Joseph M. Smith, M.D., Ph.D.

Place of Birth: Baltimore, Maryland, USA

Address: West Health Institute
10350 North Torrey Pines Road
La Jolla, California 92037

Employment History

April, 2010 – present
Chief Medical and Science Officer
West Health
La Jolla, California.

Providing medical and scientific leadership for a novel non-profit initiative, composed of a medical research organization, policy center, investment fund, and small business incubator, all dedicated to innovative solutions that drive down US healthcare costs.

May, 2007 – April, 2010
VP, Emerging Technologies
Corporate Office of Science and Technology
Johnson & Johnson
New Brunswick, NJ.

Leading a corporate function and a group of professionals positioned in centers of innovation and discovery around the world, responsible for early identification and effective translation of those early-stage technologies that will transform healthcare and constitute future growth platforms for Johnson & Johnson.

July 2007 – May, 2008
VP, Microelectronic Technology
Cordis Corporation, a Johnson & Johnson Company
Warren NJ.

Responsible for development of an integrated strategy for Cordis Corporation and Johnson & Johnson to extend the development and commercialization of life-enhancing and life-saving technologies via the integration of microelectronic technologies into a variety of implantable intelligent therapies.

December, 2002 – December, 2006
Chief Medical Officer & Senior VP, Medical Science and Policy,
Boston Scientific (Guidant) – Cardiac Rhythm Management
Arden Hills, MN.

Provided senior medical and scientific leadership for new product planning, clinical trial strategy, reimbursement and public policy, medical education, and business development strategy. Successes include fostering a culture of medical device innovation; driving a positive National Coverage Decision for ICD therapy effectively extending the reach of this life-saving technology to millions more patients; creating the Institute for Therapy Advancement in St. Paul, a world-class physician educational and training facility; and multiple patents in the space of cardiac rhythm management.

Employment History (cont.)

September, 2000 – December, 2002
Director, The Arrhythmia Institute;
Research Director, The Cardiovascular Group;
Fairfax, VA.

Served as the founder and director of The Arrhythmia Institute, a private clinical and research organization in clinical cardiac electrophysiology which remains today as a center of clinical and research excellence in the field.

August, 1992 – September, 2000
Academic Faculty, Washington University School of Medicine and Department of Biomedical Engineering, St. Louis, MO.

Led a research program in biomedical signal processing in parallel with serving as associate director of the clinical and teaching program in Clinical Cardiac Electrophysiology at Washington University School of Medicine.

Education:

Undergraduate	1975 - 79	B.E.S.	The Johns Hopkins University, Baltimore, MD
Graduate	1979 - 82	S.M.	M. I. T., Cambridge, MA
	1982 - 85	Ph.D.	M. I. T., Cambridge, MA
	1979 - 87	M. D.	Harvard Medical School, Boston, MA

Postgraduate

1985 - 1987 Research Fellow, Massachusetts Institute of Technology, Cambridge, MA
1987 - 1988 Intern in Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA
1988 - 1989 Junior Assistant Resident, Brigham and Women's Hospital, Harvard Medical School, Boston, MA
1989 - 1990 Senior Assistant Resident, Brigham and Women's Hospital, Harvard Medical School, Boston, MA
1990 - 1991 Clinical Cardiology Fellow, Cardiovascular Division, Brigham and Women's Hospital, Harvard Medical School, Boston, MA
1991 - 1992 Cardiac Electrophysiology Fellow, Krannert Institute of Cardiology, Indiana University, Indianapolis, IN
1992 - 1994 Special Clinical Fellow, Cardiovascular Division, Washington University School of Medicine, St. Louis, MO

Academic Positions:

1992-1997 Assistant Professor of Medicine, Washington University School of Medicine, St. Louis, MO
1992-1997 Assistant Professor of Biomedical Computing, Institute of Biomedical Computing, Washington University, St. Louis, MO.
1998-2000 Associate Professor of Medicine, Washington University School of Medicine, St. Louis, MO

1998-2000 Associate Professor of Biomedical Engineering, Washington University Department of Biomedical Engineering, St. Louis, MO.

University and Hospital Appointments and Committees:

1987-1988 Intern in Medicine, Brigham and Women's Hospital
1988-1990 Resident in Medicine, Brigham and Women's Hospital
1990-1991 Clinical Fellow in Cardiology, Brigham and Women's Hospital
1991-1992 Clinical Fellow in Cardiology, Indiana University Hospital
1992-2000 Clinical Electrophysiologist, Barnes Hospital
1994-2000 Associate Director, Cardiac Electrophysiology Laboratory
1994-2000 Minority Recruitment Committee, Cardiovascular Division
1996-2000 Premedicine Committee (Chair), Biomed. Engineering
1996-2000 Heart Services Clinical Service Delivery Design Team
1996-2000 Tissues and Procedures Committee
1997-2000 Arrhythmia Services Re-engineering (Co-chair)
1999-2000 Clinical Cardiology Practice/Compensation Committee (Chair)
2000-2002 Director of Cardiac Electrophysiology, Virginia Hospital Center - Arlington

Board Certification:

1988 Diplomate, National Board of Medical Examiners
1990 Diplomate, American Board of Internal Medicine
1995 Diplomate, Cardiovascular Disease Sub-specialty exam
1996 Diplomate, Clinical Cardiac EP Sub-specialty exam

Honors and Awards:

1978 Greenberg Fellowship Award, The Johns Hopkins University
1978 Eta Kappa Nu, The Johns Hopkins University
1980 Sigma Xi, Massachusetts Institute of Technology
1981 Poitras Fellowship Award, Harvard-MIT Division of Health Sciences and Technology
1993 Washington University New Investigator Research Award
1997-1999 SmithKline Beecham Development Partners Faculty Award in Cardiology
1999 Listed in "America's Best Doctors"
2006 Elected to College of Fellows, AIMBE.

Professional Societies:

National:

1978 Institute for Electrical and Electronic Engineers
1988 American Medical Association
1990 American Heart Association
1991 American College of Physicians
1992 Cardiac Electrophysiology Society (AHA)
1993 NASPE, The Heart Rhythm Society (#1954)
1998 Fellow, AHA Council on Clinical Cardiology
1998 Fellow, American College of Cardiology

	2002	Heart Failure Society of America
Local:	1988	Massachusetts Medical Society
	1991	Indianapolis Electrophysiology Society
	1993	Mid-America Society for Pacing and Electrophysiology

Professional Committees:

1994-1997	Editorial Board, *Journal of Cardiovascular Electrophysiology*
1994-2000	Great Plains Peer Review Committee, AHA
1996-1999	NASPE Computerized Communication Committee
1998-2000	Director, Computerized Communications, MO Chapter, ACC
2004-2006	President, Board of Director, Twin Cities American Heart Assoc.
2004-2005	HRS ICD Training working group
2004-2005	HRS/CMS ICD registry working group
2004-	Harvard-MIT HST Advisory Council
2004-	Johns Hopkins Technology Alliance
2008-	Advisory Board, Johns Hopkins Biomedical Engineering
2009-	Industry Visiting Committee, Case-Western Reserve University
2009-	Wellcome Trust / Health Care Innovation Challenge Fund Committee
2012-	Chair, Affordable Healthcare in India (Wellcome Trust as sponsor)

Guest Editorships:	1996	*Coronary Artery Disease*
	2001	*Current Treatment Options in Cardiovascular Medicine*
	2002	*Current Treatment Options in Cardiovascular Medicine*
	2013	American Journal of Preventive Medicine (supplement)

Clinical Sub-Specializations:

Complex catheter ablation procedures, ICD and pacemaker implantation, Sudden-death risk stratification and arrhythmia consultation

Publications:

1. **Smith, JM**: Finite element model of ventricular dysrhythmias, S.M. Thesis, Massachusetts Institute of Technology, 1982.

2. **Smith JM**, Ritzenberg A, and Cohen RJ: Simple computer model of cardiac conduction disturbances, Computers in Cardiology, 10:201, IEEE Computer Society Press, Silver Spring, MD, 1983.

3. **Smith JM**, and Cohen RJ: Simple computer model predicts a wide range of ventricular dysrhythmias, Proceedings of the National Academy of Sciences, 81:233-237, 1984.

4. Adam D, **Smith JM**, Akselrod S, Nyberg S, Powell A, and Cohen RJ: Fluctuations in T-wave morphology and susceptibility to ventricular fibrillation, Journal of Electrocardiology, 17:209-218, 1984.

5. Ritzenberg AL, **Smith JM**, Grumbach MP, Cohen RJ: Precursor to fibrillation in cardiac computer model, Computers in Cardiology, 11:175, IEEE Computer Society Press, MD, 1984.

6. **Smith JM**, Ritzenberg A, and Cohen RJ: Percolation theory and cardiac conduction, Computers in Cardiology, 11:175, IEEE Computer Society Press, MD, 1984.

7. **Smith JM**: The stochastic nature of cardiac electrical instability: theory and experiment, Ph.D. Thesis, Massachusetts Institute of Technology, 1985.

8. Kaplan DT, **Smith JM**, Rosenbaum DS, Cohen RJ: On the precision of automated activation time estimation, Computers in Cardiology, 15:101, IEEE Computer Society Press, Salt Lake City, 1988.

9. **Smith JM**, Clancy EA, Valeri CR, and Cohen RJ: Electrical alternans and cardiac electrical stability, Circulation, 77(1):110, 1988.

10. Abboud S, **Smith JM**, Shargorodosky B, Laniado S. Sadeh D, Cohen, RJ: High frequency electrocardiography of three orthogonal leads in dogs during coronary artery occlusion, PACE, 12:(4 pt 1):574-581, 1989.

11. Clancy EA, **Smith JM**, Cohen RJ. A simple electrical-mechanical model of the heart applied to the study of electrical-mechanical alternans. IEEE Trans Biomed Eng. 38(6):551-60, 1991.

12. Rosenbaum DS, Wilber DJ, **Smith JM**, Du D, Ruskin JN, and Garan, H: Local activation variability during **monomorphic** ventricular tachycardia in the dog, Cardiovascular Research, 26(3):237-43, 1992.

13. **Smith JM**, Cain ME: Radiofrequency catheter ablation for supraventricular tachycardias - blazing paths or burning bridges?, Journal of Cardiovascular Electrophysiology, 4(4):390, 1993.

14. **Smith JM** and Botteron GW: Estimation of the correlation length of activation processes during atrial fibrillation, Computers in Cardiology, 20:41-45, IEEE Computer Society Press, Los Alamitos, 1993.

15. Rosenbaum DS, Jackson LE, **Smith JM**, Ruskin, JN, and Cohen, RJ: Repolarization alternans and arrhythmia vulnerability in man, New England Journal of Medicine, 330:235-41, 1994.

16. Botteron GW, **Smith JM**: Spatial and temporal inhomogeneity of adenosine's effect on atrial refractoriness in humans: Using atrial fibrillation to probe atrial refractoriness, Journal of Cardiovascular Electrophysiology, 5:477-484, 1994.

17. Ferguson TB, **Smith JM**, Cox JL, Cain ME, and Lindsay BD: Direct surgery versus ICD therapy for ischemic ventricular tachycardia, Annals of Thoracic Surgery, 58(4):1291-1296, 1994.

18. Peck JB, Bayly PV, Botteron GW, and **Smith JM**: The effects of refractoriness and conduction velocity on spatial organization on a computer model of atrial fibrillation, Computers in Cardiology, IEEE Computer Society Press, 1994.

19. Botteron GW, **Smith JM**: A technique for measurement of the spatial organization of atrial activation during atrial fibrillation in the intact humans heart, 42(6):1-8, IEEE Transactions on Biomedical Engineering, 1995.

20. Baker B, Botteron G, **Smith JM**: Low energy internal cardioversion for atrial fibrillation resistant to external cardioversion, Journal of Cardiovascular Electrophysiology, 6:44-47, 1995.

21. Cox JL, Boineau JP, Kater KM, Ferguson TB, Cain ME, Lindsay BD, **Smith JM**, Corr PB, Hogue CB, and Lappas DG: Electrophysiologic basis, surgical development, and clinical results of the Maze procedure for atrial flutter and atrial fibrillation, Advances in Cardiac Surgery, 6:1-67, 1995.

22. Baker BM, **Smith JM**, and Cain ME: Nonpharmacologic approaches to the treatment of atrial fibrillation and atrial flutter, Journal of Cardiovascular Electrophysiology, 6:1-7, 1995.

23. Botteron GW, **Smith JM**: Quantitative assessment of the extent of spatial organization present in atrial fibrillation in humans, Circulation, 93:513-518, 1996.

24. **Smith JM**: Non-pharmacologic management of refractory arrhythmias: Overview, Coronary Artery Disease, 7(1), 1-4, 1996.

25. Baker BM, Lindsay BD, Bromberg B, Frazier DW, Cain ME, and **Smith JM**: Catheter Ablation of clinical intra-atrial reentrant tachycardias resulting from previous atrial surgery: localizing and transecting the critical isthmus, Journal of the American College of Cardiology, 28:411-417, 1996.

26. Park TH, Eichling JO, Schechtman KB, Bromberg BI, **Smith JM**, Lindsay BD: Risk of radiation-induced skin injuries from arrhythmia ablation procedures, PACE, 19:1363-69, 1996.

27. Narayan, SM, Cain ME, **Smith JM**: Atrial Fibrillation, The Lancet, 350:943-950, 1997.

28. Atiga WL, Calkins H, Lawrence JH, Tomaselli GF, **Smith JM**, and Berger RD: A novel index of repolarization predicts sudden death, Journal of Cardiovascular Electrophysiology, 9:899-908, 1998.

29. **Smith JM**: Evaluating the Patient with Arrhythmia Detection Failures, Cardiac Electrophysiology Review, 2:334-336, 1998.

30. Narayan SM and **Smith JM**: Spectral analysis of periodic fluctuations in electrocardiographic repolarization, IEEE Transactions in Biomedical Engineering, 46(2):202-212, 1999.

31. Narayan SM and **Smith JM**: Differing rate dependence and temporal distribution of repolarization alternans in patients with and without inducible ventricular tachycardia, Journal of Cardiovascular Electrophysiology, 10:1, 61-71, 1999.

32. Narayan SM, Lindsay BD, **Smith JM**: Demonstration of the Proarrhythmic Preconditioning of Single Premature Extrastimuli by Use of the Magnitude, Phase, and Distribution of Repolarization Alternans, Circulation 100:18, 1887-1893, 1999.

33. Narayan SM, **Smith JM**: Exploiting Rate-Related Hysteresis in Repolarization Alternans to Improve Risk Stratification for Ventricular Tachycardia, Journal of the American College of Cardiology, 35(6): 1485-92, 2000.

34. Hahn SJ, **Smith JM**: ICD Therapy for the Prevention of Sudden Cardiac Death in Post-MI Patients; Current Treatment Options in Cardiovascular Medicine, Oct; 5(5):369-376, 2003.

35. Narayan SM, **Smith JM**, Schechtman KB, Lindsay BD, and Cain ME: T-wave alternans phase following ventricular extrasystoles predicts arrhythmia-free survival, Heart Rhythm. Mar; 2(3):234-41, 2005.

36. **Smith JM**: Industry viewpoint: Guidant: Pacemakers, ICDs, and MRI; Pacing Clin Electrophysiol. Apr; 28(4):264, 2005.

37. Narayan SM, **Smith JM**, Lindsay BD, Cain ME, Davila-Roman VG: Relation of T-wave alternans to regional left ventricular dysfunction and eccentric hypertrophy secondary to coronary heart disease; Am J Cardiol. Mar 15; 97(6):775-80, 2006.

38. Berger RD, Lerew DR, **Smith JM**, Pulling C, Gold MR; The Rhythm ID Going Head to Head Trial (RIGHT): design of a randomized trial comparing competitive rhythm discrimination algorithms in implantable cardioverter-defibrillators. J Cardiovasc Electrophysiol. Jul; 17(7):749-53, 2006.

39. Martin DO, Stolen KQ, Brown S, Yu Y, Christie C, Doshi SK, **Smith JM**, Gold MR, Day JD: Pacing Evaluation-Atrial SUpport Study in Cardiac Resynchronization Therapy (PEGASUS CRT): design and rationale; Am Heart J. Jan;153(1):7-13, 2007.

40. Al-Khatib SM, Sanders GD, Bigger JT, Buxton AE, Califf RM, Carlson M, Curtis A, Curtis J, Fain E, Gersh BJ, Gold MR, Haghighi-Mood A, Hammill SC, Healey J, Hlatky M, Hohnloser S, Kim RJ, Lee K, Mark D, Mianulli M, Mitchell B, Prystowsky EN**, Smith J**, Steinhaus D, Zareba W; Preventing tomorrow's sudden cardiac death today: part I: Current data on risk stratification for sudden cardiac death, Am Heart J. Jun;153(6):941-50, 2007.

41. Sanders GD, Al-Khatib SM, Berliner E, Bigger JT, Buxton AE, Califf RM, Carlson M, Curtis AB, Curtis JP, Domanski M, Fain E, Gersh BJ, Gold MR, Goldberger J, Haghighi-Mood A, Hammill SC, Harder J, Healey J, Hlatky MA, Hohnloser SH, Lee KL, Mark DB, Mitchell B, Phurrough S, Prystowsky E, Smith JM, Stockbridge N, Temple R; Preventing tomorrow's sudden cardiac death today: part II: Translating sudden cardiac death risk assessment strategies into practice and policy, An Heart J. Jun; 153(6); 951-9, 2007.
42. **Topol** EJ, Schork NJ, **Smith** JM.:Digital medicine and the Scripps Translational Science Institute. Clin Transl Sci. Feb;4(1):8-9, 2011.
43. Smith, JM; Wireless Health Care (The doctor will see you always), IEEE Spectrum, October, 2011.
44. Smith, JM; The stakeholder imperative, American Journal of Preventive Medicine; 44:1;S1-4, Jan, 2013
45. Smith, JM, Topol, E; A call to action: Lowering the cost of health care; 44:1; S54-57, Jan, 2013

Books and Book Chapters:

1. **Smith JM**, Ritzenberg AL, and Cohen RJ: Finite element models of cardiac dysrhythmias, In: Eisenberg, J, Delisi, C (editors): Mathematics and Computers in Biomedical Applications, pp 65-78. Amsterdam, North Holland, 1985.

2. Kaplan DT, **Smith JM**, Saxberg BEH, and Cohen RJ: Nonlinear dynamics in cardiac conduction, Mathematical Biosciences, 90:19-48, 1988.

3. **Smith JM**, Kaplan DT, and Cohen RJ: The physics of re-entry and fibrillation, In: Zipes, DP, and Jalife, J, (editors) Cardiac Electrophysiology: Cell to Bedside, pp 215-223, WB Saunders, Phila, 1990.
4. Appel ML, Berger RD, Saul JP, **Smith JM**, and Cohen RJ: Beat to beat variability in cardio-vascular variables: noise or music, In: An era in cardiovascular medicine, pp. 265-273, Elsevier Science Publishers, Amsterdam, 1991.

5. **Smith JM**: Cardiac Arrhythmias, In: McKenzie, C, and Brown, G (editors): Washington Manual of Medical Therapeutics, Little, Brown And Company, Boston, MA, USA, 1995.

6. **Smith JM**: Intra-atrial Reentrant Tachycardias, In: Medical Management of Heart Disease, Sobel BE (editor), Marcel Dekker, NY, 1996.

7. Lindsay BD and **Smith JM**: Electrophysiologic Aspects of Human Atrial Fibrillation, In DiMarco, J (editor) Cardiology Clinics, 1996.

8. Baker B, and **Smith JM**: AF Surgery Now: The Cardiologist's Perspective, In Nonpharmacologic Management of Atrial Fibrillation, Camm AJ & Murgatroyd F (editors), Futura Publishing Co, Inc, Armonk, NY 1997.

9. Botteron GW, and **Smith JM**: Cardiac Arrhythmias, In Washington Manual of Medical Therapeutics, Little, Brown And Company, Boston, MA, USA, 1997.

10. Cain ME, **Smith JM**, and Cox JL: Surgery for atrial fibrillation: the next step in the development of a nonpharmacologic cure. In: Topol E: Text of Cardiovascular Medicine, Lippincott & Raven Publishers, Philadelphia, PA, 1998.

Patents:

1. Cohen RJ and **Smith JM**: Method and apparatus for assessing myocardial electrical stability, US Patent # 4802491, February 7, 1989. (*Foundational patent for Cambridge Heart, Inc*)

2. Ayers GM and **Smith JM**: Combined mapping, pacing, and defibrillating catheter. US Patent # 5405375, April 11, 1995; European Patent # 95250008.0

3. **Smith JM** and Botteron GW: System and method for determining spatial organization of atrial activation, US patent # 5605159, Feb 25, 1997.

4. **Smith JM** and Botteron GW: System and method for determining spatial organization of atrial activation, US patent #5676153, Oct 14, 1997.

5. Hsu W and **Smith JM**, System and method for classifying cardiac complexes. US patent# 6266554 , July 24, 2001

6. Hsu W and **Smith JM**, System and method for arrhythmia discrimination. US patent# 6308095, October 23, 2001.

7. Hsu W and **Smith JM**, System and method for classifying cardiac complexes. US patent# 6438410, August 20, 2002.

8. Hsu W and **Smith JM**, System and method for classifying cardiac complexes. US patent# 6728572, April 27, 2004.

9. Hsu W and **Smith JM**, System and method for arrhythmia discrimination. US patent# 6959212, October 25, 2005.

10. Bocek JM, Dujmovic Jr RM, Foshee P, White H, Kim J, Harrington A, Sanders RS, Daum, DeCoriolis P, **Smith J**, Fogoros R: Pacer with combined defibrillator tailored for bradycardia patients. US patent # 7386344, June 10, 2008.

11. Dujmovic Jr RM, Foshee P, Fogoros R, **Smith JM**, Daum DR, Sun W: Cardiac rhythm management system with defibrillation threshold prediction. US patent # 7643877, January 5, 2010