# Scientific Program: “The Pacemaker: Past, Present, and Future”

**Mayo Auditorium, Academic Health Center, University of Minnesota**

**December 13, 2007**

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<th>Time</th>
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<td>7:00 am</td>
<td>Registration and Continental Breakfast</td>
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| 8:00 am | **Welcome and Introductions:**  
Selwyn M. Vickers, MD, Head of the Department of Surgery, University of Minnesota  
Deborah E. Powell, MD, Dean of the Medical School, University of Minnesota  
Frank B. Cerra, MD, Senior Vice President of the Academic Health Center, University of Minnesota |
| 8:30 am | **Session Moderator:** Herbert B. Ward, MD, PhD  
**Early pacing: breakthrough to permanency**  
Earl E. Bakken, Founder and Director of Medtronic, Inc., Inventor of the battery-powered pacemaker |
| 8:40 am | **The role of the U of MN physiologist, Dr. Jack Johnson, in the origins of Minnesota’s pacemaker industry**  
Vincent L. Gott, MD, Professor of Cardiac Surgery, The Johns Hopkins Medical Institute |
| 9:10 am | **Parsing the pacemaker: the meanings of Earl Bakken’s little white box**  
David J. Rhees, PhD, Executive Director of the Bakken Museum |
| 9:40 am | **Early design work at Medtronic for the development of pacing systems**  
Samuel W. Hunter, MD, Retired Cardiac Surgeon, Co-invented the “Hunter-Roth” electrode |
| 9:50 am | Break                                                                                                 |
| 10:10 am | **Session Moderator:** Paul A. Iaizzo, PhD  
**Current state-of-the-art of the single and dual chamber pacemaker**  
Walter H. Olson, PhD, Vice President for Research, CRDM, Medtronic, Inc. |
| 10:50 am | **Biventricular (CRT) pacing and current indications**  
David G. Benditt, MD, FACC, FRCP(C), FHR, Professor of Cardiology, University of Minnesota |
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| 11:30 am | **Cardiac resynchronization therapy: future trends, technologies, and tools**  
Dusan Kocovic, MD, Chief of Electrophysiology, Lankenau Hospital and the Main Line Health Heart Center |
| 12:00 pm | Lunch                                                                    |
| 1:30 pm  | **Session Moderator: Sara J. Shumway, MD**  
**Next generation cardiac rhythm management: innovation in therapy, monitoring, and telemetry**  
Mike Hess, MS, Vice President of Product Planning, CRDM, Medtronic, Inc. |
| 2:00 pm  | **Left ventricular epicardial pacing lead placement via robotic surgery**  
Kenneth K. Liao, MD, PhD, Assistant Professor, Cardiac Surgery, University of Minnesota |
| 2:30 pm  | **Mapping cardiac and brain electrical activity**  
Bin He, PhD, Professor of Biomedical Engineering, University of Minnesota |
| 3:00 pm  | Break                                                                    |
| 3:30 pm  | **Session Moderator: Daniel J. Garry, MD, PhD**  
**The future of cardiac pacing: the biological pacemaker**  
Eduardo Marbán, MD, PhD, Director of Cedars-Sinai Heart Institute |
| 4:30 pm  | Adjourn                                                                  |

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the University of Minnesota and Life Science Alley. The University of Minnesota is accredited by the ACCME to provide continuing medical education for physicians.

**Physicians:** The University of Minnesota designates this educational activity for a maximum of 4.75 AMA PRA Category 1 Credits(s). Physicians should only claim credit commensurate with the extent of their participation in the activity.

**Other Healthcare Professionals:** If requested, attendees will receive a Statement of Attendance which can be used by other healthcare professionals for requesting Continuing Education Units (CEUs) in accordance with state nursing boards, specialty societies, or other professional associations.
Educational Objectives:

- Gain updates on current clinical practices associated with the pacemaker
- Learn about current practice guidelines for clinical use of the pacemaker, as well as current outcomes
- Gain an appreciation for the future direction in medical device research and clinical trials, as related to the pacemaker
- Develop an awareness of novel prototype medical devices

Introductions by:

Frank B. Cerra, MD
Senior Vice President of the Academic Health Center, University of Minnesota

Deborah E. Powell, MD
Dean of the Medical School, University of Minnesota

Selwyn M. Vickers, MD
Head of the Department of Surgery, University of Minnesota

Speakers:

Earl Bakken co-founded Medtronic, Inc., the world’s leading medical technology company, providing lifelong solutions for people with chronic disease. He developed the first wearable, external, battery-powered, transistorized pacemaker for Dr. C. Walton Lillehei, a University of Minnesota heart surgeon. In retirement in Hawaii, Mr. Bakken participates with Five Mountains Hawaii; the North Hawaii Community Hospital; Tutu’s House, a Community Resource Center; The Kohala Center; Na Kalai Waa Hawaiian canoe project; and the North Hawaii Outcomes Project, just to name a few. He has worked with these organizations in order to improve the health of the 30,000 people of northwest Hawaii Island. Mr. Bakken also founded The Bakken, a nonprofit museum, library, and education center, and the Pavek Museum of Broadcasting – both in Minneapolis – as ways to get children interested in Science and Engineering careers. His newest endeavor is the founding of the Earl & Doris Bakken Institute for Heart-Brain Medicine at Cleveland Clinic.
Vincent Gott graduated from Yale Medical School in 1953. As an intern at the University of Minnesota Hospital in 1954, Dr. Gott observed first-hand Dr. C. Walton Lillehei's first cross-circulation case. He worked as a research fellow in Dr. Lillehei's laboratory during 1956 and 1957, during the time the pacemaker in combination with myocardial wire was developed for use in children developing heart block following ventricular septal defect repair. On completion of his residency training, Dr. Gott joined the faculty at the University of Wisconsin, Madison where, in partnership with Ronald Daggett, he developed a bileaflet prosthetic valve for clinical use. Dr. Gott was appointed Cardiac Surgeon-in-Charge at the Johns Hopkins Medical Institutions in 1965 and remained in that position until 1982. He remained active in clinical cardiac surgery until 1994, and is most proud of his role in helping to train more than 60 cardiac surgeons at Johns Hopkins over the past 42 years. Currently, he is co-director of the Dana and Albert "Cubby" Broccoli Center for Aortic Diseases. Dr. Gott has authored or co-authored more than 300 scientific publications related to cardiac surgery, and has earned several awards including the Lillehei Heart Institute's Lifetime Achievement Award and the Earl Bakken Scientific Achievement Award from the Society of Thoracic Surgeons.

David Rhees has been the Executive Director of The Bakken Museum since 1992. He holds a doctorate in the history and sociology of science from the University of Pennsylvania, and has been a fellow of the Smithsonian Institution’s National Museum of American History. Before coming to The Bakken he spent 7 years as assistant director of the Library of the American Philosophical Society in Philadelphia, an institution founded by Benjamin Franklin. His research, publications, and exhibits have focused on the history of electricity, medical technology, and the popularization of science. He also serves as adjunct assistant professor in the Program in History of Medicine at the University of Minnesota.

Samuel Hunter co-invented the “Hunter-Roth” electrode with Norm Roth. He is a retired Director of Research at St. Joseph's Hospital, St. Paul, Minnesota.
Walter Olson is Vice President for Research at Medtronic’s Cardiac Rhythm Disease Management division in Minneapolis. Since 1980, he has conducted and managed research for development of cardiac pacemakers and implantable defibrillators (ICDs). His research on sensing and detection of cardiac arrhythmias was used to improve cardiac pacemakers, and to detect ventricular fibrillation and ventricular tachycardia in all of Medtronic's ICDs. He was awarded the Patent of Distinction for the PR-Logic detection algorithm. He conducted research on rate responsive sensors for pacemakers including stroke volume, oxygen saturation, activity and sensors for implantable monitors. Diagnostic tools included marker channel diagrams, Holter telemetry devices for research and clinical studies, and cycle length diagrams. He has researched electrical safety issues and electromagnetic interference for pacemakers and ICDs. He earned a BS in Electrical Engineering in 1967 at Penn State and a PhD in Bioengineering in 1973 at the University of Michigan. He was Assistant Professor of Electrical Engineering and Bioengineering at University of Illinois (1973-1977) and then Associate Professor of Health Science and Technology at the Massachusetts Institute of Technology and Harvard (1977-1980). He was appointed a Medtronic Technical Fellow in 1983, elected a Bakken Society Fellow in 1987, an AIMBE Fellow in 1999, and received the Medtronic Technical Leadership Excellence Award in 2004.

David Benditt was born in Winnipeg, Canada, received a B.Sc. degree in Electrical Engineering as well as a MD degree from the University of Manitoba. Following postgraduate training in Internal Medicine, he completed a cardiology and cardiac electrophysiology Fellowship at Duke University Medical Center in Durham, North Carolina. Thereafter, he joined the faculty of the Cardiovascular Division in the Department of Medicine at the University of Minnesota. Dr. Benditt is currently Professor of Medicine and Co-director of the Cardiac Arrhythmia Center at the University of Minnesota in Minneapolis. His principal research interests are in autonomic control as it applies to syncope, and in implantable and external devices for cardiac rhythm management.

Mike Hess is Vice President of Product Planning for Medtronic’s Cardiac Rhythm Disease Management division. Product planning oversees the definition of new implantable devices, leads, and future capabilities including data management and network connectivity. Mr. Hess has been at Medtronic for 17 years, including positions in pacemaker research, atrial fibrillation device development, heart failure therapies, clinical study management and, most recently, new product planning. He is a Medtronic Technical Fellow and a member of the Medtronic Bakken Society, an honorary technical society. He holds 23 issued patents, has authored several published articles, and has presented abstracts in the area of pacing and electrophysiology. He has a BS in Biomedical Engineering from Case Western Reserve University and a MS in Software Engineering from the University of St. Thomas.
Kenneth K. Liao, MD, PhD

Kenneth Liao holds various academic positions at the University of Minnesota, including Assistant Professor of Surgery, Surgical Director of the Heart Transplantation Program, and Head of the Robotic and Minimally Invasive Cardiac Surgery Program. Dr. Liao earned a MB degree with distinction from Hubei Medical College in China and a Doctoral Degree of Surgery (PhD equivalent) from Beijing Medical University in China where he was Chief Resident in Surgery. He held the positions of Research Fellow and Intern in General Surgery at Albert Einstein College of Medicine (Bronx, New York) before completing his Residency (Chief Resident) in General Surgery at the Brookdale University Hospital Medical Center in Brooklyn, New York. From 1999 to 2002, Dr. Liao was a Fellow in Cardiovascular and Thoracic Surgery at the University of Minnesota. Dr. Liao has received several awards including the C. Walton Lillehei Scholar, awarded by the Lillehei Heart Institute. He established the Robotic and Minimally Invasive Cardiac Surgery Program at the University of Minnesota, and is proficient in the clinical use of various ventricular assisted devices. Dr. Liao performed the most heart transplantations in the state of Minnesota over the last two years, and performed the highest number of ventricular assisted device implantation procedures in the state last year.

Bin He, PhD

Bin He is Professor of Biomedical Engineering, and currently serves as Interim Director of the Center for Neuroengineering at the University of Minnesota. His research interests include neuroimaging, neural interfacing and stimulation, cardiac mapping and imaging, and cancer imaging. He has published over 120 articles in peer-reviewed journals and given over 300 seminars or presentations at various institutions and international conferences. Dr. He was the recipient of an NSF CAREER Award, Tejima Prize, and American Heart Association Established Investigator Award. He serves as an Associate Editor for IEEE Transactions on Biomedical Engineering, IEEE Transactions on Neural Systems and Rehabilitation Engineering, IEEE Transactions on Information Technology in Biomedicine, and International Journal on Bioelectromagnetism, and as a Guest Editor for IEEE Transactions on Medical Imaging and IEEE Engineering in Medicine and Biology Magazine. Dr. He is a Fellow of IEEE and AMBIE, and has served as Vice President for Publications of IEEE Engineering in Medicine and Biology Society (EMBS) from 2005-2007, as well as President of the International Society of Bioelectromagnetism from 2002-2005. Recently, Dr. He was elected as President-elect of IEEE-EMBS in 2008 and will serve as President of IEEE-EMBS for 2009-2010. See http://www.tc.umn.edu/~binhe/ for details.

Eduardo Marbán, MD, PhD

This fall, Eduardo Marbán will assume new responsibilities as the Director of the Cedars-Sinai Heart Institute. Most recently, he held various positions at Johns Hopkins including: Chief of Cardiology; Professor of Medicine, Physiology and Biomedical Engineering; Michel Mirowski, MD Professor of Cardiology; Director of Institute of Molecular Cardiobiology; and Director of the Donald W. Reynolds Cardiovascular Clinical Research Center. Dr. Marbán earned his medical and doctorate (physiology) degrees from Yale University. He completed his residency at the Johns Hopkins Hospital Department of Medicine Osler Medical Service, and fellowships at Yale University (Department of Physiology), University of Maryland School of Medicine (Physiology), and The Johns Hopkins Hospital (Cardiology Division). Dr. Marbán's research interests include cardiac arrhythmias, ischemic preconditioning, adenoviral gene transfer, and potassium inward rectifier. In addition to publishing more than 300 peer-reviewed manuscripts, Dr. Marbán has made several discoveries that have translated into patents in such areas as gene therapy, stem cells, and drug treatments for heart disease and stroke, and his inventions have also formed the basis for three startup companies. Dr. Marbán is the Editor-in-chief of Circulation Research, one of the world's leading cardiovascular journals. Among the honors he has received over the years are: the Gill Heart Institute Award, Fellow of the International Society
for Heart Research, Fellow of the American Physiological Society, Fellow of the American Heart Association, Fellow of the Heart Rhythm Society, Distinguished Scientist Award of the American Heart Association, and the MERIT Award from the NIH which recognizes researchers who have demonstrated superior competence and outstanding long-term productivity in research.