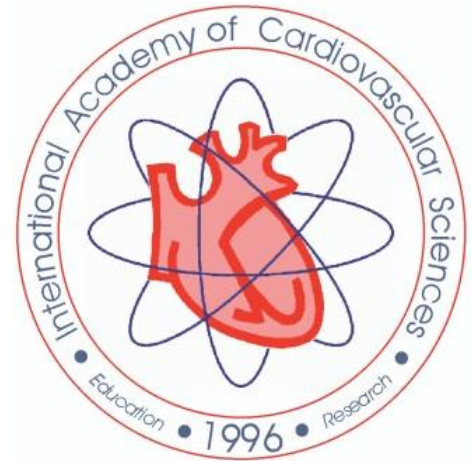


Promoting Cardiovascular Education, Research and Prevention

# CV Network

THE OFFICIAL BULLETIN OF THE INTERNATIONAL ACADEMY OF CARDIOVASCULAR SCIENCES

PUBLISHED WITH THE ASSISTANCE OF THE ST. BONIFACE  
HOSPITAL ALBRECHTSEN RESEARCH CENTRE



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## Academy Announcements

Prof. Dr. Bohuslav Ostadal was pleased to announce the following awards at the North American Section Meeting of the IACS in Orlando, Florida during August 31<sup>st</sup> - September 2<sup>nd</sup>, 2017.

1. Medal of Merit to Dr. Arnold Schwartz, Cincinnati
2. Lifetime Achievement Award to Dr. Mark Entman, Houston
3. Lifetime Achievement Award to Dr. William Weglicki, Washington, DC

### IACS Bestows Medal of Merit to Arnold Schwartz



*Dr. Arnold Schwartz*

Arnold Schwartz, PhD, MD (hc), D.Sc. (hc), R.Ph. the 2016 Drake Awardee, and Distinguished University Research Professor awarded in 1988, specialty is a team effort approach to developing new drugs used to treat heart dysfunctions. Utilizing many disciplines he initially established the mechanism of action of digitalis, known as the oldest drug used to treat heart failure. Schwartz is in the top 300 most cited authors to date.

Schwartz graduated from Abraham Lincoln HS in Brooklyn in 1946. Secondary education in New York especially this public HS, was the home for mostly children of immigrants. The NY Public School system in those days was the best in the US. Many later received Noble prizes in various fields attended ALHS. Notable were Arthur Kornberg and Maurice Berg.

Schwartz was accepted to the prestigious Chemical Engineering program in City College of NY, and after 2 years realized that medicinal chemistry was his calling to develop drugs. He transferred to and graduated from the

(now named) Arnold and Marie Schwartz College of Pharmacy, cum laude, in 1951. Schwartz enlisted in the USAF as a Registered Pharmacist serving first at Stewart AFB and then in Suwan, Korea as Chief Pharmacist. He did not take an offer to attend medical school, free, because his love of Pharmacy superseded any patient care profession. After his Air Force experiences, he took advantage of the GI Bill of Rights and attended OSU receiving a M.Sc. in Pharmacy-Pharmacology. Schwartz tried to enter the doctoral program at Albert Einstein College of Medicine, but the Chair, Al Gilman rejected him because "he was too old..."<sup>27</sup>).

Robert F. Furchgott (later the recipient of the Nobel for his discovery of the gaseous transmitter NO) accepted Arnie to his new department of Pharmacology at the State University College of Medicine, in Brooklyn. This is where a team approach became the vogue. Schwartz's PhD embraced the subject of mitochondria in heart failure. Schwartz developed what is now known as TAC: Thoracic ascending aorta constriction, in the guinea pig and discovered that Site 3 of the electron transport chain was defective. This was published in an early issue of Circulation Research. Later this defect in the cytochrome oxidase site (III) was recognized as the pore system involved in apoptosis.

After graduating in 1961, Schwartz was awarded a USPHS Postdoctoral Award to study ions in brain slices under the tutelage of Henry McIlwain (Inventor of the McIlwain Chopper) in the department of Biochemistry, at the Maudsley Hospital, University of London. This hospital housed patients referred to as insane. Recruitment of the Berlin-born Hans Eysenck the controversial behavior scientist who believed that drug treatment such as the use of chlorpromazine could function along with behavior therapy, in a symbiotic way so patients could be released in society. Arnie had lunch with him daily, to hear of his exploits. The work of Schwartz on normal and

diseased brain slices, brought into play the newly discovered (J.C. Skou, Denmark) Na, K-ATPase. Schwartz traveled to Aarhus with his wife and 2 year old daughter to work with Skou on the Na, K-ATPase isolation from heart. This enzyme was specifically inhibited by digitalis drugs. Schwartz's father died suddenly of a heart attack, and Arnie decided to devote his career to the heart. While maintaining a Visiting Professorship at the Royal Free Hospital Pharmacology department under Eleanor Zaimis (discovered hexamethonium), Arnie was recruited to the newly named Baylor College of Medicine in Houston in the department of Pharmacology headed by the cancer researcher Harris Busch. Rising swiftly through the ranks. Professor Schwartz was approached by the world famous cardiac surgeon Michael E. DeBakey, President of BCM, to establish a new Department called Cell Biophysics located solely in the Brown-Fondren Hospital next to the OR suites. The large budget allowed recruitment of superb faculty and graduate students mostly from Rice University, where Schwartz was an adjunct Professor of Chemistry.

When the "Whole Heart Transplant" season began, Schwartz and his team received the diseased heart and a piece of the transplanted heart and carried out ground breaking studies on the mechanism of biochemical control of calcium in all of the systems that regulate the heart Excitation-Contraction-Relaxation coupling. Many papers were published, prizes awarded and the first US-USSR trip arranged by DeBakey to visit many of the heart laboratories in the USSR.

The OR furnished human heart tissue almost every day and frequently at night and in the early morning hours. Arnie appeared in the OR, with ice bucket, so often that the famous writer Thomas Thompson referred to Arnie as the "Ghoul from School" a phrase that caught the attention of DeBakey and his associates and the Chair of all the departments.

Arnie loved to communicate and his lectures were loved by the small class of medical students. This continued throughout his long career. He has won several golden apple awards.

In 1977, the late Dr. Stanley Troup Provost and Sr. VP of UC visited me in Houston to learn how to develop a department with a team effort approach to CV sciences. He and the late Robert Daniels, Dean of the UC College of Medicine recruited me and 17 faculty and staff to Cincinnati to build a CV Program. In one year we received a Program Project Grant (PPG), encompassing not only our new department but many of the existing faculty in other departments and disciplines. We also were successful in establishing a NHLBI Training Grant (TG),

with predoc and postdoc and medical and surgical fellows, benefitting from superb faculty and their laboratories. Individual grants and MERIT awards were also transferred from Houston. The PPG lasted 30 years and the TG 36 years, both among the longest continuously funded team effort grants in the NIH.

Schwartz has authored over 500 peer reviewed papers in his long career. He chaired the first Gordon Conference on digitalis. In distinguishing himself in molecular and biochemical aspects of excitation-contraction-relaxing coupling, he became a worldwide expert in the role of calcium and in the Na, K-ATPase. Together with Jerry Lingrel and Gary Shull, the subunits of the Na, K-ATPase was cloned at the University of Cincinnati.

Schwartz and his research team was the first to identify the location of the voltage dependent calcium channel (L-VDCC) in the human heart, and together with colleagues at the Salk Institute (SIBIA), cloned the highly complex L-VDCC which consisted of what is known as the alpha 1 and alpha 2 subunits. It soon became obvious that a new class of drugs, the calcium channel blockers (CCB) acted by binding to the alpha 1 subunit. Schwartz collaborated with Tanabe and with Pfizer and chose the lead compounds with the help of their medicinal chemists. He is credited with developing the drugs DILTIAZEM and AMLODIPINE, and presented at the FDA who approved. Diltiazem, as well as the dihydropyridines and verapamil, are still used. The CCB's, after 50 years, have saved countless lives and relieved a number of disease cardiac conditions.

In his long career, Arnie has won many awards: A D.Sc. received in 1988 from the Arnold and Marie Schwartz College of Pharmacy; an honorary M.D. degree from the Albert Szent-Gyorgy College of Medicine in 2006; The Samuel Kaplan, MD Visionary Award from the AHA; The Ohio Affiliate AHA Research Merit Award; the Otto Kraye Distinguished Award in Pharmacology, in 1988 from ASPET; The Ariens Receptor Award from the Dutch Pharmacological Society for Receptor Pharmacology in 1994; the Distinguished Investigator Award, awarded in 1995 from the American College of Clinical Pharmacology; the Chauncey Depew Leake Pharmacology Award in 2009 from OSU; The final four AHA Distinguished Scientist Research Award, in 2010; and the Most Dramatic Scientist Award, known as the ARNIE award from the AHA Basic CV Council, in 2012.

Despite the research and the honors, his first love is teaching medical students. He hopes someday soon that he will be asked to reenter the teaching program at the University of Cincinnati.



## Mark Entman Receives the IACS Lifetime Achievement Award



*Dr. Mark Entman*

Dr. Entman was recruited to Baylor College of Medicine as an assistant professor in 1970. He was a Howard Hughes Medical Investigator from 1971 and 1979 when he assumed his present position. In 1977, Dr. Entman became the chief of the Section of Cardiovascular Sciences and director of the Division of Research of NHLBI National Research and Demonstration Center at Baylor College of Medicine and The Methodist Hospital. In 1985, the DeBakey Heart Center replaced that program. Dr. Entman has been continuously funded as a principal investigator by the National Institutes of Health since 1967 and is currently funded until 2017. He was principal investigator of two Program Project Grants (21 years) and Research Director of the NHLBI Research and Demonstration Center at Baylor from 1976-1985.

Dr. Entman's early research interests relate to control of myocardial calcium and sarcoplasmic reticulum function. These studies were continuously supported by the National Heart, Lung and Blood Institutes since before his arrival at Baylor until 2000. For this work, Dr. Entman received the Outstanding Research Award from the International Society of Heart Research (1986) and was awarded an NIH MERIT AWARD (1989-1999).

Dr. Entman's other research interests relate to the molecular and cellular mechanism injury and repair in the myocardium. These studies have been supported since 1974 by an RO1 and subsequent Program Project Grants and RO1's of which he was Principal Investigator. In the late 1980s, the studies shifted to examining the role of inflammation in cardiac injury following reperfusion of the infarcted myocardium. Studies were aimed at characterizing the accelerated reperfusion-induced inflammation and its role in extending myocardial injury.

Dr. Entman and his colleagues were the first to demonstrate the induction of ICAM-1 expression on viable cardiac myocytes in the jeopardized border zone of a reperfused myocardial infarction. They demonstrated in vivo that the presence of ICAM-1 sensitizes myocardial cells to adhesion-dependent neutrophil induced injury

(oxidative). Subsequent work dealt with characterizing the cytokine cascade responsible for inflammatory injury of the surviving border zone. Factors influencing both the cardiac and leukocyte response were studied and examined in the context of the pathophysiologic course of infarct progress.

These studies led to examination of reperfusion-induced inflammation as a mediator of cardiac repair and remodeling. The overall strategy involved identification of cellular and molecular events that result in injury and identification of potential factors which might reduce inflammatory injury or promote repair. An emphasis related to chemokine and TGF $\beta$  roles in suppressing acute inflammation and allowing repair. This work led to investigations of the cellular and molecular link between inflammation and adverse remodeling in the heart. In recent years, the laboratory has defined, in both murine models and clinical material taken from ischemic cardiomyopathy (in the absence of infarction) the presence of CD45<sup>+</sup> fibroblasts arising from marrow derived blood borne monocytic cells in response to MCP-1 dysregulation. The model demonstrates a sequential role for M1 macrophages inducing cytokines and lymphokines to effect M2 polarization. M2 macrophages become myeloid fibroblasts seen in cardiac remodeling.

In contrast, we showed that fibroblasts mediating cardiac scar formation arose from endogenous mesenchymal stem cells (MSCs). Examination of MSCs in the aging mouse demonstrated the dysfunctional lineage choice and its association to the generation of fibroblasts in the myocardial infarction that did not transition to myofibroblasts. Dysfunctional fibroblasts in the aging mouse have marked reduction in TGF- $\beta$  responsiveness and markedly reduced levels of TGF $\beta$ 1 receptor. Growing endogenous mesenchymal stem cells from young animals in the presence of higher insulin levels (seen in aged mice) also resulted in a similar dysfunction. This data suggests that defective scar formation in aging mice previously reported by our laboratory and the well-observed problems with infarct healing in aging patients arise from this defect in mesenchymal stem cells.

Dr. Entman is a member of the American Society for Clinical Investigation and the Association of American Physicians. He received the Distinguished Alumnus Award from Duke University Medical Center in 1996. In 2007, Dr. Entman received the Bowman Award for Outstanding Research from the Institute of Cardiovascular Sciences for his work on the cellular mechanisms of

cardiac remodeling and repair. He has also been the associate editor for *Federation Proceedings* and *FASEB Journal* and associate editor of *Circulation* and has served on multiple editorial boards and study sections. In 2016,

an endowed chair was established in his name for the Cardiovascular Research Institute at Baylor College of Medicine.

## William B. Weglicki Receives the IACS Lifetime Achievement Award



Dr. William B. Weglicki

William Weglicki, M.D. is the Professor of Medicine (Cardiology), and Acting Chair of the Department of Biochemistry and Molecular Medicine

Dr. Weglicki trained in Medicine at the Georgetown University Hospital before completing his cardiology fellowship at Duke University Medical

Center. After two years as a Research Associate at NIH and Johns Hopkins University, he joined the faculty of Harvard Medical School where he was promoted to Associate Professor of Medicine. In 1975 he was appointed Chairman of the Department of Biophysics at the Medical College of Virginia of Virginia Commonwealth University. While at Harvard and MCV he was awarded several NIH research grants. At the Oklahoma Medical Research Foundation he led their

Cardiovascular Research Program. He joined the George Washington University Department of Medicine in 1985 and formed the Division of Experimental Medicine; this core group of investigators was awarded a Program Project research grant on Molecular Mechanisms of Cardiovascular Injury from the National Heart, Lung and Blood Institute. For 12 years he served as chairman of the Department of Physiology at GW and during that time he was appointed King Fahd Professor of Cardiac Pathobiology. From 2002 -2006 he served as President of the US, Canada, Mexico Section of the International Society for Heart Research. In 2005 he organized a symposium for the WHO on magnesium and disease processes. In 2006 he was an invited chair and speaker at the International Magnesium Society meeting in Japan. He chaired the Gordon Conference on Magnesium in Biochemical Processes and Medicine in 2008 in California. He has been a principal investigator on NHLBI research grants continuously for more than 30 years. In addition, he continues to teach and treat patients in the Cardiology Clinic at the George Washington University. In 2014 he was appointed Acting Chair of the Department of Biochemistry and Molecular Medicine.

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## Election of 2017 IACS Fellows

Prof. Dr. Bohuslav Ostadal, President of IACS, is pleased to announce the election of the following eleven Fellows for the year 2017. (The maximum member of active Fellows of the Academy does not exceed 250 at any given time):

1. Dr. Madhu Dikshit, Lucknow, India
2. Dr. Henrique B. Furtado, Palmas, Brazil
3. Dr. A. Martin Gerdes, Old Westbury, USA
4. Dr. Kavita Gulati, Delhi, India
5. Dr. Danielle Jacques, Sherbrooke, Canada
6. Dr. Richard N. Kitsis, Bronx, USA
7. Dr. V. Raman Kutty, Trivandrum, India
8. Dr. David J. Lefer, New Orleans, USA
9. Dr. C.N. Manjunath, Bangalore, India
10. Dr. Bram Ramjiawan, Winnipeg, Canada
11. Dr. Junichi Sadoshima, Newark, USA

### Prof. Dr. Henrique Barsanulfo Furtado



*Prof. Dr. Henrique  
B. Furtado*

Dr. Furtado graduated in Medicine from the Catanduva Medical College (1977). He completed his Master (1994) and PhD (1999) Degrees in Surgery, Faculty of Medicine, Federal University of Minas Gerais. He became Professor of Cardiology at the Federal University of Tocantins, Palmas, Brazil (UFT) in 2010. He is a specialist in Cardiovascular Surgery, Cardiology, Intensive Care

and Labor Medicine. His present research activities, are in the area of Experimental Surgery, specifically heart transplants, immunosuppression, ischemia and reperfusion of the heart and solid organs. He is Titular Member of the Brazilian Society of Cardiovascular Surgery, since 1978. He also has certification in hospital administration from São Francisco University. Dr. Furtado is also heavily involved in undergraduate and post graduate education.

Dr. Furtado is the Chief of the Department of Cardiovascular Surgery, at Dom Orione Hospital in Araguaína Tocantins. He was trained in Cardiovascular Surgery in the Instituto Dante Pazzanese under the guidance of Dr. Adib Jatene, from 1977 to 1982. He was Chief and founder of the Department of Cardiovascular Surgery in the Base Hospital in Bauru, São Paulo, from 1982 to 2002.

In 2002 he went to Palmas Tocantins as the State Secretary of Health in the Govern Siqueira Campos. In 2003, he was also the State Secretary of Health in the Govern Marcelo Miranda. In the positions he dedicated his knowledge to public health assistance as well as family health assistance.

In 2002, Dr. Furtado completed his Master in Medicine, in the field of Cardiovascular Surgery at the Fundação Cardiovascular São Francisco de Assis - Servcor - Belo Horizonte, under the supervision of Prof Dr. Otoni Moreira Gomes. His thesis work was on "Comparative Study of Heart Frequency, Coronary Flow, and Myocardial Contractility, in Isolated Hearts, subjected to Ischemia and Ischemic Preconditioning, Before and After the administration of Fentanyl Citrate - Experimental Study in Rats".

Dr. Furtado is also Chief of Research in Valvular Bioprosthesis in the Instituto Dante Pazzanese of Cardiology. He was involved in manufacture of thousands of Dura Mater Bioprosthesis, and developed the Pericardium Valvular Bioprosthesis, based on Ionescu Shiley Prosthesis. In Bauru he established a Bioprosthesis Valve Factory called BIOVAL, that sent valves for implantation in many States of Brazil, Mexico, Ecuador, and Canada, with approval of the Health Public Branch.

He developed a machine to make amorphous ice to use in cardiac heart surgery, to freeze muscle and protect heart during surgery. This machine has been used in hospitals across Brazil, Mexico and Ecuador.

He is also the Director of the Cardiovascular Simulation Center in Tocantins University. This Center is involved in basic life support and advanced cardiovascular life

support, with the approval of the American Heart Association. This is an extension of activities at the University of Tocantins.

Dr. Furtado made the first Pulmonary Valve Autotransplantation to substitute the Aortic Valve, Ross Operation, in Latin America and gave a talk entitled "Pulmonary Valve Auto transplantation to substitute the Aortic Valve", during the Brazilian Society of Cardiac Surgery Congress in Belo Horizonte. This work was also published as a paper in the Journal of Brazilian Society of Cardiovascular Surgery.

He has been participating in the directory of the Brazilian Society of Cardiovascular Surgery in the last 30 years as well as in the Deliberative Council, Department and Regional Society Directory. Dr. Furtado founded the Cardiovida Hospital in Bauru, in 1992 and has served as President Director from 1992 to 2002. In Bauru, his group has carried out over 8,000 procedures for pump heart surgery, with very good success.

He was the pioneer on Cardiovascular Surgery in Tocantins, a new State of the North Part of Brazil and founded the Heart Institute of Palmas, Tocantins. Dr. Furtado is the Director of the Cardiac Surgery Department of the Hospital Dom Orione, where his team has treated almost 15,000 patients, with almost 5,000 of these with open heart surgery.

Dr. Furtado is also currently a surgeon at Palmas Public General Hospital in Palmas, Tocantins, and the sponsor of Cardiovascular Heart Surgery Institute in Palmas, Tocantins. Dr. Furtado was the President of the X Cardiology Congress of São Paulo, bringing many important speakers, including Prof. Alain Carpentier and many others.

He was speaker at the Forum Científico – Congresso Internacional de Ciências Cardiovasculares, which is one of the most important scientific meetings in the world, organized by the Instituto Cardiovascular São Francisco de Assis - Servcor, under the coordination of Prof. Dr. Otoni Moreira Gomes.

## Dr. A. Martin Gerdes



*Dr. A. Martin Gerdes*

Dr. Gerdes received a PhD in Anatomy from the University of Texas Medical Branch (UTMB) at Galveston in 1978. He did postdoctoral training at Louisiana State University in New Orleans and the University of Alabama at Birmingham before joining the faculty at the University of South Florida in Tampa for 10 years.

In his early career, Gerdes developed precise methods to evaluate myocyte remodeling to better understand the relationship between myocyte shape and cardiac function during physiological and pathological growth of the heart. He found that changes in myocyte length and width correlate with changes in chamber circumference and wall thickness, respectively. Importantly, he demonstrated that the increase in chamber diameter/wall thickness ratio with progression to dilated heart failure was due to excessive myocyte lengthening from series addition of sarcomeres with no change in myocyte diameter.

While searching for those factors that beneficially or adversely affect myocyte remodeling, he found beneficial effects on myocyte shape by restoring normal cardiac thyroid function. In addition, he noted that restoration of normal thyroid hormone function in heart diseases improves blood flow, systolic function, diastolic function, and gene expression while reducing fibrosis. Gerdes also defined other basic features of the heart. He demonstrated a rapid transition from myocyte hyperplasia to myocyte hypertrophy shortly after birth at day 5 in rats.

He demonstrated that cardiac myocytes in dilated, non-failing hearts have the ability to remove series sarcomeres and reduce chamber diameter after removal of the overload. Gerdes showed that dilated failing hearts have the ability to reverse remodel back to normal by removing series sarcomeres with pharmacological intervention and, subsequently, reducing chamber dilatation when the drug specifically targets the cause (e.g. ACE inhibitors or AT1 blockers in high renin angiotensin models like Spontaneously Hypertensive Heart Failure rats). He demonstrated that males and females have the same number of cardiac myocytes. But, myocytes are larger in males due to the larger body mass. Follow up studies indicated that this adaptive reserve may offer an



advantage in females undergoing pathological cardiac hypertrophy.

Gerdes served as Chairman of the Department of Anatomy at the University of South Dakota from 1993-98 and currently serves as Chairman of the Department of Biomedical Sciences at New York Institute of Technology College of Osteopathic Medicine in Old Westbury, NY since 2011. He was the founding scientist for Sanford Research in Sioux Falls, South Dakota in 1998 and served as Director of the Cardiovascular Research Institute at Sanford Research from 1998-2010.

Some of his major achievements are indicated below:

- 1) South Dakota Board of Regents Award for Excellence in Research, 2000.
- 2) 2013 UTMB Distinguished Alumnus Award, Graduate School of Biomedical Sciences.
- 3) UTMB Notable Alumni. Recognized as 1 of 37 all-time PhD graduates at 125 year anniversary.
- 4) Hans Peter Krayenbuehl Memorial Award for distinguished contributions in the field of research in cardiac function. 22nd World Congress on Heart Disease, 2017.
- 5) Recipient of over \$30M in NIH funding as PI.

He participated in the Postdoctoral Joint Meeting on Cardiovascular Sciences, in Buenos Aires, July 21st, with the lecture: "Myocardial Revascularization: Strategies and Perspectives". Dr. Gerdes is also the Chief of Cardiovascular Surgery Department of the "Heart Surgery Institute" in Palmas, Tocantins, Brazil.

### Dr. Kavita Gulati



*Dr. Kavita Gulati*

Dr. Kavita Gulati is Professor in Pharmacology at Vallabhbhai Patel Chest Institute, University of Delhi. She obtained her Master's degree in Pharmacology from the All India Institute of Medical Sciences and subsequently did her Ph.D from the University of Delhi. Dr Gulati has more than 24 years of teaching

and research experience in Clinical and Experimental Pharmacology and Toxicology in different capacities in India and abroad. She is the recipient of several national awards including the Achari Prize and Uvnas Prize and

the prestigious Prof. B.N. Ghosh Oration of the Indian Pharmacological Society. She is member of several professional bodies/societies relating to pharmacology and allied sciences (viz. National academy of Medical Sciences, International Neuroendocrine Federation, New York Academy of Sciences, Society of Toxicology, Society of Pharmacovigilance, Indian Pharmacological Society, etc. Her biography has also been included in the Marqui's "Who is Who" in the world in science. Her research interests are in Respiratory Pharmacology and Toxicology, Neuropharmacology and Stress Research, and she is the Principal Investigator of several extramurally funded research projects (viz. DST, DBT, AYUSH, CSIR, ICMR, etc.). She has the distinction of being invited to present talks at prestigious international meetings like IUPHAR (China, Copenhagen and South Africa), CMB Congress (France), World Stress Congress (Hungary), and CPT Congress (Australia), International Immunology Forum (Canada). She has been visiting scientist to reputed international institutions like Semmelweis Medical University (Budapest, Hungary), University of Pittsburgh Medical Center (USA), Army Medical Institute (Xian, China), University of Minnesota at Minneapolis (USA), University of Illinois at Chicago (USA), University of Manitoba (Canada), West Cape University (South Africa) etc. and expert member at different Institutions and Government organizations in her field. She has published extensively in leading national and international journals (more than 120 publications), is co-author of several chapters in reference and textbooks of Pharmacology, and co-editor of four books in Pharmacology.

### Dr. Danielle Jacques



*Dr. Danielle Jacques*

Dr Danielle Jacques obtained her Ph.D. in physiology in 1995 from University of Sherbrooke. She then spent three years postdoctoral training in neuropharmacology at McGill University (Dr Rémi Quirion). In 1998, Dr Jacques joined the department of anatomy and cell biology, Faculty of medicine and health sciences of University of Sherbrooke where she is full professor since 2008. She

obtained several awards including the Alfred B. Grossman Award from the EJLB Foundation (Heart and Stroke Foundation of Quebec) and the George Fodor Feature Symposium Award from the Canadian Institutes



of Health Young Investigator Forum and more recently the Distinguished Service Award in Cardiovascular Science, Medicine and Surgery from the International Academy of Cardiovascular Sciences. She was editor-in-chief of «Revue Medicine Sciences Amerique» and she is an associate editor for the Canadian Journal of Physiology and Pharmacology and for Molecular and Cellular Biochemistry. During the course of her career, Dr Jacques published many papers and book chapters and two of her papers are among the 10 most cited in the field of endothelin-1 and Angiotensin II. She is highly implicated in the medical curriculum renewal at her institution. She is supported by the Canadian Institute of Health Research and Natural Sciences and Engineering Research Council of Canada. Dr Jacques's research interests are in the implication of the peptides and their specific receptors in cardiac pathophysiology to elucidate endothelial dysfunctions in general and more specifically of the endocardial endothelium in hypertrophy and heart failure.

### Dr. V Raman Kutty



*Dr. V Raman Kutty*

MD (Pediatrics), DCH, M Phil (Jawaharlal Nehru University), M P H (Harvard)

Professor and Head, Achutha Menon Centre for Health Science Studies (AMCHSS), Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum, Kerala, India. SCTIMST is an Institute of National Importance created

by an act of the Indian Parliament and has the status of a university. AMCHSS is the public health research and training school attached to SCTIMST.

AMCHSS offers a Masters' program in Public Health (MPH), the first of its kind in India. Besides this, it also offers the PhD degree in Public Health. Prof. Kutty teaches topics in introductory epidemiology, intermediate epidemiology, health policy, public health ethics, and data science using the 'R' package. His major research interests include chronic non-communicable diseases such as coronary heart disease and type 2 diabetes, which have emerged as major problems in the state of Kerala. In the past, he did pioneering research on establishing the prevalence and correlates of ischemic heart disease and type 2 diabetes in the state of Kerala. His international collaborations include the PURE study, led by Professor Salim Yusuf from McMaster University. He is the head of the team of investigators for PURE in Kerala. He is

currently co-principal investigator or principal investigator of major research projects on 'Prevention and Control of Non-Communicable Diseases in Kerala' (funded by the Govt. of Kerala), 'Closing the gap-Health Equity Research in India' (funded by IDRC, Canada) among others. He is also a policy consultant, being on the group which drafted the renewed health policy for the state. Dr. Kutty is a member of the International Epidemiological Association. Chairman of 'Health Action by People', a voluntary not-for-profit organization in health. To date, Dr. Kutty has published more than 50 research articles in peer reviewed journals.

### Dr. C.N. Manjunath



*Dr. C.N. Manjunath*

Dr. C.N. Manjunath is a Senior Cardiologist and Director of Sri Jayadeva Institute of Cardiovascular Sciences and Research, Bengaluru. Under his leadership the Institute has recorded 300% overall growth and the Bed Strength has been increased from 330 to 1150 beds exclusively for cardiac care. He has introduced and practicing the "Treatment First Payment Next concept".

He has very exclusively implemented the concept that "every needy patient should be given quality treatment irrespective of financial affordability".

Under this concept, thousands of poor patients with cardiac disease irrespective of financial affordability were treated and free treatment is given in deserving poor not only for the people of Karnataka and other parts of the Country and third world countries. He has taken affordable cardiac care across the State by opening branches in Mysore/Kalaburagi apart from Bangalore. He has also organized and participated in many camps across the State and under-privileged and tribal patients are treated. He has mobilized more than 25 Crores Rupees (US\$ 400,000) donations from various charitable organizations and built up a poor patient corpus fund, the interest generated is utilized for needy and poor. Even medicines are given free of cost for deserving patients.

He has continued and even contributed much more to the society and also has brought many laurels to the Country in the area of interventional cardiology since then. He has donated Two acres of land for establishing Primary Health Centre in his native village which is functioning.

## Dr. Bram Ramjiawan



*Dr. Bram Ramjiawan*

Dr. Bram Ramjiawan received his M.Sc. from the Department of Physiology, University of Manitoba in 1996 and obtained his Ph.D. from the Department of Pharmacology, University of Manitoba in 2006. Dr. Bram Ramjiawan is the Director of Research Innovation and Regulatory Affairs, Director of Research, Asper Clinical Research Institute, as well as Director of the Office of

Clinical Research at the St. Boniface Hospital in Winnipeg, Canada. Prior to joining the hospital, Dr. Ramjiawan was with the Government of Canada-National Research Council- as an Industrial Technology advisor who specialized in Life Sciences and Biomedical Technologies. Dr. Ramjiawan is also an Adjunct Professor of Pharmacology and Therapeutics for the Faculty of Medicine at the University of Manitoba. He is on many national and international organizations. At the national level Dr. Ramjiawan is on the steering committee

of the Canadian Standards Association on Medical Technology and Health Care. At the international level, he is a reviewer for the United States National Institutes of Health and for the European Union Commission on Health Science and Ethics. Dr. Ramjiawan is on the editorial board of an international journal, Journal of Pharmacoeconomics and Outcomes Research. He is the co-chair of the St. Boniface Hospital Research Ethics Committee. Dr. Ramjiawan is also one of the founding members of the Caribbean Canada Heart Health Education program under the auspices of the International Academy of Cardiovascular Sciences. He has published 25 peer reviewed papers, contributed to 6 books/book chapters and generated 2 patents for health related technologies. Dr. Ramjiawan is regarded as a global authority in the ethical conduct of clinical trials, their regulatory management as well as commercialization/business opportunities. Consequently, these achievements have been recognized worldwide including in USA, Canada, South America, the Caribbean and Europe. In many of the international committees that he has served including Fogarty International, European Union Research Panels, Dr. Ramjiawan represents Canada as the only Canadian member of these committees. He has given more than 40 invited talks in 9 different countries.

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## Academy Announcements

Prof. Dr. Bohuslav Ostadal was pleased to announce the following awards at the North American Section Meeting of the IACS in Orlando, Florida during August 31<sup>st</sup> - September 2<sup>nd</sup>, 2017.

1. Norman Alpert Award for Established Investigator in Cardiovascular Sciences
2. Naranjan S. Dhalla Award for Innovative Investigators in Cardiovascular Sciences
3. Distinguished Leadership Award in Cardiovascular Sciences
4. Two Distinguished Service Awards in Cardiovascular Science, Medicine and Surgery

### Michael Czubryt Receives the Norman Alpert Award for Established Investigator in Cardiovascular Sciences



*Dr. Michael Czubryt*

Dr. Czubryt is a tenured Professor of Physiology and Pathophysiology at the University of Manitoba, and a Principal Investigator of the Institute of Cardiovascular Sciences at the St. Boniface Hospital Albrechtsen Research Centre. His research program focuses on how genes are activated or silenced, how these

regulatory mechanisms contribute to heart disease, and how this knowledge can be exploited to create new therapies for cardiac patients. The work from his laboratory has provided critical new insight into the processes by which altered gene regulation leads to heart dysfunction, and more importantly has shown the way forwards to innovative and novel treatments not previously envisioned.

Dr. Czubryt's current work has uncovered a surprising new regulator of fibrosis in the heart: a protein called scleraxis, which governs how tendons form before birth. Like the heart, tendons are collagen-rich, and he was the first to hypothesize a common role for scleraxis in both tissues – the control of matrix genes and thus matrix production. His recent publications have confirmed this hypothesis, and revealed scleraxis as a new target for development of anti-fibrotic drugs. He has found that scleraxis not only governs matrix production in the heart, but in fact is both sufficient and necessary for the conversion of cardiac fibroblasts to pathological myofibroblasts. He was the first to describe this critical role for scleraxis, and recently published the first evidence of post-translational modifications that may be targeted

for therapeutic effect. An editorial in the Journal of Molecular and Cellular Cardiology described his initial discovery as “the Achilles’ heel” of cardiac fibrosis (2009), and a more recent editorial (2016) in the same journal has further highlighted his work as bearing tremendous promise for the treatment of fibrosis.

Dr. Czubryt is actively working to translate his discoveries to the clinic, having launched seven provisional patents and with two full patents granted for targeting scleraxis in cardiac fibrosis, and for high throughput screening of potential blockers of scleraxis function. His laboratory is currently working to identify lead pharmaceutical compounds representing first-in-class for cardiac fibrosis treatment. For this, he was honored with the Ronald Duhamel Innovation Fund Award.

This body of work has prompted nearly 80 invitations to speak at universities, symposia (including the prestigious Keystone Symposium on Collagen, Biovaria 2012 in Munich and the 2015 Gordon Conference on Collagen) and national and international meetings (including the American Heart Association and Experimental Biology, where he has also been invited to develop speaker sessions and symposia). These speaking engagements have led directly to the establishment of numerous international collaborations.

To date Dr. Czubryt has published 60 papers, and has over 1400 citations to his work with an H-index of 17. He has been continuously funded by national granting agencies since opening his laboratory. He was recently elected as Fellow of the American Physiological Society Cardiovascular Section, of the American Heart Association, and of the International Academy of Cardiovascular Sciences. He has served on the editorial board of four scientific journals.

## Gary Lopaschuk Receives the Naranjan Dhalla Award for Innovative Investigators in Cardiovascular Sciences



*Dr. Gary Lopaschuk*

Dr. Gary D. Lopaschuk is a Distinguished University Professor of Pediatrics at the University of Alberta, Edmonton. He is a Cardiovascular Researcher whose research focuses on the regulation of fatty acid oxidation in the heart, and the mechanism by which high rates of fatty acid oxidation contribute to heart disease and heart failure. He is also examining how alterations in

fatty acid metabolism contribute to cardiovascular disease in the diabetic. At a molecular level he has characterized a number of key enzymes important in the regulation of cardiac fatty acid oxidation. He is also developing a number of therapeutic strategies that involve optimizing energy metabolism in the heart that can be used to prevent the development of heart disease, and that can also be used to treat heart failure. His research has resulted in the publication of over 400 original research articles, and he

has been recognized by awards such as the Canadian Cardiovascular Research Achievement Award and the International Academy of Cardiovascular Sciences Research Achievement Award.

Dr. Lopaschuk is an Alberta Innovates Health Solution Scientist, and is a Fellow of the Royal Society of Canada. He has served as Scientific Director of the Mazankowski Alberta Heart Institute, and has previously served in a number of capacities with the Heart and Stroke Foundation of Canada, including as Chair of the Scientific Review Committee and the Vice-Chair of the Research Planning and Priorities Committee. He serves on a number of journal editorial boards, including Circulation Research, Journal of Clinical Investigation, American Journal of Physiology, Cardiovascular Research, Journal of Molecular and Cellular Cardiology, Canadian Journal of Physiology and Pharmacology, Heart and Metabolism, and Cardiovascular Drugs and Therapy. He is also the President and CEO of a biotechnology company (Metabolic Modulators Research Ltd.), that is developing novel drugs to treat heart disease that optimize energy metabolism in the heart.

## IACS Leadership and Distinguished Service Awards

Distinguished  
Leadership Award



*Dr. Dinender Singla*

Distinguished Service  
Award



*Dr. William DeCampi*

Distinguished Service  
Award



*Dr. Sampath Parthasarathy*



# Award Recipients for Different Competitions at the IACS North American Section Meeting, Orlando, Florida August 31<sup>st</sup>-September 2<sup>nd</sup>, 2017

## **James T. Willerson Competition for Postgraduate Fellows and Residents**

- Andrea L. Edel, Institute of Cardiovascular Sciences, University of Manitoba, Winnipeg, Manitoba, Canada

## **Gary Lopaschuk Competition for Graduate Students**

- Jamillah Hammond, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA

## **Roberto Bolli Competition for Young Faculty in Translational Science**

- Sanjiv Dhingra, Institute of Cardiovascular Sciences, St. Boniface General Hospital Research Centre, Regenerative Medicine Program, University of Manitoba, Canada

## **Grant Pierce Competition for Young Faculty in Biomedical Sciences**

- Chandrakala Alugantinarasimhulu, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA

## **Morris Karmazyn Poster Award Competition**

- Zahra Tavakoli Dargani, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA
- Kaley Garner, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA
- Michael Rohr, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA
- Richard Barrett, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA

## **Margaret Moffat Poster Competition**

- Aleksandra Stamenkovic, Institute of Cardiovascular Sciences, St. Boniface Hospital, and the Departments of Physiology and Pathophysiology, Canada
- Krista Filomeno, Department of Physiology and Pathophysiology, Institute of Cardiovascular Sciences, Faculty of Health Sciences, College of Medicine, University of Manitoba, Canada
- Pragny Deme, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA
- Tibor Hornyik, Department of Pharmacology and Pharmacotherapy, University of Szeged Szeged, Hungary

## **UCF Undergraduate Poster Competition Award Recipients**

- Jessica Hellein, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA
- Reetish Singla, Burnett School of Biomedical Sciences, College of Medicine, University of Central Florida, USA

## **COM Fire Poster Competition Award**

- Naina Sharma, College of Medicine, University of Central Florida, Orlando, Florida, USA

## **St. Boniface Hospital Albrechtsen Research Centre Travel Awards**

- Aleksandra Stamenkovic, Institute of Cardiovascular Sciences, St. Boniface Hospital Albrechtsen Research Centre, and the Department of Physiology and Pathophysiology, University of Manitoba, Canada
- Jialiang Liang, Department of Pathology and Laboratory Medicine, College of Medicine, University of Cincinnati, USA
- Krista Filomeno, Institute of Cardiovascular Sciences, St. Boniface Hospital Albrechtsen Research Centre, and the Department of Physiology and Pathophysiology, University of Manitoba, Canada
- Wanling Xuan, Department of Emergency Medicine, Ohio State University Wexner Medical Center, Ohio State University, USA
- Tibor Hornyik, Department of Pharmacology and Pharmacotherapy, University of Szeged Szeged, Hungary
- Alex Austria, Institute of Cardiovascular Sciences, St. Boniface Hospital, and the Departments of Physiology and Pathophysiology, Canada
- Vijayan Elimban, Institute of Cardiovascular Sciences, St. Boniface Hospital Albrechtsen Research Centre and University of Manitoba, Canada

## Dr. Suresh K. Gupta 75<sup>th</sup> Birthday Celebrations

By: Ramesh Goyal

Vice Chancellor

Delhi Pharmaceutical Sciences & Research University, India

Email: [goyalrk@gmail.com](mailto:goyalrk@gmail.com)



*Prof. Suresh K. Gupta*

Prof. Suresh K. Gupta, Ph.D., FIACS, FIPS, FISER, FRAMS, is one of the pioneering members of International Academy of Cardiovascular Sciences who have contributed immensely to the cause of academy, specially, to India Chapter is going to complete 75 years on 17th July, 2017.

To commemorate the occasion, his students and well wishers organized an international seminar at the National Pharmacovigilance of India at Indian Pharmacopoeia Commission, the wing that has been named after Professor Gupta, by the highest drug Regulatory body of India, CDSCO, Delhi.

Dr. Gupta is currently the Distinguished Professor and Head, Department of Clinical Research at Delhi Pharmaceutical Sciences and Research University (DPSRU), New Delhi. In fact, he is one of the pioneering personalities to get this University, the first in India and second in world dedicated to pharmacy. He is the pioneer member of the Board of Governors as well as Academic Council of this University.

Dr. Gupta joined Prestigious All India Institute of Medical Sciences (AIIMS) in 1966 for his post-graduation. He did his Ph.D. in Pharmacology under the renowned Pharmacologist of the Country, Prof. R. B. Arora who was Professor & Head Department of Pharmacology. Dr. S. K. Gupta is the 1st Ph.D. in Pharmacology from AIIMS. Later he joined faculty of the Department and rose to become Professor and Head of this Institute, the top chair of the Country. During his 35 years of stay at AIIMS, he immensely contributed to teaching and research and published more than 200 papers and guided more than 150 post graduate students (MD, Ph.D., & Masters). During 1990 he met Dr. N. S. Dhalla, a man with great vision, passion and dedication for the Cardiovascular Research and Education, who encouraged him to work in the area of Cardiovascular Sciences. Since then he chose to establish the Scientific Basis for the use

of Herbal Drugs for the prevention and treatment of cardiovascular diseases as these medicines are used by 80% of the Population in the Country. Since then he has published more than 75 research publications in the field and have shown that these Medicine can play significant role in Cardio protection. Dr. Gupta has been actively involved in promoting various activities of ISHR India Chapter as Secretary General of the India section. He played a key role in establishing the International Academy of Cardiovascular Sciences (India Chapter) since 2004 in India and served as Secretary General till 2011 and later he was elected as President of IACS India Section till 2015. He played key role in organizing at least 8 International Conferences of IACS with grand success.

Dr Gupta was pioneer in establishing the speciality of Ocular Pharmacology in India. He contributed significantly there in the field of ocular pharmacology and developed first time in the country earlier in 1980s a formulation for eye problems for which India was dependent on imports. His research contributions have been such that for some of the formulations he got 16 Patents awarded including a patent U.S.A for the management of Glaucoma, Cataract and Diabetic retinopathy. There has been an interest from countries abroad to be utilized in the patients with glaucoma and retinal degeneration.

He also established the National WHO-Pharmacovigilance centre for the safety monitoring of Drugs (1998), a center for pharmacovigilance for the first time in India at AIIMS, New Delhi. In addition he also established Drugs and Poison Information center that was again among the first of its kind in India. He served as the Chief of National Poison Information Centre at AIIMS.

Currently Dr. Gupta is the Advisor National Pharmacovigilance Program of India Min. of Health & F.W. Under CDSCO – IPC. He is responsible for establishing the program at India Pharmacopoeia Commission Ghaziabad. This program is now a network of 200 Medical Colleges all over the Country & has collaboration with National Health Programs in India. In recognition of this work a wing has been dedicated in the name “Prof. S.K Gupta wing for Pharmacovigilance Program of India” at IPC Ghaziabad.

In continuation Prof. Gupta started International Society of Pharmacoeconomics and Outcomes Research (ISPOR), a non-profit, International, educational and scientific organization that fosters excellence in economic evaluation of healthcare solutions and the appropriate use of resulting information for decision making at all levels to promote the public health and well-being.

He also served as the Dean & Director General of the Institute of Clinical Research. This institute was the pioneer Institute of the formal educations of Clinical Research in the Country & was responsible for establishing the collaboration with Cranfield University U.K and South Carolina (USA) and it promoted the Clinical Trials and Clinical research in India. Its centres were established as Clinical Research centres at Mumbai, Bengaluru, Hyderabad, & Ahmadabad.

Dr. Gupta has more than 45 years of teaching experience to MBBS, M.D, Ph.D., MSc and M. Pharm students. Prof. Gupta has guided more than 150 M.D, Ph.D., and Master Students. He has published over 500 publications including 310 full papers in prestigious National & International Journals. His paper got 7194 Citations with 'h'-index: 44 and i10-index: 152. He also edited/ Authored 16 Books which have been published by the most renowned Publisher of Asia. Notable amongst them are Pharmacology and Therapeutics in the New Millennium; Basic Principles of Clinical Research & Methodology; Drug Screening Methods ;Clinical Ocular Pharmacology and Drug Discovery & Clinical Research He received 12 Research Grants from National Agencies DST, DBT, CSIR, ICMR etc. (Total Grant Rs. 6 Crores Approx.).

He was also the recipient of the UKIERI Award (U.K-India) for collaboration in Education & Research. He

established collaboration with Manchester University U.K to work on Diabetic Retinopathy. He was invited as the Visiting Professor & Scientist in prestigious Universities in U.S, Canada, U.K, and Germany. He was the Fellow of the International Society of Eye Research; Fellow Indian Pharmacological Society and Fellow Institute of Clinical Research U.K.

Dr. Gupta has received a number of awards and recognitions which included "Lifetime Achievement Award in Cardiovascular Sciences", International Academy of Cardiovascular Sciences, Canada (2010), "NS Parmar oration" of IPS (2005), "Distinguished Services Award" by International Academy of Cardiovascular Sciences for Cardiovascular Sciences, Medicine & Surgery (2004), and the Deutscher Akademischer Austausch Dienst (DAAD) – Visiting Scientist" by the DAAD Fellowship Organization, Bonn, Germany, 1999. He also served as a life member and member of Editorial Board of National and International Journals. Dr. Gupta was awarded Prestigious Commonwealth Fellowship to work with Prof. Bowman at the Strathclyde University, U.K.

Dr. Gupta has also contributed significantly to various professional societies. He was the President International Society of Pharmacoeconomics of Outcomes Research (U.S.A) India Chapter: 2012 Onwards; President International Academy of Cardiovascular Sciences (Canada) India Chapter; President Indian Pharmacological Society (2011-16); President Society for the promotion of Health & Environmental Sciences; Organised International Conferences and six National Conferences; Chaired many sessions at various National and International Conferences.

## Challenges for Designing and Manufacturing Future Generation Stents

By: Sukhwinder K. Bhullar<sup>1,2</sup> and Harpal S. Buttar<sup>3</sup>

<sup>1</sup>Department of Mechanical Engineering, Bursa Technical University, Bursa, Turkey, <sup>2</sup>Department of Mechanical Engineering, University of Victoria, Victoria, B.C., Canada, <sup>3</sup>Department of Pathology & Laboratory Medicine, Faculty of Medicine, University of Ottawa, Ontario, Canada.

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### Background

The incidence of cardiovascular diseases (CVDs) is escalating globally. Some CVDs are treated with medications, whereas coronary heart disease and acute myocardial infarction is often treated by catheterization and inserting into an artery a tiny metal or plastic tube or

stent in the form of a mesh to open the previously blocked blood vessel. Stents have emerged as effective medical devices for opening the narrowed and blocked arteries which are obstructed by a variety of disorders. In the last two decades, stenting has become virtually a routine procedure to open up blocked arteries with blood clots,

plaques, esophageal cancer, airways blocked due to lung cancer, scar inflammation, bile duct or weakening of the airway wall. It's estimated that more than one million stents are implanted each year worldwide, and in United States alone around 60% stenting procedures are carried out annually in about 600,000 patients suffering from myocardial infarction or other cardiovascular problems [1]. The main advantage of stenting is that they do not require major surgical interventions, since they are implanted directly through catheterization of the arteries. Relatively less hospital cost, low risk of stenting, and quick patient recovery are well recognised, as opposed to the higher risk and prolonged rehabilitation after open-heart surgery. Due to the cost effectiveness and quick recovery offered by stent placement over the conventional surgical procedures, the demand for stenting is rapidly increasing all over the world. According to the projected forecast, the international stent market will increase at an annual growth rate of 5.8 % over the period 2013-2018. Currently, the United States dominates this market with 40% shares, whereas Europe is the second largest shareholder with 37.0% of the market for coronary stent devices. According to the Global Data consulting firm, the global market for coronary stents is projected to increase up to \$5.6 billion by the year 2020 [2].

### Historical aspects of stent technology

In the late 1970s, balloon angioplasty was used to open blocked arteries. The balloon attached at the tip of the catheter when inflated helped to open the blocked vessel and allowed blood flow [2]. Unfortunately, 30% of coronary arteries opened with balloon angioplasty got narrower again due to absence of the support to keep them open. In 1986, the first metal stent was implanted into a human coronary artery. However, the bare metal stent known as first-generation stents almost abolished the chances of the artery collapsing, but modestly reduced the risk of re-narrowing to about 10%. Subsequently, second generation drug coated stents called drug-eluting stents were produced. While the drug-eluting stents reduced chances of re-narrowing and repeat stenting procedure, but still in-stent thrombosis and restenosis occurred after six months or one year after stent implantation. To overcome such challenge, in 2016, an innovative drug loaded polymer stent, known as third generation biocompatible and bioresorbable stent was approved by the US FDA. The biocompatible/bioresorbable stent not only reduces the formation of scar tissue but also keep the blood vessel open for longer duration. Drug-eluting stents also reduced early and delayed complications with stenting as well as restenosis rate by 80% [2]. There still are challenges to minimise the potential risks of stenting: namely restenosis of arteries due to in-stent thrombosis, growth of scar tissue caused by in-stent-restenosis, migration of stent due to insufficient radial stretch, inflexibility and mechanical mismatches between stented

and non-stented vessels, and shortening of in-stent length. To overcome these difficulties, development of biodegradable nanofibrous drug-eluting stents is warranted to enhance the long-term safety and mechanical effectiveness of stents.

Currently, a wide variety of stents are marketed for clinical use. Stents developed from different materials include metals, metal-alloys, platinum, polymer, plastics, coated or un-coated, drug eluting, balloon-expandable and self-expandable are commercially available or in developmental stages. During the last decade, the quantity and quality of life of patients suffering from heart attacks due to arterial blockages has improved immensely through stent implantation interventions, especially by the drug-eluting and bioresorbable stents. Many new stent designs with nanomaterials are being developed and are undergoing clinical trials. These include biocompatible, bioresorbable and drug-eluting stents with a covering that delivers anti-coagulant and anti-restenosis drugs over a long period. This category of stents disappears after treating diseased blood vessel and help to create a thin and all-natural cell layer inside the artery [3].

### Types of Drug-Eluting Stents and Marketing Companies

According to market dynamics and the prevalence of coronary artery disease, stenting of coronary blood vessels with drug-eluting and biodegradable stents has demonstrated a lead in the market. They are known as the gold-standard treatment and due to the reduced need for repeat intervention their sale is nearly 90% of the total coronary stent market [4]. Briefly, the drug-eluting stents are comprised of bare metal and have a biocompatible and biodegradable polymer coating or wrapped with nanofibres loaded with an antiproliferative drug, which allows drug elution into the coronary wall for weeks to months after stent implantation. Durable polymer drug-eluting stents sold in the market are summarised in Table 1 [5].

Table 1: Currently Marketed Drug-Eluting Stents	
Company Name	Stent System
Boston Scientific	TAXUS, ION (coated with paclitaxel); PROMUS: ELEMENT, PREMIER (coated with everolimus)
Cordis	CYPHER (coated with sirolimus)
Abbott	XIENCE: XPEDITION, V, PRIME (coated with everolimus)
Medtronic	ENDEAVOR, RESOLUTE (coated with zotarolimus)

Drug coated stents as mentioned in Table 1, were developed to minimize the challenges such as thrombosis



and restenosis, however, they are used only in selected cases such as arterial perforations [6]. Recently, the third generation drug-eluting and bioresorbable stents have arrived in the stent market, but they do not have enough clinical safety evidence. Further, the cost of bioabsorbable polymer drug-eluting stents is greater than other stents coated with everolimus [7]. The first generation bare-metal stents (BMS) are usually used for the treatment of stable and unstable angina, acute myocardial infarction, and multiple-vessel pathologies. It has been found that BMS are stronger than those of the second and third generation stents, whereas the new generation stents have demonstrated better clinical performance than the BMS [4-10]. The currently available BMS are shown in Table 2 [11]. In 2016, Bonaa et al. performed the risk/benefit analyses of drug-eluting stents versus bare-metal stents [12]. Their clinical evaluation results in 9,013 patients with stable or un-stable coronary artery disease showed that there was no significant difference in the 6-year rates of deaths or spontaneous myocardial infarctions among patients receiving contemporary drug-eluting stents and those receiving bare-metal stents. There was also no difference in the quality of life between different groups. However, the rate of repeat revascularization was lower with the use of drug-eluting stents.

Table 2. Currently Marketed Bare-Metal Coronary Stents	
Company Name	Coronary Stent System
Abbott Vascular	Multi-Link 8 SV
Multi-Link 8	L-605 Cobalt chromium
Multi-Link 8 LL	L-605 Cobalt chromium
Multi-Link Vision	L-605 Cobalt chromium
Multi-Link Mini Vision	L-606 Cobalt chromium (also includes nickel, tungsten)
Multi-Link Ultra Vision	316 L Stainless steel (also includes iron, chromium, nickel, molybdenum)
Multi-Link Zeta	316 L Stainless steel (iron, chromium, nickel, molybdenum)
B. Braun Melsungen AG	Coroflex
Coroflex Blue	Cobalt chromium
Coroflex Blue Ultra	Cobalt chromium
Coroflex Blue Neo	Cobalt chromium
Boston Scientific	Veriflex BMS
Medtronic Inc.	Integrity BMS
Driver BMS	F-562 cobalt chromium
MicroDriver BMS	F-562 Cobalt chromium

## The Next Generation of Stents

Unhealthy lifestyle, such as smoking and excessive alcohol consumption, physical inactivity, unhealthy diet and aging (55 - 65 years) are important risk factors which can cause heart attack and stroke due to blocked arteries. Such ailments not only require immediate lifesaving medical/surgical intervention but also stimulate the stent market growth. As alluded to earlier, presently Europe is the second largest shareholder with 37% market for coronary stent devices, whereas US dominates with 40% market share. To fulfill the need for effective stent devices, many new stent designs are being developed and clinical trials conducted to evaluate the safety and efficacy of new generation stents. However, there remain challenges to minimise the potential risks of stenting. For instance, some stent designs and manufacture need collaboration among biomedical engineers, surgeons, industry, and medical device regulators to develop safe stents and to take them from laboratory testing to real life applications.

In summary, there is a need for improving the stent design and to reduce the risks of stenting such as occlusion of arteries due to in-stent thrombosis, development of scar tissue underneath the healthy lining of blood vessels, in-stent-restenosis, insufficient radial strength resulting in migration of stents, inflexibility, shortening of length, and mismatches in mechanical behavior between stented and non-stented vessels. To overcome the existing potential risks, further research is warranted to enhance the long-term safety and efficacy of stent technology. Overall, the major current challenges are to develop, design and manufacture such stents which would be compatible with physiological conditions. Such stents should also be mechanically robust and match with the biological function and mechanical properties of the native tissue. They should minimise the risks of thrombosis, restenosis and in-stent stenosis as well as improve the longevity and quality of life of patients.

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## Environment Pollution and Cardiovascular Disease

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*Taken from Google Images*

Yes, there is a definite association of increased air pollution with pulmonary and cardiovascular diseases. As recent as August, 2016, a very meticulously designed study, the largest to date, by Kaufmann and his colleagues

(1) has brought to the fore the dangerous association between environmental pollution and coronary artery calcification (CAC). The Kaufmann study followed numerous reports on the association of air pollution with cardiovascular diseases. Contribution of particulate matter air pollution to cardiovascular disease (ischemic heart disease, heart failure, cerebrovascular involvement, peripheral arterial and venous diseases, cardiac arrhythmias and arrest) and deaths was first announced as a statement by the American Heart Association in 2004 (2, 3). Birth defects of heart have also been found to be more in areas of high industrial pollution.

Kaufmann and colleagues (1) studied the pattern of exposure to pollution in about 7000 people in different areas in the USA over a period of 10 years, noted the progress of CAC and delineated a definite association.

The exposure assessment relied on monitoring campaigns and advanced spatio-temporal modelling. Ultrasound examination to determine thickness of the vessel wall, CAT scan to track calcium deposition in the coronary artery and blood pressure examination formed part of the medical data collection.

Fine particulate matter (PM) less than 2.5  $\mu\text{m}$  in diameter was found in concentrations ranging from 9.2 to 22.6  $\mu\text{g}/\text{m}^3$  and CAC progressed across all the participants. They found that particulate matter and high levels of nitrogen oxide can age blood vessels and cause an increase in calcification in the coronary artery. Further, the association between long term exposure to PM 2.5 and cardiovascular disease is observed irrespective of socioeconomic strata of the population studied (4).

During the last decade, environmental pollution has been in the news for its effect on life in general. Today, we are very much aware of the effect such pollution has on human health. Is the air we breathe in, safe? The air we breathe in carries oxygen and other gases, which are carried from the lungs to each and every cell of our body. Each cell needs this oxygen to keep its machinery working. The air we breathe out carries carbon dioxide which is formed in the body and released from cells.

We also breathe in whatever is suspended in the air in the environment - gases, liquids and particulate matter. Our body does have mechanisms along the passage way to the lungs as well as in the lungs to filter out these pollutants. However, there is a limit for everything; so too, for these pollutants. Above a certain limit, we are overcome with various diseases of lungs and heart caused by these pollutants.

Tiny solid particles or liquid droplets suspended in the air are considered as particulate matter (PM). They vary in size in a mixture. Coarse particles of 2.5 to 10  $\mu\text{m}$  in diameter (PM 10) come from the road, tyre wear, construction materials and demolition dust. Particles 2.5  $\mu\text{m}$  (PM 2.5) and less than 2.5  $\mu\text{m}$  mainly come from traffic emissions and industry. These are the particles which have been found to predominantly affect the cardiovascular system. The ultrafine particles (UFPs) less than 0.1  $\mu\text{m}$  are emitted from tail pipes of vehicles.

Pollution of the environment with these particulate matters has spiralled high all over the world. We are experiencing this increase in our country too, particularly in large cities with high vehicular traffic and industries.

Environmental pollution leads to increased mortality; this was made so clear in the historic Harvard Six Cities Study, in which around 8,000 people in polluted and non-polluted cities were studied for about 14 to 16 years (5).

The report indicated for the first time the link between increased pollution and long term increase in death rates. Following reports on this association worldwide, currently, it is believed that there is a significant relationship between pollution and deaths from cardiopulmonary diseases (6).

### **How does all this really happen?**

Studies on mechanisms of cardiovascular diseases suggest that development of coronary atherosclerosis (occlusive disease of blood vessels supplying the heart), may be accelerated either over a period of time or even suddenly by triggering of an arrhythmia (abnormal heart rhythm) or myocardial infarction (death of heart muscles) by acute inflammatory responses, altered platelet (small circulating cells involved in blood clotting) adhesiveness, or perhaps vascular endothelial (inner lining cells of blood vessels) dysfunction. There is also a causal association between active and passive smoking and heart disease.

Gases and ultrafine particles may cross directly into blood circulation through the pulmonary epithelium (lining cells of air spaces in the lungs). Particulate interaction with epithelial cells may activate pulmonary neural reflexes with resulting changes in autonomic tone thus affecting plaques in blood vessel walls or initiate abnormal heart rhythms (arrhythmias). The pollutants over time, may cause pulmonary oxidative stress (releasing oxygen free radicals) or causing inflammation which could gradually assume a systemic inflammatory state leading to activation of blood clotting pathways, derange vascular function and enhance fat deposition in vessel walls. Presence of suspended particles in the air we breathe increases fibrinogen (a clotting factor) in the blood which in turn increases blood viscosity. The association between increased blood viscosity in relation to cardiovascular disease is well known.

Air pollution is also linked to heart failure. Inhalation of particulate matter is associated with increased systemic blood pressure and constriction of small blood vessels as well as an increase in lung and right ventricular filling pressures during relaxation. Along with arrhythmias, this imposes an increasing demand on the failing heart, potentially precipitating acute failure. Further, death of heart muscle causes loss in contractile capacity and inhalation of particulate matter has been found to be associated with adverse ventricular remodelling and a worsening of scar formation in the heart. All these factors collectively affect heart function.

Environmental pollution is a major problem the world over; newspaper headlines state "Poison in the air". Environmental pollution by industries in 1952 in London which killed about 12,000 people led to the air pollution legislation. But today it is the transport vehicles that are

the dangerous contributors to air pollution. Petrol and diesel emissions, particulate matter, oxides of nitrogen, volatile organic chemicals and secondary phytochemical production of ozone collectively pollute the air we breathe. A collaborative effort by the Royal College of Physicians and the Royal College of Pediatrics and Child Health carried out a large study on the health of individuals exposed to both indoor and outdoor air pollution. The report 'Every breath we take: the lifelong impact of air pollution' submitted in February 2016 (Royal College of Physicians, 2016) is alarming and throws light on the close association between inhalation of primary and secondary small and ultrafine particles (PM10, PM 2.5 and PM0.1) and deaths from cardiovascular and respiratory disease. No age is safe. Particulate matter impairs fetal growth, increases risk of asthma and affects heart and lungs by direct toxicity and via mechanisms that mediate gene and environmental interactions. It can also lead to adverse effects such as development of impaired cognition, type 2 diabetes, cancers, skin aging and is a risk factor for obesity as well. Stephen Holgate's call for action is indeed timely (7).

India does not lag far behind. Figures provided by the Central Pollution Control Board for the last block of 4 years ie 2011 to 2015 reveal breach of annual pollution limits in a third of Indian cities. 680 pollution monitoring units in 300 cities all over the country have measured particulate matter, nitrogen dioxide and sulphur dioxide.

Startling findings in India were revealed in February 2013, by the Global Burden of Disease report, an initiative of the World Health Organisation. The Indian and South Asia-specific data, released at a Dialogue Workshop jointly organised by the Centre for Science and Environment, Indian Council of Medical Research and the US-based Health Effects Institute, revealed air pollution as the second largest killer in India with pre-mature deaths being mainly due to respiratory and cardiovascular diseases [stroke (25.48%) and ischemic heart disease (48.6%)].

Breathe in breathe out, breathe in breathe out....this is the basic feature of Pranayama. It is the air around us that we

breathe in and breathe out, in and out of our lungs day and night. Is the air in our cities safe today for Pranayama?

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**Editor's Note:** The following article is reproduced with permission from “*Matters of the Heart.*”  
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## Soft Robotic Sleeve Supports Heart Function

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Heart failure is a condition where the heart is unable to pump sufficient amount of blood to the body due to weakening of heart muscle, leading to disability or death. The main symptoms of heart failure are shortness of breath, especially when lying down, swelling in the feet and ankles, on a sudden weight gain. Patients in end-stage heart failure when other medical or surgical treatments have failed are often considered for heart transplantation. As donor organ availability is limited, many patients die awaiting transplantation.

In some cases, in those patients who have severe heart failure, doctors advise a mechanical support to the failing heart using ventricular assist devices (VADs). Ventricular Assist Devices (VADs) are used as a life-prolonging therapy, either as a bridge to transplant or as a ‘destination therapy’, meaning the device remains implanted for the rest of the patient’s life where heart transplantation is not an option. It is a battery-operated, mechanical pump-type device that is surgically implanted. It helps continue the pumping capacity of a heart that cannot work effectively by its own.

VAD is called as a ‘bridge to transplant’ because sometimes patients might wait for a long time for a suitable heart for transplantation. During this wait, patient’s already-weakened heart’s function may get worse and become unable to pump enough blood to sustain life. During this time VAD can help the weak heart and reduce the need for a heart transplant.

The use of VAD increases the risk of thromboembolic (formation of blood clot) events including stroke, which may occur in up to 20% of patients. Blood clots in the legs that may travel to the lungs and blood clots that form in the device, sometimes leading to heart attack or stroke, and infections are the major risk factors in the usage of VAD.

Sometimes, most external devices reverse the normal twist of the heart and act differently from the remaining

native cardiac contraction mechanisms. Many of these devices do not integrate and synchronize with native cardiac contraction mechanics and direction, and some cannot assist the relaxation (filling) phase of the cardiac cycle. Because of these reasons it is important to discover the shortcomings of existing technologies and thus increase the efficiency of the failing heart to pump sufficient amount of blood.

To overcome these disadvantages, Roche and colleagues (1) invented a soft robotic device with material properties analogous to native heart tissues (cardiac muscles) that can be placed tightly around the heart and provide ventricular support without contact of blood. The robotic sleeve uses compressed air to power artificial silicon muscles that compresses and twist, mimicking the movement of the normal human heart. They could show that this device increases cardiac ejection volume using adult pigs with drug induced cardiac arrest. The efficacy of soft robotic sleeve as a cardiac assist was validated in pigs with acute heart failure induced by infusing esmolol, a short acting cardioselective beta blocker that reduces contractility and cardiac output.

The main advantages of using soft robotics for cardiac compression are the ability to apply timing schemes to optimize the actuation sequence which can simultaneously monitor and record physiological performance parameters such as heart rate and pulmonary artery and ascending aorta pressures and flow rates. Inflammation at the device-tissue interface, a major risk factor of using VAD, can be controlled.

Unlike VADs (currently in clinical use) which cause forced non-physiological motions that do not mimic the natural motion of the heart, soft robot device restore circulatory function without contact of blood. This device prevents the need for anticoagulation among patients receiving mechanical circulatory support, thus reducing the risk of complications from clotting, simplifying treatment, and reducing costs. Different from currently

used supports, the soft robot sleeve uniformly squeezes the heart from the outside or use twisting action alone to achieve circumferential and longitudinal shortening of the ventricle, which finally increases ejection fraction.

The soft robot sleeve can mimic the dynamically changing mechanical properties of the native tissue throughout the cardiac cycle. As robot mechanism can be recorded and monitored periodically, it can be turned off when no longer required, and clinicians can switch the device either as a passive restraint device, or for partial support, or full support. Thus, the device provides a versatile platform to manipulate the mechanical environment of the heart to target cardiac rehabilitation or recovery.

The current version of the device is a tethered implantable system and uses wall-compressed air supply for actuation. Roche and colleagues are trying to modify the device by connecting a fluidic tethered external pump to the soft robotic sleeve; it could serve as an additional channel for

the delivery of agents that promote regeneration or prevent abnormal heart rhythms (arrhythmia).

Roche and colleagues thus present an active sleeve that is modifiable to patient-specific needs and has a potential to bridge a heart failure patient to transplant or to aid in cardiac rehabilitation and recovery. The device can act as artificial muscles for selectively activating to twist, compress, or perform both actions on one side or both sides of the heart. Thus this artificial support helps the failing hearts to increase cardiac ejection volume during heart failure.

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## *In Memoriam: H. Ivan Berkowitz, 1933-2017*

**Editor's Note:** Taken from Winnipeg Free Press Passages, June 21, 2017

<http://passages.winnipegfreepress.com/passage-details/id-246719/H-IVAN-BERKOWITZ>



*Ivan Berkowitz*

H. Ivan Berkowitz, born November 23, 1936, passed away peacefully on June 15, 2017. Ivan will be sorely missed by his partner Irene and her family, sister AC Dolgin, husband Marc and family, children, Jay and wife Bonnie, Wendy Poer and husband Colin, daughter Niki and their mom Sheri.

He was a devoted

Bapa/Zaida to Christopher, Agnes and Henry. Ivan was born in Winnipeg, Canada and he couldn't have been prouder to be a Winnipegger and Canadian. He received his B.Comm. from the University of Manitoba and an MBA from Harvard. After graduating, Ivan joined the family business, Monarch Wear of Canada Ltd. and with his innovative marketing leadership, the company introduced stylish denim "jeans" as a fashion choice for teens, a trend which swept Canada. Next, Ivan founded H. I. Marketing and they promoted the popular home shows, car shows and boat shows at the Winnipeg Convention Centre. After losing both of his beloved parents far too early to heart disease, Ivan began a long, passionate career

as a volunteer and supporter of many heart-related causes. He served as the President of the Manitoba Heart Foundation and left his indelible mark leading the Foundation to its first \$1,000,000 Year. He spearheaded the Canadian introduction of "Jump Rope For Heart", he served on the Board of St. Boniface Hospital Research Foundation, was a founder and President for nine years of the Myles Robinson Memorial Heart Fund. For the past 15 years, Ivan served as the International Academy of Cardiovascular Sciences Director of Development working with acclaimed heart researcher Dr. Naranjan Dhalla. Their tenure together was highlighted by winning the bid to host the XVII ISHR World Heart Congress, in Winnipeg, July 6 to 11, 2001. The results were unprecedented with over 2,000 delegates attending; reports were picked up nationally and internationally on CNN and the BBC. For his own heart health, Ivan ran 22 to 42 km full marathons all around the world. He was a trainer of more than 100 first-time marathoners and he served over 10 years on the Manitoba Marathon Board of Directors. Ivan has made a selfless contribution to international charitable undertakings including: Chief Barker Manitoba and International Vice-President of the Variety Club, Management Committee of the successful Winnipeg Jets "Save The Jets" Campaign, Board Member and volunteer Vice-President of Marketing for the

community-owned Jets, and catalyst for the Jets to create the "Goals For Kids" fundraiser. Ivan was the recipient of many honours including: the Queen Elizabeth II Diamond Jubilee Medal; Medal of Merit from SERVCOR, Brazil; The Reh-Fit Foundation Healthy Living Award; the Big Heart Award for Organizational Achievement by the Heart & Stroke Foundation of Manitoba; and the International Academy of Cardiovascular Sciences "Distinguished Service Award in Cardiovascular Science, Medicine and Surgery" see pictures and hear the audio: <http://futureofhearthealth.blogspot.ca/> Ivan was a passionate collector and supporter of the arts. He served

on the Board of Directors of the Royal Winnipeg Ballet; he was a longtime supporter of the Winnipeg Art Gallery and Ivan became an artist himself at age 60. He was an accomplished pottery designer with multiple exhibits and shows. Ivan was a most devoted father and grandfather, a loving partner and the most loyal and dependable friend to so many, a true mensch. Perhaps more than anything, Ivan loved spending time with family at his cottage at Trout Lake, Ontario. He recently celebrated his 80th birthday with his family and his heart and soul will always have a place on his beloved Blueberry Hill.

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