THE ENGINEERING INSTITUTE OF CANADA
and its member societies

L'Institut canadien des ingénieurs
et ses sociétés membres

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ENGINEERING HISTORY PAPER #76

"CMBES 50th Anniversary Commemorative Journal – 1965 to 2015"

By CMBES & The Willow Group

February 2019

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EIC HISTORY AND ARCHIVES

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CMBES/SCGB

CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY

50TH ANNIVERSARY

COMMEMORATIVE JOURNAL

1965 • Years • 2015

FEBRUARY 2019

The Canadian Medical and Biological Engineering Society
50th Anniversary Commemorative Journal

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CMBES/SCGB

Knowledge • Exchange • Networking

50

1965 • Years • 2015

WELCOME MESSAGES

Welcome Message from the Minister of Health

As Minister of Health, I am pleased to welcome readers to the Canadian Medical and Biological Engineering Society's (CMBES) 50th Anniversary Commemorative Journal.

Innovation in our health system is critical to improving patient care, achieving successful outcomes and strengthening health system performance. It is vital to ensuring that our health system continues to evolve to meet the changing needs of Canadians and that Canadians are able to access the care they need, where and when they need it.

I would like to commend the CMBES for its contributions to innovation, and for its commitment to advancing medical technologies that will improve the health of Canadians.

I wish the society and its members all the best as it marks this important milestone.

Ginette Petitpas Taylor

The Honourable
Ginette Petitpas Taylor, P.C., M.P.

Salutations de la Ministre de la Santé

À titre de ministre de la Santé, c'est avec plaisir que je souhaite la bienvenue aux lecteurs de cette revue commémorative du 50e anniversaire de la Société canadienne de génie biomédical.

L'innovation au sein de notre système de santé est essentielle pour améliorer les soins aux patients, atteindre des résultats positifs et renforcer le rendement du système de santé. Elle est cruciale pour garantir que notre système de santé continue d'évoluer afin de répondre aux besoins changeants de la population et que les Canadiennes et les Canadiens puissent avoir accès aux soins dont ils ont besoin, où et quand ils en ont besoin.

Je tiens à féliciter la Société canadienne de génie biomédical pour ses contributions à l'innovation et pour son engagement à faire progresser les technologies médicales qui amélioreront la santé de la population canadienne.

Je transmets à la Société ainsi qu'à ses membres mes meilleurs vœux à l'occasion de ce jalon important.

Ginette Petitpas Taylor

L'honorable
Ginette Petitpas Taylor, C.P., députée

WELCOME MESSAGES

Welcome Message from the CMBES President

Many thanks to Past President, Martin Poulin for keeping this journal on the radar over the last 3 years. See his message below.

Mike Capuano, CBET, CCE, fCMBES
President, CMBES

Welcome Message from the CMBES Past President

Welcome to the commemorative journal to celebrate the 50th Anniversary of the Canadian Medical & Biological Engineering Society.

As Past President of CMBES, I am extremely pleased to present this special publication to celebrate the CMBES's excellence in medical and biological engineering over the past 53 years. It's an honour and privilege to highlight the activities and accomplishments of the many esteemed members and colleagues who made a difference. I would like to thank members of the CMBES Publications Committee and all of those who have contributed to this edition.

53 is a significant number of years for a Canadian society to be incorporated. I'll have to admit I was a twinkle in my mother's eye when the organization was formed. I have to congratulate the foresight of our founding executive led by Dr Jack Hopps to create a society to facilitate the sharing of ideas and issues on a national basis.

Biomedical Engineering has evolved tremendously since the inception of our society along with the exponential growth of computer technology in the last 25 years. The profession continues to evolve and gain identity among the general public; although, I still have to explain to most people what a Biomedical Engineer does for work. Even our title has evolved into different sub disciplines such as Bio Engineer, Clinical Engineer, and Health Technology Manager, to name a few.

Medical technology has advanced at a tremendous rate over the last 50 years. We've gone from mercury thermometers and sphygmomanometers to electronic vital signs monitors that automatically check your blood pressure, temperature and oxygen saturation, then sends the data to the electronic health record. Remember when X-ray's were produced on film and displayed on light boards; now most diagnostic imaging departments operate with direct digital detectors.

The gender balance in the profession has changed as well over the years. At one point, engineering was a very male dominated profession. Now women have become a large proportion of the workforce in both the research and support roles.

Our organization started with a strong academic focus, but thinned out when individuals branched out to other societies more focused on their particular discipline. Biomedical Engineers working within healthcare (Clinical Engineers) have continued to be the core of the society for many years, but I believe it's essential to have researchers, clinical practice and industry partners in the same group to facilitate the improvement of healthcare technology. To that end, there has been a focus in the latter 10-15 years to ensure we hold an annual national conference that provides a forum for all 3 groups of people. We have also been trying to ensure we are a national society that promotes both official languages. The Clinical Engineering Standard of Practice and the CMBES/SCGB Brochure have only been translated into French this past year.

So take a look at some of the history and achievements we've made as a profession in this journal over the last 50 years. Ensure that you marvel at the past and dream about what the profession will look like in the next 50 years; Better yet, become a part of it.

M.Eng., P.Eng.
Past President, CMBES/SCGB (2014 - 2018)

Message from the Task Force Chair

Fellow colleagues, as we mark 50 years of the Canadian Medical and Biological Engineering Society with this 50th Anniversary Commemorative Journal, we pause to recognize and acknowledge our founding visionaries who built the CMBES from humble beginnings. We also recognize the role models who have continued to carry the torch and set a path for the Society's evolving roles. We take this opportunity to reflect on the successes of the Society and future opportunities.

This journal was born out of the pride and passion of the CMBES 50th Anniversary Commemorative Journal Task Force and their desire to share and write the history of our Society and its place in human resources development and delivery of healthcare. So, as you read through this journal, and explore CMBES history, its contributions and future challenges and opportunities, I would like you to join me in thanking the passionate and dedicated members of this Society who have worked tirelessly to provide invaluable ideas and contribute content for this journal. Their passion, enthusiasm and unwavering commitment to this ambitious initiative is greatly appreciated. It has been a great honour for me to work with these incredible individuals who, even with personal challenges, have given all their support for this initiative.

The Task Force members have tried their very best to provide a broad sample of our society's role models, acutely aware that there are many more who have made equally important contributions. The fact that not all are included in this commemorative journal does not in any way diminish their contributions. The Task Force has recommended to the CMBES Executive to start an online museum ensuring that all CMBES role models and Society initiatives will continue to be recorded. Therefore, the completion of this journal forms the beginning of an archiving initiative for CMBES.

And as we continue to define our role in the future of the Canadian healthcare system; in education, research, healthcare technology management, delivery of care, regulations and policy, it is important that we continue to leverage emerging technologies to provide efficient and cost-effective services across the continuum of care. In particular, the emergence of AI and VR will have profound impact on how we handle big data for decision support as well as influence how we provide technology service and sustainment. That means there are ample opportunities to continue to innovate in the delivery of services as well as develop a comprehensive strategy for CMBES.

May this journal be a testament of the past successes as well as a source of motivation to continue to write the Society's chapter into the future of Canadian society at large. In the coming decades, let us rededicate our efforts to achieve our aspirations in shaping the delivery of healthcare. I would like us to look into the future with hope and optimism that someday CMBES will be minted into a Canadian coin or be recognized on Canadian stamps. Let us continue to make it happen! Thank you.

Tidimogo Gaamangwe

Tidimogo Gaamangwe
PhD., P.Eng.
Chair, CMBES 50th Anniversary
Commemorative Journal Task Force

Thank you to the members of the Commemorative Journal Task Force

Amanda Saigeon, Alberta (Secretary)
Anthony Chan, British Columbia
Barry Pask, Manitoba
Bill Gentles, Ontario
Bryan Finlay, Ontario
Evelyn Morin, Ontario
Jennifer Mcgill, British Columbia
Mario Ramirez, Ontario
Martin Poulin, British Columbia
Mike Capuano, Ontario
Morris (Mickey) Milner, Ontario
Murat Firat, Ontario
Natalia Kaliberda (Executive Secretariat)
Robin Black, British Columbia
Tidimogo Gaamangwe, Manitoba (Chair)
Tony Easty, Ontario
Zoabli Gnahoua, Quebec (Vice Chair)

WHAT IS CMBES?

CMBES/SCGB

The Canadian Medical and Biological Engineering Society (CMBES) has approximately 300 members. The membership consists of industry and university based professional biomedical engineers, hospital based clinical engineers, biomedical engineering technologists and clinicians.

OUR VISION

To be the national Society and professional home for Medical and Biological Engineering in Canada.

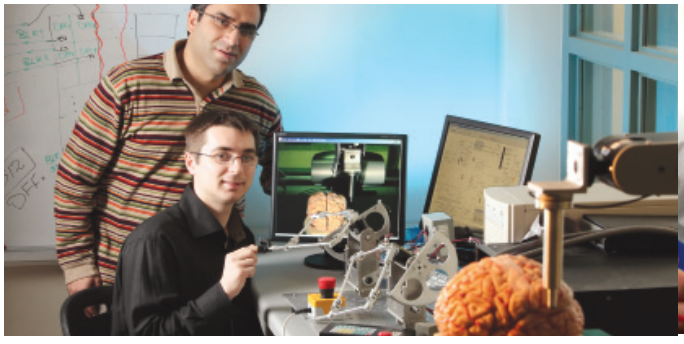
OUR MISSION

To advance and promote the theory and practice of engineering sciences and technology to medicine and biology, serving as a forum for information exchange between healthcare professionals, scientists, and the general public.

The Canadian Medical and Biological Engineering Society is Canada's principal society for engineering in medicine and biology. It is a member of Engineering Institute of Canada (EIC) and affiliated with the International Federation for Medical and Biological Engineering (IFMBE).

The Society's aims are twofold: scientific and educational: directed toward the advancement of the theory and practice of medical device technology; and professional: directed toward the advancement of all individuals in Canada who are engaged in interdisciplinary work involving engineering, the life sciences and medicine.

The CMBES organizes national medical and biological engineering conferences in various cities across Canada. In addition, CMBES hosts seminars, conducts Peer-Reviews, technical paper presentations, exhibits of current medical devices, a continuing education program, workshops, symposia, and networking opportunities.



CMBES HISTORY

In 1959 a small international group of electronics engineers met in Paris to discuss the current developments in the emerging field of medical engineering. The meeting was designated as the First International Conference of Medical Electronics. A result of that meeting was an expressed intention to organize an international body, which would foster and nurture the development of medical engineering. John Davis a physician and engineer from the Allen Memorial Institute in Montreal and Jack Hopps, an electrical engineer from the National Research Council of Canada were the Canadian representatives. The meeting was held at the UNESCO building in Paris and the outcome was the formation of the International Federation for Medical Electronics, later to become the IFMBE. The arguments for the formation of the IFMBE were so compelling that the Canadian representatives determined that it was fundamental for Canada to take part in this activity and that a Canadian focus on medical engineering was essential.

> **"the health care sector presented many opportunities"**

From the beginning the IFMBE was constituted as an umbrella organization of national societies. To become a member of the IFMBE a national society needed at least 20 individual members. For the Canadians at that time this appeared to be a daunting task. A number of avenues for potential members were explored including the use of the organizational capabilities of the National Research Council's Associate Committee on Biophysics chaired by Dr. Alan Burton. However, the Associate Committee proved to be more interested in biophysics than medical engineering and showed a general disinterest in health care concerns. Finally after much discussion and many strategy sessions, 26 individuals, mainly from the academic and government community, were identified as possible members and the process of forming a new society began.

In 1965 the Canadian medical engineering community consisted of the Medical Engineering Section at the NRC, the graduate school of Medical Engineering at the University of Saskatchewan, the Institute of Medical Electronics at the University of Toronto and embryo organizations at Queen's, McGill and Dalhousie Universities. In 1965 there were very few hospital based clinical engineers and the continuing interaction of engineers and the medical profession was uncommon. The NRC realized that the health care sector presented many opportunities for the innovative and the constructive use of technology. In order to encourage growth and increased activity in this field the NRC sponsored the first conference on medical engineering. The conference was held in Ottawa, in 1966, in the auditorium of the Radio and Electrical Engineering Division. Twenty papers were presented and 60 people were in attendance. At the conference the Canadian Medical and Biological Engineering Society was formed and the first officers were elected. The National Research Council kindly agreed to provide the office space for the CMBES Secretariat and a new society was launched. The Secretariat was located in the in the Radio and Electrical Engineering Division Building on the NRC Montreal Rd. campus.

Clinical Engineering was recognized as a distinct group within CMBES when Orest Z. Roy first became the President in 1976.

This generated professional association functions (such as training and certification) which were not available through professional engineering associations. The CMBES was founded through the Engineering Institute of Canada (EIC) which is a collection of "learned associations" and hence the stretch with the academic community taking on this association role. Some of the specialized groups started to form at this time perhaps seeing CMBES in a less academic light.

The National Research Council (NRC) support for publications and scientific organizations played a large role in starting up the CMBES. But in the 80's the policy changed and all the supported organizations were kicked out of the nest, although Orest Z. Roy did stretch that support for some time.

CMBES EXECUTIVE

THE FIRST CMBES EXECUTIVE (1965)

President	J.A. Hopps, NRC
Vice-President	J.H. Milsum, McGill University
Treasurer	W. Delbridge, Health and Welfare Canada
Secretary	F.A. Roberge, University of Montreal
Membership	D.W. Lywood, Queen's University

CMBES EXECUTIVE THROUGH THE YEARS

	1966-1968	1968-1970	1970-1972	1972-1974
President	J.A. Hopps	J.A. Hopps	D. Winter	D. Winter
Vice-President	J. Milsum	J. Milsum	R. Cobbold	R. Cobbold
Treasurer	F. Roberge	F. Roberge	H. Kunov	A.O. Quanbury
Secretary	W. Delbridge	H. Callan	H. Callan	P. Nelson
Membership	--	D. Lywood	R.N. Scott	D. Shepley
Publications	--	--	C.A. Laszlo	C.A. Laszlo

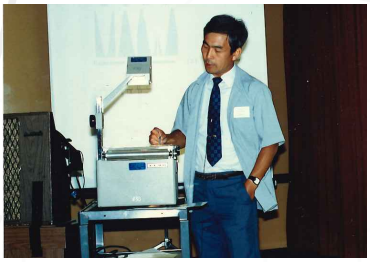
	1974-1976	1976-1978	1978-1980	1980-1982
President	J. Milsum	O.Z. Roy	O.Z. Roy	A.M. Dolan
Vice-President	F. Roberge	M. Frize	M. Frize	M. Milner
Treasurer	C.A. Laszlo	R.N. Scott	J.B. Finlay	J.B. Finlay
Secretary	A. Quanbury	R.C. Black	R.C. Black	T.R. Fenton
Membership	N. Durie	N. Durie	H. Davis	E. Shwedyk
Publications	A.M. Dolan	A.M. Dolan	B. Vachon	B. Vachon
Professional Affairs	M. Milner	M. Milner	A.M. Dolan	M. Frize
Awards	--	M. Raber	M. Raber	--
Conference	F. Roberge	G.F. Klein	G. Mathieu	--

CMBES EXECUTIVE THROUGH THE YEARS

	1982-1984	1984-1986	1986-1988	1988-1990
President	A.M. Dolan	W. Zingg	W. Zingg	R. Kearney
Vice-President	R.N. Scott	R. Demers	R. Demers	A. Easty
Treasurer	K. Hunter	R. Kearney	R. Kearney	K. Whitmore
Secretary	T.R. Fenton	R. Kearney	R. Keamey	K. Whitmore
Membership	W. Zingg	Z.J. Koles	Z.J. Koles	R. Gander
Publications	D. Zilm	D. Zilm	D. Uttley	D. Uttley
Professional Affairs	M. Cheng	W. Gentles	W. Gentles	R. Evans

	1990-1992	1992-1994	1994-1996	1996-1998
President	R. Kearney	A. Easty	C. Small	D. Lovely
Vice-President	A. Easty	E. Shwedyk	R. Black	M. Ramirez
Treasurer	C. Small	C. Small	M. Kohler	M. Kohler
Secretary	C. Small	--	--	--
National Exec. Secretary	--	S. Chapman	S. Chapman	S. Chapman
Membership	R. Gander	E. Morin	E. Morin	C. Small
Publications	B. Graham	G. Graham	R. Rangayan	A. Chan
Professional Affairs	R. Evans	G. Campbell	G. Campbell	P. Kresta

	1998 - 2000	2000 - 2002	2002 - 2004	2004 - 2006
President	D. Lovely	M. Ramirez	R. Gander	W. Gentles
Vice-President	M. Ramirez	R. Gander	W. Gentles	D. Russell
Treasurer	B. Winchester	B. Winchester	T. Zakutney	T. Zakutney
Secretary	--	--	--	--
National Exec. Secretary	S. Chapman	F. Olive	F. Olive	F. Olive
Membership	M. Capuano	M. Capuano	M. Capuano	M. Capuano
Publications	A. Chan	B. Skiver	B. Skiver	B. Skiver
Professional Affairs	P. Kresta	P. Kresta	M. Firat	M. Firat



CMBES EXECUTIVE THROUGH THE YEARS

	2006 - 2008	2008 - 2010	2010 - 2012	2012 - 2014
President	W. Gentles	D. Russell	M. Firat	M. Firat
Vice-President	D. Russell	M. Firat	AD. Chan	AD. Chan
Treasurer	T. Zakutney	M. Poulin	M. Poulin	K. Eckhardt
Secretary	--	--	--	K. Eckhardt
National Exec. Secretariat	Willow Group	Willow Group	Willow Group	Willow Group
Membership	T. Gaamangwe	D. Len	D. Len	M. Poulin
Publications	D. Gretzinger	D. Gretzinger	G. Zoabli	M. Capuano
Professional Affairs	M. Firat	M. Capuano	M. Capuano	G. McNamee
Awards	--	J. Dann	T. Zakutney	D. Len
Long Term Conference	--	J. Leung	S. Kelso	S. Kelso

	2014 - 2016	2016 - 2018
President	M. Poulin	M. Poulin
Vice-President	M. Capuano	M. Capuano
Treasurer	K. Eckhardt	A. Saigeon
Secretary	M. Hamilton	K. Kobe
National Exec. Secretariat	Willow Group	Willow Group
Membership	S. Kelso	S. Kelso
Publications	M. Elgarch	T. Gaamangwe
Professional Affairs	A. Ibey	A. Ibey
Awards	E. Morin	E. Morin
Long Term Conference	M. Rice	M. Rice

Collage of photos from various conference presentations and exhibits

CMBES ACTIVITIES AND IMPACT

CMBES has always provided leadership to the Canadian Biomedical Engineering community through the volunteer dedication of its officers and the unstinting commitment of its members at large. The Society has always supported activities that enhance the exchange of ideas and improve the delivery of health care services. To this end, one of the major functions of the Society is its annual scientific conference. In addition to the scientific paper presentations, the conferences include a student paper competition and a continuing education program.

The conference along with its commercial and scientific exhibit is held in different regions across Canada. All the papers are peer reviewed and referenced proceedings are published. The meetings are entirely self-supporting and provide an annual focal point for the Society's activities.

While the annual conference is a premier event for the CMBES, it is by no means all we do. There are many activities and programs that the CMBES engages in. These include peer review for clinical engineering in hospitals, the development of Standards of Practice, advocacy for processes like hospital accreditation and medical device surveillance, education programs such as webinars, promotion of patient safety, participation on standards committees, collaborative efforts with other societies, promotion of clinical and biomedical engineering, and international outreach. These efforts contribute significantly to the advancement of Biomedical Engineering in Canada.

CMBES CONFERENCES 1966 - 2018

Date	Location	Description	Conf. Chairs
1966	Ottawa	1st CMBEC	Richard Cobbold
1968	Toronto	2nd CMBEC	Edward Llewellyn Thomas
1970	Halifax	3rd CMBEC	C.H. Miller
1972	Winnipeg	4th CMBEC	M.B. Raber
1973	Ottawa	Seminar on Engineering in Health Care	J.A. Hopps and O.Z. Roy
1974	Montreal	5th CMBEC	Jacques Dagenais
1976	Ottawa	6th CMBEC and 11th World Congress (Jointly with IFMBE and the IOMP)	
1977	Montreal	1st Clinical Engineering Conference	Monique Aubry-Frize
1978	Vancouver	7th CMBEC	Charles Laszlo
1979	Halifax	2nd Clinical Engineering Conference	Wayne Rockwell
1980	Hamilton	8th CMBEC	Sushil Sarna
1981	Saskatoon	3rd Clinical Engineering Conference	B.L. Graham
1982	Fredericton	9th CMBEC	
1983	Edmonton	4th Clinical Engineering Conference	
1984	Ottawa	10th CMBEC (Jointly with RESNA)	Michael Cheng
1985	Kingston	11th CMBEC	
1986	Vancouver	12th CMBEC	
1987	Halifax	13th CMBEC	Allan Marble, Alexander Nickerson
1988	Montreal	14th CMBEC (Jointly with RESNA)	A. Robert LeBlanc

CMBES CONFERENCES 1966 - 2018

Date	Location	Description	Conf. Chairs
1989	Toronto	15th CMBEC	
1990	Winnipeg	16th CMBEC	Monte Raber
1991	Banff	17th CMBEC	Jack Kingma, Ted Malach, Dev Menon
1992	Toronto	18th CMBEC (Jointly with RESNA)	Tony Easty, Bill Gentles
1993	Ottawa	19TH CMBEC (Jointly with (COMP)	Derek Uttley
1994	Vancouver	20th CMBEC	Keith Whitmore
1995	Montreal	21st CMBEC (Jointly with IEEE/EMBS)	Fernand A. Roberge
1996	Charlottetown	22nd CMBEC	Mario Ramirez
1997	Toronto	23rd CMBEC	Bill Gentles, Raymond Chan
1998	Edmonton	24th CMBEC	Zoly Koles-Ray Cislo
1999	London	25th CMBEC	Mike Capuano
2000	Halifax	26th CMBEC	Mario Ramirez
2002	Ottawa	27th CMBEC	Tim Zakutney
2004	Quebec City	28th CMBEC	Donald Russell
2006	Vancouver	29th CMBEC	Anthony Chan, Ken Yip
2007	Toronto	30th CMBEC (Jointly with FICCDAT)	Bill Gentles
2008	Montreal	31st CMBEC (Jointly with APIBQ)	Bill Gentles, Zoabli Gnahoua
2009	Calgary	32nd CMBEC	Dennis Len, Gord McNamee
2010	Vancouver	33rd CMBEC	Martin Forbes
2011	Toronto	34th CMBEC (Jointly with FICCDAT)	Dave Gretzinger
2012	Halifax	35th CMBEC (Jointly with ACCES17)	Steve Smith
2013	Ottawa	36th CMBEC	Tim Zakutney
2014	Vancouver	37th CMBEC	Martin Poulin
2015	Toronto	38th CMBEC and 24th World Congress on Medical Physics and Biological Engineering (IFMBE)	Tony Easty
2016	Calgary	39th CMBEC	Kelly Kobe
2017	Winnipeg	40th CMBEC	Kyle Eckhardt
2018	Charlottetown	41st CMBEC/ACCES 23	Brent McKinnon

IFMBE – International Federation for Medical and Biological Engineering
IOMP – International Organization for Medical Physics
EMBS – Engineering in Medicine and Biology (IEEE Society's division for Biomedical Engineering)
IEEE – Institute of Electrical and Electronic Engineers
FICCDAT – Festival of International Conferences on Caregiving,Disability, Aging and Technology
RESNA – Rehabilitation Engineering Society of North America
COMP – Canadian Organization of Medical Physics
ACCES – Atlantic Canada Clinical Engineering Society
APIBQ - l'Association des physiciens et ingénieurs biomédicaux du Québec

CLINICAL ENGINEERING STANDARDS OF PRACTICE

Clinical engineering is one of several professional disciplines contributing to safe, effective and economical health care. The role and primary responsibility of a clinical engineering service is management of medical device technology, including adherence to recognized safety, quality, cost and efficiency standards.

Presenting the 2014 CMBES Clinical Engineering Standards of Practice at CMBEC37 in Vancouver. Bill Gentles speaks along with Zoabli Gnahoua, Mario Ramirez, Kelly Kobe, Tim Rode, and Anthony Chan.

The Clinical Engineering Standards of Practice have two goals:

1. To define the scope and role of Clinical Engineering services in Canadian Health Care organizations.
2. To define standards suitable for evaluation in a review process.

The original Clinical Engineering Standards of Practice for Canada were published in 1998. A second edition was published in 2007. The final document was presented to the membership for approval by electronic ballot after being presented at a workshop at the CMBES conference in Vancouver on May 23, 2014. The CMBES wishes to thank all of the members of the development committee as follows: Bill Gentles (Chair), Anthony Chan, Marc d'Entremont, Tim Rode, Bob Dony, Glen Hughes, John Inch, Kelly Kobe, Darrel Nilsson, Mario R. Ramirez, Chris Rouire, Gurpreet Saini, and Gnahoua Zoabli. The new standards now feature over 70 standards, which contain numerous updates. The revised Standards of Practice document is available to members at no charge. To order a copy of the Standards in PDF format, go to the CMBES web site at www.cmbes.ca.

CMBES PEER REVIEW PROGRAM

After the Clinical Engineering Standards of Practice (CESOP) were adopted by the Society, the Peer Review process was implemented in 2001. The Peer Review process is based on the standards outlined in the CESOP. The purpose of Peer Review is to create periodic opportunities for a service to assess its performance, and identify how it might be enhanced. The assessment provides the institution with an indication of the breadth and quality of the services. Also, Peer Review enhances the sharing of ideas throughout the Clinical Engineering and Health Service communities.

The process includes four steps:

1. Internal Review: Staff of the service shall rate themselves according to the CESOP pre-survey questionnaire (PSQ).
2. The PSQ will be reviewed by the Peer Review Committee Survey visit: an external survey team reviews the service.
3. Survey Report: the survey team submits a written report.

The importance of associating a Peer Review process with Standards of Practice cannot be overemphasized. One of the principal activities of a profession is self-regulation, and Peer Review is one form of such self regulation(1).

Peer Review surveyors: Mike Capuano (front centre) and Jean Ngoie (far left) are seen in the Medical Engineering department at the Hospital for Sick Children (HSC) in Toronto. They were part of a team conducting HSC's second CMBES Peer Review which took place in 2016. The CMBES CESOP forms are the basis for these reviews.

(1)Easty, Tony and Gentles, Bill (2004). Clinical Engineering Handbook, PP576-578, "Clinical Engineering Standards of Practice

CMBES AND THE WORLD CONGRESS

The World Congress is held every 3 years and is coordinated by the IUPESM (International Union for Physical and Engineering Sciences in Medicine) which is affiliated with the International Council for Science (ICSU). The IUPESM is the umbrella organization that oversees two groups; the IFMBE (International Federation for Medical and Biological Engineering) and IOMP (International Organization for Medical Physics). Through 10 committees, the IUPESM represents the combined efforts of more than 40,000 medical physicists and biomedical engineers. They organize and coordinate the triennial World Congress for Medical Physics and Biomedical Engineering. Other objectives include publishing scientific journals, newsletters, books and electronic documents to enhance progress; and disseminating, promoting and/or developing standards of practice in the fields of medical physics and biomedical engineering to enhance the quality of health care worldwide. CMBES Fellow Monique Frize is an Ex-officio member of the Administrative Council (AC) chairs the IFMBE council of Societies. She served on the IFMBE Administrative Council from 2012 to 2015.

As COMP (Canadian Organization of Medical Physicists) is a member of IOMP, the CMBES is a member of the IFMBE. The International Federation for Medical and Biological Engineering (IFMBE) is primarily a federation of national and transnational societies. These professional organizations represent interests in medical and biological engineering. The IFMBE is also a Non-Governmental Organization (NGO) for the United Nations and the World Health Organization (WHO), where we are uniquely positioned to influence the delivery of health care to the world through Biomedical and Clinical Engineering.

Drs. David Jaffray (IOMP) and Tony Easty (IFMBE) (1st and 2nd from left) host an interactive session at the 2015 World Congress in Toronto.

CMBES AND THE WORLD CONGRESS

Right from the beginning, CMBES founder Jack Hopps laid the foundation of our organization's continued links with international affairs and with colleagues beyond our borders. In 1957, he travelled to Sri Lanka to set up an Electromedical Division for the government health service. He helped lead the IFMBE (International Federation for Medical and Biological Engineering), serving as its president in 1971 and as its secretary general from 1976 to 1985.

CMBES and its members continue to make efforts abroad by participating in events both scientific and operational. The 24th World Congress on Medical Physics and Biomedical Engineering was hosted by the CMBES in 2015 (Toronto). Previous to that, Canada hosted the 11th World Congress in Ottawa in 1976. The 2018 World Congress is being held in Prague, Czech Republic in June, 2018.

In 2009, CMBES Fellow and Former President, Dr. Tony Easty takes the podium in Munich. As part of a contingent, Tony helped deliver CMBES's bid to host the 2015 World Congress in Toronto. The bid was successful.

The World Congress provides opportunities to share issues internationally. Mike Capuano and Jean Ngoie (1st and 2nd from left) lead a panel of Clinical Engineers on the topic of Supportability of Medical Devices at the 2015 World Congress.

IUPESM 2015

THE WORLD CONGRESS ON MEDICAL PHYSICS AND BIOMEDICAL ENGINEERING

CO-HOSTED BY:
CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY
CANADIAN ORGANIZATION OF MEDICAL PHYSICISTS

CMBES, along with the Canadian Organization of Medical Physicists (COMP), will be hosting the 2015 World Congress on Medical Physics and Biomedical Engineering June 7 to June 12, 2015 in Toronto, Ontario. More information on the Congress will be forthcoming, for more information or questions and comments please join our forum. If you're interested in joining the Organizing Committee contact the Secretariat at secretariat@cmbes.ca

AWARDS AND HONOURS

Award for Outstanding Contributions to the Field of Biomedical Engineering

This Award was established in 1976 and is made to a Canadian Biomedical Engineer who has shown outstanding involvement in, and contributions to the field of biomedical engineering. Achievements considered towards this award can be in the form of scientific (or technical) contributions, and general contributions such as organizational abilities toward the improvement of health care delivery in Canada, or prominence in institutions and organizations concerned with biomedical engineering at the national and/or international level. Achievements for consideration shall have taken place during the three years immediately previous to June of the award year.

Potential candidate must be a member of CMBES in good standing who is actively engaged in some form of biomedical engineering activity in Canada. The award may be made annually, and consists of a Certificate and cash prize to be presented at the Annual General Meeting. In any Year, the award will be made only if a worthy candidate is proposed.

The Young Biomedical Engineer and Early Career Achievement Awards were established to recognize outstanding performance and achievement in the early career stages – within 5 years of graduation – of the recipients.

From 1989 to 1997, thanks to the sponsorship of BIONETICS Inc. the award was changed to the BIONETICS Outstanding Canadian Biomedical Engineer Award and the age limitation was eliminated.

Recipients of the Young Biomedical Engineer Award:

1976	Jim McEwen
1977	Brian Trenholm
1978	Michael Toll
1979	T. Richard Fenton
1980	Carolyn M. Small
1986	Wm. Gibson
1987	Anthony C. Easty

Recipients of the Early Career Achievement Award:

2008	Adrian Chan
2012	Andrew Ibey
2015	Kyle Eckhardt
2015	Tiago Falk
2016	Jeswin Jeyasurya
2017	Marie-Ange Janvier

AWARDS AND HONOURS

Outstanding Canadian Biomedical Engineer Award:

1989	Mario Ramirez
1990	Ian Hunter
1991	Berj Bardakjian
1992	Timothy J. Bryant
1993	Gordon Campbell
1994	Ronald Evans
1995	Louis F. Durand
1996	Edmond Biden
1997	Robert E. Kearney
1998	John M. Smith
1999	William Gentles
2000	Bryan J. Finlay
2004	Paul Fabry
2006	Ken Yip
2007	Anthony Chan
2008	Timothy Zakutney
2009	Murat Firat
2010	Petr Kresta
2011	Ezra Kwok
2012	Kevin Englehart
2013	Michael Cheng
2014	Gordon McConnell
2015	Adrian Chan
2016	Sridhar (Sri) Krishnan
2017	Gordon Jasechko
2018	Zoabli Gnahoua

Sponsored by Bionectics from 1989 to 1997

Outstanding Canadian BMET Award:

This Award was established in 1982 and is made to a Canadian BMET who has shown outstanding involvement in and contributions to the field of biomedical engineering technology. Achievements considered towards this award can be in the form of technical (or scientific) contributions, and general contributions such as organizational abilities, activities toward the improvement of health care delivery in Canada: or prominence in his/her institution or organizations concerned with biomedical engineering technology at the national and/or international level. Achievements for consideration shall have taken place during the three years immediately previous to May of the award year.

Potential candidate must be a Certified BMETs or eligible for Certification as a BMET and must be a member in good standing in CMBES. He/she must be actively engaged in some form of biomedical engineering technology in Canada. The award will be made only if a worthy candidate is proposed, and will consist of a Certificate and a cash prize to be presented at the Annual General Meeting.

Please refer to the CMBES website (www.cmbes.ca) to review the history and criteria of the CMBES Special Membership Recognition / Honours and Awards.

AWARDS AND HONOURS

Young Canadian Biomedical Award:

1982	Allison C. Illsley	1987	Stephen A. Retfalvi

Outstanding Canadian Biomedical Engineering Technologist (BMET) Award:

1989	George Speelman	2003	Jeremy Then
1990	Derek Uttley	2006	Dennis Len
1991	Tony Wallace	2007	Mike Capuano
1992	Stephen Retfalvi	2008	Graham Wickham
1993	Larry Boyce	2009	Rick Stewart
1994	H. Nottebrock	2010	Gord McNamee
1995	Brian Graham	2011	Murray Greenwood
1996	Arthur Chisholm	2013	David Hancock
1997	John Wiebe	2014	Adam Majewski
1998	Murray Greenwood	2017	Kelly Kobe
2000	Chris Chovaz	2018	Greg Brett
2002	Peter Bennett		

AWARDS AND HONOURS

CMBES Fellows

A Fellows category was established by the Society to honour members of the CMBES who have made outstanding contributions to the field of biomedical engineering. Fellows are nominated and elected to this class by other fellows of the society.

Recipients are:

1976	John A. Hopps	1999	Richard Cobbald	2008	Robert Leblanc
1976	Norman Moody	2000	Hans Kunov	2009	Bill Gentles
1976	E. Llewllyn Thomas	2002	Carolyn F. Small	2013	Monique Frize
1980	Robert N. Scott	2004	Pierre A. Mathieu	2015	Murat Firat
1986	Orest Z. Roy	2006	Robin C. Black	2015	Anthony Chan
1988	Dennis W. Lywood	2006	Tony Easty	2015	Graham Wickham
1988	Fernand A. Roberge	2006	Dennis F. Lovely	2015	Mike Capuano
1989	Walter Zingg	2006	James A. McEwen	2017	Petr Kresta
1991	Bryan Finlay	2007	Bob Gander	2017	Graham Wickham
1994	Morris Milner	2007	Philip Parker	2018	Kevin Englehart
1999	Richard Cobbold	2007	Barry Pask		
1999	Alfred Dolan	2007	Raj Rangayyan		

Honourary Fellow:

Awarded to non-members of the CMBES who have provided extraordinary service and support to the Society.

Recipient is:

Sally Chapman	1996

Honourary Life Members:

Awarded to non-members of the CMBES who have supported and contributed to the Society's advancement.

Recipients are:

Eleanor Hopps	1976
Anne Statham	1976
Ethel Swail	1984
Fernand A. Roberge	1988
Fleurette Olive	2008

Lifetime Achievement Award:

In conjunction with the IFMBE International conference, CMBES/SCGB, has awarded Lifetime Achievement Award to two Canadian Biomedical Engineers who have made a significant contribution to the profession in Canada and the world through their efforts.

Recipients are:

Monique Frize	2015	Morris Mickey Milner	2015

Emeritus:

Awarded to retired members of the CMBES who have made outstanding contributions to the field of Biomedical Engineering.

Recipients are:

1980	W.A. Prowse	1998	Charles Laszlo	2008	Robert Scott
1986	John H. Milsum	2000	Alan E. Marble	2011	Orest Z. Roy
1990	A.B. Thornton-Trump	2004	Kenneth H. Norwich	2016	Tony Easty
1993	Nelson D. Durie	2006	Leon Katz		

ACADEMICS

Academics with a focus on Biomedical Engineering research were the pioneers who initially formed the Society. Academics have the added responsibility to train and educate emerging biomedical engineers and technologists. To this day they are an integral part of CMBES for students to present their research.

Biomedical Engineering (BME) Education In Canada

There are numerous education institutions across Canada providing biomedical engineering and technology programs that offer a wide variety of career opportunities such as:

- Biomaterials
- Biomechanics
- Biomedical Engineering Education
- Clinical Engineering
- Health Care Technology Management
- Health Sciences
- Information Technology / Clinical Information Systems
- Medical Device Technology
- Medical Imaging
- Medical Tele-robotics
- Microelectronics
- Optoelectronics
- Rehabilitation Engineering
- Signal Processing
- Telemedicine

ACADEMICS

BME Education Programs

There is a continuous evolution of programs in the Biomedical Engineering field, particularly with regard to research topics being actively pursued. Prospective students are advised to contact the institutions directly for detailed program information.

Province	Program	Level	Institution	Contact
Alberta	Biomedical Engineering	Graduate	University of Alberta	Robert Burrell rburrell@ualberta.ca
Alberta	Biomedical Engineering	Graduate & Undergraduate	University of Calgary	Michael Kallos mskallos@ucalgary.ca Kristina (Tina) Rinker kdrinker@ucalgary.ca
Alberta	Biomedical Engineering Technology	Diploma (2 yr)	Northern Alberta Institute of Technology	Roy Sharplin roys@nait.ca
British Columbia	Biomedical Engineering	Graduate & Undergraduate	University of British Columbia	Rob Rohling rohling@ece.ubc.ca Karen Cheung kcheung@ece.ubc.ca
British Columbia	Biomedical Engineering	Graduate & Undergraduate	Simon Fraser University	Andrew Rawicz rawicz@sfu.ca
British Columbia	Biomedical Engineering	Undergraduate	University of Victoria	Stephanie Willerth willerth@uvic.ca Nikolai Dechev dechev@uvic.ca
British Columbia	Biomedical Engineering	Diploma (2 yr)	British Columbia Institute of Technology	Anthony Chan Anthony_chan@bcit.ca
Manitoba	Biomedical Engineering	Graduate & Undergraduate	University of Manitoba	Zahra Moussavi Zahra.Moussavi@umanitoba.ca Danny Mann Danny.Mann@umanitoba.ca
New Brunswick	Under Electrical or Mechanical Engineering	Graduate & Undergraduate	University of New Brunswick	Kevin Englehart kevin.englehart@gmail.com
Nova Scotia	Biomedical Engineering	Graduate	Dalhousie University	Geoffrey Maksym Geoff.Maksym@dal.ca
Newfoundland	BME undergrad concentration in Engineering and Applied Sciences	Graduate & Undergraduate	Memorial University	Edward Kendall ejbk00@gmail.com edward.kendall@mun.ca
Newfoundland	Electronics Engineering Technology (Biomedical)	Diploma (3 yr)	College of North Atlantic	Kelly Spencer kelly.spencer@cna.nl.ca
Ontario	Biomedical Engineering	Graduate & Undergraduate	University of Toronto	Christopher Yip christopher.yip@utoronto.ca

ACADEMICS

Province	Program	Level	Institution	Contact
Ontario	Biomedical Engineering	Graduate & Undergraduate	McMaster University	Hubert de Bruin debruin@mcmaster.ca
Ontario	Biomedical Engineering	Graduate	Queens University	Evelyn Morin evelyn.morin@queensu.ca
Ontario	Systems Design Eng (Biomed) Biomedical Engineering	Graduate Undergraduate	University of Waterloo	Catherine Burns catherine.burns@uwaterloo.ca Maud Gorbet mgorbet@uwaterloo.ca
Ontario	BEng and Biomedical Eng Working on Clinical Engineering	Graduate & Undergraduate	Carleton University	Adrian Chan adcchan@sce.carleton.ca
Ontario	Ottawa-Carleton Institute of Biomedical Engineering (OCIBME)	Graduate	University of Ottawa & Carleton University	Adrian Chan adcchan@sce.carleton.ca
Ontario	Biomedical Engineering	Graduate & Undergraduate	University of Ottawa	Hilmi Dajani hdajani@site.uottawa.ca
Ontario	Biomedical Engineering	Undergraduate	University of Guelph	Manjusri Misra mmisra@uoguelph.ca
Ontario	Biomedical Engineering Technology	Advanced Diploma (3 yr)	St. Clair College	Peter Wawrow pwawrow@stclaircollege.ca
Ontario	Biomedical Engineering Technology	Advanced Diploma (3 yr)	Centennial College	Dr. Charanjit Bambra CBambra@centennialcollege.ca njagaric@centennialcollege.ca
Ontario	Biomedical Engineering Technology Health Care Technology	Advanced Diploma (3 yr) Undergraduate (honours)	Durham College	Pravin Patel pravin.patel@durhamcollege.ca Sandra Kudla sandra.kudla@durhamcollege.ca Richard Tidman Richard.Tidman@durhamcollege.ca
Quebec	Biological and Biomedical Engineering	Graduate & Undergraduate	McGill University	Pina Sorrini, Ms. pina.sorrini@mcgill.ca Yu (Brandon) Xia brandon.xia@mcgill.ca
Quebec	Biomedical Technology – Electronic Instrumentation	Certificate (for grad technologists) - IT (2.5 yr part-time) - BME Practicum (1.5 yr full-time)	École Polytechnique de Montréal	Alain Lapointe alain.lapointe@polymtl.ca
Saskatchewan	Biomedical Engineering	Graduate	University of Saskatchewan	Gordon Sarty gordon.sarty@usask.ca

ACADEMICS

WINNERS OF THE STUDENT PAPER COMPETITION

1982 Michael Lee U. of Western Ontario
(1st Place Prize sponsored by Medicine/Honeywell)
Daniel Stashuk McMaster University
(2nd Place Prize sponsored by CMBES)
D.J. Doyle U. of Toronto (3rd Place Prize sponsored Harco Electronics & CMBES)

1984 Patricia Weiss McGill University (1st Place Prize sponsored by IMED)
Evelyn Morin U. of New Brunswick
(2nd Place Prize sponsored by Smith & Nephew)
Jean M. Laurens E. Polytechnique de Montreal 3rd Place Prize sponsored by Travenol)

1988 Sylvie Dor' McGill University (1st Place Prize)
Bill Kraemer U. of Western Ontario
(2nd Place Prize)
Michel Lorange U. of Montreal
(3rd Place Prize)

1990 Chae J. Lee U. of British Columbia (1st Place Prize sponsored by INSET)
P.G. Charette McGill University (2nd Place)
M. Slawnych U. of British Columbia (3rd Place)

1991 Declan Slemon U. of Limerick
(1st Place Prize sponsored by INSET)
Sylvie Dore McGill University
(2nd Place Prize sponsored by INSET)
S. Rathee and David Wilson U. of Alberta
(3rd Place Prize)

1992 L.K. Ryan U. of Toronto
(1st Place Prize sponsored by INSET)
J. L. B'rub' U. of New Brunswick (2nd Place)
D.T. Westwick McGill University (3rd Place)

1993 Sponsored by Bionetics Ltd.
U. Kuruganit U. of New Brunswick (1st Place)
A.C.Cova, McGill University (2nd Place)
T. D. Doukoglou McGill University (3rd Place)

1994 Carolyn Anglin U. of British Columbia
(1st Place)
N. Yuwaraj U. of Toronto (2nd Place)
Thomas Schuessler McGill University (3rd Place)

1995 M. Yuwaraj U. of Toronto (1st Place)
Michael Westmore, U. of Western Ontario
(2nd Place)
Craig Michael Parfitt U. of British Columbia
(3rd Place)

1996 Shane Greek U. of British Columbia (1st Place)
Ross Wagner McGill University (2nd Place)
John Lysack Queen's University (3rd Place)

1997 Nathanael Kuehner U. of Toronto (1st Place)
Tatiana Nikitina McGill University (2nd Place)
Nicolae Schiopu U. of Toronto (3rd Place)

1998 S.K. Boyd U. of Calgary (1st Place)
Nora S. O'Neill U. of Alberta (2nd Place)
C.P. Barrett McGill University (3rd Place)

1999 Sponsored by Trudell Medical International
M. Yuwaraj U. of Toronto (1st Place)
D.M. MacIsaac U. of New Brunswick (2nd Place)
Aaron Courville U. of Toronto (3rd Place)

2000 Robyn. Macquarrie, DalTech (1st Place)
Nancy. Black, University of New Brunswick
(2nd Place)
Adrian Chan, University of New Brunswick
(3rd Place)

2002 Adrian D.C. Chan, University of New Brunswick (1st Place)
Usha Kuruganti, University of New Brunswick (2nd Place)
Gerry Fung, University of Toronto (3rd Place)

2004 Franziska Dietrich, Drexel University, Philadelphia, PA (1st Place)
Jean-François Thouin, Université de Montréal (2nd Place)
Tasima Haque, McGill University (3rd Place)

2006 Orcun Goksel, University of British Columbia
(1st Place)
Hadi Izadi, Simon Fraser University (2nd Place)
Brinda Prasad, University of Calgary (3rd Place)

2007 Erin Budd, University of New Brunswick
(1st Place – tie)
Lisa D'Alessandro, University of Toronto
(1st Place – tie)
José Zariffa, University of Toronto (2nd Place)

2008 Vincent Chabot, Université de Sherbrooke
(1st Place)
Lisa D'Alessandro, University of Toronto
(2nd Place)
Mehran Talebinejad, University of Ottawa
(3rd Place)

ACADEMICS

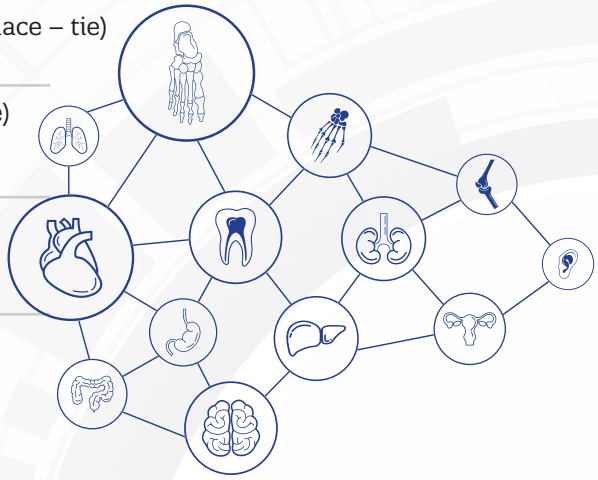
WINNERS OF THE STUDENT PAPER COMPETITION

2009 Michael L Pougnet, University of New Brunswick (1st Place)
Chun Kit-Fu, University of Calgary (2nd Place)
James Elber Duverger, Montreal Health Institute (3rd Place – tie)
Kyle Nishiyama, University of Calgary (3rd Place – tie)

2010 Adriana Cajiao, University of British Columbia (1st Place)
Michael Willand, McMaster University (2nd Place)
Jason Motkoski, University of Calgary (3rd Place)

2013 K.C. Geoffrey NG, University of Ottawa (1st Place)
Sankua Chao, Carleton University (2nd Place)
Adeel Alam, University of Toronto (3rd Place)

2014 Gillian Cook (1st Place)
Ing Xu (2nd Place)
Samantha Grist (3rd Place)
Melissa Barazandegan (3rd Place)



Collage of photos from various Conference meetings and AWARD ceremonies.

CERTIFICATION OF CLINICAL ENGINEERS AND TECHNOLOGISTS

Clinical engineering is concerned with the application of engineering tools and theory to all aspects of diagnosis, cure of disease, patient care and life support in general, all of which are embraced by the term "delivery of health care services." The delivery of these services takes place in a multidisciplinary hospital environment, which is predominantly, nurse/physician oriented. In such an environment it was found difficult to determine a person's engineering and technical abilities as well as their understanding of the interaction of the various technologies with the well being of the patient. In a response to this need the CMBES (in 1976) established a mechanism by which engineers and technologists, working in hospital settings, could have their technical capabilities and engineering competence assessed. The CMBES instituted a certification procedure, which includes written and oral exams monitored and administered by a group of eminent individuals chosen by their peers. The procedure has the support of regulatory and accreditation organizations.

To date 52 clinical engineers and 68 technologists have been certified.

WORKING GROUPS AND COMMITTEES:
Working groups and committees are constituted as the need arises and are structured to address a particular need.

Working groups and committees have included:

- **Education,**
- **Clinical Engineering,**
- **Biomedical Engineering Technology,**
- **Biomechanics,**
- **Rehabilitation Engineering,**
- **Regulations and Standards.**

INTERNATIONAL OUTREACH PROGRAM

The CMBES International Outreach Committee pursues and develops opportunities for CMBES members to participate in volunteer programs to support Clinical Engineering initiatives and Health Technology Management in developing countries.

Improving the Effectiveness of Medical Equipment Donations to Developing Countries

The CMBES International Outreach Committee recently completed a research study into the challenges of donating medical equipment to developing countries. Our objective was to improve the effectiveness of such donations by raising awareness of the challenges, and sharing best practices among donor organizations. The video that we produced is a key component of our communication strategy to share our research findings and promote awareness of best practices to a global audience of donor organizations.

You can view this video at:
https://www.youtube.com/watch?v=R27CP-PAwL1Y

This study was funded by a grant from the International Development Research Centre (Ottawa).

For more resources on effective medical equipment donation practices, visit:
World Health Organization guidelines
THET "Making it Work" toolkit

The Tools For Techs Project to Support Biomeds in Low Resource Countries

Some studies have shown that 40-60% of medical equipment in low resource countries is out of service. This situation leads to a degradation of patient care. Many of the problems that keep this equipment from being used are minor, and could be corrected if the staff responsible for maintaining the equipment had the proper tools and test equipment.

The Canadian Medical & Biological Engineering Society (CMBES) started this project with some seed funding, and is now issuing small grants to Biomeds in low resource countries.
You can see their stories on the project website: www.tools4techs.ca

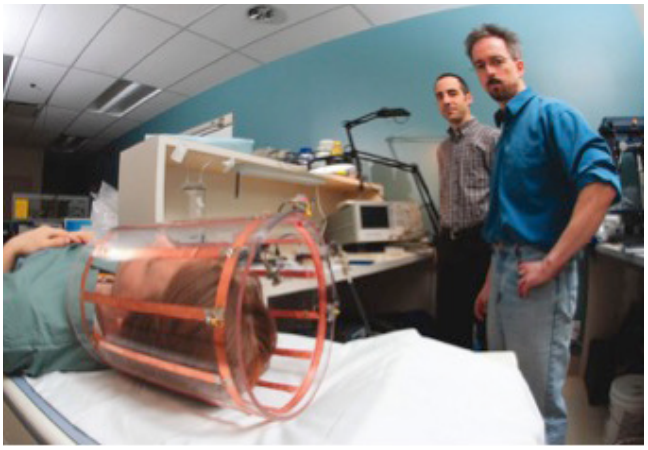
TOOLS 4 TECHS PROGRAM:
Supporting Biomeds in low resource countries

TRAVEL GRANTS

Each year, the International Outreach Committee of CMBES invites applications for a travel grant in aid of supporting volunteer work in Clinical Engineering. This grant is intended to partially defray the travel costs of a Clinical Engineer, Biomedical Engineering Technologist, or Clinical Engineering student, who is a CMBES member and a Canadian Resident, who is planning to travel to a developing country to do volunteer work related to Clinical Engineering within the next year. The call for applications is sent out in January of each year, with a deadline of March 31. The award is announced in mid April.

BIOMEDICAL ENGINEERING PROFESSION

The Canadian Medical and Biological Engineering Society has been and continues to be an important presence in the development of biomedical engineering. It has provided leadership and direction for the safe and effective use of technology in the health care system. The Society has assumed responsibilities that have made it a respected member of the national and international scene.



The Biomedical Engineer's role is unique, as the individual has the knowledge in both fields - medicine and engineering. The ability to bridge medicine and engineering is a distinguishing feature. In clinical fields, understanding the clinical environment (clinical engineering) or the patient constraints and abilities (rehab engineering) are examples.

> **"There is a continuous evolution of programs in the biomedical field"**

BIOMEDICAL ENGINEERING PROFESSION

Biomedical Engineering Technologists & Technicians

Any title involving the term "biology" infers the study of plants and animals (not just humans). Bioengineering evolved in university engineering departments and its range was limited by the specific interests of those faculty members. In the 1960s, pioneer Professor Robert Kenedi, at the University of Strathclyde, could always garner students' interest by noting that Brewing was just one of the chemical engineering aspects of the discipline. His department was also working on the development of artificial membranes for dialysis.

It wasn't long before hospitals realized the value of having an engineer on staff who had been trained to understand the requirements and needs of a clinical/research/teaching environment. Some of these appointments were within existing departments and were created to support those departments with their research. It soon became apparent that the design and construction of custom electrical/electronic devices warranted the support of an Electronic Technologist.

In the early 1970s a negative public statement about electrical safety in hospitals from a U.S. consumer advocate focused hospitals' attention on medical device safety. This milestone drove an increase in Clinical Engineering departments (many continued to use the title Biomedical Engineering), Clinical Engineers, and staff including Technologists and Technicians. With this expertise within the hospital, it was possible for Hospital management to address the electrical safety issues, obtain unbiased in-house pre-purchase advice, and investigate medical device patient incidents. Hospital management soon realized that this new department was in a position to manage and implement a comprehensive medical device maintenance program with existing staff.

As a new department in healthcare it was realized that in order to promote and improve the service, credibility needed to be established with clinical staff and management. In healthcare credentials matter — a lot. Clinical Engineers in CMBES recognized this from interaction with the Association for the Advancement of Medical Instrumentation (AAMI) that had its own certification program. CMBES soon followed and in collaboration with AAMI developed their own Certified Clinical Engineer (CCE) program.

In the early days there were very few Colleges with full-time Biomedical Technology programs in Canada. Employers could not find qualified BMETs (Biomedical Engineering Technologist/Technician) and were forced to hire Electronics people and train them on the job. Concerned about a renewable source of qualified people, legal exposure, and credibility, employers approached local colleges to start Biomedical Technology programs. It took many years and today there are 6 programs across Canada. In addition there is one Health Care Technology Management – Honours Bachelor program offered at Durham College in Oshawa.

In 1979 a sub-committee of CMBES Professional Affairs on BMET Certification was formed. After many meetings with BMETs, College Program Coordinators, employers (including ISOs and OEMs) the sub-committee submitted a proposal to the International Certification Commission (ICC). The ICC approved the Canadian Board of Examiners for Biomedical Engineering Technologists/Technicians in 1982. The first certificate was issued in 1982 with the credentials CBET(c). The credential stands for Certified Biomedical Engineering Technologist (Canada).

Since the dissolution of the ICC in 2016, the Board of Examiners continues to this day. It is estimated that there are several thousand BMETs working in hospitals, OEMs, and ISOs across Canada.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Michael Albisser

Professor of Medicine, Surgery, and BioEngineering. Developed artificial endocrine pancreas, and various unique systems that achieve perfect diabetes control.
Director of Biomedical Research Division
1968 - 1990

With colleagues and students, Professor Albisser built and tested the first bedside artificial endocrine pancreas, the first portable intravenous insulin delivery system, the first hand-held insulin/medication dosage computer. His research discovered and patented phosphorylated insulin. He developed telemedicine and cloud technologies for diabetes including TeleDoc and HumaLink that have been on-line for 18 years in use by persons with diabetes.

He pioneered the realization of portable digital technologies that can guide any person with diabetes to achieve and maintain perfect control. he developed specific algorithms for the precise control of insulin and tablet dosing rates that are effective and above all safe.

> **His research discovered and patented phosphorylated insulin**

Dolan M. Alf

Professor Emeritus BSc (Saskatchewan), MSc (Missouri) Institute of Biomaterials & Biomedical Engineering

Research Interests

Professor Dolan's research had been involved with the defibrillation and artificial heart field as well as with the technology of cardiovascular surgery and intensive care.

More recently, in collaboration with Dr. W. Zingg, Prof. Dolan has begun to consider the problem of technology evaluation and effectiveness. His long standing involvement in international standardization for more that two decades now includes chairing the working group of the International Standards Organization, which is addressing risk management issues, including risk assessment, risk estimation, risk control and risk analysis for medical devices.

Additional interests include the development of appropriate clinical and management information systems for health care institutions. That system has now been extended beyond the prototype in one hospital to become part of the patient management system.

> **involved with the defibrillation and artificial heart field as well as with the technology of cardiovascular surgery and intensive care.**

ROLE MODELS
AND MAJOR ACHIEVEMENTS

ROBIN CHARLES BLACK

Ph.D., P.Eng., C.C.E., B.A.Sc., B.Sc., F.C.M.B.E.S., F.E.C, F.G.C.(Hon.), F.C.S.S.E.

Dr. Robin Black has been a supporter of the Biomedical Engineering profession for his entire career and an active member of CMBES and many other organizations. He received his undergrad training (Mechanical Engineering -1971 and Biology - 1968) in Ontario and his PhD in Biomedical Engineering from Strathclyde University in Scotland (1984).

His early career was spent as a researcher in the field of Rehabilitation Engineering at the Ontario Crippled Children Centre in Toronto developing a pressure sore prevention clinic augmented by quantitative thermography. At the National Research Council in Ottawa, he served as a Senior Research Officer and Adjunct Professor in the Surgery department at the University of Ottawa while building an orthopaedic research program that led to the development of a Canadian Orthopaedic manufacturing company, Terray Manufacturing. The balance of his career was with the National Research Council as an Industrial Technology Advisor for the Industrial Research Assistance Program.

This role provided a consulting service to client companies with respect to strategic technological development. To effectively meet this task, it is necessary to analyze company capabilities and needs before recommending a course of action. The core competencies are identified and business plans reviewed to provide a background understanding of corporate operations. Specific assistance in developing strategic alliances commonly requires, utilizing both national IRAP information resources and personal networks.

In particular, technical and scientific assistance to the IRAP network with respect to the Medical Devices Industry had been provided. A continuing liaison with the Alberta Heritage Foundation for Medical Research was established to strengthen the medical industry in Alberta.

Dr. Black developed working relationships with the Alberta Stock Exchange, CDNX and TSX Ventures with respect to the high technology sector. He was a co-founder of an advisory board for the CDNX and later assisted in TSX-V educational programs in Calgary. He led IRAP collaboration with Calgary Technologies Inc. in the development of venture capital programs for entrepreneurs.

He is a Certified Clinical Engineer, a Fellow of CMBES, Engineers Canada and the Canadian Society of Senior Engineers. In 2006 he received the NRC Outstanding Achievement Award and in 2018, he received the Canadian Pacific Railway Engineering Medal for his years of leadership and service from the Engineering Institute of Canada.

> **“Even in his retirement, he continues to support the profession with his work on various boards including the recently formed Vancouver Island Engineering Society.”**

Even in his retirement, he continues to support the profession with his work on various boards including the recently formed Vancouver Island Engineering Society.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Richard S. C. Cobbold

Professor Emeritus
BSc (London), MSc (Sask), PhD (Sask), FRSC

Research Areas:

Doppler Ultrasound

Doppler methods have an important role in the non-invasive assessment of patients with arterial disease. Our research includes the development of:

- Spectral estimation methods to accurately determine the flow velocity
- Colour flow imaging to measure 2-D vector flow velocity distributions
- Clutter models based on the haemodynamics of pulsatile arterial blood flow

Nonlinear Ultrasound for Imaging and Doppler Applications

- Models of nonlinear ultrasound propagation in tissue
- Use of coded excitation for improving the SNR

Ultrasound Propagation in Metamaterials

This represents a new area of investigation that may enable some of the limitations of current ultrasound methods to be overcome.

Elastography using Radiation Pressure Excitation

Measurement and imaging of the elastic properties of tissue by generating shear waves.

Ultrasound Propagation in Bone

Experimental and theoretical methods for understanding ultrasound propagation in bone.

Ron Evans, P.Eng.

VP Product Development
Datrend Systems
Richmond, BC

Ron worked as the Director of Biomedical Engineering at BC Children's Hospital for many years before branching out to develop Biomed Test Equipment with Datrend Systems.

He has been the VP of product development with Datrend for 27+ years.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Dr. Geoff Fernie
Professor at University of Toronto and Senior Scientist at the Toronto Rehabilitation Institute - UHN

Geoff Fernie, CM, PhD, PEng, CEng, FCAHS, is the Creaghan Family Chair in Prevention and Healthcare Technologies, Department of Surgery, University of Toronto and a Senior Scientist at the Toronto Rehabilitation Institute. He has cross-appointments that include professorships in the Institute of Biomaterials and Biomedical Engineering, Department of Mechanical and Industrial Engineering, and the Rehabilitation Sciences Institute.

A biomedical engineer by training, Dr. Fernie's passion is the search for practical solutions to the common problems of daily living for an aging population and for people who live with different forms of disability.

"Dr. Fernie has led the growth of TRI to be the top rehabilitation research centre in the world. He has a track record of taking inventions from the laboratory and making them available on the market."

Dr. Fernie has led the growth of TRI to be the top rehabilitation research centre in the world. He has a track record of taking inventions from the laboratory and making them available on the market. Under his mentorship, trainees are exposed to complex, applied research activities in a range of laboratory, clinical, design studio, manufacturing, and business settings.

Dr. Geoff Fernie's research and product development focus on three broad areas that hone in on common worries that people face as they age or when they provide care to others, including the following: prevention of injury and illness, restoring function after a health event, and enabling people to live as independently as possible as they age. He currently has 8 commercialized products and 4 currently in clinical trials and has helped to launch several companies.

In addition to his investigative work as a world-class scientist, and an outstanding and progressive engineer, Dr. Fernie has served on numerous committees to inform and advance public policy pertaining to persons with disabilities; he has chaired a number of influential conferences to further advance the profile and the need to address issues related to disability and aging. Dr. Fernie has over 140 peer-reviewed journal papers and book chapters, 22 awarded patents and an additional 13 patent filings.

Dr. Fernie has maintained a focus on the reduction of falls through the development of innovative mobility products, non-slip winter footwear and improvements to accessibility and building codes. He has made significant advances in preventing hospital-acquired infections by improving hand hygiene. His recent involvement in the development of an instrument for home diagnosis of sleep apnea will significantly reduce the prevalence of cardiovascular complications resulting from untreated sleep apnea.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Dr. Fernie has been responsible for many products that assist people's independence, including innovative wheelchairs and bathroom aids. Many of his inventions have reduced the physical burden of caring for people, including the prevention of back and shoulder injuries in professional nurses and family caregivers caused by lifting and moving people. Dr. Fernie played a key role in linking CMBES with the Festival of International Conferences on Caregiving, Disability, Aging and Technology (FICCDAT) for joint conferences in Toronto - 2007 & 2011.

Dr. Fernie has received several awards for his achievements in improving the lives of people with disabilities and exemplary dedication to the creation and design of modern technology, including the Order of Canada (2017), the Lister Prize (2017) which is the highest honour bestowed by the Department of Surgery at the University of Toronto, RESNA's (Rehabilitation Engineering and Assistive Technology Society of North America) 2016 Samuel McFarland Memorial Mentorship Award for which he was nominated by his former students, the Inaugural 2014 Honourable David C. Onley Award, the Canadian Society for Biomechanics Biannual Career Award in 2014 and the Queen Elizabeth II Diamond Jubilee Medal in 2012.

“Dr. Fernie has received several awards for his achievements in improving the lives of people with disabilities and exemplary dedication to the creation and design of modern technology,”

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Dr. Monique Frize
OC, P.Eng., FCMBES, FEC

Monique Frize, received a B.A.Sc. degree (Electrical Engineering) from the University of Ottawa in 1966. From 1967 to 1969, she was an Athlone Fellow for post-graduate studies in the United Kingdom where she received a M.Phil. degree in Electrical Engineering (Engineering in Medicine) from Imperial College of Science and Technology in London. In 1986, she received a MBA degree from the Université de Moncton and a Ph.D. degree from Erasmus Universiteit in Rotterdam in 1989.

A clinical engineer for 18 years she was Director of the Regional Clinical Engineering Service in Moncton, New Brunswick. In 1989, she was appointed the first holder of the Nortel-NSERC Women in Engineering Chair at the University of New Brunswick and a professor of Electrical Engineering.

She was the first Chair of the Division of Clinical Engineering for the International Federation of Medical and Biological Engineering (IFMBE).
In 1992, Monique Frize received an Honorary Doctorate from the University of Ottawa (DU); in June 1993, a Ryerson Fellowship; in 1994, an Honourary Doctorate in Science (DSc) at York University; in 1995, an Honourary Doctorate in Engineering at Lakehead (DEng). She was inducted as a Fellow of the Canadian Academy of Engineering in 1992.

“In 1993, she was made an Officer of the Order of Canada, in recognition of being “well-known in the field of biomedical engineering” and for being “a role model and an inspiration for women seeking careers in science”.”

In 1993, she was made an Officer of the Order of Canada, in recognition of being “well-known in the field of biomedical engineering” and for being “a role model and an inspiration for women seeking careers in science”.

In 1995, Dr. Frize received the Second Historical Professional Achievement Award (jointly with Dr. Michael Shaffer) from the American College of Clinical Engineers.

In 1997, she was appointed Professor in the Department of Systems and Computer Engineering at Carleton University and Professor in the School of Information Technology and Engineering at the University of Ottawa.

She received the Gold Medal in 2010 from Professional Engineers Ontario and the Ontario Society of Professional Engineers and she became Fellow of Engineers Canada in 2010. In 2013, she was awarded the honour of Fellow of the Canadian Medical and Biological Engineering Society.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Bryan Finlay
PhD, Bioengineering
BSc 1st Class Hons,
Mechanical Engineering

Bryan served a 7-year Engineering Apprenticeship with Bristol Siddeley (Rolls Royce). In only his second year, he received the Whitworth Society Prize in Great Britain and was awarded the Second-Best Apprentice award for that year for the high marks in his Mech Eng Ordinary National Certificate. With company sponsorship, he went on to earn a First-Class Honours BSc in Mech Eng from Lanchester College (Coventry University, UK). The focus of his degree-project on Instrumentation and Controls Systems was to guide the rest of his career.

After a year at Sperry Gyroscope working on the control systems for defensive missiles, he was appointed as Assistant Lecturer to teach Instrumentation in the Department of BioEngineering at Strathclyde university (Glasgow, Scotland). During the first 3 years of his 5 years of teaching at Strathclyde, he also obtained his PhD for studying the Biodynamic Properties of Human Skin, both in vivo and in vitro, with a sophisticated electro-mechanical servo that he developed. Along with this work on skin in the West of Scotland Regional Plastic Surgery Unit at Canniesburn Hospital, he also used an early version of the scanning electron microscope to study the microstructural properties of a variety of soft-and-hard connective tissues. A highlight of this time in Scotland was the presentation of a review paper on "The Dynamic Mechanical Properties of Skin" at a 1971 NATO conference in Portugal. During this time, he also rose to the level of Fellow in both the Institution of Mechanical Engineers and the Institution of Electrical Engineers in the UK.

In 1972, with the encouragement of his mentors, engineer Professor Robert Kenedi and surgeon Professor Tom Gibson, Bryan accepted a position in London (Ontario) to set-up a Biomedical Engineering unit (With Research, Teaching and Service functions) at the proposed University Hospital, and with an academic appointment as Assistant Professor in the department of Medical Biophysics of the University of Western Ontario.

During the following 10 years, Bryan published many papers on Clinical Engineering and the BME department (apart from its Service and Teaching functions) created a number of patient and physician-assistive devices which included: a Demand Analgesia device; an Electro-Convulsive Therapy unit; a Fibrillator; an anastomosis device for the colon; a Patient Hoist; a customized Electrical Wheelchair; seating for a dwarf; electrical coding for the screens of radiological devices; and more. He established a Shared Service (Based at UH and funded by the OHA) for the 8 hospitals of District 1 of OHA in SW Ontario. While presenting a paper on Electrical Burns at a BES meeting in Edinburgh (UK), he met Jack Hopps who encouraged him to become involved in CMBES activities; this was to be the start of a long-term friendship and productive association with CMBES. During 1978-1982, he served effectively as the Treasurer of CMBES, taking advantage of the high-interest (18-20%) one-year GICs that were available. From 1975 to 1978, he was also very active promoting BME with the London section of the IEEE with positions as Secretary, Vice-Chair, Chair, and Chair of the Fellow Nominations committee. For 1978-1980, he served as Chair of the Technology Advisory committee at Fanshawe College which instituted a popular, 2-year, BMETT course. He also served on several CSA committees (1977-1982) and was on the Review Board for the journal Health Devices produced by ECRI. With the early days of the internet, he organized a CMBES Workshop in Banff (1991) with participants from the UK, Ireland,

ROLE MODELS
AND MAJOR ACHIEVEMENTS

USA and Canada who all submitted their papers through university-linked e-mail. In that same year, he was elected as a Fellow of CMBES.

Having risen to the level of Full Professor, in 1982 and still at UWO/UH, Bryan moved to become Director of Orthopaedic Research and set-up the Orthopaedic Research Laboratory. From 1990-1995, he held the Gwynneth D Rorabeck Scientist position at UH. The group developed an international reputation, working on several projects that included: joint replacements for the hip and knee; externally-applied fracture-fixation systems; bone-healing; sports-medicine issues that included compartment syndromes and a continuous passive-motion device for the shoulder; a computer-based clinical database; and more. Their sophisticated strain-measurement systems on bone won them the 1985 Charnley Award of Hip Society. Bryan served on committees of the Canadian Orthopaedic Association and acted as the President of the Canadian Orthopaedic Research Society 1992-1993. In 1992, based on his nomination by CMBES members at Queens University (in recognition of his Clinical Engineering and Orthopaedic contributions), he was awarded the R&D Medal of the Professional Engineers of Ontario.

“Up to 1998, he had: 87 Book/Journal publications; 73 Conference Papers; 92 Abstracts; over 65 Research Grants that totalled over $2.8M; with a variety of Invited Talks, Supervised Theses, Examined theses.”

Up to 1998, he had: 87 Book/Journal publications; 73 Conference Papers; 92 Abstracts; over 65 Research Grants that totalled over $2.8M; with a variety of Invited Talks, Supervised Theses, Examined theses.

The Orthopaedic Research Laboratory at UH closed in 1995 and Bryan served a year as a Clinical Engineering consultant before becoming the Director of BME at LifeTech Corporation where he worked for 2 years on instrumentation for the controlled production and use of ozone for sterilizing biological fluids such as blood. He was involved in a few patents that were submitted in relation to this work.

In his final position, he served as Director of Flow Technologies at Trudell Medical International where he worked for 13 years on instrumentation for the controlled delivery of fine-particle aerosols for respiratory and abdominal applications for humans and animals that ranged from a mouse to a horse. This work created several North American, European and other patents. In 1990, TMI provided funding for the CMBES Student Paper competition for which Bryan acted as the Chairman.

In retirement, Bryan continues his personal research interest (which he started in 1969) in the design, development and application of telemetry systems to measure the Core Temperature of marathon swimmers. In 2017, the Lord Mayor of Coventry (his birth place) conferred on him the status as Freeman for the time he served as an apprentice 1959-1966.

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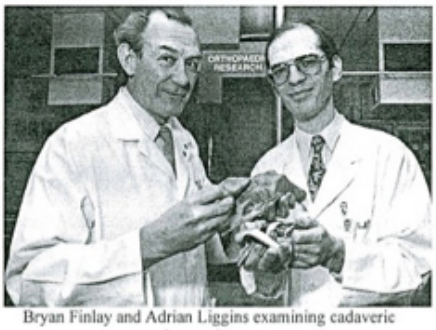

Bryan Finlay and Adrian Liggins examining cadaveric human knee.

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CANADIAN ENGINEERS' CONTRIBUTIONS TO MEDICINE

Bryan Finlay and Orest Roy

Introduction

The interaction of engineering with medicine and biology has been extremely successful from the point of view of product development and technical innovation. Canada's engineering community has contributed to the development of useful and effective medical technology. Devices such as the cardiac pacemaker, new materials for dentistry, orthopaedics and cardiovascular implants, improved cements for total hip replacements, robotics in surgery, and technology to assist the elderly and disabled persons are but a few examples of such contributions.

Engineers from Newfoundland to British Columbia are applying their talents to the solution of medical and biological problems. As with many applications of engineering technology, these advances reflect a combination of engineering disciplines, and especially the chemical, electrical/electronic, mechanical and metallurgical ones.

One of the challenges for an individual working in this area is the multidisciplinary aspect of problem-solving. The engineer must interact with, and prove himself/herself to, a team that often consists of clinicians, surgeons, biologists, physiologists and other health care professionals. This challenge has led the American Institute for Medical and Biological Engineering to review and debate the role of engineering in medicine and biology.[1] The discussions included the following aspects of the engineering approach to medicine and biology and contributions to added value:

- a systems analysis framework that can serve as an antidote to the reductionist approach of cell and molecular biology;
- an emphasis on the quantification of processes, products and procedures before introduction in the clinic;
- a commitment to concrete 'deliverables' beyond scientific publications; and
- a built-in consciousness of cost-effectiveness issues in the process of optimization.

Here in Canada, the Canadian Medical and Biological Engineering Society (CMBES)—founded in 1966—has provided leadership and support mechanisms for engineers and technologists practising in this field. The CMBES has a continuing education program, supports a clinical engineering

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ROLE MODELS
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Dr. John (Jack) Hopps,

Founder of CMBES
Inventor of the Heart Pacemaker,
Father of Biomedical Engineering in Canada

In 1965, Dr. Hopps founded the Canadian Medical and Biological Engineering Society and became its first President. He was also President of the International Federation for Medical and Biological Engineering in 1971 and served as Secretary General for the Federation from 1976 to 1985. From 1985 to 1988, Dr. Hopps was Secretary General of the prestigious International Union for Physical and Engineering Science in Medicine. He dedicated most of his career to working for the Medical Engineering Group of the National Research Council of Canada, which he joined shortly after graduating from the University of Manitoba in 1941.

Dr. Hopps, who preferred to be called 'Jack', was a leader in the medical application of engineering science for almost half a century. Although he passed away in November 1998, Jack will always be remembered for his significant technical and scientific achievements, which continue to improve the lives of millions of people the world over. He left a legacy of medical devices and instruments that help people with a variety of disabilities. His contributions to medical technology and his outstanding reputation as a national and international leader in the biomedical engineering profession make him an important figure in human history.

His early research was highlighted by the invention of the world's first cardiac pacemaker, which he developed in collaboration with Dr. W.G. Bigelow and Dr. J.C. Calahan, at the Banting Institute in Toronto. In an Angus Reid poll conducted in March 1999, the pacemaker was recognized by Canadians to be the Most Significant Engineering Achievement of the 20th Century. Some of the other numerous honours and awards he received include his appointment as an Officer in the Order of Canada; Merit Award of the International Union for Physical and Engineering Science in Medicine; Leadership Award of the Alliance for Engineering in Medicine and Biology; The Institute of Electrical and Electronics Engineers General A.G.L. McNaughton Award, and the Distinguished Scientist Award of the North American Society for Pacing and Electophysiology.

> **"founded the Canadian Medical and Biological Engineering Society"**

Dr. Hopps' name is engraved in our memories for the pioneering role he played in the biomedical profession and for the outstanding contributions he made to the advancement of bioengineering by affecting the transfer of advanced technologies to medicine. Jack Hopps created a strong foundation for CMBES. Thanks to his legacy and reputation, biomedical engineering professionals are becoming increasingly more recognized and respected in the health care sector.

Knowledge • Exchange • Networking

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1965 • Years • 2015

ROLE MODELS
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Dr. Charles Laszlo, CM, OBC, PhD, PEng
Professor Emeritus, UBC Department of Electrical and Computer Engineering

Dr. Charles Laszlo started his engineering education in 1957 at McGill University; he obtained his BEng, MEng, and completed his PhD in 1968. He became the Associate Director of the Division of Health Systems at the University of British Columbia from 1974 and pioneered the UBC Clinical Engineering Program in 1980. From 1980 to 1993, Charles' Clinical Engineering Program graduated many clinical engineers who are now holding prominent positions in the Canadian healthcare system. He founded the Institute for Hearing Accessibility Research at UBC in 1993, and was the Director until he retired in 1999. He is now a Professor Emeritus at the UBC Department of Electrical and Computer Engineering.

Charles has severe hearing impairment since his twenties. Knowing first-hand the profound impact of biomedical engineering on quality of life and healthcare, he has been working relentlessly over three decades in auditory basic research including devices for people with hearing disabilities, and computer applications in healthcare. He has over 170 publications and four patents to his credit. He is the inventor of several innovative hearing aids. In technology transfer and commercialization, Charles is the co-founder and chairman of Assistive Listening Device Systems, Inc. which produces infrared assistive listening devices for people with hearing loss, and Mitroflow International Inc. which developed and manufactured a unique heart valve in B.C.

> **"Charles is deeply committed to the enrichment of many people's lives through his ongoing services."**

Charles is deeply committed to the enrichment of many people's lives through his ongoing services. He was the founding president of the Canadian Hard of Hearing Association, and also served as the president of the International Federation of Hard of Hearing People.

Dr. Charles Laszlo has received many honours. He was appointed as a National Health Scientist at UBC in 1974 - the first biomedical engineer in Canada to receive this honour. He was a recipient of the Order of British Columbia (1998), the Order of Canada (1998), the Queen Elizabeth II's Diamond Jubilee Medal (2002 & 2012), and the Gold Medal of the Canadian Council of Professional Engineers (2018). Charles was a member of CMBES' Executive, serving in different positions from 1972 to 1976. He is an Emeritus member of CMBES.

ROLE MODELS
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Kim Marshall

Kim Marshall started his career in 1973, after graduating from Fanshawe College, London, Ontario, with a Senior Electronics Engineering Technician diploma. He was accepted at Electrohome Limited where he worked in Engineering and Production Engineering. In Engineering, he was responsible for building prototype televisions for the design engineers. Later, he was given the task of developing one of the service manuals for the model C16 televisions. He was given this task after the Manager had reviewed his Technical Report from college. In Production Engineering, his responsibilities were to build and assemble tuner prototypes (following the design engineer modifications) for assembly lines to follow. He was also responsible for quality control for component tolerances used in production. He also led plant tours for foreign component manufacturers. In this position he learned about automated component assembly of PCB and related problems surrounding the wave soldering process, which assisted him in future troubleshooting.

He left Electrohome in the fall of 1974 to attend Electrical Engineering at the University of Western Ontario which he did not complete. All he wanted was to attend college in the electronics program. While he was pondering his future, he received a letter from Fanshawe College about a new Biomedical Engineering program they were offering. They were looking for past students, who had graduated from their electronics program and who had experience. His mother was a registered nurse, and he thought this type of career would be interesting. One of his instructors at the time was Dr. Bryan Finley, head of Biomedical Engineering at University Hospital in London, Ontario. Kim graduated from Fanshawe College in 1976, with his second diploma in Engineering Technology.

"This is a biography on a true BMET pioneer. How biomedical equipment servicing came to be in the Niagara Peninsula."

His Technical report at college was based on electro-muscular stimulating devices and he received information for this report from Dr. John Smith, head of Biomedical Engineering at Sick Kids hospital. His first Co-op in Biomedical Engineering was a two month stint working with Ron Evans, who was manager of Biomedical Engineering at St. Joseph's Hospital in Hamilton. His last two month college co-op was working for Rod Kosmick, manager of the Niagara Regional Biomedical Engineering (NRBE). He was offered a full time job there, even before he completed his college co-op. During the early years of biomedical engineering, it was difficult to start servicing medical equipment because it was taking the place of maintenance staff who were attempting to repair it. We had to prove ourselves and show everyone that we were highly skilled in repairing medical equipment. It took a while to break the ice. As medical equipment became more electronic than just electrical, biomedical technicians and technologist became more accepted.

The Niagara Regional Biomedical Engineering was started by a USA Kellogg's Foundation grant. This

was the first grant of its kind given by Kellogg's to Canada to assist in healthcare. The program was given approximately $130,000 in 1975, spread over three years, to get the biomedical program started. Each year NRBE had to submit a report on how the funds were used to benefit healthcare in the Niagara Region before they could obtain the next years funding. The program first started servicing electro- medical and laboratory equipment. Kim joined during the second year of the funding. For the third and last year of funding they setup and started a regional radiology service, performing HARP testing and radiology repairs. At the time, NRBE was the first Biomedical Engineering shared service in Canada. In fact, Gregg Coutts later started a biomedical shared service for some of the Toronto Hospitals, after reviewing our biomedical operations. To obtain the funding from Kellogg's, we had to be a non-profit operation. The biomedical group fell under the responsibility of the Greater Niagara General Hospital. The manager of the biomedical program there reported to the senior vice president. A regional biomedical steering committee (of regional hospital administrators) met monthly to review the program. At this meeting, the biomedical manager would present the budget for service training, test equipment etc. The steering committee would base their hourly rate for billings on the budget. Staff monthly utilization reports would be submitted to finance, for our time spent in each hospital, and the hospitals would be billed for our monthly service. These receivables covered the cost of running the program.

In the fall of 1978, Kim left the NRBE (the same time the biomedical manager left) and attended, for a second time the Electrical Engineering program, at the University of Western Ontario. It was at this time he realized that university wasn't for him. During his year at Western, he was assisting Niagara Regional Biomedical Engineering completing equipment repairs on the weekends. In 1979, he spent the summer working for NRBE and realized the program was starting to suffer. He was then offered the opportunity to take the management position of NRBE (at this time he had a job offer from Honeywell in Toronto). In 1979, at 28 years old he assumed the position of manager until 1995. Without manage ment experience, he found it challenging. He tried to manage and do service at the same time. He asked the NRBE for two additional employees; which were granted. This allowed him to better manage the program.

> **"As medical equipment became more electronic than just electrical, biomedical technicians and technologist became more accepted."**

He also took a one year 'Ontario Hospital Departmental Management' course and later a two-year certificate in Health Services Management course offered jointly by the Canadian Hospital Association and Canadian Health Executives. During the 15 years he was manager, he had many Fanshawe College biomedical co-op students some of which he hired. He also served two years on the college's advisory committee for the biomedical program.

In 1995, the largest hospital, St. Catharine's General Hospital, pulled out of the NRBE and the program dissolved. The rest of the employees went to Niagara Falls and Welland Hospitals. In 1995, the CEO of the St. Catharine's General Hospital offered Kim the opportunity to setup an in-house biomedical program, which he accepted. He returned to the position, as a full-time biomedical technologist. He obtained the necessary

test equipment, service training and setup an in-house PM program. He doesn't know how he survived this time as a biomedical technologist. He was the sole biomedical technologist for six years before additional staff were added to the department. He had to survive a hospital reengineering (each department had to reduce funding by 30% which meant layoffs). Hired consultants asked an independent service organization (ISO) to put an offer forward to replace the in-house biomedical program to try and save costs. With the assistance of Dr. John Smith of Sick Kids Medical Engineering, he presented his case to keep biomedical in-house, and he won. Then he had to survive Y2K.

Around 2001, the hospital boards dissolved and then all six regional hospitals joined together under the Niagara Health System, and due to administrative repositioning, an ISO was allowed to assume management of Biomedical Engineering. Kim requested that Dr. Tony Easty to do a presentation to the Board regarding what a clinical engineer could do for the biomedical program. The offer was turned down. In 2002, the biomedical employees became unionized under OPSEU. Kim served on the OPSEU executive for a few years. The ISO's management contract was not renewed. We were then managed by a professional engineer who managed the regional hospital facilities. Later we convinced management to hire a biomedical clinical engineer, Jean Ngoie. From this point, the biomedical program took off and never looked back.

This story largely conveys how much Biomedical Engineering has meant to Kim Marshall throughout his life. He wouldn't change a thing ('other than being a Clinical Engineer' he says). The growth and effectiveness of the biomedical engineering field in Canada, more specifically 'clinical engineering,' depended largely on efforts taken on by individuals like Kim. They were visionary and worked hard at what they did. This resulted in an increased awareness of the profession and a legacy of engineering practices, Kim served on the boards of the United Way and Rotary Club of St. Catharine's for 13 years. He retired in 2017.

"The growth and effectiveness of the biomedical engineering field in Canada, more specifically 'clinical engineering,' depended largely on efforts taken on by individuals like Kim. They were visionary and worked hard at what they did."

ROLE MODELS
AND MAJOR ACHIEVEMENTS

James McEwen
Engineer, PhD, P. Eng, Professor, University of British Columbia

James McEwen is a biomedical engineer and the inventor of the microprocessor-controlled automatic tourniquet system, which is now standard for 15,000-20,000 procedures daily in operating rooms worldwide. He is also an adjunct professor in the Faculty of Orthopaedics and the Faculty of Electrical and Computer Engineering at the University of British Columbia. He currently resides in Vancouver, British Columbia.

He was awarded the CMBES Outstanding Biomed award in 1993.

Dr. Morris (Mickey) Milner
Ph.D. (Wits), D.Sc. (Hon) (Queen's), P. Eng, C.C.E.

Dr. Morris (Mickey) Milner Ph.D. (Wits), D.Sc. (Hon) (Queen's) of Toronto, received B.Sc.(Eng) and Ph.D. degrees, respectively in 1957 and 1968, in the Department of Electrical Engineering, University of the Witwatersrand, South Africa. He held academic/research appointments in South Africa, Canada and the USA before joining Bloorview MacMillan Childrens Centre (BMCC) as Director, Rehabilitation Engineering, in 1978 as Director, Rehabilitation Engineering, then VP Research, with academic appointments at the University of Toronto where he also served as Deputy Director, Institute of Biomaterials and Biomedical Engineering (IBBME), and Chairman, Rehabilitation Medicine. He is now Professor Emeritus in IBBME. As VP Research at BMCC his responsibilities included Rehabilitation Engineering and Research and administration of Variety Ability Systems Inc., a facility for manufacturing assistive devices. He is Founding Director of the Ontario Rehabilitation Technology Consortium (ORTC) which linked Ontario rehabilitation facilities, academic centres, consumers, and manufacturers to develop and commercialize assistive technologies. Over 12 years, 33 assistive devices were marketed and some 10 start-ups initiated. He served as President and CEO, htx – The Health Technology Exchange (HTX), then as Consultant to the organization and subsequently as a member of the Board of Directors. He was instrumental in attracting an investment of $21.4-million for the benefit of the medical and assistive technology sector in Ontario.

> **He was instrumental in attracting an investment of $21.4-million for the benefit of the medical and assistive technology sector in Ontario.**

Dr. Milner served on numerous national and international organizations including granting agencies. He has contributed to training scores of persons in biomedical / rehabilitation engineering and mentored countless others in various disciplines. He is the recipient of many prestigious awards.

ROLE MODELS
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Fernand Roberge
Professor, Department of Physiology, Faculty of Medicine, University of Montreal

Professor in the Department of Physiology of the Faculty of Medicine of University of Montreal since 1964, Dr. Fernand Roberge is a key figure in biomedical engineering in Quebec. Throughout his career, he has worked closely with École Polytechnique de Montréal to develop teaching and research structures in this field at the intersection of medicine and engineering. He is the founder of the Institute of Biomedical Engineering, where the vast majority of Quebec specialists have been trained, and is responsible for the creation of master's and doctoral programs in biomedical engineering. Between 1996 and 2005, he served as Associate Dean and Executive Vice-Dean at the Faculty of Graduate Studies.

Fernand Roberge's contribution to Quebec's scientific heritage comes in the form of another important achievement: the creation of the Montreal Sacré-Coeur Hospital Research Center, in which he participated very closely. In recognition of this commitment, the Faculty of Medicine of University of Montreal has created a Graduate Scholarship bearing its name. Dr. Roberge also supported the establishment of a clinical electrophysiology laboratory at Sacré-Cœur Hospital and contributed to the development of the arrhythmic clinical electrophysiology program at the University of Montreal.

As member of numerous associations including the Royal Society of Canada and the Board of the Health Technology Assessment and Response Agency, Fernand Roberge is also a fellow of the Institute of Electrical and Electronic Engineers (IEEE). He chaired the IEEE's annual conference in 1995, earning him the title of Greater Montrealer. He is credited with the Rousseau Award from the Francophone Association for Knowledge (ACFAS), the Léon-Lortie Prize from the Saint-Jean-Baptiste Society of Montreal, the Agora Award from the Palais des congrès de Montréal and the Medal of IEEE's Third millennium.

“Fernand Roberge's contribution to Quebec's scientific heritage comes in the form of another important achievement: the creation of the Montreal Sacré-Coeur Hospital Research Center, in which he participated very closely.”

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ROLE MODELS
AND MAJOR ACHIEVEMENTS

OREST Z. ROY

How I got into the field

In 1960 we at the National Research Council of Canada were asked to assist a young man who had had a severe stroke and could not communicate. He was completely paralyzed except for a slight movement in his right hand. I designed and built a communication device called the Comhandi. It was an electronic letter board. The board allowed him to select letters and thus build up words. It was one of the first devices of its kind in the world.

Important event(s) that influenced my early decision to get into the assistive technology field

My professional background is in electrical engineering and biomedical engineering. I graduated from the University of Manitoba in 1956 with a degree in electrical engineering and then in 1960 received a Masters Degree in electrical engineering from McGill. In 1956, I began my career in biomedical engineering at the National Research Council. My first project was to integrate the ecg, blood pressure monitor, etc into a unit that could be used in the OR during corrective cardiac procedures. Over a period of 35 years I have carried out research on cardiac pacemakers, defibrillators, the effects of micro currents on the heart, including taser currents and research on assistive technology. I am a founding member of the Canadian Medical and Biological Engineering Society (CMBES) and was its president from 1976 to 1980. I was the Secretary General of the International Federation for Medical and Biological Engineering from 1984 to 1990. I am a fellow of the Rehabilitation Society of North America and the Canadian Medical and Biological Engineering Society. I am a life member of the International Federation of Medical and Biological Engineering and a Senior Member of the Institute of Electrical and Electronic Engineering.

> **“I have always championed the importance of rehabilitation engineering”**

Although my major areas of interest were in the acute care field I have always championed the importance of rehabilitation engineering. I thought the NRC, with its laboratories and expertise, needed to have a presence in this area. To this end, as head of the biomedical engineering at the National Research Council of Canada, I established a rehabilitation engineering program and was instrumental in bringing the first ICRE meeting to Toronto Canada and hosting the 1984 ICRE 2 conference to Ottawa.

My inspiration and mentor

I was inspired by the dedication, optimism, and professionalism of all the people in this field. Dr. David Symington, physiatrist and professor at Queens University, Kingston Ontario, had a great influence on me. Dr. Symington lived and breathed importance of the rehabilitation process.

Source: RESNA website

ROLE MODELS
AND MAJOR ACHIEVEMENTS

My memorable successes and greatest contributions to the field

Besides being involved with the first ICRE meeting in Toronto and hosting the second ICRE meeting in Ottawa, I was instrumental in establishing a marketing agency TASH, Technical Aids and Systems for the Handicapped. With the support of NRC, TASH had a mandate, which addressed the problem of getting useful technical aids manufactured and available to the disabled community. In 1991 the Canadian Rehabilitation Council for the Disabled recognized the importance of this achievement by presenting me with the Walter Dinsdale award. The award was to celebrate exceptional achievement in the development of technical aids for the benefit of disabled persons.

My most memorable failures

I was instrumental in establishing the NRC Associate Committee on Research and Development for Rehabilitation of Disabled Persons. This was an important committee that solicited input from people across Canada as to the direction and priorities of rehabilitation engineering research. Unfortunately it was disbanded after three years, not due to the lack of interest, but due to the lack of funding.

On the future of RESNA

RESNA should continue to raise the profile of rehabilitation engineering and technical aids development. With our aging population, all the rehabilitation sciences will gain in stature and relevance.

> **The work is rewarding, the challenges are many, and it is an area of activity that addresses a vital need.**

My suggestions for those just entering the field

The work is rewarding, the challenges are many, and it is an area of activity that addresses a vital need.

Orest passed away in 2017.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Robert N. 'Bob' Scott
B.Sc.(EE), D.Sc (Hon), P.Eng.
Director, Inst. of Biomedical Engineering, UNB

Bob Scott graduated from the Electrical Engineering program at the University of New Brunswick in 1955. He joined UNB as a professor of electrical engineering in 1956 and remained there until his retirement in 1990. His vision and pioneering research in the development of electronic aids for the disabled improved the lives of many people.

In 1962, Bob established the Technical Assistance and Research Group for Physical Rehabilitation (TARGPR) to work with clinical staff at the Forest Hill Rehabilitation Centre in Fredericton, to find technical solutions for patients with quadriplegia. The work was re-focussed to myoelectric control of upper limb prostheses when the Canadian government targetted funding towards prosthetics research in response to the thalidomide tragedy in the early 1960's. In 1965, Bob founded the Bioengineering Institute (later renamed the Institute of Biomedical Engineering) at UNB, and was its director from 1965 till 1990. In these years, he developed the three-state myoelectric control system for powered prostheses (still common in commercially available myoelectric upper limb prostheses), and oversaw development of child-size artificial arms. In 1982, he established the Child Prosthetics Research Centre in Fredericton, with the aim of fitting young amputees early so that they learned to use their prostheses naturally. He started the Myoelectric Controls Symposium, which continues to attract professionals working in the field, both nationally and internationally.

Bob developed a Hospital Engineering Program for the Province of New Brunswick in the 1970's, and helped to develop Clinical Engineering standards. In 1976, the CMBES published a book,

> **"In 1976, the CMBES published a book, "Portrait of Clinical Engineering", written by him"**

"Portrait of Clinical Engineering", written by him; he travelled the country to study clinical engineering departments in hospitals, and many of the issues and responsibilities defined in this book have changed little since then. He was one of the first engineers to obtain Certification as a Clinical Engineer in Canada, and he has made contributions to the development and improvement of the field.

Author of more than 150 publications, he was active in academic affairs, serving two terms as a member of the Natural Sciences and Engineering Research Council of Canada. His work with amputees led to international appointments, including serving on the National Research Council (USA) Committee on Prosthetics Research Development.

Bob served two terms on the CMBES executive (Membership Chair, 1970-72; Treasurer, 1976-78), and was on the planning committee of the 9th CMBEC in 1982. He was made a Fellow of the Society (1980), and an Emeritus member (2008). He was awarded the Canadian Centennial Medal (1967), and received an Honourary Doctorate (D.Sc.) from Acadia University (1981). In recognition of his 25 years of service as the director of the Institute of Biomedical Engineering, during which it became internationally renowned, it was re-named R.N. Scott Hall in 2002. In that same year, he received the prestigious C.C. Kirby Award from the Association of Professional Engineers and Geoscientists of New Brunswick, for his outstanding contributions to the profession and the province. Bob passed away in 2014.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Carolyn Francis Small, PhD, PEng., Professor

Professor of Mechanical Engineering and Surgery at Queen's University, Kingston, Ontario

Professor Carolyn Small was born in 1952 and earned her BSc (Mechanical Engineering) in 1973 from Queen's University. In 1977, she earned her PhD in biomedical engineering from the University of Strathclyde, Glasgow, then returned in 1978 to hold a biomedical engineering position at Vancouver General Hospital.

Carolyn was an outstanding young professional, which in 1980 earned her the Outstanding Young Canadian Biomedical Engineer of the Year Award from the Canadian Medical and Biological Engineering Society (CMBES). Besides her outstanding contribution as a young professional, Carolyn made important contributions to CMBES for over three decades; as a member as well as an executive in various capacities, which included Treasurer (1990-94), President (1994-96) and Membership Chair (1996-98). She was one of the trail blazers for women in engineering and as such made significant contributions for women as well as the profession; in academics and in healthcare.

On November 3, 2002, Carolyn received CMBES' highest honour; Fellow of CMBES. In her acceptance speech, she noted the importance of participation in professional societies such as the CMBES; "Professional societies don't exist until they are created. They are conceived, developed, built, and maintained by people, by you and me, who care about what they do enough to share it with others. I've been on both sides of the fence, as a clinical engineer and as an engineering teacher and researcher, and in both venues it has been clear that there is no progress until you share your experiences with others. Preferably face to face, and meetings like this one is where that happens." During this time Carolyn was battling cancer and so she encouraged everyone to "Appreciate life. Take nothing for granted. Be here now. Challenge yourself. Build something. And above all, have fun."

"She was also the first woman graduate of the Faculty of Applied Sciences to be appointed as a faculty member."

By this time Carolyn was a Professor of Mechanical Engineering and Surgery at Queen's where she had started her academic career in 1987. She was also the first woman graduate of the Faculty of Applied Science to be appointed as a faculty member.

As a professional, she was an effective collaborative researcher and an innovative thinker in teaching methods. She was one of the first to develop design-based engineering courses that challenged students and developed their problem-solving competencies. Her design course, MECH 212, became one of the Department's most sought after courses and featured a novel-design-build-test challenge called Mechmania. The Faculty of Engineering and Applied Science at Queen's has established an award in her honour; Professor Carolyn Small Engineering Education Innovator Award (https://engineering.queensu.ca/news-events/professor-carolyn-small-engineering-education-innovator-award/). Carolyn passed on September 27, 2005 in Kingston, Ontario.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

At a personal level Carolyn is remembered by those who knew and worked with her as someone who loved life and enjoyed engaging in academic exchanges with her colleagues. She also enjoyed challenging herself, mentally and physically, and this led her into various adventures such as cooking, dancing, skiing and racing. She enjoyed the company of friends and colleagues. She will always be remembered for her zest for life and significant contributions to education, women in engineering and the profession.

> **"As a professional, she was an effective collaborative researcher and an innovative thinker in teaching methods. She was one of the first to develop design-based engineering courses that challenged students and developed their problem-solving competencies."**

John Smith

In 1988, John Smith Director of Medical Engineering at the Hospital for Sick Children, was awarded the Engineering Gold Medal by the Professional Engineers Association of Ontario. This is the highest honour awarded by the Association. No more than one gold medal is awarded each year.

This was awarded for his accomplishments in the field of biomedical engineering highlighted by:

(1) The re-design of an ultrasonic probe to assist in the localization of blood vessels in the newborn.
(2) Design and development of a system for the detection of abnormal electrical pathways in the heart during cardiovascular surgery.
(3) Design of an infant compartment for a neonatal transport incubator.
(4) Design of a computer-based indirect calorimeter systems for the study of energy metabolism in infants.

ROLE MODELS
AND MAJOR ACHIEVEMENTS

Dr. James C. Swail
C.M., B.Sc., D.Sc.
Member of the
Order of Canada

Losing his sight early in life, he gave no quarter to despair but armed himself with a science degree and joined the National Research Council. Here, in cooperation with the Canadian National Institute for the Blind, he has developed numerous devices enabling the blind and blind-deaf to take their place in the work force. His latest products are a Braille computer and a speech attachment for computer terminals.

Dr. Swail retired as a researcher at the National Research Council in 1985 after 38 years. During his tenure at NRC he developed many aids for the visually impaired. He spent years assisting the CNIB in the delivery of aids for the handicapped. He was also widely known to amateur radio operators as VE3KF, the "King Fish".

Not so long ago, the NRC had difficulty seeing the commercial potential of projects even in its own labs. James Swail, a blind researcher who worked at the NRC for four decades, pioneered several advanced technologies for people with low or no vision, including an ultrasonic object detector, tactile or audible thermometer readouts, and voice synthesizers that anticipated those now used for text-to-speech software – all before he retired in 1985. None was ever commercialized by the NRC, though U.S. companies have since rediscovered Mr. Swail's innovations.

"He actively manufactured the synthesizers in our basement," says Mr. Swail's son Carl, who also had a career as an NRC researcher. "He probably made and sold a few hundred of them." But aside from a collapsible white cane he developed, Mr. Swail Sr. was unable to get his innovations to a broad market, Carl says, in spite of personal networking through the CNIB and among Ottawa's financial community.

Blind since the age of four, James Swail spent almost 40 years at NRC developing devices to increase the mobility and job skills of the blind. He was determined to make a personal contribution in the struggle of blind people to achieve an independent way of life in a sighted world.

Among his countless inventions are a sensor for detecting light sources, sound beacons to identify where objects are located, voice synthesizers for telephones and electric thermometers with readouts that can be heard or felt.

Perhaps this NRC inventor is best known for developing a better white cane. White canes are used by visually impaired people to feel and avoid obstacles in their path and as means of identifying themselves. But in certain situations, like crowded classrooms or restaurants, long canes can get in the way or become difficult to store. To help reduce inconvenience, Swail devised a four-section collapsible cane that could be easily folded and kept in a pocket

Swail also developed an alternative to the cane for use in crowded situations where canes are not practical, like parties or busy stores. His ultrasonic obstacle detector used radar to locate obstacles in a blind person's path. When a person or object was detected, the device's handle vibrated to alert the user.

Several devices have been created to help the visually impaired use technology, including a pocket-sized electronic calculator for the blind, a device to allow blind computer programmers to read punch cards and a synthetic speech output for blind computer users.

EMERGING CHALLENGES, OPPORTUNITIES AND FUTURE DIRECTIONS

As CMBES marks its fiftieth anniversary as the national society for Biomedical Engineering in Canada, there is much to celebrate. The field has grown very significantly, and whole new areas of specialization have come into being. This anniversary also prompts us to examine the current role of the Society and how it might evolve in future.

In the early days, Biomedical Engineering was predominantly an academic initiative in Canada, and early efforts of the Society were aimed toward building that network and fostering collaboration between individuals and institutions. With the diversity of the field, and the strong growth of clinical engineering as an area of specialization, the desire to link all participants in the field together at a national level has been diluted by the need for specialists to present their work at international meetings attended by other specialists. As a result, CMBES is no longer a venue for sharing much of the research work that occurs in Canada in biomedical engineering. Rather, it has become a strong venue for those working on clinical applications in universities, hospitals and in industry, and for the promotion of topics such as education and certification.

In our view this evolution is reasonable, and while we strongly believe that CMBES should welcome anyone working in the field of biomedical engineering, we also recognize that membership and participation must offer tangible benefits to participants, and so this evolution is inevitable. This then poses questions about the emerging challenges faced by CMBES and its members currently, and what future directions might be beneficial.

Emerging Challenges & Opportunities:

- The role of women within Biomedical Engineering in Canada has grown steadily, and it is heartening to see more women training and working in all areas of Biomedical Engineering. As our national society, CMBES has an important role to play to ensure that women are actively encouraged to enter our field and to succeed at the highest levels.

- It became clear during the World Congress in Toronto in June 2015 that medical physicists face many of the same challenges as biomedical engineers and technologists working in clinical environments. Both fields are closely aligned and are potential allies in helping to improve the health care domain.

- There is a continued need for a focus on safety in health care. Around the world, our systems are less safe than they should be, and biomedical engineers can contribute very significantly to helping to engineer safer solutions.

- There is a significant gap between medical technology innovation and commercialization in Canada. We have many talented people working on new applications and technologies, and yet many of these do not move forward to commercialization. As our economy shifts away from the exploitation of resources, we need to do more to ensure that good ideas for new and improved health care technologies and systems get developed and commercialized here in Canada.

EMERGING CHALLENGES, OPPORTUNITIES AND FUTURE DIRECTIONS

- There is a rapidly growing demand for high quality affordable health care technologies in middle-income countries, and a pressing need for cheap and effective technologies in low-income countries that Canadians could help to fill.

- We need to design, manufacture and select technologies that work well for users - reducing the cognitive load of users and integrating the technologies into effective care processes.

- As Canada pushes forward toward a comprehensive electronic medical record for all, we have a role to play in helping to ensure that technologies can be integrated into these systems, and that members of the care team are presented with relevant patient data in a timely fashion.

- The rapid emergence of personal health technologies and mobile health systems offers an opportunity for us to ensure that these systems add value to health promotion and patient care by assessing them and ensuring that the information they provide is clinically useful.

- Regarding certification of clinical engineers in Canada, there has been a low rate of adoption by eligible people. Countries like the US and China now outnumber Canadian participation on a percentage basis, and it is unfortunate that this has not been more widely adopted. On a positive note, the departmental peer review process, based on the Standards of Practice for Clinical Engineering departments, is evolving well and has generated considerable interest in other countries.

- As global warming becomes a pressing concern, there is an opportunity to examine the environmental impacts of health care technologies and build into their design and manufacture strategies to reduce these impacts.

- The CMBES is currently dealing with the supportability of medical devices in hospitals. According to surveys conducted by the CMBES and AAMI (Association for the Advancement of Medical Instrumentation), obtaining supports to service medical equipment is becoming increasingly difficult. The issue has been the topic of discussion at several conferences, journals, and in webinars. We're at a stage where engaging and challenging manufacturers appears to be the next step.

EMERGING CHALLENGES, OPPORTUNITIES AND FUTURE DIRECTIONS

Future Directions:

- Continue to encourage and welcome the participation of women in biomedical engineering in Canada at all levels. Outreach should start at high school, and CMBES could help to organize presentations by members locally across Canada. A guideline document promoting our profession to the youth of Canada would be most helpful.

- CMBES has the opportunity to build on its current webinar series, to make information access to those who cannot attend meetings in person. The CMBES Forum could be enhanced to be more accessible and user friendly, with a broader variety of material available. Peer-reviewed articles by Society members could be published electronically as well.

- Although CMBES cannot represent all the specialized areas now active in biomedical engineering, it can serve as a national body to list other groups and organizations pursuing these specialties, helping to link people together.

- In addition to the current positions open postings, CMBES could actively work to develop entry-level positions in the field. This is a pressing need since getting the first position is often a great challenge. The Society could work to develop contacts with potential employers.

- Explore areas of common interest and concern with medical physicists, and build collaboration between the professions.

- Promote the role that biomedical engineers and technologists can play to help to design safer health care technologies and systems. We need to engineer safety into health care.

- Promote the commercialization of promising new health technology innovations in Canada. One approach would be to strengthen our ties with the Canadian devices industry.

- Move our focus beyond specific health care technologies to bring value to patients, clinicians and administrators - take a holistic approach to technology in health care.

- Examine how we might stimulate more interest in clinical engineering certification, to avoid Canada being sidelined as this spreads around the world.

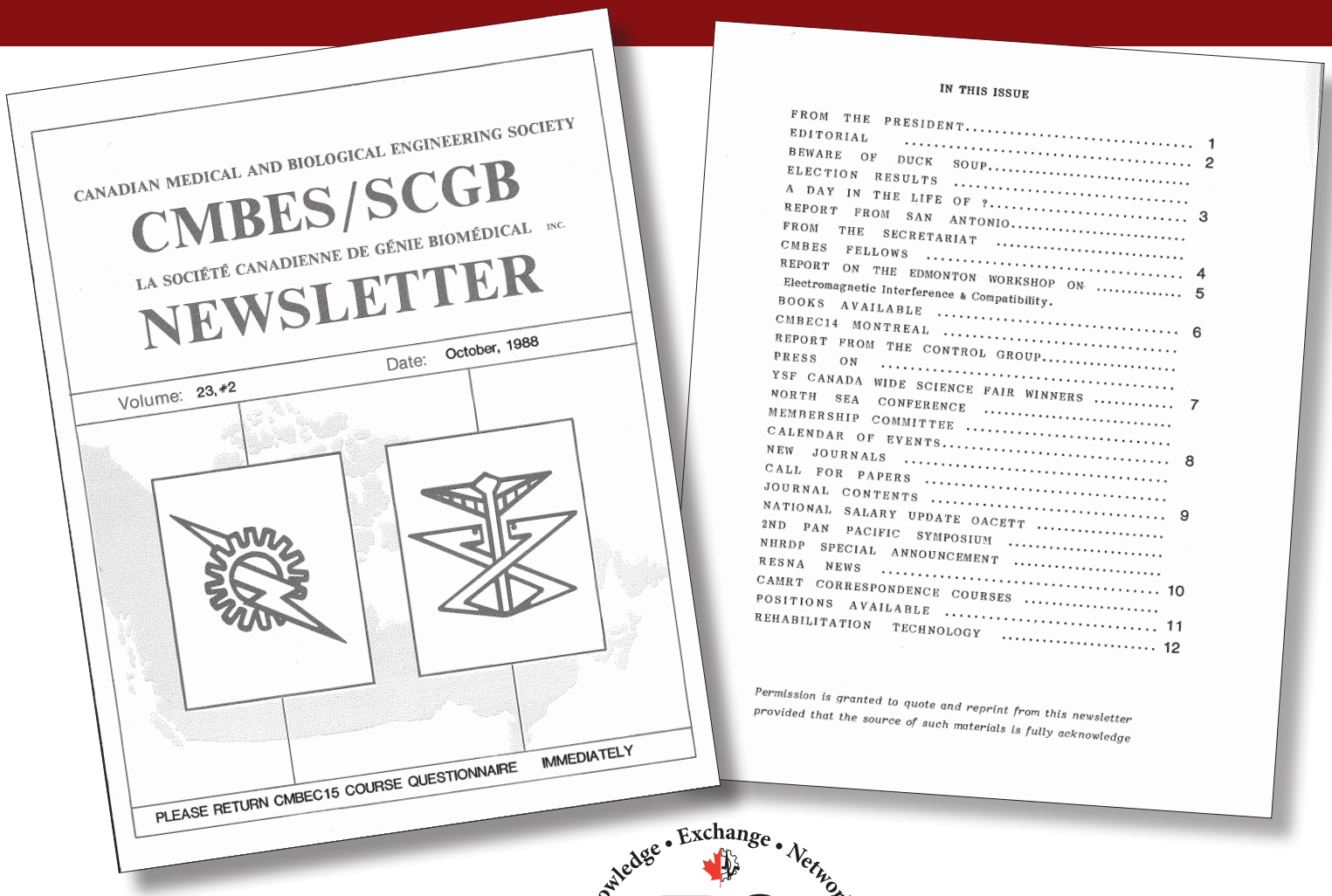
CMBES 50 YEARS OF HISTORY

How Things Change Over the Years – The CMBES Newsletter

This section provides snippets from some of the previous CMBES Newsletters over the years. Enjoy!

The CMBES Newsletter retro-look (Vol 23 No 2 1988)

From the information we have, it appears this cover was used until the early 1990s. Designer not known.


CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY

CMBES/SCGB

LA SOCIÉTÉ CANADIENNE DE GÉNIE BIOMÉDICAL INC.

NEWSLETTER

Volume: 23, #2 Date: October, 1988

PLEASE RETURN CMBEC15 COURSE QUESTIONNAIRE IMMEDIATELY

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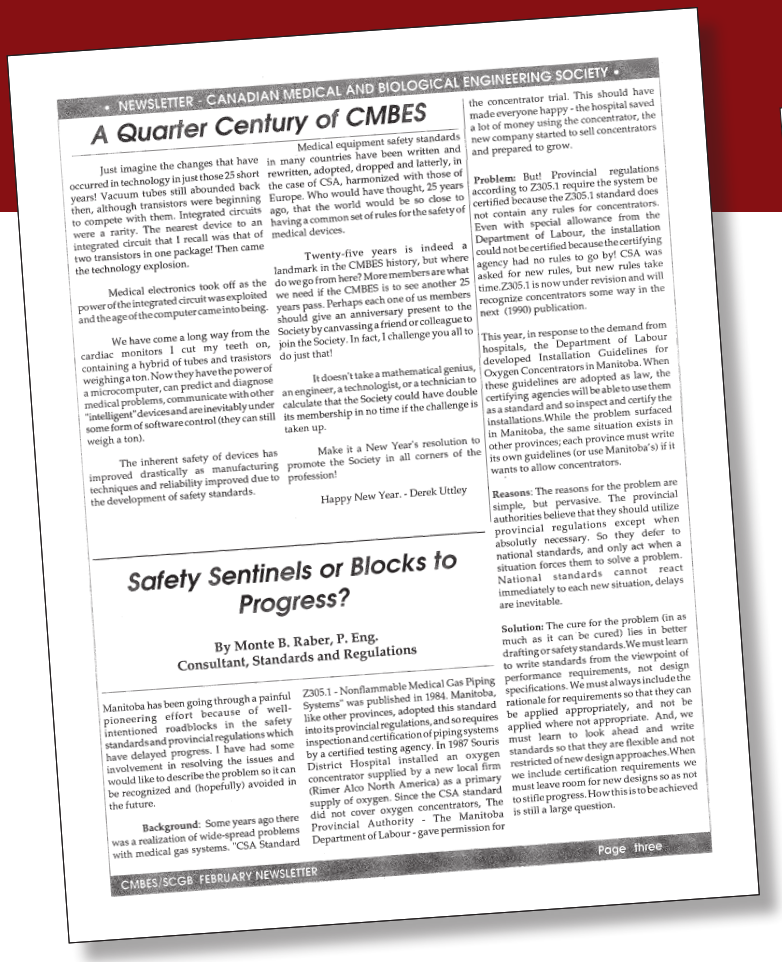
CMBES 50 YEARS OF HISTORY

Celebrating 25th Anniversary

(Vol 25 No 1, Feb 1990)



• NEWSLETTER - CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY •

A Quarter Century of CMBES

Just imagine the changes that have occurred in technology in just those 25 short years! Vacuum tubes still abounded back then, although transistors were beginning to compete with them. Integrated circuits were a rarity. The nearest device to an integrated circuit that I recall was that of two transistors in one package! Then came the technology explosion.

Medical electronics took off as the power of the integrated circuit was exploited and the age of the computer came into being.

We have come a long way from the cardiac monitors I cut my teeth on, containing a hybrid of tubes and trasistors weighing a ton. Now they have the power of a microcomputer, can predict and diagnose medical problems, communicate with other "intelligent" devices and are inevitably under some form of software control (they can still weigh a ton).

The inherent safety of devices has improved drastically as manufacturing techniques and reliability improved due to the development of safety standards.

Medical equipment safety standards in many countries have been written and rewritten, adopted, dropped and latterly, in the case of CSA, harmonized with those of Europe. Who would have thought, 25 years ago, that the world would be so close to having a common set of rules for the safety of medical devices.

Twenty-five years is indeed a landmark in the CMBES history, but where do we go from here? More members are what we need if the CMBES is to see another 25 years pass. Perhaps each one of us members should give an anniversary present to the Society by canvassing a friend or colleague to join the Society. In fact, I challenge you all to do just that!

It doesn't take a mathematical genius, an engineer, a technologist, or a technician to calculate that the Society could have double its membership in no time if the challenge is taken up.

Make it a New Year's resolution to promote the Society in all corners of the profession!

Happy New Year. - Derek Uttley

Safety Sentinels or Blocks to Progress?

By Monte B. Raber, P. Eng.
Consultant, Standards and Regulations

Manitoba has been going through a painful pioneering effort because of well-intentioned roadblocks in the safety standards and provincial regulations which have delayed progress. I have had some involvement in resolving the issues and would like to describe the problem so it can be recognized and (hopefully) avoided in the future.

Background: Some years ago there was a realization of wide-spread problems with medical gas systems. "CSA Standard Z305.1 - Nonflammable Medical Gas Piping Systems" was published in 1984. Manitoba, like other provinces, adopted this standard into its provincial regulations, and so requires inspection and certification of piping systems by a certified testing agency. In 1987 Souris District Hospital installed an oxygen concentrator supplied by a new local firm (Rimer Alco North America) as a primary supply of oxygen. Since the CSA standard did not cover oxygen concentrators, The Provincial Authority - The Manitoba Department of Labour - gave permission for the concentrator trial. This should have made everyone happy - the hospital saved a lot of money using the concentrator, the new company started to sell concentrators and prepared to grow.

Problem: But! Provincial regulations according to Z305.1 require the system be certified because the Z305.1 standard does not contain any rules for concentrators. Even with special allowance from the Department of Labour, the installation could not be certified because the certifying agency had no rules to go by! CSA was asked for new rules, but new rules take time. Z305.1 is now under revision and will recognize concentrators some way in the next (1990) publication.

This year, in response to the demand from hospitals, the Department of Labour developed Installation Guidelines for Oxygen Concentrators in Manitoba. When these guidelines are adopted as law, the certifying agencies will be able to use them as a standard and so inspect and certify the installations. While the problem surfaced in Manitoba, the same situation exists in other provinces; each province must write its own guidelines (or use Manitoba's) if it wants to allow concentrators.

Reasons: The reasons for the problem are simple, but pervasive. The provincial authorities believe that they should utilize provincial regulations except when absolutly necessary. So they defer to national standards, and only act when a situation forces them to solve a problem. National standards cannot react immediately to each new situation, delays are inevitable.

Solution: The cure for the problem (in as much as it can be cured) lies in better drafting or safety standards. We must learn to write standards from the viewpoint of performance requirements, not design specifications. We must always include the rationale for requirements so that they can be applied appropriately, and not be applied where not appropriate. And, we must learn to look ahead and write standards so that they are flexible and not restricted of new design approaches. When we include certification requirements we must leave room for new designs so as not to stifle progress. How this is to be achieved is still a large question.

Reminiscing About the Genesis of CMBES

(Vol 25 No 1, Feb 1990)

• NEWSLETTER - CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY •

Five Past Presidents Reminisce

THE GENESIS OF THE CMBES

By Dr. John A. Hopps, O.C.
President 1966-1970

In 1958 a small group of electronic engineers met in Paris for a modest conference and a plan for an international organization representing medical electronics. At a second Paris conference the following year was established International Federation for Medical Electronics. The federation accepted Associate Members in its early days but encouraged the formation of national affiliate organizations.

As I recall there were three Canadians at the 1959 conference and we all signed on as Associates. John Davis of Allen Memorial Institute in Montreal had been unable to attend but had already made contact with the new organization and had been named as our national representative. When we had twenty sign up members we would be eligible to be a Canadian affiliate.

In June 1962, John Davis was appointed director of a new offshoot of the Federation, the International Institute of Medical Electronics and Biological Engineering and hemoved to Paris where the Institute would be located. I was appointed to replace John as a national representative. It was a challenge to find twenty individuals in Canada with a commitment to medical electronics in 1962 and I looked for alternative ways to use a existing organization. The closest group was the National Research Council's Associate Committee on Biophysics, of which I had just become a member. It did not take long to become disenchanted with this committee The other members biophysicists had no interest in health care science. Their concept of a practical way of spending the NRC funds allocated was to tour the country lecturing on specific fields of biophysics.

The Associates Committe was a write-off that atrophied and died in the mid-sixties. Even if it had expressed a lively interest in medical health care science, its members were appointed rather than elected and this was incompatible with the Federation requirements. We continued our search for candidates and by the end of 1964 we had twenty-six Canadian members of the Federation. I wrote the Secretary-General and announced our intention to appy for affiliation at the 6th International Conference, to be held in Tokyo during the summer of 1965.

Eight of us went to Tokyo, to find that the Federation had gathered momentum and now represented many areas of medical engineering. The Administrative Council moved to adopt a more inclusive title and the organization became the International Federation for Medical and Biological Engineering. The Canadian application was approved in very short time and the Canadian Medical and Biological Engineering Society became the sixth national affiliate of the IFMBE. Richard Cobbold and I celebrated that night with a Genghis Khan dinner at the Cinzanzo Park on the outskirts of Tokyo. Norman Moody had directed us there in error!

We had an organization with no structure or officers. The first task was to contact the twenty-six members and arrange a meeting. There was an agreement to hold the first meeting of CMBES in 1966 in Ottawa, where NRC offered facilities and a travel grant for invited speakers. When the time came the attendance far exceeded our estimate of sixty attendees.

Dick Cobbold served as Program Chairman for the 1st CMBES. To add to his burden he moved from Saskatoon to Toronto just prior to the meeting but managed to complete his program arrangements in time for the conference. Dr. G.M. Fitzgibbon, Chief of the Cardiopulmonary Unit of the newly-opened National Defence Medical Centre arranged a tour of his hospital.

The first conference was modest in its scope but seemed to be a success. At our General Meeting we elected an executive for a two-year term: president, J. Hopps; vice-president, John Milsum, treasurer, Fernard Roberge (at the time Dept. of Physiologie, University of Montreal) and secretary, Bill Delbridge of the Department of Trade and Commerce. At the session we spent some time in discussion of the objectives of CMBES. We established a priority of gaining recognition for medical engineering with government and hospital administrators. I suspect that this is still an important objective!

We celebrated our 1967 Centennial Year with two events. First we were recognized at a dinner meeting of all the Canadian engineering organizations, held at Montreal in June. Later that summer we held a Seminar on Hospital Hazzards, the first meeting of its kind in North America. Several experts in the field were brought to this Ottawa meeting. The sessions were held at National Defence Medical Centre and Riverside Hospital cooperated by making available its excellent cafeteria and tours of its sophisticated x-ray facilities. Perhaps the most exciting outcome of the meeting was the printed Proceedings which went through two printings and brought substantial revenues to the CMBES. The book became a manual on hospital hazards in the next ten years.

Dr. Llewellyn Thomas chaired the second CMBES, held at the King Edward Hotel in Toronto in 1968, under the sponsorship of the Institute of Medical Engineering at the University of Toronto. This meeting had a much larger attendance, due in part to an invitation to the Canadian prosthetics groups from Vancouver to Fredericton to participate. Milsum, Hopps, and Roberge were voted back in office for a second term and Harry Callan of National Health and Welfare replaced Bill Delbridge whose work had been directed to other areas.

I cannot recall any earthshaking accomplishments of my second term as president. We spent much of our time in preparing statements for various hospital and government bodies and druming up new members. At the memorable 1969 Chicago Conference of the IFMBE, at which delegates from a thousand countries watched the moonwalk, I was elected to the Administrative Council, which in turn heard much of CMBES and its rapid growth. We became the template for many other national affiliates during the 1970's. When I stepped down from my CMBES position at the Halifax meeting in 1970, I did so with a great sense of pride in the Society, a pride which has continued through the years that followed.

Knowledge • Exchange • Networking

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1965 • Years • 2015

CMBES 50 YEARS OF HISTORY

Certification News

(Vol 28 No 1, Mar 1993). It appears the new look as depicted on the 1994 issue started in 1993.

CMBES/SCGB NEWSLETTER

MEMBERSHIP NEWS

by Dr. Evelyn Morin

By now you will have received your 1993 Membership Dues Notice and invoice. Once again the Society has not increased Membership Fees for 1993 - the fee for a full member is still $90.00 per year, which is a modest cost for the many services provided by the Secretariat. Also remember that membership in the Society entitles you to discounts on the CMBEC fees and the conference proceedings.

The Secretariat will soon begin updating the Membership Handbook. Some time ago, members received a print-out of their current listing to update. If you have any further information changes, please advise the Secretariat. Updates to membership are included in newsletter mailings.

A reminder that the Student Membership year has been changed to reflect the academic year rather than the calendar year. Student memberships will now be valid from November 1st to October 31st. Student members whose fees were paid up until December 31st 1992 received a discount on their fees for 1993. Also remember that student members only will be considered in the student paper competition at the CMBEC - so encourage your graduate students or your friends to join the CMBES.

A new item of interest for students and educational institutions: the CMBES is now offering a Student Institutional Membership. It would cover a minimum of 5 (five) student at $25.00 per student (because 3 months will have elapsed in this year already, the cost would be $21.00 per student for 1993 only). Interested institutions should contact the Secretariat for an application package.

☺ **Congratulations to Members!** - To Dr. Carolyn Small on receiving her tenure at the Department of Mechanical Engineering at Queen's University, Kingston, Ontario

-To Larry Boyce on his appointment as Director of the Biomedical Electronics Program, Fanshawe College, London, Ontario

-(Note from Editor and your friends at the Secretariat): To Dr. Evelyn Morin who will soon achieve the glorious position of motherhood. ("♪ You've only just begun ♫")

WELCOME TO NEW MEMBERS

- *ARENDTSZ, Nina*, University of New Brunswick
- *CHARARA, Gamal*, St. Francois d'Assise Hospital, Quebec
- *CHIN, Kirk*, Centenary Health Centre, Scarborough
- *DONAUER, Andreas*, University of British Columbia
- *HOWARTH, Doug*, Centenary Health Centre, Scarborough
- *MORSE, Wayne*, Redmond, Washington, USA
- *SABOUNJI, Jack*, Centenary Health Centre, Scarborough
- *WORDEN, Brian*, Queen Elizabeth II Hospital, Grand Prairie

CERTIFICATION NEWS

These were the successful CBETs in 1992:

- *GREENWOOD, Kim J.*, Toronto, Ontario
- *GREENWOOD, Murray*, Oshawa, Ontario
- *HARASYMUK, Brian M.*, Prince Albert, Saskatchewan
- *PHILLIPS, Rick*, Saskatoon, Saskatchewan
- *SKRABA, Thomas*, Winnipeg, Manitoba
- *WORDEN, Brian*, Grand Prairie, Alberta

Following is the one and only successful Clinical Engineer for 1992:

- *GEORGE, Ken*, Nova Scotia Health Organization, Halifax

THE NEW STUDY GUIDE FOR BMET CERTIFICATION (CANADA) 1992

This Study Guide has been prepared by Society members to assist those wishing to take the Certification examinations set by the Canadian Board of Examiners for Biomedical Engineering Technologists and Technicians.

It provides information about the Certification Programme in Canada, a suggested reading list and a "mini-exam", which reveals the style and type of questions one can expect in the examination. Correct answers are provided. In the case of the essay questions, a guide to the type of information that should be included in the answer is provided.

Although there are two separate examinations for Technologists and Technicians, this Study Guide should provide sufficient examples to satisfy both levels.

Price per copy is $15.00 + GST = $16.05 Cdn. Copies may be obtained from: CMBES Secretariat, 837 Eastvale Drive, #134, Gloucester, Ontario K1J 7T5

Gary Larson: The Far Side

"So please welcome our keynote speaker, Professor Melvin Fenwick — the man who, back in 1952, first coined the now common phrase: 'Fools! I'll destroy them all!'"

3

The President's Message

(Vol 29 No 1, Jan 1994)

CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY

Newsletter

LA SOCIÉTÉ CANADIENNE DE GÉNIE BIOMÉDICAL INC.

Volume 29, No. 1
JANUARY 1994

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PRESIDENT'S MESSAGE

Tony Easty

Dear CMBES Member:

Let me start by offering best wishes to all members of our Society for 1994. At a time when many of us are feeling the effects of reduced funding, it is all the more important for us not to lose sight of the role that Biomedical Engineers and Technologists can play in providing high quality, cost-effective healthcare. Here in Canada, we are fortunate to have one of the finest healthcare systems in the world. If we wish to maintain it, and keep alive the guiding principles of the Canada Health Act, then we all must ask ourselves how we can help solve the current healthcare crisis.

I believe that we are exceptionally well placed to facilitate constructive change in the system. If we see our role as simply managers of medical technology, looking to incorporate more and more devices into healthcare regardless of efficacy, then we will rightly be sidelined in the future. If, on the other hand, we look to the future needs of our population, and help to assess the true efficacy of medical devices we will be a central part of an exciting period of change. Whether we work in hospitals, universities, or industry, the challenge is the same. How can we better design, build and apply medical technology to improve the health of us all.

The results of the vote on the proposed annual fees increase are in. One-third of our eligible members responded, and of those responses, 76% were in favour of the proposal. Under the bylaws of our Society, this proposal is carried. Accordingly, our Secretariat have been mailing out renewal notices at the new rates. The Executive recognizes that a hike in fees is only marginally more popular than death and taxes, but when you consider that this is the first increase in nine years, and you compare our fees and benefits with other Societies, I hope you will agree that CMBES membership is still excellent value.

At the Executive meeting in Toronto last December, we agreed to appoint a Society member as Editor of our Newsletter. At present, this role is being filled by our Publications Chair, but we recognize that the Newsletter leaves very little time for other publication work, and we would like to see our Society expand its publication efforts. Our present Publications Chair, Brian Graham, steps down at these elections, and has agreed to take on the role of Newsletter Editor. This position is appointed by the Executive. Many thanks to Brian for agreeing to continue this task for us. Brian and the Secretariat have turned our Newsletter into a very high quality document. We can look forward to seeing it evolve further in the next while. When our new Publications Chair is elected, she or he will have the challenge of building our publications activities in other areas.

May, and warmer temperatures, will soon be with us, so plan to attend our 20th CMBEC in Vancouver this May 1-5. The Conference Committee are doing their best to plan a stimulating, successful Conference, so please add your support by submitting an abstract, attending some courses, or participating in the sessions. This is the one time in the year when we all get together. Don't miss out on this chance to catch up with old friends and learn about all the interesting work that is in progress across Canada.

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Clinical Engineering in Evolution

(Vol 30 No 2, Aug 1995)

Ice Storm – Kingston

(Vol 33 No 1, Feb 1998)

CMBES/SCGB NEWSLETTER

Ph.D. THESIS ABSTRACT

MECHANICAL AND HISTOLOGICAL CHARACTERISTICS OF RHEUMATOID WRIST TENDONS AND LIGAMENTS

Student: Martine J. Breault-Janicki

Supervisor: Dr. Carolyn Small, Queen's University

Replacement arthroplasty for reconstruction of deformed and painful wrist joints due to rheumatoid arthritis has had a high incidence of migration, dislocation, and fracture. I believe that these failures are associated with the insufficiency and maybe the degraded mechanical properties of the rheumatoid tendons and ligaments. Such a hypothesis has not been investigated in the literature. An experimental study was undertaken to characterize the mechanical behaviour of rheumatoid wrist extensor tendons and ligaments in order to comment on the adequacy of the rheumatoid tissues in reconstructive surgery.

An experimental protocol was developed to characterize the tissues including mechanical tensile testing via standard viscoelastic tests and histological evaluation via microscopy. Material properties of non-rheumatoid and rheumatoid tissues from twenty-one patients undergoing wrist arthrodesis were measured, compared, and correlated. Results of the mechanical tests showed that rheumatoid tendons demonstrate decreased properties in terms of stiffness, ability to sustain load upon relaxation, and strength when compared to equivalent non-rheumatoid tendons. Histological slides of rheumatoid tissues showed increased signs of inflammation: invasion of inflammatory cells with neovascularization, fibrin deposition, and edema. The differences in mechanical and histological properties between non-rheumatoid and rheumatoid tissues were found to be statistically significant.

Two additional series of experiments were performed to determine a suitable method to measure the physical parameters of the specimens and determine the preservation method which would the least affect tissue properties. The Vernier calliper was selected to measure gauge length and cross-sectional area of tendons, while freezing at -20°C was chosen to preserve tissue until testing time.

The present research work is a first step in characterizing rheumatoid tendons and ligaments. Histological examination of tissues showed that rheumatoid arthritis invades the tissues surrounding the wrist joint, and affects the structure of the tendons and ligaments. The mechanical properties of the tissues have been altered in such a way that the tendons and ligaments may be less effective in stabilizing the wrist, and are less able to secure a wrist implant. The second step in characterizing rheumatoid tissues could pertain to a biochemical analysis. A better understanding of rheumatoid tissue behaviour will lead to an improved management of wrist instability and deformities. Future work may lie in the development of a bio-inert material to be used in reconstructive surgery with current wrist implants, and the design of a wrist arthroplasty which promotes bony integration while maintaining soft tissue integrity.

CLINICAL ENGINEERING - A PROFESSION IN EVOLUTION

Hans Kunov, Walter Zingg, Alf Dolan
Institute of Biomedical Engineering, University of Toronto

In one of the last NEWSLETTERS Bob Scott wrote a thought-provoking and realistic assessment of the current situation. While in general agreeing with Bob, we would like to propose a different and more optimistic outlook.

A review of the recent history is the basis of Bob's assessment. This approach is important, and nobody can do it better than Bob Scott who has been closely associated with Clinical Engineering since its beginnings in Canada. However, the historical approach has its limitations. It can explain the reasons why we are at this particular point in the development of Clinical Engineering as a Profession. To pause and think along these lines is useful; we should do it more often!

Health Care Delivery Systems are in the middle of some sort of a revolution, and the future by and large is uncertain. Predictions are difficult because so many factors are changing simultaneously, but certain trends are beginning to be recognizable.

Michael B. Dector, the former Deputy Minister of Health of the Province of Ontario has written a book entitled "Healing Medicare, Managing Health System Change The Canadian Way." (McGilligan Books, Toronto, 1994). The contributions of the intelligent use of new technologies is clearly recognized throughout the book, particularly the potential value of information and telecommunication technology to achieve the objective of restructuring health work: "Maximize the portion of health work allotted to providing patient care, and minimize all other work by health workers" (Page 98).

On page 99 Dector writes: "Any health care organization should fully investigate the potential of information and telecommunication technology to assist them in re-engineering the processes of providing health care. It is time to get going or risk being left behind. Many corporations have created the position of Chief Information Officer to underscore the importance of this expertise and to lead their investments in technology."

the manufacturer's fitness for use specifications, and perform the manufacturer's recommended preventive maintenance. Servicers do not significantly change a finished device's performance or safety specifications, or intended use." The FDA currently includes ISOs, shared services, out-sourced contracts, and in-house biomedical/clinical engineering departments within the scope of "servicers". For the first time, a regulatory agency proposes to consider regulating the service activities of in-house biomedical/clinical engineering departments within hospitals. More information on this topic may be obtained from the FDA website (URL:www.fda.gov/cdrh/fr/fr1223af.html). **Comments on the proposed rule making will be accepted until March 23, 1998.**

Ice Storm 1998: *Kingston General Hospital Clinical Engineering Perspective*

by Mike Henderson

On January 11, 1998 I drove through a maze of broken tree branches, downed power lines and police barricade tape to finally arrive at KGH to the roar of our two backup power generators. Power to the hospital is supplied from two separate sources both of which had been compromised at about 3:30 am. Emergency generators switched on immediately without problem, as had been anticipated after years of testing. Power was restored to the hospital about seven and a half hours later and has remained stable since.

Monitoring equipment, lab equipment, operating room power, elevators, hall lighting and the patient care systems remained functional with the odd computer monitor requiring plug movement to a red emergency backup power plug. Only one general purpose radiology room was connected to the generator, so emergency CAT scanning was out of the question. There was some concern about this until we learned that the Hotel Dieu Hospital had power and could provide this service for the city.

To our Lab's and Maintenance Department's surprise, some specimen and reagent refrigerators and freezers, thought to be connected to emergency power in the labs, were not functional and extension cords had to be pressed into service.

To our knowledge, only one clinical equipment failure might be related to the power outage and subsequent surges as the power came back on. A Lifepak 7 defibrillator switching power supply transformer failed at around the time of the power outage. This is a relatively unusual part to fail on these units and since the unit is constantly plugged in in charge mode, a surge causing failure seems possible. The other equipment casualty was the car roof of one out Clinical Engineering technologists. Her car was the victim of a large falling branch in the hospital parking lot.

Throughout the senior management meetings that occurred during and after the storm to review status and conduct planning, Clinical Engineering sat at the table and provided input regarding medical equipment issues. At one point it was uncertain how long the power would be out and concern was raised about what would happen if an extended power outage if either of the generators failed. Fortunately, an inventory of battery operated devices and expected battery life under load had been produced in the past to enable rapid location of appropriate equipment for short time monitoring.

Areas of the Kingston General Hospital and the Hotel Dieu Hospital and an out of use section of Kingston Psychiatric Hospital, and Providence Continuing Care Centre were pressed into service as shelters for some staff who could not get back and forth to work and for community members with medical problems who were without power.

The hardest hit community members were the elderly and those on home treatment, power dependent systems such as, IV pumps, hemo and peritoneal dialysis, ventilators, and oxygen concentrators. Community health workers often could not even get to the homes of their patients/clients due to impassable roads and walkways. These individuals were accommodated mainly at the Hotel Dieu Hospital until their power could be restored.

There were two memorable sights that I will never forget that typify the extent of the help that our community received from the outside. I was returning from Trenton Hospital driving along the 401 on Sunday January 11th at nine PM. Stretching ahead of me almost the whole distance from Trenton to Belleville (approx. 20 km) was a convoy of Detroit-Eddison cherry picker trucks that had come all the way from the mid USA to help Eastern Ontario and Western Quebec with our problem. The other image occurred on Saturday night, January 18th on Princess Street Kingston. All of the out of town power utility vehicles staged an impromptu farewell parade, on the main street of Kingston, that filled the whole of the downtown with blaring horns and people spontaneously shaking hands and embracing the linemen who had left their comfortable homes to help us out in our time of need.

In summary, the hospital emergency power functioned well with only minor glitches. We learned some valuable information regarding equipment that needed connection into the emergency power system. We had only one minor storm related equipment failure. Being without power at home for five days, taught me that emergency planning should extend to the home as well as the workplace.

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New Look

(Vol 39 Iss 3, Oct 2005)

This look was used until early 2015.

Canadian Medical and Biological Engineering Society (CMBES) Inc.
La Société Canadienne de Génie Biomédical Inc.

Fall 2005
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ISSN: 1499-4089

The CMBES Newsletter

Inside this issue:

CMBES Executive

President: William Gentles
Vice President: Donald Russell
Past-President: Robert E. Gander
Executive Secretary: Fleurette Olive
Treasurer: Timothy Zakutney
Membership: Michael Capuano
Professional Affairs: Murat Firat
Publications: Dave Gretzinger
Newsletter Editors: Dave Gretzinger, January Gnitecki

Message from the President of the CMBES, Dr. William Gentles

Here is an update on some society activities since the last newsletter.

Brian VanSkiver Steps Down as Publications Chair, David Gretzinger Appointed as His Replacement

On August 17, 2005, Brian VanSkiver regretfully tendered his resignation as CMBES Publications Chair. I would like to take this opportunity to publicly thank Brian for his many years of service and dedication to the CMBES. The contributions he has made are certainly important and we are grateful for his commitment to the Society's mission and objectives. Brian is pursuing a slightly different career path with a new job that started on August 22.

I would like to welcome our new Chair of Publications, David Gretzinger. The CMBES Executive offered this position to David, and we are delighted that he has accepted. David has been an active member of the Society, recently working with January Gnitecki as co-editor of this Newsletter.

Dr. Gentles, taken at the CMBES meeting with Health Canada, 2004.

Battery Management Audioconference

On Friday October 28, 2005, at 1300 Hr EST, CMBES hosted an audioconference entitled "Batteries & Medical Devices: A Managed Approach to Risk Reduction," presented by Tim Zakutney and Mark Cleland of the Ottawa Heart Institute. This is the first of a series of audioconferences that we are planning to meet the needs of Clinical Engineering staff working in hospitals.

CMBEC29 Conference in Vancouver, June 1-3, 2006

This is shaping up to be an exciting conference. We have an enthusiastic organizing committee working on a number of new ideas for the event. The Call for Papers deadline for abstract submissions is Dec 31, 2005. I encourage all members to submit an abstract. See the Society web site for details and the latest updates.

Membership Dues – Have You Paid?

Apparently a number of long-standing members of the Society have been extremely tardy in paying their membership dues. Please check your correspondence for overdue reminders and correct this situation.

Respectfully submitted,

Bill Gentles

Mark your calendars!
CMBEC29, June 1-3, 2006
Vancouver, BC

Cover

(Vol 42 Iss 1, Jun 2009)

Canadian Medical and Biological Engineering Society (CMBES) Inc.
La Société Canadienne de Génie Biomédical Inc.

Spring 2009
Volume 42, Issue 1 rev1
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The CMBES Newsletter

Inside this issue:

CMBES Executive

President: Dr. Donald Russell
Vice President: Murat Firat
Past-President: Dr. Bill Gentles
Executive Secretary: Pamela Wilson
Treasurer: Martin Poulin
Membership: Dennis Len
Professional Affairs: Mike Capuano
Publications: Dr. Gnahoua Zoabli
Newsletter Editors: Dr. Gnahoua Zoabli, Pamela Wilson

Message from the President of CMBES, Dr. Donald Russell

I hope you are enjoying this first edition of our revigorated newsletter. The past few months have brought a number of changes to our Society. For over a year now we have been working with The Willow Group who provide support services for the Society. We have seen a number of changes in that time including the redesign and launch of a new, more effective website, an improvement in our Conference planning and organizing efforts as well as many other changes, both major and minor to the way we operate. While these efforts have not been without their challenges, I firmly believe that we are in the process of moving the operations of the Society into a more effective and efficient realm.

The Willow Group

The Willow Group is a company located in Ottawa who bring considerable experience to the table with their many years of working with Societies similar to ours. Since I live in Ottawa I have had the pleasure of visiting them many times and I have been impressed with their offices and operation. Their suggestions and input have given the Executive much to think about as we strive to move the Society forward. During the upcoming Conference in Calgary we will be meeting to discuss some of these issues. We welcome any and all input as we review our first year of operation with The Willow Group and look forward to the possibilities that next year will offer.

CMBEC 32 in Calgary

I am very much looking forward to the CMBEC32 Conference in Calgary, Alberta. Hopefully I will meet (or will have met) many old and new members there. The conference program looks very exciting and I would like to take this opportunity to thank all of the members of the Conference organizing committee for their hard work and dedication.

Conference Planning

One of the bylaw changes made at last years AGM was the introduction of a new long range Conference Planning Committee. In its first year of operation we have seen significant improvements in our planning and we have already signed the hotel contract for CMBEC 33 next year in Vancouver. (Before CMBEC 32 has even started!)

Involvement

Those of us serving on the Executive or in many of the other roles in the organization receive many rewards for the time we devote to the Society. There is always more to do and the CMBES will benefit from everyone who gets involved. I encourage you to participate either formally or informally whether you are a student member just joining the society or a senior member with many years (decades for many of us) of experience. If there are services or other expectations of the CMBES that you believe would be of benefit please put your ideas forward (and if possible devote some time to bring them to reality.)

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Cover
(Vol 44 Iss 1, Feb 2011)

CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY
SOCIÉTÉ CANADIENNE DE GÉNIE BIOMÉDICAL

Winter 2011
Volume 44, Issue 1 rev1
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The CMBES Newsletter

Message from the President of the CMBES, Murat Firat, MSc.

Inside this issue:

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Professional Affairs: Mike Capuano
Awards: Tim J Zakutney, MHSc, PEng, CCE
Publications: Dr. Gnahoua Zoabli
Long Term Conference Planning: Sarah Kelso
Newsletter Editors: Dr. Gnahoua Zoabli, Pamela Wilson

Shaping CMBES's Strategic Directions

As announced earlier at CMBEC33 in Vancouver, CMBES Executive Committee members have started working on the "Strategic Plan 2011." We are refreshing our Society's "vision and mission," and shaping new strategic directions to navigate CMBES through this rough and challenging financial climate. The plan has not been finalized yet , and I'm not in a position to report the details, but I believe it would be safe to hint that we are heading towards some of the most exciting times of our Society. Believing that our strength lies within our members, we will be investing our energy in creating an environment of participation, collaboration and communication.

I beg and encourage each of you to participate. I do thank the Executive Committee members and Dr. Bill Gentles for their efforts and time that they have been putting in CMBES Strategic Plan 2011. Details to be reported at CMBEC34....

CMBEC33 Vancouver (2010)

I'm having difficulty finding words to describe CMBEC33: the amazing Continuing Education program, the colourful exhibit area, the excellent scientific and clinical engineering sessions, and last but not least, the perfect banquet in the mesmerising Vancouver Aquarium...

High-quality event topped up with high- quantity networking opportunities with colleagues... CMBEC33 in Vancouver has taken its place in the CMBES history as one of the best conferences (again!). Congratulations to Martin Forbes, the Organizing Committee, volunteers, Pamela Wilson and the Willow Group for doing an excellent job!

CMBEC34/FICCDAT – Toronto (2011)

Canadian Medical Biological Engineering Conference will be held, for the second time, as a joint conference within the Festival of Conferences on Caregiving, Disabilities, Aging and Technology (FICCDAT). Those who participated in CMBEC30 would remember how successful the first FICCDAT was, so expect nothing less this year. Many thanks to Dave Gretzinger and the Organizing Committee of CMBEC34; they have put together a fabulous program to look forward to. For details, please check out the second page.

CMBES and APIBQ Sign a Memorandum of Understanding

As I hinted above, we are sailing towards exciting times. I'm proud to report on one of the many ideas and actions that have come to life recently: Last week CMBES and APIBQ (Association des physiciens et ingénieurs biomédicaux du Québec) signed a memorandum of understanding (MoU) to formalize the affiliation of both societies. The highlight of the MoU for the members of each society is a generous reciprocal 50% membership discount. We believe both CMBES and APIBQ members will benefit from this exciting collaboration. Both societies will enjoy the collective energy produced by this momentum. Special thanks to Gnahoua Zoabli who spearheaded this initiative. Please check out the copy of the MoU published at the website.

CMBES35 – Halifax 2012

Another hint for another upcoming exciting event: CMBES and ACCES joint conference in Halifax. Thanks to Sarah Kelso, Long-Term Conference Planning Chair. The planning is already underway. More details will be announced in June at the Toronto Conference. I hope to see you all there.

Respectfully submitted.

New Look
(Vol 48 Iss 1, Dec 2015)

CMBES/SCGB
CANADIAN MEDICAL AND BIOLOGICAL ENGINEERING SOCIETY
NEWSLETTER
LA SOCIÉTÉ CANADIENNE DE GÉNIE BIOMÉDICAL

VOLUME N°48 ISSUE N°1 ISSN: 1499 - 4089 DECEMBER 2015

Knowledge • Exchange • Networking
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Join us in Beautiful Calgary for CMBEC39!

In This Issue :

Designer: Jean-Alexandre Thibault | The Willow Group

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Are you a Member of CMBES?

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Questions?

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