INSTITUTE FOR COMPUTING, INFORMATION AND COGNITIVE SYSTEMS

ICICS
CONNECTING KNOWLEDGE

FOCUS

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Motion Metrics International

ICICS-incubated start-up company an international success. Pg.02

"Without ICICS there would be no Motion Metrics."
- Shahram Tafazoli

THE UNIVERSITY OF BRITISH COLUMBIA

DIRECTOR'S CORNER

WELCOME TO THE SPRING 2010 issue of FOCUS, which is my first as ICICS Director. I would like to thank you for giving me the chance to lead ICICS into the new decade. Mostly due to technology, the world today is much more tightly integrated than it was when ICICS was created in 1986, and requires thinking beyond traditional disciplinary boundaries. For over twenty years ICICS has promoted a multidisciplinary culture that emphasizes flexible thinking and finding a common language across disciplines. The collaborations profiled in this issue illustrate these hallmarks of ICICS researchers and their students.

Now, with roughly 150 faculty members from across the campus and state-of-the-art infrastructure, we are ideally positioned to meet the demands of the new academic and economic realities, where borders are constantly shifting. In the coming years, I will act as an ambassador for ICICS to increase our engagement with academia, industry, and government agencies, both in Canada and internationally. I am confident that with your help and support, we can take ICICS to the next level of growth and recognition on the road to excellence. Our best days are still ahead.

Panos Nasiopoulos, ICICS Director

COVER ARTICLE

ICICS-incubated Start-up Company an International Success

SHAHRAM TAFAZOLI FOUNDED MOTION METRICS INTERNATIONAL 10 YEARS AGO WITH A LITTLE HELP FROM HIS FRIENDS AT ICICS.

NINETY-FIVE PERCENT of university start-up companies fail, so Shahram Tafazoli, founder and president of Motion Metrics International (MMI), was wise not to consider his company a success until it was generating at least $1M annually in sales. Housed in the ICICS building, Motion Metrics recently celebrated its tenth anniversary. The company develops intelligent embedded monitoring systems for the open-pit mining industry. Their main product, ToothMetrics™, is a camera-based system for detecting missing teeth in mining shovels. Since the operators of these enormous machines can't see the bucket clearly, they have no way of knowing if its teeth are intact. A broken tooth that goes undetected may end up jamming and seriously damaging the mine crusher. "We are providing a system that prevents a one-million dollar problem," says Tafazoli, who is also an ICICS member and ECE adjunct professor. It also protects workers, who have been seriously injured and even killed trying to remove broken teeth from jammed crushers.

THE ICICS INCUBATOR

Tafazoli scouted UBC in 1992 after completing his M.A.Sc. degree in Iran. The applications focus of ICICS member Peter Lawrence (ECE), who would become his Ph.D. supervisor, appealed to him, so he decided to stay. At the time, Lawrence and a team of ICICS researchers were working on simplifying the operator controls on heavy equipment such as excavators, log loaders, grapple yarders, and feller-bunchers. These machines are notoriously difficult to operate, with various combinations of hand controls and foot pedals required to rotate the cab, extend the boom, operate the grapple, etc. "You see something that's obviously wrong in the world," Lawrence explains, "and start thinking about it. I get a lot of pleasure out of improving bad designs."

Through successive rounds of funding and other support from MacMillan Bloedel, Caterpillar, Finning, RSI Research Ltd., Western Economic Diversification Canada, Precarn/IRIS, the BC Science Council, BC Advanced Systems Institute, Forest Industry Engineering Research Institute of Canada, and others, Lawrence and his team developed a single hand controller so easy to use that the 12-year-old daughter of a visiting professor could operate a feller-buncher with no training. The multidisciplinary team included ICICS

(L–R): Peter Lawrence, Shahram Tafazoli, the Honourable Jean-Pierre Blackburn, Minister of National Revenue.

› Open-Pit Mining
› Broken Tooth Detection
› R&D Tax Credits

"ICICS played a key role in the early stages when Motion Metrics International was a start-up company, by providing space and other facilities. Our relationship has evolved continuously since then. Motion Metrics has initiated and provided industrial sponsorship for numerous collaborative projects involving ICICS members and students, all while based in ICICS. We have also hired graduates from ICICS, and continue to work with the ICICS governance to spotlight this important multi-disciplinary organization. ICICS has been instrumental in our ability to successfully commercialize innovative "Made in Canada" technologies in the mining industry worldwide. Without ICICS there would be no Motion Metrics."

Shahram Tafazoli,
President, Motion Metrics International

members Lawrence, Alan Mackworth (CS), David Lowe (CS), Tim Salcudean (ECE), Farrokh Sassani (MECH), and the late Dale Cherchas (MECH). Their control system was shown to significantly boost productivity and reduce operator fatigue. Although it was not widely adopted by manufacturers, many students received important design training over the course of the multi-year project, which Lawrence feels is the point: "It's about the students," he says. "Solving a problem for someone in industry is very motivating for them."

A THESIS WITH LEGS

For his doctoral thesis, Tafazoli, who was co-supervised by Clarence de Silva (ICICS/MECH), modelled the dynamics and frictional effects of hydraulic excavator arms. At the urging of one of Lawrence's industrial contacts, Tafazoli put these metrics together with previous kinematics work done by the team to develop a real-time technique for determining the bucket payload of hydraulic mining shovels. After graduating in 1997, Tafazoli started a consulting company, with initial free space from ICICS. For his first product, he packaged his payload measurement system as LoadMetrics™, which is still on the market.

In 1998, a researcher from Syncrude Research brought the broken tooth problem to Tafazoli's attention after speaking with Lawrence. Over the next five years, with seed funding from Syncrude Research and several rounds of funding from NRC-IRAP, Motion Metrics developed ToothMetrics™. "Nobody believed you could put a camera system that would survive on top of a large mining shovel," he recalls. "So we had to prove ourselves." Tafazoli and his talented team of ICICS-affiliated graduates did just that, and MMI made its first sale of the system to a De Beers diamond mine in Botswana in 2003. Word spread, and ToothMetrics™ is now in place in 26 mines around the world.

The company's other products include ViewMetrics™, a camera-based collision avoidance system for mining shovels; ViewMetrics™-Radar, which adds proximity detection to the camera views; and FragMetrics™, which uses computer vision to determine the size distribution of rock fragments in the bucket.

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Kellogg Booth to Lead $23.25 Million Network of Centres of Excellence

> Networks of Centres of Excellence
> Games, Animation, New Media
> GRAND

(L–R): Sid Fels, Cristina Conati, Kellogg Booth, Kosta Beznosov, Alison Ariss, Michiel van de Panne.

ICICS member Kellogg Booth (CS) has a distinguished record of spearheading lasting multidisciplinary efforts in computer graphics and collaborative technologies. Co-founder of UBC's Imager Laboratory for Graphics, Visualization and HCI, founding director of the Media and Graphics Interdisciplinary Centre (MAGIC) at UBC, Associate Director of the six-university Network for Effective Collaboration Technologies through Advanced Research (NECTAR, 2004–09), Booth's impact on his field has been widely felt.

THE GRAND DESIGN

Booth was also instrumental in ICICS securing a $22.1 million infrastructure grant in 2000 that funded a six-storey addition to the ICICS/CS building and the purchase of a range of advanced equipment. Several of the labs set up through that grant, such as the Interactive Workroom, with the largest 3D interactive screen in the country, made research projects possible that helped lay the groundwork for Booth's latest initiative.

GRaphics, Animation and New meDia (GRAND) is one of three new Networks of Centres of Excellence announced by the federal government in January. Hosted by UBC through MAGIC with Booth as Scientific Director, GRAND comprises a network of 56 Network Investigators (9 of them ICICS members), over 40 Collaborating Researchers, and industrial partners from across the country. The overall goal of the network is to build bridges among its participants that will accelerate innovation in new media, animation, and electronic games. "Social networks and new media," Booth emphasizes, "represent some of the most significant popular adaptations of computer technology. GRAND will enable research collaborators to address issues and explore opportunities in this fast-growing sector."

Research will be conducted in 32 projects structured around 5 integrated themes: (1) New Media Challenges and Opportunities; (2) Games and Interactive Simulation; (3) Animation, Graphics, and Imaging; (4) Social, Legal, Economic, and Cultural Perspectives; and (5) Enabling Technologies and Methodologies. Industrial partners will be involved from the design stage, to ensure results are transferable to society to benefit Canada. Progress will be assessed annually and

funding redistributed, if necessary. It's an approach informed by Booth's experience with NECTAR.

SOME GRAND PROJECTS

Joanna McGrenere (CS/ICICS) is another "NECTARine" participating in GRAND. She will investigate personalizing user interfaces based on user task, intentions, and goals. Tailored interfaces will become increasingly important as applications become more complex. Industrial supporters include Autodesk, providers of 3D capabilities for engineering design, and Side Effects, a world leader in animation and special effects software.

ICICS member Karon MacLean (CS/ICICS) will also focus on improving interfaces, by incorporating haptic (touch) and audio modes to avoid visually overwhelming the user. Haptics technology developers Immersion Canada stand to benefit from this research.

Dolby Computer Science Research Chair and ICICS member Wolfgang Heidrich developed the underlying algorithms for the High Dynamic Range (HDR) display, a UBC invention that provides a range of contrast close to what we see in the real world. As Animation, Graphics, and Imaging theme leader, Heidrich aims to overcome the computational "brick wall" often hit in realistic simulation, by integrating image capture with physics-based animation. GRAND industry partners Autodesk and Pixar Animation Studios will be keeping a close eye on Heidrich's progress.

A measure of GRAND's scope and potential is the involvement of two UBC Nobel Laureates. John Robinson (Institute for Resources, Environment and Sustainability) contributed to the Intergovernmental Panel on Climate Change, which was jointly awarded the Nobel Peace Prize with Al Gore in 2007. He will work on a project sponsored by Autodesk and BC Hydro to create interfaces aimed at reducing homeowner energy consumption, and explore applying these approaches in commercial buildings. Carl Wieman, winner of the 2001 Nobel Prize in Physics, will collaborate with MAGIC Director Sid Fels (ECE/ICICS) to improve the effectiveness of display sharing in classroom and other learning environments. This project builds directly on advances made by NECTAR researchers.

Booth will also contribute to the shared display project, as well as to a special project that involves dissemination of operational information across the network, and another that assesses GRAND's progress against its goals, specifying intervention where necessary.

These are just a smattering of GRAND projects. By assembling a wide-ranging network of academic researchers, industrial sponsors, and other stakeholders, Booth has laid strong foundations for his most ambitious collaborative venture yet. Its results will touch us all in some way in the near future.

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INNOVATION REWARDED

Tafazoli and his team of 15 employees are constantly developing novel customer-driven products. This past August, the Honourable Jean-Pierre Blackburn, federal Minister of National Revenue, acknowledged this emphasis on innovation with a cheque for $931,000 in scientific research and experimental development tax credits. This amount represents 35 to 40 cents of every dollar spent by the company on R&D over the preceding two years. Motion Metrics was the only company in Vancouver visited by the Minister.

What goes around comes around. Motion Metrics is now an industrial sponsor of an NSERC Strategic Grant held by Lawrence and Robert Hall (Mining Engineering). Financially, Tafazoli can now consider his company a success; even with last year's economic downturn, MMI generated $2.7M in sales. And like many of Lawrence's former students, a number of Tafazoli's employees have moved on to high-level industrial positions, the true metric of success for both men.

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An Integrated Approach to Microsystems Design

ICICS MEMBER EDMOND CRETU LENDS HIS MICROSYSTEMS EXPERTISE TO PORTABLE ULTRASOUND AND INKJET MICROFABRICATION PROJECTS.

TO BE A SUCCESSFUL MICROSYSTEMS DESIGNER, you have to be a "glass-half-full" sort of person. This is because at the microscale, interactions between the various subsystems, such as electrostatic forces, have an impact on system performance they wouldn't have at the macroscale. Instead of seeing these forces as a problem, Electrical and Computer Engineering professor Edmond Cretu finds ways to turn them to his advantage.

FINDING FUNCTIONALITY

Microelectromechanical systems (MEMS) design is an inherently multidisciplinary field, and well suited to the ICICS context. Before coming to UBC, Cretu spent five years at Melexis N.V. in Belgium, developing MEMS-based angular-rate sensors for automotive applications, such as rollover detection. In that work, he learned how to manage multidisciplinary teams, by focusing on their overlapping elements. A microscale inertial sensor, for example, has virtually no mass, making acceleration hard to detect by conventional means. This deficit in the mechanical domain, however, can be compensated for architecturally by coupling with electrostatic forces in a feedback loop, so acceleration can be sensed. "Microsystem design," Cretu says, "requires an integrated approach. You have to design and simulate a complex system, not just the sensor itself." Power transfer from one domain to the other is controlled through digital signal processing in a feedback loop, so the system can adapt to changing conditions.

TRANSDUCER ARRAYS FOR ULTRASOUND

The trend toward miniaturization in almost all areas of technology has made Cretu a key player in several ICICS research endeavours. In a project sponsored by Ultrasonix Medical Corporation, Cretu and ICICS colleagues Shahriar Mirabbasi (ECE), Rob Rohling (ECE/MECH), and Tim Salcudean (ECE) are developing a low-cost portable ultrasound (US) machine. Current machines use piezoelectric transducers to convert electrical energy into an acoustic wave that penetrates the body, reflects off tissue, and is converted back to electrical energy by the transducers. This signal is then sent through wires to the US machine for image reconstruction. The transducers are assembled in a linear array, each one connected to the US machine by a wire.

Moving to a 2D array, and ultimately 3D and 4D (real-time) is infeasible using current arrays, because of the number of wires involved. The team is therefore developing MEMS-based transducer arrays, with CMOS electronics and signal processing at the "front end" to replace the connecting wires. "We looked around ICICS," Cretu says, "and realized we are in a privileged research environment." He was able to assemble a team with expertise in CMOS design (Mirabbasi) and biomedical imaging (Rohling, Salcudean) that neatly complemented his own in microsystems.

Cretu is designing the MEMS-based transducers, whose tiny membranes can vibrate at higher frequencies than piezoelectric transducers. This could lead to new applications such as skin analysis. By exploiting the membrane dynamics, he hopes to improve the received signal for better imaging. The future integrated "front end" will make the developed US machine much cheaper to manufacture than current machines, and portable, so doctors will be able to detect and monitor diseases such as breast cancer in their offices.

INKJET MICROFABRICATION FOR STRUCTURAL MONITORING

Cretu is also lending his expertise to monitoring the health of structures, in collaboration with ICICS ECE colleagues Konrad Walus, John Madden, and Boris Stoeber (ECE/MECH). The team is developing techniques for printing flexible electronic devices such as strain sensors, using a commercial inkjet printer.

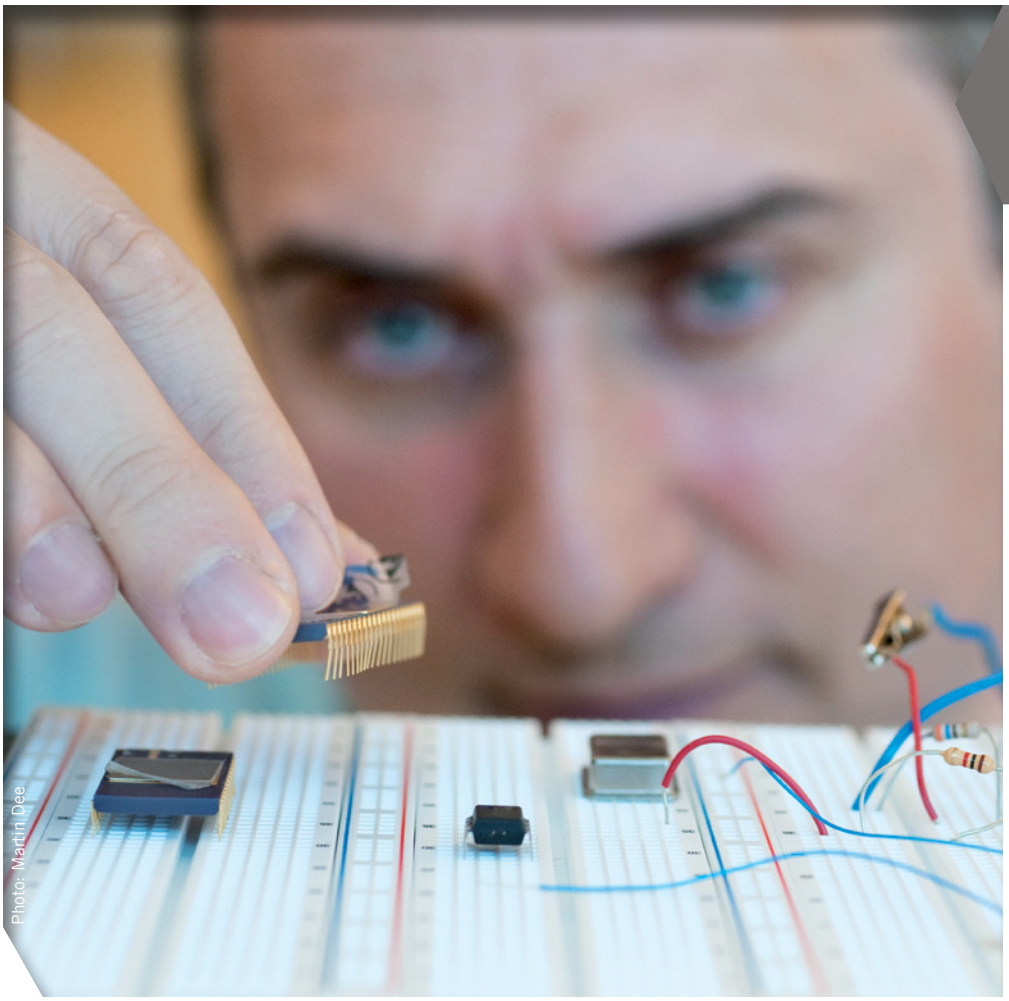
Photo: Martin Dee

> Adaptive Microsystems
> Ultrasound Transducers
> Printable Electronics

"We looked around ICICS and realized we are in a privileged research environment."

The sensors will be based on carbon nanotubes/nanowires or a carbon/polymer matrix, suspended in a viscous, ink-like fluid. Since the conductivity of these carbon particles changes under stress, they can be used as the basis for stress or strain (accumulated stress) gauges. Conventional, metallic-film gauges are manufactured by lithography in several steps, which is expensive and slow. They are also inflexible and can cover only a small surface area. Flexible, large-area printed sensors could be used for structural monitoring of pipes, bridges, and buildings. Conventional metallic strain-gauges are DC-operated, while the new sensing devices could operate in either DC or AC modes; this will enhance their detection capabilities for hidden defects like microcracks. Researchers and manufacturers would be freed from reliance on silicon foundries, making for cheap, rapid prototyping and production.

The Weir-Jones Group engineering firm sees the project's potential. They have agreed to install prototype sensors in the field alongside the firm's conventional sensors, giving the team invaluable, real-world testing conditions. The project has just begun, but may lead to other printable devices such as solar cells, microcapsules for drug delivery, and tissue scaffolds for use in skin and bone grafting.

BUILDING CANADA'S MICROSYSTEMS RESEARCH CAPACITY

Cretu is also one of 10 PIs on a $48.26 million Canadian Foundation for Innovation grant to implement advanced microsystems research infrastructure at 37 universities across Canada. Led by Queen's University under the umbrella organization CMC Microsystems, the grant will enable purchasing portable equipment that can be shared among centres, and setting up complete centres for tackling strategic research themes. UBC will be one such centre, with Cretu as the lead investigator.

Cretu's key role in a number of ICICS research projects is now playing itself out on the national stage, it seems.

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If These Arterial Walls Could Talk...

ELECTRICAL AND COMPUTER ENGINEERING PROFESSOR KENICHI TAKAHATA HAS DEVELOPED A NOVEL MEDICAL STENT THAT CAN BE WIRELESSLY MONITORED.

> Micromachining
> Micro-Electro-Mechanical Systems (MEMS)
> Stentenna

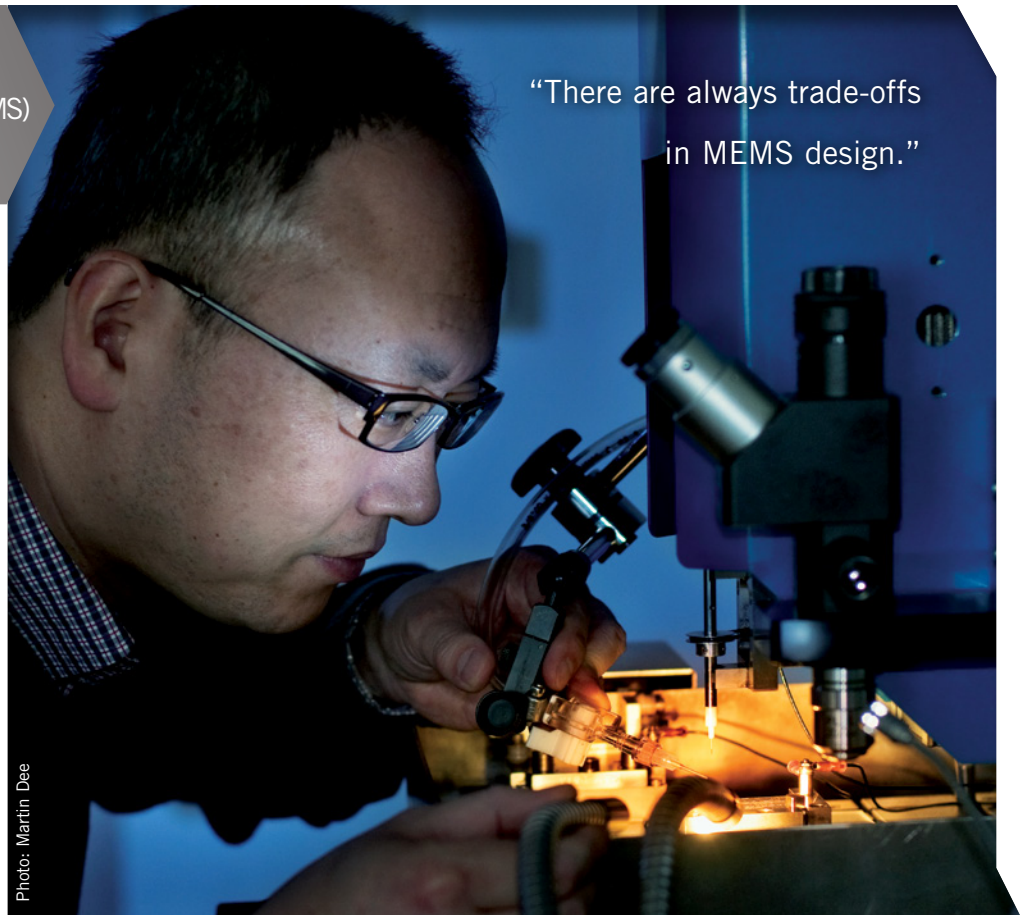

Photo: Martin Dee

MICROMACHINING BREAKTHROUGHS driven by the semi-conductor industry have made micro-electro-mechanical systems (MEMS) possible. Their low cost, small size, and high functionality have led to a range of applications, from attitude control in spacecraft to implantable medical devices. ICICS member Kenichi Takahata, a Tier-2 Canada Research Chair in Advanced Micro/Nanofabrication and MEMS, draws on 12 years of industrial research experience in micromachining techniques to make some startling advances in his field.

BUILDING A BETTER STENT

From 1999–2001, Takahata was a visiting scientist at the University of Wisconsin, where he developed advanced micro-electro-discharge machining (micro-EDM) techniques on behalf of his employer, Panasonic. He found the academic environment stimulating and decided to pursue a PhD, graduating from the University of Michigan in 2005.

For his thesis, Takahata applied micro-EDM to making medical stents, wire-mesh tubular structures used to expand and scaffold blood vessels narrowed by plaque accumulation. Conventional stents are cut from surgical stainless steel tubes by a scanning laser. They are positioned within the blood vessel using a catheter, and expanded by a balloon inflated with saline solution. A common problem with implanted stents, however, is restenosis, or re-narrowing of the blood vessel. The patient must be monitored regularly by invasive procedures such as X-ray angiogram, or by MRI with its lengthy wait times.

Takahata has devised a better way to monitor stent status. Having demonstrated that stents could be made from flat (planar) stainless steel using micro-EDM, he incorporated capacitive pressure sensors at either end that form passive electrical circuits with the expanded stent's helical structure. The resonant frequencies of these circuits can be monitored wirelessly using a magnetically coupled external coil; the stent becomes its own antenna. "Changes in blood pressure," Takahata explains, "modify the device's resonant frequencies, pointing to changes in blood flow rate and the need for further testing."

TOWARDS COMMERCIALIZATION

At UBC, Takahata is taking a multidisciplinary approach to advancing the "stentenna" towards commercialization. To improve its sensing and wireless communication abilities, he is developing miniaturized sensors that will be completely embedded in the stent coils, and working on a design with higher radiofrequency (RF) performance. With ICICS colleague and system-on-a-chip expert Shahriar Mirabbasi (ECE), he is investigating an "active" stentenna with incorporated integrated-circuit chips that convert the signal from analog to digital and reduce noise. Dr. Jay Kizahakkedathu of UBC's Centre for Blood Research will investigate various polymer coatings to prevent restenosis and biofouling.

"There are always trade-offs in MEMS design," Takahata stresses. "In our case it is between improving the stentenna's electrical functionality while maintaining its mechanical performance and minimizing its biological impact." If his team gets the balance right, biomedical device manufacturers in the U.S. and Canada plan to bring the stentenna to market. Ultimately, millions of patients around the world may be able to monitor their stent status at home and transmit the data to their doctor's office over the Internet.

CONTROLLED MEMS-BASED DRUG DELIVERY

Takahata is also developing implantable MEMS-based drug delivery devices for targeted treatment of lesions. Operating without batteries, one or more drugs stored in tiny reservoirs are released by hydrogel valves that contract when heated. A circuit similar to that used in the stentenna acts as a heater when an external magnetic RF field is tuned to its resonant frequency. Unlike other MEMS-based designs, this approach allows controlled, selective drug release; if the patient has an adverse reaction, drug administration can be stopped immediately. If necessary, a different drug can be released by adjusting the RF field to open the appropriate valve.

MICROMACHINING INNOVATIONS

Takahata continues to explore improved micromachining methods. One innovative approach is to fabricate multiple arrays of moveable electrodes and microactuators on a sacrificial film laminated to the workpiece. Large-area devices such as flat-panel displays could be manufactured in this way, without the need for an expensive micro-EDM machine.

Takahata is excited to be involved in research that will make a difference. We can be glad he decided to go back to school.

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ICICS Connects Researchers with Industry at Dinner

Dean of Applied Science, Tyseer Aboulnasr, addresses Industry Dinner

"INDUSTRIAL SUPPORT" of university research is a nice-sounding phrase, but what does it really mean? Sometimes a company will endorse a research proposal in writing, sometimes they will lend significant financial and other support (e.g., equipment donations, loan of a technician). It is generally acknowledged that researchers in disciplines represented by the ICICS membership need to make their industrial collaborations more meaningful. The funding agencies want to see more return on their investment: funded projects that produce results translated to society through industry.

In order for this to happen, researchers need to forge connections with appropriate, interested companies. Those new to the university, however, are not always aware of the local industrial landscape, or how best to approach potential contacts. Happily, ICICS has considerable experience in this area, and drew on it to co-host, with NSERC, a reception and dinner at Cecil Green Park House on October 27, 2009 for ICICS members and senior industrial executives. Rabab Ward, ICICS Director from 1996–2006 and Director Pro Tem from July–December 2009, worked closely with ICICS members and NSERC-Pacific to match researchers with appropriate guests from industry. Judging from the lively conversations throughout the evening among ICICS members and their 37 guests from 34 local companies, this was a wise approach.

Rick Warner, NSERC-Pacific Manager, is often involved in functions aimed at bringing academia and industry together. What made this dinner a uniquely "terrific event," he said afterwards, was this strategic matching. By the next morning, it had already generated several calls to his office from industry guests eager to discuss potential collaborations and programs he had outlined in his presentation. In her talk, Applied Science Dean Tyseer Aboulnasr stressed the importance of industry as a means of translating researchers' advances to society. Mario Kasapi of the University Industry Liaison Office (UILO) spoke about steps his office has taken to streamline commercialization of research at UBC. Duncan Phillips of MITACS and Ross Waddell of the BC Innovation Council summarized programs offered by their organizations that mutually benefit UBC researchers and industry.

The quality of the food and the complimentary drinks might have had something to do with it, but the evening's overall "buzz" was mostly generated by the enthusiasm on both sides about bridging the gap between academia and industry. Dr. John Pacey is President of Verathon Medical Canada, as well as a surgeon and inventor. His GlideScope Video Laryngoscope has a video camera mounted on a scope to provide a monitor view of the larynx for procedures such as intubation and removal of foreign bodies. He has also invented a number of other surgical devices. Even so, he feels there is a danger in industry of having too narrow a focus. "The last thing you want," he said in a conversation before the dinner, "is to become trapped in a silo. Events like this keep you open to new ideas and possible directions."

Dr. Pacey's comments capture the spirit of the evening. There is a clear desire among ICICS members and their industry guests to deepen existing collaborations and explore new ones. Events such as the ICICS-NSERC Industry Dinner can help make this happen.

Continued from back page ››

P2P:

ICICS Members Named Fellows of Engineers Canada

Elizabeth Croft (MECH) and **Bill Dunford** (ECE) have been named Fellows of Engineers Canada (FEC) for their impressive achievements and service to the engineering profession. Croft is an expert in robotics, leading research projects in human–robot interaction relevant to assistive technology and industrial automation. Dunford specializes in power electronics, particularly applied to photovoltaic applications and alternative energy systems.

Ultrasound Innovations Garner Synergy Award

Rob Rohling (ECE/MECH) and **Tim Salcudean** (ECE), along with their industry partner Ultrasonix Medical Corporation, have received one of four $200,000 Synergy Awards for Innovation presented by NSERC in 2009. The collaborators were recognized for developing new ultrasonic imaging techniques that could improve cancer diagnosis and treatment and reduce the number of biopsies required. The Synergy Awards recognize partnerships between universities and industry in Canada.

Yusuf Altintas Recognized for Industry Collaboration

Pratt and Whitney Canada has recognized **Yusuf Altintas** (MECH) as one of six P&WC Research Fellows across Canada, for his academic excellence and outstanding contribution to their technology programs. PW&C has also renewed his NSERC/Pratt & Whitney Chair in Virtual High-performance Machining, with colleague **Steve Feng** (MECH) as Associate Chair. Altintas received an honorary doctorate from the University of Stuttgart in 2009 for his contributions to metal cutting, machine tool vibrations, and machine tool control.

Search Engine Developed at UBC Provides "Discoveries"

Worio, an ICICS-incubated spinoff company, has developed a search engine that uses machine learning to provide "discoveries" based on understanding the user's interests, as well as keywords. Users can network search results with contacts through social media, so they benefit from one another's searches, or browse privately. "Worio" is an acronym based on "Web of Research," the name given to the researchers that came together at UBC to develop the technology.

Artificial Intelligence Innovator Elected to the Royal Society of Canada

Alan Mackworth (CS) has been elected as a Fellow of the Royal Society of Canada. Mackworth is Canada's leading figure in the field of artificial intelligence. His work has widespread applications for computer system design and has lead to a new discipline known as constraint-based programming, widely used in scheduling of, for example, airline flights and equipment maintenance. Mackworth is also the founding father of the robotic soccer challenge *RoboCup*, the primary platform for multi-agent systems research.

UBC Robotics Team Dominates Competition

The ICICS high-head lab was long home to UBC's Thunderbird Robotics team, under the guidance of Mining Engineering professor John Meech. The large floor space allowed them to test their "Snowbots" as they developed them. These 1/12th scale autonomous robotic cars are guided by computer vision and employ various collision-avoidance techniques. At the University of Waterloo's Robot Racing Challenge last summer, they took places 2 to 6 among 12 entrants.

Sid Fels and Students Win Best Demonstration Award in Beijing

Sid Fels (ECE) and students Billy Lam (Masters), Ian Stavness (PhD) and Ryan Barr (Co-op) won the Best Demonstration Award at the 17th International ACM Conference on Multimedia in Beijing this past October. Their project was entitled "Interacting with a Personal Cubic 3D Display." pCubee is a cubic 3D display that enables users to experience new interaction techniques for 3D scene manipulation in a cubic display, such as navigating through a large landscape.

Honourary Doctorate for Martha Salcudean

Professor Emerita **Martha Salcudean** (MECH) has been given an honourary Doctor of Engineering degree by the University of Waterloo. Salcudean is the Weyerhaeuser Industrial Research Chair Emerita in Computational Fluid Dynamics and a member of the Order of Canada and the Order of British Columbia, and a Fellow of the Royal Society of Canada and of the Canadian Academy of Engineering.

Van den Akker Prize for Paper Physics

James Olson (MECH), student David Goosen, and Dick Kerekes of UBC's Pulp & Paper Centre have been awarded the Johannes Van den Akker Prize for Advances in Paper for their paper, "The Role of Heterogeneity in Compression Refining." The award was presented at the 14th Fundamental Research Symposium in Oxford, UK. It was created by the Institute of Paper Science and Technology at Georgia Tech.

Taiwanese Design Contest Technical Award

Clarence De Silva (Mech) and collaborators at the National University of Singapore recently won the Digital Signal Processing Creative Design Contest's Technical Award for their paper, "Distributed DSP for Fault Monitoring and Control." This project was carried out in collaboration with Professor K.K. Tan and his laboratory in the Department of Electrical and Computer Engineering, National University of Singapore (NUS). The design contest was held in November 2009 in Tinan, Taiwan, and was sponsored by the Taiwanese Ministry of Education.

P2P: Peer-to-Peer

ICICS CONNECTING KNOWLEDGE

Vijay Bhargava Awarded Strategic Grant

Vijay Bhargava (ECE) has been awarded a $446,000 NSERC Strategic Project Grant for the period 2009–2012 to work on "Advanced Radio Transmission and Resource Management Techniques for Cooperative Cellular Wireless Networks." The Co-PI on the award is Ekram Hossain of the University of Manitoba. Bhargava has also received the 2010 IEEE Canada Outstanding Engineering Educator Award.

Strategic Grant for Visualization Research

Cristina Conati (CS) and co-investigators **Giuseppe Carenini** (CS), James Enns (Psychology), and Melanie Tory (CS-UVic) have received an NSERC Strategic Project Grant of $428,000 over 3 years to investigate "Advanced Tools for User-Adaptive Visualization" of information. The team's main industrial supporter is Envision Sustainability Tools, Inc. Conati was also an invited speaker at the International Joint Conference on Artificial Intelligence (IJCAI-2009), where she spoke on intelligent tutoring systems.

CIHR Grant Will Lead to Improved Mobility for Older Adults

A 6-year, $1.5 million Emerging Team Grant from the Canadian Institutes of Health Research will enable a Canada-wide multidisciplinary team to investigate the use of powered wheelchairs by older adults and how the chairs can be improved. The Wheeled Mobility for Older Adults Team (WheeMOAT) is led by William Miller (Occupational Science and Occupational Therapy). It includes ICICS members **Gary Birch** (Neil Squire Society/ECE), **Meeko Oishi** (ECE), and **Alan Mackworth**, **Jim Little**, and **Ian Mitchell** from CS.

Edmond Cretu UBC PI for Microsystems Infrastructure Grant

The Canadian Foundation for Innovation (CFI) has awarded $48.26 million to a consortium of 37 universities, led by Queen's under the umbrella organization CMC Microsystems, to implement advanced microsystems research infrastructure across the country. **Edmond Cretu** (ECE) is the grant's PI for UBC, which received the second highest funding under the grant. CMC Microsystems is a non-profit government, industry, and academic initiative aimed at building competence in microsystems. Cretu's research is profiled on Page 06 of this issue.

Kellogg Booth Elected as ACM Distinguished Scientist

The Association for Computing Machinery (ACM) has elected **Kellogg Booth** (CS) as a Distinguished Scientist. ACM Distinguished Members have "achieved significant accomplishments or have made a significant impact on the computing field." This continues to be the case for Booth, as Scientific Director of the recently announced $23.25 million Network of Centres of Excellence, "GRaphics, Animation and New meDia" (GRAND). Read more about the network on Page 04 of this issue.

CIHR Proof-of-Principle Funding for Sports Helmet Project

Peter Cripton (MECH) has received CIHR Proof-of-Principle funding of $150,000 to conduct testing that will advance his Pro-Neck-Tor™ sports helmets toward commercialization. The helmet has an inner shell that, upon impact, pivots within an outer shell to mitigate damage to neck vertebrae by up to 56 percent. Proof-of-Principle grants are intended to bridge the funding gap between research discoveries and commercialization.

David Pulfrey's Teaching Excellence Recognized—Twice

October 2009 was a big month for **David Pulfrey** (ECE). The IEEE Electron Devices Society gave him its Education Award for the quality of his teaching of semiconductor devices to undergraduate and graduate students. In the same week, the Association of Professional Engineers and Geoscientists of BC (APEGBC) honoured him with its Award for Teaching Excellence in Engineering and Geoscience Education—the highest teaching award for engineering educators in British Columbia.

ICICS Members Inducted as CAE Fellows

ECE Head **André Ivanov** and his colleague **Resve Saleh** (ECE) have been inducted as Fellows of the Canadian Academy of Engineering (CAE) in recognition of their long service to the engineering profession and their research achievements. Ivanov is an expert and innovator in the design and testing of very large scale integrated (VLSI) circuits. Saleh helped pioneer mixed-mode (analog/digital) circuit simulation.

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UBC's Institute for Computing, Information and Cognitive Systems (ICICS) is an umbrella organization that promotes collaboration among researchers from the faculties of Applied Science, Arts, Commerce, Education, Forestry, Medicine, and Science, and with industry. ICICS facilitates the collaborative multidisciplinary research of approximately 150 faculty members and 800 graduate students in these faculties. Our members attract approximately $18 million annually in grants and contracts. Their work strengthens Canada's strategic Science and Technology research priority areas, benefiting all Canadians.

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