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at
The University of British Columbia

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Seismic Safety of schools in BC—a top priority

"Are our children safe from earthquakes while at school?"

This is one of the most pressing issues on the minds of BC parents, as the majority of our existing schools have not been constructed to resist earthquake ground motions. The concern is genuine since seismological experts predict that south western British Columbia is overdue for a major seismic event, referred to as "the big one".

Consequently, in 2004, over 850 schools located in 37 school districts were assessed for seismic safety. About 750 of the schools were found to have one or more building components rated at moderate to high seismic risk. The remediation cost for these schools was estimated to be $1.4 billion, using conventional engineering practice. However, the recent escalation in construction costs has increased the estimated cost further.

To address the concern, the BC Ministry of Education announced a 10-15 year, $1.5 billion seismic mitigation program to upgrade the province's at-risk schools. New schools, or any schools retrofitted since 1990, were not considered to be at-risk. These schools were designed in accordance with the 1990 National Building Code of Canada (NBCC), which includes design provisions for buildings in seismic regions. Recently, the NBCC was updated with a 2005 edition, with refined seismic design provisions. If pre-1990 schools were to be upgraded to the provisions of the 2005 NBCC, they would certainly be safe. However, the cost of the retrofits would be so high that only some of the high-risk schools could be addressed. A different approach was clearly needed that would allow for all schools to be upgraded to an acceptable safety level. The new approach needed to be directly applicable to the geological and seismic setting of BC, while recognizing standards of construction practice in the province.

Victoria Secondary School

To direct the research initiative that would lead to this new technology, the Ministry turned to Civil Engineering Professor, Dr. Carlos Ventura. Parents can appreciate that, with an 11-year-old son in the BC school system, this project was a top priority for Ventura. In his 30 year career, Ventura has earned the reputation of being one of the world's top earthquake engineering experts. In addition to being a professor, Ventura is also the Director of the UBC Earthquake Engineering Research Facility (EERF).

The purpose of the research initiative was to develop state-of-the-art standards for the assessment and retrofit of public school buildings. These standards were intended to

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Message from the Head

As I began to reflect on the past year in preparation for writing this message, I was tempted once again to describe the year's events as "business as usual". Although there is an element of truth to this descriptor, I soon realized that it was far from complete in its capturing of the progress made in the Department last year. First and foremost, in 2006 CIVL welcomed another strong cohort of students into our second year program. In fact, the academic averages of our current second year students place them as the top incoming class among all of the engineering programs at UBC. Another milestone related to our undergraduate program was reached with the opening of the Civil Engineering Design Studio. In only one of year of operation, the Design Studio has become a favourite haunt of students, design teams, extracurricular clubs and CIVL faculty members.

Elsewhere in this issue, you will see more regarding the retirements of two of our faculty colleagues, Dr. Sid Mindess and Dr. Ken Hall. Both have made the transition to emeritus status and are still actively involved in the Department's mission. Other developments include that of Dr. Tarek Sayed, who, along with colleagues in the Sauder School of Business, secured funding for a new Bureau of Intelligent Transportation and Freight Security that will be partly housed in CIVL. Progress is also continuing in the Earthquake Engineering Research Facility on the design and installation of the third and most complex of the facility's three shake tables. Visitors to CIVL will also notice that the Department's administrative offices have been slightly relocated and vastly improved in appearance and functionality. Finally, even our gallery of grad composites has been overhauled to give it a more deliberate and prominent place in our inner sanctum.

I would welcome any comments or suggestions that may arise as you read this issue of our newsletter. Please feel free to contact me at ehall@civil.ubc.ca.

Eric Hall,
Department Head

Flashback Do you recognize this face?

In 1956, Dr. Sheldon Cherry was a very recent addition to the faculty complement of the Department of Civil Engineering. A Winnipeg native, Cherry was educated in civil engineering at the University of Manitoba and in structural engineering at the universities of Illinois and Bristol, before taking up the position of Assistant Professor at UBC. His research interests included the broad area of earthquake engineering and experimental studies on earthquake shake tables. This year, in his fiftieth year of service to The University of British Columbia as a Professor and Professor Emeritus with the Department of Civil Engineering, Dr. Sheldon Cherry has been honoured through the establishment of the Shel Cherry Scholarship. This $2,000 scholarship is to be awarded to an undergraduate student in Civil Engineering on the recommendation of the Department.

Seimic Safety... continued from page 1

allow for more efficient retrofits than those prescribed by conventional practice, by making use of performance-based earthquake engineering.

Over the past two years, Ventura and his team in the EERF have been working very closely with the Association of Professional Engineers and Geoscientists of B.C. (APEGBC) on this initiative. The first task of the EERF/APEGBC partnership was to develop a new performance-based tool to replace the procedure used in the 2004 school assessments. One of the shortcomings of the earlier assessment procedure was that it was overly conservative. While conservatism is usually desirable to ensure structural safety, it is problematic in a seismic mitigation program as it makes it difficult to determine priorities for the best use of available funds.

For the last two years, the EERF/APEGBC partnership has been developing a set of seismic retrofit guidelines for BC schools, that take a performance-based approach. This approach is based on sophisticated structural analysis that can predict the amount of damage expected in a building based on local seismic demands. This analysis can also accommodate combinations of structural systems with significantly different dynamic properties. These advances allow for significant retrofit cost-savings over a code-based methodology, while at the same time achieving the desired level of safety.

While the final product, a Retrofit Strategies and Guidelines Manual, is still a year or two away, the application of an interim release called "Bridging Guidelines" is being formally recognized by the Province of BC by the development of a stand alone building regulation for retrofit work on BC schools. The EERF/APEGBC partnership has also trained local engineers in the use of the guidelines through workshops and office visits. The use of these guidelines has now been mandated by the Ministry of Education and recognized by the APEGBC council. The first edition of the Bridging Guidelines was released in 2005 and the second edition will be released early in 2007. The development of the guidelines has been funded by the BC Ministry of Education and Western Economic Diversification Canada.

The new assessment tool developed by the EERF/APEGBC partnership has helped the Ministry to improve the planned retrofit program, by assigning a priority ranking to all high-risk schools. It is anticipated that the implementation of a performance-based, seismic mitigation program could, at the very least, achieve savings of 10% to 20% of the current estimated construction budget. Such potential savings represent a 40-fold return on the investment in the research project. The methodology has the added advantage that it has immediate application to other types of building infrastructure (hospitals, utilities, government and private industry) in both BC and other seismically active regions in Canada.

The EERF/APEGBC partnership's success is the result of synergy between academic researchers and practicing engineers, which encouraged the right number of people to ask the right questions. The funding from the Ministry of Education and the willingness of stakeholders to take a forward-looking approach to earthquake engineering, has brought the performance-based approach to reality.

The research and technical development of this methodology has been carried out under the direction of Dr. Ventura. His project team includes:

Dr. Graham Taylor, Principal of TBG Seismic Consultants Ltd.,
Dr. Kenneth Elwood, Assistant Professor,
Dr. Liam Finn, Professor Emeritus,
Dr. Timothy White, Post-doctoral Fellow, and several graduate students from the Dept. of Civil Engineering at UBC.

The Seismic Risk Assessment Committee of APEGBC established a peer review group of professional engineers to provide feedback on the development of the performance-based methodology. The peer review group includes:

Mr. Andy Mill (Chair),
Dr. Ron DeVall,
Mr. Clint Low,
Mr. John Sherstobitoff,
Mr. John Wallace, and
Dr. Robert Hanson of the U.S. Federal Emergency Management Agency.

The project has also benefited greatly from the insightful comments and critical reviews of two well-known practicing structural engineers in California, **Dr. Farzad Naeim** and **Dr. Mike Mehrain**.

Mr. Peter Mitchell, **APEGBC** Associate Director of Professional Practice, has been coordinating the project.

A true mentor—Rob Third

mentor n.: an experienced and trusted adviser or guide

Reflecting on a career in civil engineering, one can imagine it's very difficult, if not impossible, to be successful without mentors. The help of those established in the field is imperative—offering guidance, technical training, physical resources and/or job opportunities—especially for young people just getting started.

Rob Third is one such mentor. He is one of the most prominent figures in the Canadian steel industry with a career that spans the past 30 years. He is currently the director of local steel fabricator George Third & Son (GTS), a third-generation family-owned and operated company that was founded by Rob's grandfather. Rob has been very active over the years in associations that promote steel construction. His knowledge of the steel industry and his enthusiasm for sharing this knowledge with others is apparent to all who meet him.

For many years, Rob has taken the time to be involved with the UBC Department of Civil Engineering. He has been a guest presenter in the Department on several occasions. Topics have included education in the field of steel structural engineering, recent advances in steel fabrication and construction, and sharing experience gained through the fascinating steel projects that he and GTS have been involved in over the years. These talks, given by a true industry expert, have been influential to many undergraduate and graduate students who gained an understanding of how the theory learned in the classroom is applied to a dynamic array of steel structures.

The Civil Engineering Cooperative (Coop) program has had several placements at GTS over the years, and the students involved have reported very positive experiences with Rob and the company.

"I learned that it is not only safe engineering that matters, but it is also the practicability of the design. In order to become an engineer whose work will be embraced by the rest of the stakeholders involved in a project, your design must be in consideration of these procedures of construction," writes Phyllis Chan of her work term.

The success of the Coop program is highly dependent on companies like GTS and individuals like Rob who see the benefit of providing students with industry experience and then who actively partake in this aspect of student education.

Founded in 1910, Burnaby-based GTS is one of the most prominent steel fabricators in the Pacific Northwest. Prior to becoming a director in 1988, Rob worked in the company as a fabricator, production manager, draftsman, purchasing agent and project manager. The firm specializes in landmark buildings and architecturally exposed structural steel. Recent projects include Seattle's Safeco Field and Seahawks Stadium, and Light Rapid Transit Stations on the Skytrain Millenium Line in Vancouver. The firm maintains a reputation for the highest quality steel fabrication and honest business values. GTS has been the major sponsor of the UBC Steel Bridge Team for the past eight years, and Rob's role as a mentor to the team has been instrumental to its success.

"The Steel Bridge Team has benefited from Rob's experience in steel fabrication through his practical suggestions during conceptual, detail design and fabrication stages," says Mehdi Jalayer, a former team member.

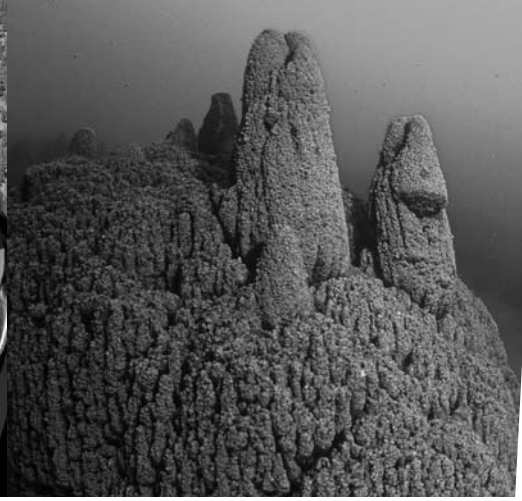
Every year GTS donates many hours of shop time to the team during the fabrication phase. Fabrication is one of the most critical stages of the project, where all the bits and pieces come together to realize the bridge. Most team members lack any practical experience with the fabrication stage.

"Rob's involvement in the project bridges the gap between what's on the drawing board and what is a practical solution to each year's competition," says Mehdi.

Rob is a past National Chairman of the Canadian Institute of Steel Construction (CISC) which promotes the safe, efficient and sustainable use of steel building materials. The branch of the CISC supporting education in engineering and architecture is the Steel Structures Education Foundation (SSEF).

"I had the benefit of being sponsored during my graduate studies by the SSEF during the time that Rob was Chairman. This provided great opportunities to meet with people from various parts of the industry, including steel mills, fabricators, detailers, engineers, architects, and university faculty. Rob's commitment to the industry, continuing education and the respect that those in the industry have for him, were always evident to me," stated Nathan Loewen, another Steel Bridge Team member and recipient of the prestigious G.J. Jackson Fellowship by the SSEF.

Aiden Zadeh (4th year Civil Engineering student, UBC), Donnie Reid (Vancouver Aquarium), and Rebekah Shepard (PhD student, UCDavis) catch up on space shuttle events before exploring the depths of Pavilion Lake. Photo by Harry Bohm.



Intermediate depth (~25m) microbialite in Pavilion Lake. Photo by Donnie Reid.

The Pavilion Lake research project

The Pavilion Lake Research Project (PLRP) forms part of an on-going UBC-NASA led effort to investigate the Mars analogue potential of terrestrial lacustrine carbonates. This project is fuelled by interest in understanding the development, preservation and degradation of carbonates on Mars. It is important to study carbonate formation in a series of lakes in which the formation processes vary, in order to relate the carbonates formed to possible Martian carbonates.

Pavilion Lake has become the first target site of the project, where a combination of hypothesis and exploration driven research is proposed to study the unusual freshwater microbialite ("fresh-water coral") structures found in this lake. These structures are of interest in terms of models of Precambrian reefs and may also be relevant to carbonate formation in ancient lakes on Mars.

Pavilion Lake is approximately 420 km northeast of Vancouver, B.C. and is located on Highway 99 between Lillooett and Cache Creek in Marble Canyon. Travellers have likely driven by and remarked on the beauty of the valley and its lake without realizing what lies within. Its beautiful clear blue waters and microbialite structures have made it a popular destination for recreational and commercial divers. The basin walls of Pavilion Lake are lined with microbialite structures that are oriented perpendicularly to the shoreline, at depths of 5 to 30 meters.

These structures are speculated to have been formed nearly 11,000 years ago after the glacial retreat of the Cordilleran Ice Sheet. Pavilion Lake is within the traditional territory of the Ts'kw'aylaxw people, and the Pavilion First Nations Indian Band holds special heritage and spiritual connection to this lake and its surrounding land. Pavilion Lake was added to the Marble Canyon B.C. Provincial Park system on April 18, 2001 as a means of conserving and managing this biologically and historically important site.

The PLRP is one of three sites within the Canadian Space Agency's Canadian Analogue Research Network and is managed by Professor Bernard Laval of UBC Civil Engineering and Geobiologist Darlene Lim of the NASA Ames Research Centre. The PLRP is currently in its second year of a four-year funding cycle to provide logistical support for research at Pavilion Lake.

Each research year culminates in a two-week intensive field program in August that includes 25 researchers and students from 16 institutions. While in operation this field camp is the largest research dive operation in Canada. Television crews from the Knowledge Network, CBC and the Discovery Channel recorded the activities of the 2005 PLRP field camp. Last year Aidin Zadeh and Joel Atwater from UBC Civil Engineering joined the research project. Joining the PLRP this year from UBC Civil Engineering are Alex Forrest and Yehya Imam who will be studying Pavilion Lake as part of their PhD work.

Dr. Bernard Laval (UBC) and Margarita Marinova (PhD student, Caltech) measuring light levels in Pavilion Lake. Photo by Donnie Reid.

How will your building behave when The Big One hits?

Damage may be intended, but can we predict how much?

The $0.9 million CFI New Opportunities Grant awarded to Drs. Elwood and Haukaas has expanded the earthquake engineering research facilities at UBC with a state-of-the-art "real-time hybrid testing" system. This equipment allows the combination of physical testing and computer-based simulation of structural behaviour. As a result, experimental evaluation of large-scale structural systems at loading rates comparable to those experienced during an earthquake is possible. In turn, this will improve the computer models used to predict the probability of damage and collapse for the building in which we work and live.

The hybrid testing system includes a 1000 kN dynamic actuator with high flow capabilities to enable testing at velocities typical of those experienced during an earthquake. The system facilitates network collaboration between UBC and national/international laboratories. For example, the workstations are used to link to the Network for Earthquake Engineering Simulation (NEES) in the U.S. and a tele-presence server is available to enable remote participation in experiments by UBC.

" That the design of your building 'conforms to code' tells you little about how it will actually perform during an earthquake."

Believe it or not, your home may have been deliberately designed to sustain considerable damage in an earthquake in order for its structure to ride out the shaking. Traditional seismic design is based on allowing the structure to dissipate energy through inelastic action, in other words, damage is expected to ensure structural integrity in an earthquake.

Now cutting-edge research at UBC's Department of Civil Engineering will allow property owners to see how their buildings would react in a major earthquake and provide life-saving information on architectural design, retrofit and perhaps even insurance options.

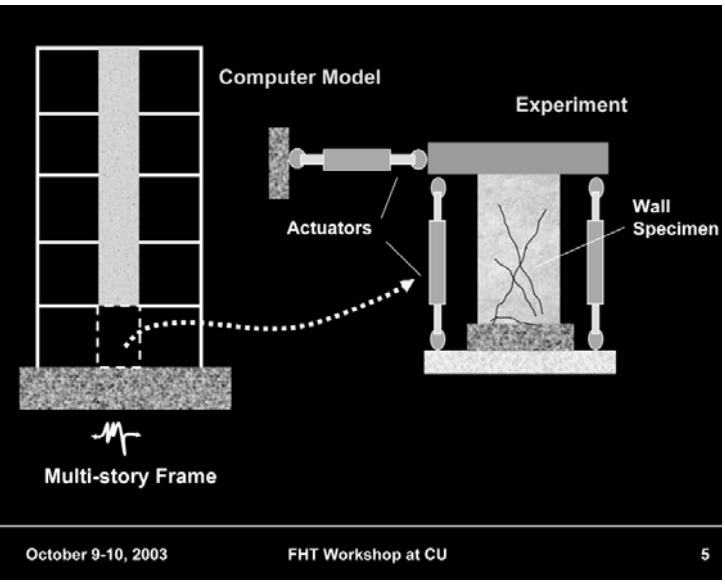
The Lower Mainland of B.C. and the West Coast of the United States sit atop seismically active terrain with potential for hefty earthquakes. In fact, it was reported in the July 2003 issue of *Nature* that the potential zone of rupture along the northern Cascadia subduction zone off the coast of Vancouver Island extends 25-30 km closer to the mainland than previously thought, thereby indicating increased seismic risk in Vancouver and Victoria. The region may see up to magnitude 9 earthquakes—similar to the massive earthquake that struck Indonesia in December 2004.

How will your building behave when the earthquake hits? Will there be damage? Is there a chance of collapse?

Researchers in the UBC Civil Engineering Structures Group are working towards a future in which the structural engineer may simulate the actual behaviour of buildings on a computer. This vision is a significant departure from the current engineering practice in which design codes hold a dominant place. These code documents, set forth by code committees to ensure life safety in expected extreme loading events, offer limited information about how a specific structure will fare. "That the design of your building 'conforms to code' tells you little about how it will actually perform during an earthquake" says Dr. Ken Elwood, Assistant Professor of Civil Engineering. "Questions about downtime and repair costs are critical to many business owners and our goal must be to provide such information based on state-of-the-art research," he asserts.

The problem of unforeseen structural behaviour has been apparent in numerous earthquakes around the globe. For example, the 1994 Northridge Earthquake in Los Angeles led to few fatalities but was one of the costliest disasters in U.S. history with an economic loss of $40 billion. This was at odds with the expectations of owners and the public and indicates that our question of actual structural performance is a challenging one.

“ It has been said that everyone believes in the experiment, except the one who performs it, while no one believes in the computer analysis, except the one who runs it.”



By having information beyond today’s answer that “your building conforms to code” one can decide whether to live with the risk and the projected damage or spend money on retrofit or improved insurance options. Structural simulation capabilities would also help the code committees to refine the code provisions without having to wait for an earthquake to bring out weaknesses in current practice.

The development of reliable computer models to predict seismic damage poses several challenges. It has been said that ‘everyone believes in the experiment, except the one who performs it, while no one believes in the computer analysis, except the one who runs it.’ The members of the Structures Group aim at shifting this attitude through a comprehensive linking of computer simulation research with results from the cutting-edge Earthquake Engineering Research Facilities (EERF) at the UBC-Vancouver campus.

The pioneering efforts at UBC are carried out along several axes. One recent and exciting development is the $0.9 million CFI New Opportunities Grant received by Elwood and Dr. Terje Haukaas for a project entitled Real-time Hybrid Control for Large Scale Seismic Testing. With this funding, UBC has procured a state-of-the-art real-time hybrid testing system which combines physical testing and model-based simulation, enabling experimental evaluation of large-scale structural systems at loading rates comparable to those experienced during an earthquake.

Currently, the vast majority of earthquake engineering experiments are conducted on individual structural *components* subjected to slowly varying *static* loads. In contrast, earthquakes subject entire structural systems to dynamic loads, resulting in a complex interaction between components not captured by most experiments.

“ Even with the most sophisticated computer models we can only predict structural behaviour in a probabilistic manner.”

Until recently, entire structural systems could only be tested by mounting specimens on shake tables capable of reproducing the ground movement during an earthquake. For such tests, however, small-scale specimens are normally required due to the limited size of shake tables.

Recent advances in computing and hydraulic control capabilities have led to the development of the real-time hybrid testing method, a combination of physical testing and model-based simulation capable of testing large-scale structural systems at rates comparable to those experienced during an earthquake. The real-time hybrid testing method requires only the most critical portion of the structure to be physically tested in the lab, while the remaining structure is modeled numerically on a computer. The combination of the real-time hybrid testing system and the state-of-the-art multi-directional shake table at the CFI-funded Earthquake Engineering Research Facility (EERF) at UBC is unique in Canada, and establishes the university as an international leader in earthquake engineering research.

A novel aspect of the computer simulation research at UBC is the recognition of uncertainties. “Even with the most sophisticated computer models calibrated through hybrid testing it is only possible to predict structural behaviour in a probabilistic manner,” says Haukaas, Assistant Professor of Civil Engineering.

Although the engineering specifications for a building are precise, there is unavoidable uncertainty associated with the actual outcomes of the material and geometry parameters and the accuracy of the numerical models themselves. There is of course also significant uncertainty in the characteristics of the actual ground motion that the building will encounter.

A unique initiative in the Structures Group is the merger of the advanced computer simulation models with probabilistic analysis. Instead of providing deterministic answers, the uncertainties are recognized and the results are presented as the probability associated with different damage scenarios. “As we incorporate more experimental and analytical information into our simulation models, the uncertainty in the result is reduced. As a result, we can provide the owners and the public with more precise damage estimates. The important point is that we must be upfront about the uncertainty in the predictions,” says Haukaas.

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Editor/events coordinator studies civil engineering

Student changes career-path for altruistic reasons

Michelle Murphy hails from Vancouver and holds two degrees, a Bachelor of Arts in English and Political Science from the University of Western Ontario (London, ON) and a Master of Journalism from Carleton University (Ottawa, ON).

After graduating, Murphy worked for four years as an editor and events coordinator in Haifa, Israel, at the Baha'i World Centre, the spiritual and administrative centre for the worldwide Baha'i community. This afforded her the opportunity to interact with many people from different cultures and backgrounds (the 700 staff members came from approximately 70 different countries); fueling her long-term interest of contributing to the betterment of humanity and expanding her knowledge of world issues, political and social processes and economic progress, especially in developing countries.

Upon her return to Canada, Murphy found employment with documentary production companies. One of her duties was to review stock footage of NASA training videos including life aboard the shuttle. Watching this footage, she realized that the astronauts were extremely talented, intelligent engineers whose profession would have an everlasting impact on humanity and she realized she wanted to do more than just write or record world issues—she wanted to get involved and make a positive impact on society.

Moving forward with tremendous determination, she spoke with several civil engineering friends about their profession, arranged meetings with UBC Professors Bruce Dunwoody and Susan Nesbit, signed up for Grade 12 Chemistry (missing from her high school diploma and a pre-requisite for university) and finally enrolled in two refresher courses at a community college for math and physics.

In no time, she was back in post-secondary education, with a purpose and goal—to become an engineer. Due to her interest in development that had been nurtured in Israel and her newly-opened eyes to environmental civil engineering, she became involved with Engineers Without Borders—a non-profit group that believes engineers can have a beneficial impact on humanity by providing such simple things as clean water, electricity or irrigation. She is currently the President of the UBC chapter.

Murphy's first two co-op work terms (totaling 8 months) were spent with EnCana in Drumheller, Alberta, as a field operator in the natural gas sector, responsible for the maintenance of natural gas wells and the booster/compressor sites.

For her third co-op work term, Murphy is currently working in downtown Vancouver with SRK Consulting; an international company whose B.C. office is primarily dealing with mine site remediation.

This is a perfect match as there is a large environmental component which is assisting Murphy in achieving her altruistic goals. She is involved in such projects as the clean up of old mine sites that are no longer functioning; putting soil covers over tailings ponds; the installation of tailings dams; re-vegetation and decontamination of water.

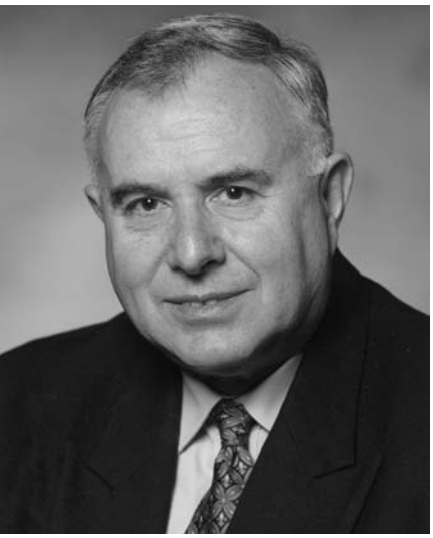
Her duties include gathering and analyzing data for a water balance of a mine site in Peru, writing specifications for the clean up of a site in Nunavut and manipulating many large excel spreadsheets. Before returning to her academics, Murphy, as the sole representative for SRK, will spend the last three weeks of August near Courtenay on Vancouver Island, supervising the reshaping of a coal pile in order to prevent erosion and to re-establish a river which will provide a safe habitat for fish.

Both the academic courses and co-op work terms of her education in civil engineering are providing Murphy the opportunity to achieve her goals of building an improved environment that will have a lasting impact upon society.

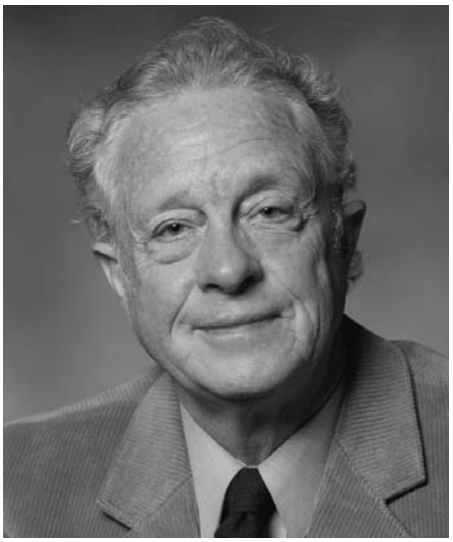
From the staff of the Engineering Co-op office, Michelle, we are delighted to have you in our program and look forward to coordinating and working with you during your final two co-op work terms in 2007.

Retirements

The closing of the year 2005 marked the retirements of two of our long serving Civil Engineering colleagues, Sidney Mindess and Ken Hall.



Sid Mindess arrived at UBC in 1969 after completing his PhD research at Stanford University. Over his subsequent 36 year career as a UBC faculty member, Mindess's achievements in the field of civil engineering materials made him widely known and highly respected at the international level. The experimental facilities developed by Mindess at UBC were by far the best in North America dedicated to the impact resistance of concrete. Indeed, in 1995, UBC constructed a larger version of Mindess's testing machinery for Pennsylvania State University, where these are now installed and in routine use. The UBC facilities remain one of the few laboratories in the world equipped to carry out precision impact testing. Mindess' worldwide reputation opened opportunities for him to work at the Technion in Israel, Imperial College in London, the University of Illinois and in Peru and Cuba. At UBC, his teaching contributions at the undergraduate and graduate levels transformed the Department's instruction in civil engineering materials. In particular, the development of a hands-on, project-based approach to laboratory testing, resulted in the innovative CIVL 322. This core course utilizes experimental work in UBC's state-of-the-art materials laboratory, along with site visits and external consultations, to bring all civil engineering undergraduates into the materials field. As an undergraduate teacher, Mindess is highly regarded outside of UBC for his widely utilized textbook with the title that says it all—*Concrete*. In his final year as a full time faculty member at UBC, Mindess' career achievements were celebrated by his peers through the organization of a tribute symposium "Concrete: Bridging Materials and Structures", held in Vancouver in August, 2005.



Ken Hall was always a unique member of the Department of Civil Engineering, perhaps most notably due to the fact that he was the sole chemist in a department of engineers. Hall first came to UBC as a post-doctoral fellow in 1970 at the Institute of Resource Ecology in the Faculty of Graduate Studies. Subsequently he became a full time faculty member with a joint appointment in Civil Engineering and the Westwater Research Centre (Faculty of Graduate Studies). Hall's teaching contributions were largely targeted at the graduate level, dealing with topics such as chemical analysis, water pollution engineering and watershed management. Hall's most enduring research passion was focussed on his famous "meromictic saline lake", better know to some of us as Mahoney Lake, in south central B.C.. Together with his colleague Tom Northcote and a long list of graduate students, Hall reported one scientific finding after another from Mahoney Lake, routinely demonstrating previously unheard of chemical and biological phenomena. Hall's other research endeavours did not go unnoticed. His co-authored 1986 paper on the biochemistry of the enhanced biological phosphorus removal process was recently named as one of only 10 "groundbreaking papers" published in the journal *Water Research* for the 40 year period 1967–2006. As a newly minted Professor Emeritus, Hall now conducts his academic activities from his new home base in Penticton, to which he and his wife Shannon relocated earlier this year.

How will your building behave... continued from page 7

As an example, building owners will be provided with the probability that a building will sustain damage in excess of x thousand dollars in the next earthquake. If this probability is small, the owner may decide to remain with the status quo. If it is, say, 50% then the decision might be different. So, although damage may indeed be intended for a building to sustain seismic forces, we are entering an era in which information about the extent of damage and the associated costs and repair times can be provided. From there, *owners* and the rest of the general public can make decisions about what is acceptable and in turn, influence future design standards.

People
Meet the faces of Civil Engineering at UBC

Dr. Violeta Martin has been with the department since June 2003. Initially, she was working on several research projects as a post-doc and a research associate, and she was also responsible for overseeing the day-to-day operation of the Hydraulics Laboratory. She started teaching hydrotechnical courses as a Lecturer in September 2005, and has taught Environmental Hydraulics, Fluid Mechanics I, Fluid Mechanics II, and the lab section of Hydrology and Open Channel Flow.

After completing her B.Sc. in Civil Engineering with a major in Hydrotechnical Engineering at the University of Novi Sad in former Yugoslavia, Martin worked with the Capital Investments Group for the regional waterworks company. She moved to Canada in 1993 and later pursued her graduate studies at UBC, earning an M.A.Sc. and a Ph.D. in Civil Engineering. Her graduate research consisted of experimental and analytical modelling work that investigated the resistance to flow in open channels, the development of the bed-water interface, and the development of velocity profiles in gravel-bed rivers.

Martin's work continued within the department with post-doctoral work on modelling pollutant spreading in a drinking water reservoir. This was followed with research examining the interaction between streambank erosion and forest growth, and the adequacy of fixed width stream buffer zones for maintaining large woody debris (LWD) inputs to stream channels. Besides enjoying her teaching engagements, she is now working towards renewing and upgrading the aging equipment in the Hydraulics Laboratory for both teaching and research needs.

Greg Johnson MAIBC, P.ENG., LEED® AP, Adjunct Professor
After obtaining his Bachelor of Applied Science in Mechanical Engineering from UBC in 1974, Greg Johnson worked a short time in the field of engineering before continuing his studies at the University of Montreal, obtaining a Bachelor of Architecture in 1977 and Masters of Applied Science in 1980 on an NSERC Postgraduate Research Scholarship. His research included analysis of wind and snow-drifting effects around buildings.

Returning to Vancouver in 1981 he became involved with issues of sustainability applied to building design, including building energy performance analysis, passive and active solar design. He worked with a number of prominent local architects, playing a key role in major projects, many of which gained recognition through design awards.

With the extensive building envelope failures in the Lower Mainland region, he further expanded his expertise into the area of building science, undertaking building envelope consulting, remediation and teaching. He obtained his LEED professional accreditation, and continues to place a major emphasis on energy performance, envelope durability and sustainability issues in all the projects in which he is involved.

Since the early 1990's, he has had his own architectural practice with several partners. At present he splits his professional time between his current architectural practice as a principal in *Marceau Evans Johnson Architects*, a firm specializing in institutional projects whose clients include School Boards and many First Nation communities throughout the province, and teaching at UBC, where he instructs in the School of Architecture & Landscape Architecture and the Department of Civil Engineering. He has been teaching the joint Civil/Wood *Building Science –Enclosure Design* course since 2002.

Dr. Dave Forgie, P.Eng. was appointed as an Adjunct Professor in Civil Engineering in 2003. He holds a B.Sc. in Civil Engineering (1972) and M.Sc. in Sanitary Engineering (1975) from the University of Saskatchewan and a Ph.D. in Environmental Engineering (1983) from the University of Toronto. After completing his M.Sc. research work, Forgie worked for Environment Canada in the Northern Technology Development group out of Edmonton investigating innovative solutions to northern wastewater and solid waste management problems in advance of the proposed Mackenzie Valley pipeline.

Following Environment Canada, Forgie was enticed to return to the University of Saskatchewan in Saskatoon as an Assistant Professor in Civil Engineering. In the following years, he taught environmental engineering, wastewater treatment, solid waste management and hazardous waste management undergraduate and graduate classes. He also conducted research into cold temperature rotating biological contactor wastewater treatment and sanitary landfill leachate collection and treatment. During the 15 years Forgie was on the U of S faculty, he spent three years on education leave to complete his Ph.D., advanced to Associate Professor and completed a one year sabbatical (1986-87) in Europe investigating landfill leachate treatment. Forgie authored several conference and refereed journal papers while at the U of S.

Eventually, Forgie joined Associated Engineering in Vancouver, in June 1990 where he has remained. Since then, he has worked on numerous wastewater and solid waste management projects in Western Canada and Ontario and around the world including Bermuda, Sri Lanka and Vietnam. This work has included liquid and solid waste management planning studies, conceptual and preliminary wastewater treatment plant designs, landfill siting and design, leachate treatment, biosolids management including composting and odour control. Forgie also developed and taught several wastewater treatment courses for BCIT's Bachelor of Environmental Engineering Technology program between 1993 and 2003. He has also been active in the BC Water and Waste Association (BCWWA) and was the Wastewater Committee chair from 2002 to 2006. During that time, he was the technical committee chair for the very successful 2nd Canadian Organic Residuals Recycling conference in Penticton in 2003.

Since being appointed as Adjunct Professor, Forgie has been involved in one Ph.D. committee, and has made presentations at undergraduate environmental engineering classes. He hopes to be able to use his experiences in academia and consulting to further contribute to the UBC Environmental Engineering program in the coming years.

Katherine Thibert graduated from the University of Western Ontario with a Bachelor's of Engineering Science Degree in Civil Engineering. She began her studies at UBC in the fall of 2004 under the supervision of Dr. Carlos Ventura and is currently working on a Master of Applied Science Degree. Her research involves seismic risk assessment for the Joint Infrastructure Interdependencies Research Program (JIIRP). There are 6 groups across Canada involved in JIIRP, with UBC receiving the largest amount of funding. Civil Engineering is playing a key role in the effort to secure Canada's infrastructure from threats and vulnerabilities that have increased as infrastructure components have evolved in complexity and interconnectedness. Thibert has also done work with Microtremor measurements, which are used for estimation of dynamic site properties. She is an active member of UBC's Earthquake Engineering Research Institute Student Chapter, where she currently has the position of Outreach Commissioner.

Events & Achievements

The undergraduate Civil Club announced that Professors Reza Vaziri, Rob Millar and Don Mavinic were selected as the 2005/2006 Top Professors in our 2nd-, 3rd- and 4th-year programs, respectively.

Professor Carlos Ventura was a successful co-applicant on a funding award from NSERC's Joint Infrastructure Interdependencies Program (JIIRP) for the project "Decision Coordination for Critical Linkages in a National Network of Infrastructures." This is the first research grant awarded to a civil engineering professor under the JIIRP program.

Professor Carlos Ventura was honoured with the 2006 Meritorious Achievement Award by the Association of Professional Engineers and Geoscientists of British Columbia. The award was presented in Victoria at APEGBC's President's Awards Gala, held in October.

Professor Emeritus Liam Finn presented the 10th Mallet-Milne Lecture, sponsored by The Society for Earthquake and Civil Engineering Dynamics in London. The topic of the day was "A Study of Pile during Earthquakes: Issues of Design and Analysis."

Professor Nemy Banthia has been elected Fellow of the Indian Concrete Institute, one of the world's largest professional bodies devoted to concrete materials and structures with over 50,000 members worldwide.

Professor Sietan Chieng was recognized with the Jim Beamish Award by the Canadian Society of Agricultural Engineering at its 2005 Annual Conference.

Professor Emeritus Peter Byrne was the winner of the 2005 Mayerhof Award of the Canadian Geotechnical Society, for significant and outstanding contributions to the art and science of foundation engineering.

Professor Rob Millar and colleagues from the Department of Geography were recognized with the 2005 BGRG Wiley Award by the British Geomorphological Research Group, for their paper published in the journal Earth Surface Processes and Landforms.

A successful Noel Nathan Memorial Lecture in structural engineering was held on September 19, 2005 at UBC Robson Square, with guest speaker Professor Jack Moehle of the University of California at Berkeley. Professor Emeritus Don Anderson offered words of recognition and remembrance of Noel and Professor Emeritus Bob Sexsmith served as Master of Ceremonies, in addition to his role as Chair of the Organizing Committee.

Professor Nemy Banthia's international conference, CONMAT '05, was successfully staged in Vancouver in August 2005. Conference events included a special symposium and associated social activities held to honour Professor Sidney Mindess for his lifetime of contributions to the area of civil engineering materials.

Professor Ken Elwood, with graduate students Sahar Safaie, Chris Meisl and Rishi Gupta, presented a special seminar to the department entitled "2004 Great Sumatra Earthquake and Tsunami: Damage and Reconstruction." The group reported on observations made during their reconnaissance trip to northern Sumatra to document the earthquake and tsunami damage to structures and the process of reconstruction.

Professor Nemy Banthia has been appointed to a Tier 1 Canada Research Chair in Infrastructure Rehabilitation and Sustainability. The Chair recognizes Banthia's outstanding contributions to research on cement-based materials and microfibre-reinforced cement composites for civil applications.

Professor Sheryl Staub-French has been appointed the inaugural Marshall Bauder Professor in Engineering and Economics. The Bauder Professorship was established with the goal of enhancing education in engineering economics within the Faculty of Applied Science.

Professor Loretta Li and her co-authors were recognized with the Geoenvironmental Award for 2006 by the Canadian Geotechnical Society. The award was based in part on an outstanding technical paper presented at the 2005 Annual CSCE Conference. Li was also awarded a short-term Invitation Fellowship by the Japan Society for the Promotion of Science, for working visits to Kyushu University, Kagoshima University and Kyoto University.

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