

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME Wan, Frederic Yui-Ming	POSITION TITLE Professor of Mathematics Professor of Mechanical and Aerospace Engineering		
eRA COMMONS USER NAME FREDERICWAN			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Massachusetts Institute of Technology (M.I.T.)	S.B.	1959	Mathematics
Massachusetts Institute of Technology (M.I.T.)	S.M.	1963	Mathematics
Massachusetts Institute of Technology (M.I.T.)	Ph.D.	1965	Mathematics

A. Positions and Honors.

Positions and Employment

- 1965 – 74 Instructor, Assistant Professor, Associate Professor, Department of Mathematics, M.I.T.
- 1974 – 83 Professor, Department of Mathematics & Director of Institute of Applied Mathematics & Statistics, University of British Columbia (U.B.C.)
- 1983 – 95 Professor, Department of Applied Mathematics and Department of Mathematics, University of Washington (U.W.); Chair Designate and Chair of Applied Mathematics (83 – 87); Divisional Dean of Natural & Mathematical Sciences, College of Arts & Sciences, (88 – 92)
- 1995 - Professor, Department of Mathematics, University of California, Irvine (U.C.I.); Vice Chancellor for Research and Dean of Graduate Studies (95 – 00); Professor of Mechanical & Aerospace Engineering (95 -); Professor of Civil & Environmental Engineering (97 -01); Faculty Athletic Representative (2000-04); Director of the Mathematical and Computational Biology (MCB) Gateway Graduate Program (07 –13); Director of the MCB for Undergraduates (MCBU) Program (11 -16).

Other Experience and Professional Memberships

- 1965 - Various consultant position (e.g., CAMROC (Cambridge Radio Observatory Committee), MIT Lincoln Laboratory, Tupperware, Dart Industries, Army Materials and Mechanics Center at Watertown, Foster-Miller Associates, SW Industries, Flow Industries, B.C. Research, Association of Professional Engineers of British Columbia, Acrowood Corp., etc.
- 1971 – 72 ARO-D (Army Research Office-Durham) Summer Scientific Advisor (a maximum of two consecutive terms)
- 1972 – 73 Visiting Associate of Applied Mechanics, Division of Engineering and Applied Science, Caltech
- 1973 – 74 Visiting Fellow, Department of Economics, M.I.T.
- 1979 – 80 Visiting Scholar, Applied Mathematics, University of Washington, 1979 – 80
- 1979 – 82 Canadian NSERC (National Science and Engineering Research Council) Committee on Pure and Applied Mathematics: Chairman 1981 - 82, concurrent with UBC appointment
- 1986 – 87 Program Director, Division of Mathematical Sciences, National Science Foundation (NSF Visiting Scientist from UW)
- 1992 – 94 Director, Division of Mathematical Sciences), National Science Foundation (NSF, IPA from UW)

Honors

- 1963 Sigma XI (elected Associate Member in 1963 and Member in 1965)

- 1973 Sloan Foundation Award
- 1979 UBC Killam Foundation Senior Fellowship
- 1982 Elected Fellow of American Academy of Mechanics, Secretary of the Fellows (64 – 89)
- 1988 Elected Fellow of American Society of Mechanical Engineers (ASME)
- 1991 Arthur Beaumont Distinguished Service Award, Canadian Applied Mathematics Society
- 1992 – 93 President of American Academy of Mechanics (92 – 93), Past President (93 – 94)
- 1994 Fellow of the American Association for the Advancement of Science (AAAS)
- 1994 Certification of Appreciation (in recognition for Outstanding Service and Achievements as Director, Division of Mathematical Sciences), National Science Foundation
- 1999 Foreign Member, The Russian Academy of Natural Sciences
- 2004 Teaching Excellence Award, School of Physical Sciences at U.C. Irvine
- 2006 UCI Chancellor's Award for Excellence in Fostering Undergraduate Research
- 2006 Outstanding Contributions to Undergraduate Education award, School of Physical Sciences, UCI
- 2010 Elected SIAM Fellow

Awards

- 1975 – 85 Canadian NSERC Operating Grant
- 1983 – 92 NSF Research Grant, Co-PI
- 1992 – 95 NSF Research Grant (through a surrogate while serving as DMS Director at NSF)
- 1995 – 00 12 mo. appointment as Research Vice Chancellor & Graduate Dean, not eligible for grants)
- 2001 – 02 NSF SCREMS Grant (DMS-0112416, PI)
- 2002 – 05 PHS - NIH General Med Science P20 Grant (GM-066051, Co-PI)
- 2002 – 15 PHS - NIH General Med Science R01 Grant (GM-67247, PI)
- 2010 – 16 PHS - NIH General Med Science R25 Grant (GM096989, PI) for conducting an annual national short course on systems biology
- 2011 – 16 NSF DMS UBM Grant DMS-1129008 for Mathematical and Computational Biology for Undergraduates (MCBU)

Professional Services

- 1974 – 79 MIT Educational Council
- 1979 – 82 Canadian NSERC (National Science and Engineering Research Council) Committee on Pure and Applied Mathematics: Chairman 1981 - 82
- 1984 – Journal Associate Editorships: Studies in Applied Mathematics (84 -), Canadian Applied Math. Quarterly (93 -), International Journal of Solids and Structures (96 -)
- 1986 – 87 Applied Mathematics Program Director, National Science Foundation (NSF), on leave from U.W.
- 1991 – 93 Visiting Committee for Mathematics, MIT
- 1992 – 94 Director, Division of Mathematical Sciences, NSF, on leave from U.W.
- 1999 – 02 Founding Chair of Board of Trustees, Institute for Pure and Applied Mathematics, (IPAM), UCLA
- 2001 – Member of Academic Advisory Committee, Zhou Pei-Yuan Center for Applied Mathematics (ZCAM), Tsinghua University of China
- 2015 – Member of the Scientific Board, Institute for Mathematical Sciences, Renmin University of China.

B. Selected peer-reviewed publications (in chronological order most relevant to proposal)

- 47. The response of a spatially distributed neuron to a white noise current injection, Biological Cybernetics 33, 1979, 39-55. (with H.C. Tuckwell)
- 68. The interspike interval of a cable model neuron with white noise input, Biological Cybernetics 49, 1984, 155-167. (with H.C. Tuckwell and Y.S. Wong)
- 118. Nature of equilibria and effects of drug treatments in some viral population dynamical models, IMA J. Math. Appl. Med. & Biol. 17, 2000, 311-327. (with H.C. Tuckwell)
- 123. A spatial stochastic neuronal model with Ornstein-Uhlenbeck input current, Biol. Cybern. 86, 2002, 137-145. (with H.C. Tuckwell & J.-P. Rospars)
- 125. Do morphogen gradients arise by diffusion?, Dev. Cell, 2, 2002, 785-796. (with A.D. Lander and

Q. Nie)

126. Determination of Firing Times for the Stochastic Fitzhugh-Nagumo Neuronal Model, *Neural Comp.* 15, 2003, 143-159. (with H.C. Tuckwell and Rodriguez)
132. Aggregation of a distributed ligand source and morphogen gradients, *Studies in Appl. Math.*, 114, 2005, 343-374. (with A.D. Lander, Q. Nie and B. Varga)
133. Spatially distributed morphogen synthesis and morphogen gradient formation, *Math. Biosci. & Eng. (MBE)*, 2, 2005, 239-262. (with A.D. Lander and Q. Nie)
134. Formation of the BMP activity gradient in the *Drosophila* embryo, *Dev. Cell*, 8, 2005, 1-10. (with C.M. Mizutani, Q. Nie, Y.-T. Zhang, P. Vilmos, E. Bier, J.L. Marsh and A.D. Lander)
135. Effects of Sog on Dpp-receptor binding, *SIAM J. Appl. Math.*, 65, 2005, 1748-1771. (with Y. Lou & Q. Nie)
136. Time to first spike in Hodgkin-Huxley stochastic systems, *Physica A - Stat. Mech. Applic.*, 351 (2-4), 2005, 427-438. (with H.C. Tuckwell)
137. Internalization and end flux in morphogen gradient formation, *J. Comp. Appl. Math.*, 190, 2006, 232-251. (with A.D. Lander and Q. Nie)
138. Membrane associated non-receptors and morphogen gradients, *Bulletin of Math. Bio.*, 69, 2007, Pgs. 33-54. (with A.D. Lander and Q. Nie)
139. Wingless directly represses DPP morphogen expression via an Armadillo/TCF/Brinker complex, *PLoS ONE*, 2007, 1 (e142, doi:10.1371/journal.pone.0000142), Pgs. 1-10 [plus supplement, 1-14, and figures, S1-S6]. (with H. Theisen, A. Syed, B.T. Nguyen, T. Lukacsovich, J. Purcell, G.P. Srivastava, D. Iron, K. Gaudenz, Q. Nie, M.L. Waterman, and J. L. Marsh)
140. Elastodynamics of embryonic epidermal wound closure, *Studies in Appl. Math.*, 118, 2007, Pgs. 365-395. (with A. Sadovsky)
143. Selective pressures for and against genetic instability in cancer: a time-dependent problem, *J. Royal Soc., Interface*, 2007, Online, June 19, 2007, doi: 10.1098/rsif.2007.1054. (with N. Komarova and A. Sadovsky)
144. The role of feedback in the formation of morphogen territories, *Math. Biosci. & Eng.*, 5 (No.2), 2008, Pgs. 277 -298. (with D. Iron, A. Syed, H. Theisen, T. Lukacsovich, M. Naghibi, J.L. Marsh, and Q. Nie)
145. Compact integration factor methods in high spatial dimension, *J. Comp. Phys.*, 227, 2008, Pgs. 5238-5525 (with Q. Nie, F.Y.M. Wan, Y.-T. Zhang and X.-F. Liu)
146. Feedback regulation in multistage cell lineages, *Math. Biosci. & Eng.*, 6(1), 2009, Pgs. 59-82. (W.-C. Lo, C.-S. Chou, K. Gokoffski, A.D. Lander, A.L. Calof and Q. Nie)
147. Localized ectopic expression of Dpp receptors in a *Drosophila* embryo, *Studies in Appl. Math.* 123, 2009, Pgs 175 - 214. (with A.D. Lander, Q. Nie and Y.-T. Zhang)
148. Cell lineages and the logic of proliferative control, *PLoS Biology*, 7(1), 2009, Pgs 1 - 17. (with A.D. Lander, K. Gokoffski, Q. Nie, and A.L. Calof)
149. The measures of success: constraints, objective, and tradeoffs in morphogen-mediated patterning, *Cold Spring Harbor Perspect. in Biol.* 2009; 1:a002022. (with A.D. Lander, W.-C. Lo, and Q. Nie)
150. Genetic instability in cancer: an optimal control problem, *Studies in Appl. Math.*, Vol. 125(1), 2010, Pgs. 1 - 10. (with A. Sadovsky and N. L. Komarova)
151. Spatial dynamics of multi-state cell lineages in tissue stratification, *Biophysical J.* Vol. 99 (10), 2010, Pgs. 3145-3154. (with C.-S. Chiou, W. Lo, K. Gokoffski, Y.-T. Zhang, A.D. Lander, A.L. Calof, and Q. Nie)
152. Size-normalized robustness of Dpp gradient in *Drosophila* wing imaginal disc, *JoMMS* Vol. 6 (1-4), 2011, Pgs. 321-350. (with A.D. Lander, Q. Nie, and B. Vargas)
153. Robustness of signaling gradient in *Drosophila* wing imaginal disc, *J. DCDS-B (Discrete and Continuous Dynamical Systems, Series B)* Vol. 16 (3) 2011, Pgs. 835-866. (with J. Lei, A.D. Lander, and Q. Nie)
154. Robustness of morphogen gradients with "Bucket Brigade" transport through membrane-associated non-receptors, *J. DCDS-B (Discrete and Continuous Dynamical Systems, Series B)* Vol. 18(3), 2013, Pgs. 721-739. (with J.-Z. Lei, D. Wang, Y. Song and Q. Nie)
155. A new approach to feedback for robust signaling gradients, *Studies in Appl. Math.* 133, 2014, 18-51. (with T. Kushner and A. Simonyan)
156. Cell-surface bound non-receptors and morphogen gradients, *Studies in Appl. Math.* 133 (2), 2014, Pgs. 151-181. (DOI: 10.1111/sapm.12030)
157. Fastest time to cancer by loss of tumor suppressor genes, *Bull. Math Bio.* 76. 2014, 2737-2784. (with C. Sanchez-Tapia)

158. Robust and precise morphogen-mediated patterning: trade-offs, constraints and mechanisms, *Interface*, J. Royal Soc. 12 . 2014, Pgs. 1014-. (with W.-C. Lo, S. Zhou, A.D. Lander and Q. Nie)

C. Research Support **Ongoing Research Support**

P50 GM066051 A. D. Lander (PI) 08/01/07 - 07/31/12,
NIH/NIGMS *National Center of Excellence on Systems Biology*

The planning grant funding is to support a three year period of expansion of research interactions and development of the necessary research, teaching and administrative infrastructure to become a Center of Excellence in Complex Biological Systems Research.

Role: Co-Principal Investigator and Education/Core Leader

R25 GM067247 Wan (PI) 1/11 -1/16
NIH/NIGMS *An Annual National Short Course on Systems Biology*

The major goal of this project is to organize and offer a national/international short course on systems biology to disseminate research experience and results of the P50 and other research effort and activities at UCI to other researchers interested in starting research in systems biology.

Role: Principal Investigator

Completed Research Support

DMS-0112416 Wan (PI) 9/01 – 8/03
NSF/DMS

The grant was for funding a 32-node Beowulf cluster and an SGI graphic workstation to be used by a number of research projects undertaken by the Co-PI and other faculty participants of the grant that require parallel computing.

Role: Principal Investigator

P20 GM066051 Lander (PI) 9/03 - 8/06
NIH/NIGMS

The planning grant funding is to support a three year period of expansion of research interactions and development of the necessary research, teaching and administrative infrastructure to become a Center of Excellence in Complex Biological Systems Research.

Role: Co-Principal Investigator

R01 GM067247 Wan (PI) 7/02 - 6/06, 7/06 – 6/10, 1/11 – 12/15
NIH/NIGMS *Principles of Robust Developmental Patterning*

The major goal of this project is to investigate morphogen signaling and pattern formation through an integrated program of mathematical and experimental approaches

Role: Principal Investigator

R01GM75309 Q. Nie (PI) 04/01/05-03/21/09
NIH/NIGMS *Specificity and Spatial Dynamics of Cell Signaling: Theory and Experiment*

The major goal of this project is to develop state-of-the-art mathematical theory and computational tools to analyze and simulate signal transduction pathways, with an emphasis on scaffolding, spatial dynamics, specificity and their potential connections.

Role: Co-Principal Investigator