

Completion Report:

Canadian Student Biomedical Engineering Conference



February 22-23, 2002
University of Manitoba, Winnipeg



Why Biomedical Engineering?

As technology pushes further and further, the potential of technology to solve the urgent medical and biological challenges of today continues to grow. Achieving this potential as a society requires motivated and trained professionals with the skills and knowledge to bridge the gap between technology and biology. Engineers are trained to solve problems in a variety of disciplines and use current technology to meet the challenges in not only their own field but also in other related fields. This unique education, coupled with a dedication to solving humanity's challenges make engineers ideal candidates to lead the fight against medical crises of tomorrow. Medical technology will see a sharp increase in development as society shifts focus to caring for our aging population.

University of Manitoba Showcase

The University of Manitoba has significant expertise in biomedical areas such as medical imaging, biomedical signal processing, prosthetics, and bioinformatics. Hosting the Canadian Student Biomedical Engineering Conference gives the U of M a chance to showcase local expertise as well as giving a chance for students at all levels to share research and design work with other students, industry representatives, and researchers. The conference gives students a perspective on the many opportunities that a University of Manitoba degree opens for them. Moreover, the conference establishes the University of Manitoba as a leader in biomedical research in a field that's on the cusp of tremendous growth.

Participants

The conference was attended by students from the University of Manitoba, the University of Calgary, and the University of Waterloo. Students came from a variety of backgrounds, from electrical, mechanical, civil, and biosystems engineering to physics and biology and included both undergraduate and masters students.

Fariborz Hashemian (P.Eng.) from the Association of Professional Engineers and Geoscientists of Manitoba (APEGM) and Arthur Quanbury (BSc., MSc., P.Eng.), an assistant professor in Occupational Therapy, graced the conference with topical lectures.

Mr. Hashemian is a structural engineer and has been with Acres Manitoba Limited for over two years. He received his B.Sc. in Civil Engineering from the University of Manitoba, where he is currently enrolled as a part-time graduate student. He has been involved in the design and construction of several highly advanced research laboratories, hospitals, correctional facilities and schools over the past few years as both a structural design engineer and inspector. In the past two years he has focused on layout and design of superstructures of hydroelectric generating stations. His experience also includes extensive research in the field of masonry, which resulted in the development of a new water-resistant concrete block.

Mr. Hashemian discussed the process of becoming an Engineer in Training (EIT) and its benefits, as well as the importance of the Association of Professional Engineers and Geoscientists of Manitoba (APEGM) and the EIT program. Also, he discussed his personal experience with APEGM, other EITs, and his life as a structural/civil engineer currently working at Acres Manitoba Limited.

Mr. Quanbury is an Electrical Engineer with over thirty years experience in biomedical engineering. He is an assistant professor and has been the director of many Biomedical Engineering Service Centres, including the Rehabilitation Centre for Children here in Winnipeg. He currently is involved with teaches occupational therapy students at the University of Manitoba's Bannatyne Campus.

Mr. Quanbury began his lecture by describing how engineers can provide unique contributions to biology and medicine. These can range from applying engineering theories and principles to understanding the actions of various biological systems (bioengineering) to working with occupational therapists and other members of a clinical team in order to design, modify and apply assistive technology devices to improve the quality of life of a person with a physical disability (rehabilitation engineering). As an overview to this broad range of involvement, Mr. Quanbury reviewed the range of projects and activities in which he has been involved during his career as a biomedical engineer. This provided a perspective to students contemplating a career in this area and allowed them to see the wide scope of engineering activities that are possible. He showed how engineering involvement in biology and medicine changes and develops as engineering knowledge and technology advances, thereby presenting new solutions to the challenges in these areas. He concluded that an effective biomedical engineer must have and maintain a solid background in a primary engineering discipline in order to recognize potential new solutions as they present themselves.

Dean Kriellaars, Ph.D. gave a 3-hour workshop on applying Global Positioning System (GPS) to biomedical research. The workshop included the basic elements of Global Positioning Systems and their various applications. Beautiful weather conditions allowed participants to gain hands-on experience with the GPS units outdoors.

Dr. Kriellaars started his academic pursuits in the Faculty of Physical Education and Recreation Studies at the University of Manitoba, where he





undertook undergraduate studies in biomechanics and exercise physiology. He then went on to complete a Master's degree under the supervision of Carol Putnam at Dalhousie University, specializing in the study of the control of rapid swinging motions, and the development of three-dimensional motion analysis systems and algorithms. During this time, he established a hardware and software development company for biological signal acquisition and analysis. This company, now known as Isodyne Inc, has developed and commercialized miniature EMG amplifiers, high-speed data acquisitions systems, software tools for the global positioning system and numerous signal and image analysis software systems.

In 1984, Dr. Kriellaars undertook his doctoral work in neural control of movement in the Spinal Cord Research Centre at the University of Manitoba under the supervision of Dr. Larry Jordan. In 1987, he began his academic and teaching career in the School of Medical Rehabilitation in the Faculty of Medicine where he established the Human Performance Laboratory. Dr. Kriellaars is a Principal Investigator of the Spinal Cord Research Centre, as well as an Associate Professor in the Department of Surgery, Faculty of Medicine, the Faculty of Physical Education and Recreation Studies, and is an adjunct professor in the Department of Physiology. Dr. Kriellaars research is directed at understanding the neural control mechanisms underlying injury and disease, and to the development and assessment of treatment and prevention of these injuries and diseases.

Dr. Kriellaars is a member of the Society for Neuroscience and is a Professional Fitness and Lifestyle Consultant with the Canadian Society of Exercise Physiologists. Dr. Kriellaars has served the Sport Medicine Council of Manitoba for over a decade. He was also the President of Biathlon Manitoba, as well as the Chair of Biathlon Canada.

Dr. Kriellaars has been awarded two major university teaching awards, as well as national and international awards for scientific research and innovation. Dr. Kriellaars received two University of Manitoba Presidential Outreach awards for his community work. In May 2000, Dr. Dean Kriellaars and Dr. Jonathan Geiger co-founded the Centre for Substance Use in Sport and Health (SUSH); a federally-funded nonprofit organization. Dr. Kriellaars has served on a number of local, national and international committees and advisory Boards.



Events

Tour of The Health Sciences Centre

Conference participants attended a tour of several facilities in Winnipeg's Health Sciences Centre. Stops on the tour included Clinical (Biomedical) Engineering, Rehabilitation Engineering, and the Pain Clinic.

Clinical Engineering

The Clinical Engineering Department, formerly Biomedical Engineering, is responsible for technology planning and life-cycle management of patient care equipment at Health Sciences Centre. The department's engineers, technologists, and machinists provide a host of technical services to virtually all patient care areas of the Centre including operating room, critical care, cardiac cath lab, and neurophysiology in both adult and pediatric settings.

The tour showed the facilities of the hospital-based clinical engineering department, illustrate the kinds of activities undertaken by engineers, technologists, and machinists, and exposed attendees to a few pieces equipment used in patient care.

Rehabilitation Engineering

The tour began with the EMAT (Electronics and Mechanical Assistive Technologies) program in the electronics lab, where devices to enhance the independence of persons with disabilities are designed, built and maintained. An example project is a simple beeper for calling an attendant. Many others are based on programmable micro-controller technology. The tour continued with an overview of Prosthetics and Orthotics (Artificial Limbs and Braces). The manufacturing process was described in the lab. The tour concluded in the EMAT mechanical shop where devices such as special grab bars to reduce effort in automotive steering are developed. Samples and work in progress were seen in each area.

Pain Clinic

The Pain Clinic is a new establishment at the Health Sciences Center. It deals with the treatment of pain in various forms, including the tens unit and more invasive measures such as spinal treatments.

The Tour Guides

Mr. Petr Kresta
M.H.Sc., P.Eng.

Mr. Kresta is the Director of the Clinical Engineering Program in the Winnipeg Regional Health Authority as well as the Director of Clinical Engineering at the Health Sciences Centre.

Bill Brereton

Mr. Brereton has a B.Sc.(Mech. Eng.) from the U.of M. and a M.Sc.(Bioeng.) from the U.of Strathclyde in Glasgow, Scotland. He works in the EMAT program, primarily as part of the electronics team. He also consults with the mechanical group as necessary.

Dr. Nelson Svorkdale

Dr. Svorkdale was a major factor in bringing the Pain Clinic to Winnipeg's facilities, as he worked in the established Pain Clinic in Norway.

Design Challenge

The **Challenge** was to design an ergonomic keyboard. Background material on various disabilities and keyboard related injuries encouraged students to focus on the potential end users of their design. Each of the four teams developed, designed, and prototyped an innovative and unique new keyboard concept. Teams targeted blind, arthritic, and typical users. New ideas include natural hand posture and position, wrist support, integrated mouse, larger keys, duplicate common keys for slow fingers, soft key press force, raised brail markings,



Group 2's keyboard was targeted at arthritic typists who have slower and less dexterous fingers.



University of Manitoba and University of Waterloo students work together on the natural hand position keyboard with integrated mouse, which went on to win the design challenge.

duct tape, wire, string, plastic canvas, and access to various tools, including saws, soldering iron, glue gun, and dremil tool, volt meter.



One prototype was even soldered to operate with the modified keys, designed and built in less than 2 hours.

EMBS Information

The conference incorporated two EMBS information sessions. Many students attending the conference were experiencing their first exposure to EMBS. University of Manitoba students were curious about the activities and services offered by our local student chapter. This was closely tied to the interests of students from other universities, who inquired about the steps involved in starting EMBS student chapters and clubs. Round table brainstorming sessions brought to light many fresh and innovative ideas to better serve students interests through EMBS student chapters and through the Canadian Student Biomedical Engineering Conference.

Social Events

In addition to the many educational proceedings of the conference, delegates had the chance interact in a less serious setting at evening social activities each night. Friday night was a tour of popular Winnipeg night spots, while Saturday night saw conference goers enjoying an evening of glow bowling at Academy Uptown Lanes.





Feedback

Verbal feedback from conference-goers was very encouraging. However, we felt that a more formal evaluation should be conducted. Students were asked to rate several aspects of the conference on a scale of 1-5. Participants in the survey voted that conference overall should get a rating of 4.5, with the average across all questions being 4.3. Students suggested that the conference be extended and include more tours, as well as more interaction with potential employers and engineers working in the field of biomedical engineering.

Sponsors

The organizers and participants of this year's conference would like to thank the event's sponsors for making this valuable experience possible with their generous contributions:

- *Univeristy of Manitoba Alumni Association*
- *University of Manitoba Faculty of Engineering Endowment Fund*
- *University of Manitoba Student's Union*
- *The Faculty of Engineering*
- *IEEE Winnipeg Chapter*
- *University of Manitoba Book Store.*

Conclusion

The first annual Candadian Student Biomedical Engineering Conference was a decisive success. Not only did the conference provide students with a valuable educational experience, it exposed biomedical engineering strengths at the University of Manitoba and associated agencies. The Conference also strengthened the local Student EMBS Chapter and opened the door for a second conference, initiating an annual event for students across Canada.

Some words of encouragement from conference participants:

"This was an excellent conference."

"GOOD WORK!"

"You've started well, and continue to do a great job."

"I had a great time."

"Thanks to all who organized, ran and went out of their way to make it all happen."