member Konrad Walus and I are developing new methods of exploring the architectural implications of quantum cellular automata."

(3) Martin McKeown
Neurology/Pacific Parkinson's Research Centre
Research: Effects of Medication on Parkinson's Disease Patients

"Dopamine, which is deficient in Parkinson's disease (PD) patients, is released from brain cells that have two modes of activity. Dopamine-replacing PD medication attempts to stabilize the 'steady state' mode and ameliorate the slowness of movement, stiffness, and tremor characterizing PD. However, it may also affect the 'transient' mode, leading to impulsive behaviour such as pathological gambling. These two modes of brain activity can be measured with electromyography (EMG) and electroencephalography (EEG), respectively. I am using ICICS' high-resolution projection screens to observe the effects of visual stimuli on EMG and EEG activity in medicated PD patients, and study various aspects of movement."

(6) Meeko Oishi

Electrical and Computer Engineering
Research: Hybrid Control Theory

"My research focuses on the design of control algorithms to guarantee safety in complex engineered systems with both discrete and continuous dynamical processes. Known as 'hybrid systems', these systems are notoriously difficult to control, and non-intuitive for humans to interact with. I am currently examining mathematical guarantees of safety in hybrid systems under shared control, for example, when a pilot and an autopilot simultaneously control a civil jet aircraft. In addition, in collaboration with ICICS members Martin McKeown and Z. Jane Wang, I am exploring how techniques from hybrid control theory can be used to improve non-invasive treatment of Parkinson's disease by elucidating faulty feedback mechanisms in the brain."

(8) Kenichi Takahata

Electrical and Computer Engineering
Research: Microelectromechanical Systems (MEMS) and Micro/Nanofabrication

"I have been involved in the field of microelectromechanical systems (MEMS) and micro/nanomanufacturing since my time in industry. My research targets the micro/nanomachined sensors, actuators, and other devices and systems that have inherent robustness and compatibility with particular environments (e.g., biocompatibility), broadening their application fields. I am also involved in the development of microfabrication techniques, including micro-electro-discharge machining, to expand the material base of MEMS. Biomedical applications are a major focus of this work, with an emphasis on implantable devices such as sensor-integrated 'smart' stents for advanced diagnoses and therapies. Another related area I am investigating is wireless sensing and control of local environments in the micro and nano domains. I look forward to the collaborations made possible by the interdisciplinary nature of ICICS."

(5) Alireza Nojeh

Electrical and Computer Engineering
Research: Nanotechnology

"My research interests include the physics of nanoscale structures and devices, as well as controlled nanofabrication, vacuum science, and electron microscopy. I focus on devices based on carbon nanotubes for highly controllable nanoscale electron emitters. These devices have applications in electron microscopy and lithography, field-emission displays, and vacuum nanoelectronics. Other areas of investigatation include nanoscale quantum dots, nanotube-based interconnect schemes, optical properties of carbon nanotubes, and electromechanical switches. My experiments are typically accompanied by modelling and simulations, using a combination of semi-classical and quantum-mechanical techniques such as molecular dynamics and density functional theory. I am planning collaborations with several other ICICS members, including David Pulfrey, André Ivanov, Konrad Walus, and Edmund Cretu.

(7) Matei Ripeanu

Electrical and Computer Engineering
Research: Distributed Computing: Peer-To-Peer and Grid Systems

"I am mainly interested in building large-scale distributed systems, with a focus on peer-to-peer and Grid systems. These systems are by nature decentralized at multiple levels, e.g., ownership, trust, and resource management, which presents a challenging set of problems. The rapid acceptance of recent peer-to-peer and Grid research indicates that solutions in this area have the potential for high social impact. Since I am an experimentalist, my approach is to characterize existing systems to understand their usage patterns, limitations, and the factors contributing to their success, then build new systems that are optimized for common usage patterns while capitalizing on successful designs. I maintain close contact with user groups to ensure that my research remains relevant."

Playing with Sound

ICICS member and new music composer Bob Pritchard is redefining the art of multimedia performance—melding software with speech, song and gesture.

- **Speech Synthesis**
- **Gesture-Controlled Speech and Sound**
- **Interactive Multimedia Performance**

Imagine singing along with yourself in the shower. Instead of soap and sponge in your hands, you wear gloves activating sensors to drive software that synthesizes another—your other—voice. The sound and words produced depend upon the gestures you make, and how well you "perform" them. What song would you choose? Would anyone else hear it?

Whether or not music professor Bob Pritchard finds inspiration in the shower, his research is a sensual–cerebral mix of technology, imagination, music, and performance. And he definitely has larger audiences in mind. Pritchard's acoustic, electroacoustic and interactive compositions have been performed and broadcast in North America and Europe, and his interactive performance research has attracted international acclaim.

Getting the GRASSP

As a composer, Pritchard is interested in layering sound, texture and meaning. "The use of gesture in the synthesis of voices adds another level of expression and communication in the performance," he notes. His current research project, Gesturally Realized Audio, Speech and Song Performance (GRASSP), was developed with ICICS colleague Sid Fels of Electrical and Computer Engineering.

In GRASSP, Pritchard is refining a gesture-controlled speech and performance system for improvising digitally synthesized sound in real time. Concert and stage performers will use glove controllers to create speech, song and electroacoustic music by manipulating a software model of the vocal tract or by controlling models of vocal sound. Performers will also be able to control multiple channels of sound from acoustical and digital instruments, as well as real-time digital imaging.

Manipulating Hand and Glove

Pritchard uses Max/MSP/Jitter software to re-implement and extend Glove Talk II, developed by Fels and colleagues (see *Synergy*, Spring 1999). With it, the user is able to synthesize speech in real time using a cyberglove, a contact glove, a wrist tracking system, and a foot pedal. The wrist tracker on the right hand controls vowel synthesis (using movement in the horizontal plane), the fingers of the right hand control consonants, and the left hand triggers plosives. A foot pedal controls overall volume.

Continued on page 8

Boris Stoeber: *Continued from page 3*

They are fabricating minute spheres—in the order of one micron—of a uniform size from biodegradable polymers that would contain a specified drug. These spheres would prevent the drug from dissolving immediately. Their eventual goal is to guide the spheres in order to target drug delivery. This could have major benefits in treating localized conditions such as arthritis.

"Now medications are either taken orally or injected in some form of solution into muscle or the bloodstream, where controlling time release is difficult because of blood flow and varying absorption rates of muscle," notes Stoeber. With oral intake, much of the drug is digested, therefore larger amounts are needed, and many drugs are literally difficult to stomach. "By controlling the size of the spheres we could control the release rate of the drug," he says.

Stoeber is also working to develop microneedles for painless drug delivery. Despite their small size, MEMS and microfluidics will be playing a "macro" part in the future of medicine.

Boris Stoeber can be reached at 604.827.5907 or stoeber@mech.ubc.ca

Playing with Sound: *Continued from page 7*

Pritchard notes that learning to use the original Glove Talk II system is not as complicated as learning to play a musical instrument. Someone can become proficient in around 100 hours.

Initially, the system Pritchard devised was more difficult than the original Glove Talk II because it lacked neural networks (machine learning). This design decision was made in order to investigate the positional skills of a highly trained concert musician. "In the next stage we are going to put machine learning back in," says Pritchard. "We proved that it was possible to use the system without it, but it takes an enormous amount of training even for a very dexterous person."

Cleaning Up Synthesized Speech

Current speech synthesizers have limited voice range and dialect capability, and there are few high-quality synthesized female voices. Pritchard and Fels are working to develop features for Max/MSP that fine-tune vowel and consonant sounds and are able to copy the wide range of sounds in human speech.

Pritchard is also working with ICICS member Keith Hamel in the School of Music, and Nancy Nisbet in Visual Arts, to develop free software patches for interactive art and performance work that can be used by students and professionals with a minimal knowledge of the Max/MSP/Jitter programming language.

Bob Pritchard can be contacted at 604.822.3526 or dr.bob@ubc.ca

Passing Notes: *Continued from back page*

ICICS Represents Canada at International Arts Biennale

ICICS associate member **Chris Welsby** (SFU Fine Arts) represented Canada recently at the international Arts Biennale in Gwangju, South Korea. The work he exhibited was called "Tree Studies" and included moving images of a deciduous tree and sound files governed by real-time weather data monitored around the globe and relayed, via the Internet, to a computer in Gwangju.

Forest Products Society Award for Graduate Student

Natalie Vadeboncoeur, an M.A.Sc. student of **Gary Schajer** (ME), received the Wood Award First Place Prize at the Forest Products Society conference held in Knoxville, Tennessee in June for her paper, "Separate-sided Surface Height Measurement Using a Handheld Profiling Device." The award recognizes outstanding research in the field of wood and wood products conducted by graduate students.

IEEE Canada Power Engineering Medal

ECE professor emeritus **Hermann Dommel** is the first recipient of the Power Engineering Award from IEEE Canada. Dommel is being recognized for his research contributions to optimal power flow, transient stability, and electromagnetic transient analysis in electric power systems. He held the Industrial Research Chair sponsored by BC Hydro and NSERC from 1995 until his retirement in 2000.

CS Graduate becomes Microsoft Canada's First User Experience Advisor

Qixing Zheng, a recent Masters student supervised by **Joanna McGrenere** (CS) and **Kellogg Booth** (CS), has become Microsoft Canada's first User Experience Advisor. Qixing is one of 17 such advisors working internationally for Microsoft. While at UBC, Zheng focused on user research for defining product requirements, interactivity and visual design for user interfaces, and usability evaluations.

Yusuf Altintas Inducted as CAE Fellow

Yusuf Altintas (ME) has been inducted as a Fellow of the Canadian Academy of Engineering in recognition of his distinguished achievements and career-long service to the engineering profession. The ceremony took place in Toronto in June, in conjunction with the Academy's Annual General Meeting. Altintas is an internationally recognized researcher in the field of machining.

ICICS Member IEEE Editorships

Lutz Lampe (ECE) has joined the Editorial Board of the *IEEE Transactions on Wireless Communications*, in the area of transmission technology. **Juri Jatskevich** (ECE) has become an editor of the *IEEE Transactions on Energy Conversion*, published quarterly by the IEEE Power Engineering Society.

Tim Salcudean Named Charles A. Lazlo Professor

Electrical engineer **Tim Salcudean** was recently named the inaugural Charles A. Laszlo Professor in Biomedical Engineering. Salcudean applies engineering principles and design to complex health-related issues. His multidisciplinary research includes developing screening systems for deep vein thrombosis, and prostate therapies such as an ultrasound-based system for localizing radioactive seeds. **Charles Laszlo** (ECE) has devoted much of his career to developing assistive technologies, particularly for the hearing impaired. The gift of $500,000 from Laszlo and his wife Doreen to endow this professorship will ensure that important biomedical engineering initiatives continue to emerge from UBC.

Best Paper Awards at Canadian IEEE Conference

A paper co-authored by Masters student Behnoosh Rahmatian and her supervisor **Shahriar Mirabbasi** (ECE), entitled "A Low-Power 75dB Digitally Programmable CMOS Variable-Gain Amplifier," won a best student paper award at the 2007 IEEE Canadian Conference of Electrical and Computer Engineering. Also winning a best paper award at the conference was a Masters student of **Vijay Bhargava** (ECE), Ziaul Hasan Hashmi, for "Design of a Family of ISI Free Pulses for Very High Data Rate UWB Wireless Systems," co-authored by V. Yadav, A. K. Chaturvedi, and Dr. Bhargava.

Women in Engineering Symposium

Elizabeth Croft (ME) helped organize a two-day symposium for women in engineering held September 15–16. Entitled "Building Communities," the symposium brought together women from all stages of their engineering careers to begin building a network of women in engineering in BC. Students, new immigrant engineers, women returning to work, academics, and established industry professionals stand to benefit from such a community.

Computer Science and Emily Carr

An intuitive search engine designed by PhD student Eric Brochu, under the supervision of **Nando de Freitas** (CS), is being used by the Vancouver Art Gallery in a unique website launched in conjunction with the current exhibition, *Emily Carr and the Group of Seven*. Covering Carr's paintings, drawings, textiles, pottery, cartoons, and writing, the website brings together an extensive database of nearly 1,700 works. (www.emilycarrart.com)

Vancouver Hosts QShine 2007

Victor Leung (ECE) chaired the Fourth International Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (QShine 2007), held in Vancouver from August 14–17. The conference focused on the research challenges of designing and implementing large-scale wired and wireless networks and distributed systems.

UBC SAT Solver Big Winner in International Competition

SATzilla, a SAT (satisfiability testing) solver developed in the Laboratory for Computational Intelligence by Lin Xu, Frank Hutter, **Kevin Leyton-Brown** (CS) and **Holger Hoos** (CS), won three gold, a silver, and a bronze medal in the 2007 international SAT competition. SATzilla predicts the runtime of a number of existing SAT algorithms and runs the one with the minimal predicted runtime.

Anne Condon Appointed Faculty of Science Associate Dean

Anne Condon (CS) has been appointed Associate Dean for Faculty Affairs and Strategic Initiatives in the Faculty of Science. As Associate Dean, Condon will focus on faculty issues such as recruitment, retention, mentoring, diversity, career evolution, and policies and procedures. She plans to continue her research on computational complexity theory and biomolecular computation.

IEEE Canada R.A. Fessenden Medal

ECE head **Vijay Bhargava** has been awarded the 2007 IEEE Canada R.A. Fessenden Silver Medal for his outstanding contributions to research and education in wireless communications. Canadian inventor Reginald Fessenden is best known for his pioneering work in radio, notably the first audio transmission by radio (1900), the first two-way transatlantic radio transmission (1906), and the first radio broadcast of entertainment and music (1906).

Taylor Medal for Mechanical Engineering Professor

Xiaodong Lu (ME) has received the 2007 F.W. Taylor Medal from the International Academy for Production Engineering (CIRP). The award is given annually to one researcher under the age of 35 who is producing work of outstanding merit that falls within the scope of CIRP. Lu's research interests include mechatronics, electromechanical systems, electromechanics and electric machines, and precision machine design, among others.

Passing Notes:

Canada Foundation for Innovation (CFI) Funding for ICICS Researchers

Researchers **Boris Stoeber** (ME/ECE) and **Karen Cheung** (ECE), from the Microsystems and Nanotechnology (MiNa) group, have received $654,512 from the CFI, British Columbia Knowledge Development Fund (BCKDF) and industrial partners to produce a single lab-on-a-chip using microelectromechanical systems. Such a chip would enable cells to be cultured in a natural environment, characterized, and returned to the culture. More sensitive, efficient and cheaper diagnostics should result.

Alireza Nojeh (ECE, MiNa) will use $301,474 granted by the CFI, BCKDF, and industrial and institutional sources to build a laboratory for carbon nanotube-based vacuum nanoelectronics. Nojeh aims to develop a new source of single electrons that will lead to major improvements in throughput and resolution for electron-beam lithography and microscopy. He also intends to develop high-gain nanoscale transistors whose conducting channel is a vacuum. Potential applications include ultra-fast devices, flat-panel display technologies, and nanoscale probing of physical phenomena.

Complex fluids have internal structures that deform and reorient under the influence of deformation. A $311,059 CFI Leaders Opportunity Fund grant supported by BCKDF and private sources will allow **Dana Grecov** (ME) to investigate this process in different lubricants, biolubricants, nematic nano-composites, and synovial (joint) fluid. She will be looking for peculiarities that might lead to novel high-performance materials.

NSERC Research Tools and Development (RTI) Grant Funding

The following ICICS members have recently received NSERC RTI grants, which are one-year awards to be used to purchase or develop research equipment costing more than $7,000.

ECE and MiNa researchers **Konrad Walus**, **Karen Cheung**, **Boris Stoeber** (joint ME), **John Madden**, **Edmond Cretu**, and **Kenichi Takahata** have been awarded $125,872 for their project, "Inkjet Fabrication of Novel Microstructures and Devices." The team will use a commercial inkjet system to print flexible electronic devices and organic materials, pattern three-dimensional tissue scaffolds for possible use in bone and skin grafts, create microcapsules for drug delivery, and form hydrogel microstructures for wireless diagnostic and therapeutic devices.

Supported by a $145,220 RTI grant, **Sidney Fels** (ECE) and **Eric Vatikiotis-Bateson** (Linguistics) plan to attach an anthropomorphic face model to an existing jaw model to produce an anthropomorphic robotic face capable of interacting with people in an almost human way. The robot will be used to investigate the visual information introduced by the human face concurrently with speech and other aspects of communication.

Boris Stoeber has been granted $127,000 by the NSERC RTI program toward equipment required for the "lab-on-a-chip" project mentioned above.

Alireza Nojeh has received $83,579 to purchase a high-vacuum apparatus for his electron-emission experiments.

NSERC Discovery Accelerator Supplements for ICICS Researchers

Elizabeth Croft (ME), **Dinesh Pai** (CS), and **Robert Schober** (ECE) have been granted three of the seven NSERC $120,000 Discovery Accelerator Supplements awarded to UBC researchers in the 2007 competition. These grants are a new NSERC initiative that supports researchers at a critical juncture in their careers. They target 50 outstanding researchers in Canada whose accomplishments indicate that they are poised to make real breakthroughs in their fields.

Google Research Award for CS Professors

Giuseppe Carenini and **Raymond Ng** have received a US$34,000 Google Research Award to develop techniques for summarizing evaluative text and emails, using an interactive, multimedia approach. For example, users would be able to browse summarized hotel reviews depending on the level of detail they require. Similarly, emails could be summarized by information pertinent to the user.

Continued on page 8

•I•C•I•C•S• Institute for Computing, Information and Cognitive Systems www.icics.ubc.ca

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 160 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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