

CURRICULUM VITAE

Sui Huang, M.D., Ph.D.

Professor
Institute for Systems Biology
Seattle WA (USA)

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I. RESEARCH INTERESTS “Systems Biology of Multi-cellularity in Health and Disease”

- *Stem cell biology*: multipotency, cell fate decision control by gene regulatory networks and molecular noise (non-genetic heterogeneity)
- *Cancer biology*: cancer stem cells, non-genetic population dynamics and progression, drug resistance
- *Application*: multi-target drug therapy in cancer considering non-linear dynamics and cell heterogeneity
- *Theory*: Statistical physics and dynamics of genotype-phenotype mapping, cell population dynamics
- *Approaches*: cell and molecular biology (single-cell techniques), genomics, bioinformatics, computational models

II. EDUCATION & PROFESSIONAL ACTIVITY

■ Education / Training

1977-1983	Gymnasium, Matura Type B (Arts and Sciences), Cantonal School of Zurich
1983-1989	Medical School, University of Zurich
1990-1995	Ph.D. Program, Molecular Biology and Physical Chemistry, University of Zurich
1995-1999	Postdoctoral Fellow, Department of Surgery, Children's Hospital / Harvard Medical School

■ Academic Appointments:

1999-2004	Instructor in Surgery	Harvard Medical School, Children's Hospital Boston
2004-2007	Assistant Professor in Surgery	Harvard Medical School, Children's Hospital Boston
2007-2009	Visiting Associate Professor	Harvard Medical School, Children's Hospital Boston
2007-2011	Associate Professor	Faculty of Sciences, Univ. of Calgary
2011-	Adjunct Associate Professor	Faculty of Sciences, Univ. of Calgary
2011-	Professor	Institute for Systems Biology

■ Professional Society Involvement, Affiliations:

1995-	American Association for the Advancement of Science
1996-1999	American Society for Cell Biologists
1999-	New England Complex Systems Institute (affiliated member)
2005-2007	Harvard Stem Cell Institute (affiliated member)

■ Review, Editorial and Consulting activities (past 7 years):

Grant review committees, conference review panels/organizer:

2007, 2008	National Science Foundation – ext. reviewer
2008	Kavli Institute of Theoretical Physics in China; “Collective Dynamics” – organizer
2009	European Commission remote FP7 grants – ext. reviewer
2009	Dutch National Science Foundation (NWO) – ext. reviewer
2009	DoD/Congressionally Directed Medical Research, Breast Cancer – Pathobiology review panel
2009, 2011	Israel Science Foundation – external reviewer
2009	Human Frontier Science Program Organization, Research grants – external reviewer
2009	Wellcome Trust, UK “Molecules, Genes and Cells” – external reviewer
2010	DoD/Congressionally Directed Medical Research, Breast Cancer – Pathobiology review panel
2010	Kavli Institute of Theoretical Physics in China “Emergent Behavior...” – organizer
2011	NIH/NCI Cancer Imaging-Systems Biology (RFA special panel, ad hoc)

Editorial board memberships

- 2006- Systems and Synthetic Biology (Springer)
- 2006- Experimental Biology and Medicine (Society for Experimental Biology and Medicine)
- 2007- PLoS One (Public Library of Science)
- 2010- BioEssays

Industry consulting

- *Ad hoc*: Entelos (2000); Physiome (2001); Novartis (2004)
- *Scientific Advisory Board/Network*: Sectoral Asset Management (2005-); Fate Therapeutics (2009-2011)

■ Awards and Honors:

1990 Academic Career Development Award, Canton of Zurich (KFAN) – 1993 Swiss National Foundation of Sciences, M.D.- Ph.D. Program Fellowship – 1995 Swiss National Foundation of Sciences, Junior Investigator Award – 1997 Swiss Cancer Research Fellowship (Krebsforschung/Krebsliga) – 2001 Finalist, MIT \$50 K Competition – 2010 Alberta Innovates The Future Scholar

III. PRESENTATIONS (past 7 years)**■ Invited Lectures and Seminars**

2006: • Karolinska Institute, Schrödinger 'WHAT IS LIFE' Lecture, Stockholm, Sweden • Niels Bohr Institute, Copenhagen, Denmark (K. Sneppen) • Institute for Biophysical Dynamics, University of Chicago, IL – 2007: • MGH, Center for Regenerative Medicine, HMS (K. Orford/D Scadden). – 2008: • Institute for Advanced Study, Princeton • Institute for Systems Biology • Karolinska Institute, Schrödinger 'WHAT IS LIFE' Lecture, Stockholm, Sweden . • Dept of Bioengineering, University of Pennsylvania (C. Sarkar) – 2009: • Dept of Genetics, University of Cambridge • Sloan Memorial Kettering Cancer Center, Cell Engineering Retreat (M. Sadelain) – 2010: • Institute for Molecular Biotechnology, Austrian Acad. (IMBA) • Leeds Institute of Molecular Medicine, University of Leeds • Dept of Bioengineering, University of Michigan • University Medical Center Groningen, The Netherlands • Dept. Biostatistics & Comp. Biol. Dana Farber Cancer Inst. , Harvard Medical School • Dept. Physiology, Wayne State University, Detroit (D. DeGracia) – 2011: • Gurdon Institute, Cambridge University • Ctr. for Vascular Biology Research, BIDMC, Harvard Medical School – 2012: • USCD Biocircuits Institute – 2013: • Moffit Cancer Center, Tampa (A. Anderson) • University of Kuopio, Biotechnology (M. Heinäniemi)

■ Invited plenary/keynote presentations at meetings

2006: • American Physics Society, March meeting, Baltimore, MD – 2007: • Statistical Mechanics of Distributed Information Systems, Mariehamn, Finland • IBM Systems Biology workshop, IBM Watson Center, NJ • iCore Banff Informatics Summit, Banff, AB, Canada – 2008: • Kavli Institute of Theoretical Physics, Collective Dynamics of Information Systems, Beijing • EuroSystem Stem Cell Summer School, Hydra, Greece – 2009: • EuroSystem Stem Cell Modeling Workshop, Leipzig • American Physics Society, March meeting (Biological Noise), Pittsburgh, MD • Noise in Life meeting, Cambridge • Integrated Post-Genomics (IPG) Symposium, Lyon • SEMM Conference 'Reprogramming cell fate', Milan – 2010: • Systems Biology of Stem Cell Symposium, UC Irvine, CA • Workshop for Computational System Biology, Luxembourg • Kavli Institute for Theoretical Physics in China "Emergent Cell behavior..." • Royal Society – Stem cell meeting, London • Amazon Project, Biennial Intl. Conference on Breast Cancer, Palermo – 2011: • Epigenetics in Clinical Medicine, Karolinska Institut Workshop, Stockholm • 4th Systems Radiation Biology Workshop, Royal Swedish Academy of Sciences Stockholm • Univ. Lyon/Ecole Normal Superior Workshop: "Chance at the Heart of Cell", Lyon • Radcliffe Institute for Advanced Study / Harvard University "Role of Variation..." – 2012: • Fields Institute Workshop: "Cooperative Activity in Physiology...", Toronto • Future Challenges in Systems Medicine Workshop, University of Manchester • Intl. Conf. Stochastic Processes in Systems Biology, Rice Univ. • NIH/NSF Cancer-Physics Workshop "Drug resistance..." Arlington, VA • BIOTEC Forum "Bioinformatics and Computational Biology", Dresden – 2013: • Gordon Research Conference, Stochasticity in Biology, Ventura, CA • NCI/Physical Sciences-Oncology Annual meeting, Scottsdale AZ • FASEB/CYTO Conference Frontier Lecture, San Diego, CA • "Systems Biology of Stem Cells" UC Irvine/NIH Systems Biology Center • Nordita Workshop "Statistical Mechanics of Biological Cooperativity", Mariehamn, Finland. • NSF Cell Decision Making Workshop, Arlington, VA • NCI/Physical Sciences-Oncology Program Summer Retreat

IV. BIBLIOGRAPHY**■ Original Articles (chronological)**

1. Huang S., Hendriks W, Althage A, Hemmi S, Bluethmann R, Kamijo, Vilcek J, Zinkernagel RM, Aguet M. Immune response in mice that lack the interferon-g receptor. **Science** 259: 1742-1745 (1993).
2. Kamijo R., Shapiro D, Le J, Huang S, Aguet M, Vilcek J. Generation of nitric oxide and induction of major histocompatibility complex class II antigen in macrophages from mice lacking the interferon g receptor. **Proc Natl Acad Sci. USA** 90: 6626-6630 (1993).
3. Kamijo R, Le J, Shapiro D, Havell EA, Huang S, Aguet M, Bosland M, Vilcek J. Mice that lack the interferon-g receptor have profoundly altered responses to infection with Bacillus Calmette-Guérin and subsequent challenge with lipopolysaccharide. **J Exp Med** 178:235-1440 (1993).
4. Car BD, Eng VM, Schnyder B, Ozmen L, Huang S, Gallay P, Heumann D, Aguet M, Ryffel B. Interferon gamma receptor deficient mice are resistant to endotoxic shock. **J Exp Med** 179:1437-1444 (1994).
5. Schijns VE, Haagmans BL, Rijke EO, Huang S, Aguet M, Horzinek MC. IFN-gamma receptor-deficient mice generate antiviral Th1-characteristic cytokine profiles but altered antibody responses. **J Immunol** 153:2029-2037 (1994).
6. Swihart K, Fruth U, Messmer N, Hug K, Behn R, Huang S, Del Giudice G, Aguet M, Louis JA. Mice from a genetically resistant background lacking the interferon gamma receptor are susceptible to infection with Leishmania major but mount a polarized T helper cell 1-type CD4+ T cell response. **J Exp Med.** 181:961-971 (1995).
7. Fiette L., Aubert C., Muller U., Huang S., Aguet M., Brahic M., Bureau JF. Theiler's virus infection of 129Sv mice that lack the interferon alpha/beta or interferon gamma receptors. **J. Exp. Med.** 181:2069-76 (1995).
8. Flesch IE, Hess JH, Huang S, Aguet M, Rothe J, Bluethmann H, Kaufmann SH. Early interleukin 12 production by macrophages in response to mycobacterial infection depends on interferon gamma and tumor necrosis factor alpha. **J Exp Med.** 181: 1615-1621 (1995).
9. van den Broek MF, Muller U, Huang S, Aguet M, Zinkernagel RM. Antiviral defense in mice lacking both alpha/beta and gamma interferon receptors. **J. Virol.** 69: 4792-6 (1995).
10. Cauwels A, Brouckaert P, Grooten J, Huang S, Aguet M, Fiers W. Involvement of IFN-gamma in Bacillus Calmette-Guerin-induced but not in tumor-induced sensitization to TNF-induced lethality. **J Immunol.** 154:2753-2763 (1995).
11. Car BD, Eng VM, Schnyder B, LeHir M, Shakhov AN, Woerly G, Huang S, Aguet M, Anderson TD, Ryffel B. Role of interferon-gamma in interleukin 12-induced pathology in mice. **Am J Pathol** 147:1693-1707 (1995).
12. Saulnier M, Huang S, Aguet M, Ryffel B. Role of interferon-gamma in contact hypersensitivity assessed in interferon-gamma receptor-deficient mice. **Toxicology** 102:301-312 (1995).
13. Deckert-Schluter M, Rang A, Weiner D, Huang S, Wiestler OD, Hof H, Schluter D. Interferon-gamma receptor-deficiency renders mice highly susceptible to toxoplasmosis by decreased macrophage activation. **Lab Invest** 75:827-841 (1996).
14. Coyle AJ, Tsuyuki S, Bertrand C, Huang S, Aguet M, Alkan SS, Anderson GP. Mice lacking the IFN-gamma receptor have impaired ability to resolve a lung eosinophilic inflammatory response associated with a prolonged capacity of Tcells to exhibit a Th2 cytokine profile. **J Immunol** 156:2680-2685 (1996).
15. Vermeire K, Heremans H, Vandeputte M, Huang S, Billiau A, Matthys P. Accelerated collagen-induced arthritis in IFN-gamma receptor-deficient mice. **J Immunol** 158:5507-5513 (1997).
16. Manoury-Schwartz B, Chiochia G, Bessis N, Abehsira-Amar O, Batteux F, Muller S, Huang S, Boissier MC, Fournier C. High susceptibility to collagen-induced arthritis in mice lacking IFN-gamma receptors. **J Immunol** 158:5501-5506 (1997).
17. Brazillet MP, Huang S, Alimi E, Charreire. Experimental autoimmune thyroiditis in mice lacking the IFN-gamma receptor. **Eur J Immunol** 28: 201-208 (1997).
18. Matthys P, Vermeire K, Mitera T, Heremans H, Huang S, Billiau A. Anti-IL-12 antibody prevents the development and progression of collagen-induced arthritis in IFN-gamma receptor-deficient mice. **Eur J Immunol** 28: 2143-2151 (1998).
19. Matthys P, Vermeire K, Mitera T, Heremans H, Huang S, Schols D, De Wolf-Peeters C, Billiau A. Enhanced autoimmune arthritis in IFN-gamma receptor-deficient mice is conditioned by mycobacteria in Freund's adjuvant and by increased expansion of Mac-1+ myeloid cells. **J Immunol** 163:3503-3510 (1999).
20. Chen CS, Mrksich M, Huang S, Whitesides GM, Ingber DE. Geometric control of cell life and death. **Science** 276: 1425-1428 (1997).
21. Huang S, Chen SC, Ingber DE. Control of cyclin D1, p27Kip, and cell cycle progression in human capillary endothelial cells by cell shape and cytoskeletal tension. **Mol Biol Cell** 9: 3179-3193 (1998).
22. Chen CS, Mrksich M, Huang S, Whitesides GM, Ingber DE. Micropatterned surfaces for control of cell shape, position, and function. **Biotechnol Prog** 14:356-363 (1998).
23. Chiu DT, Jeon NL, Huang S, Kane RS, Wargo CJ, Choi IS, Ingber DE, Whitesides GM. Patterned deposition of cells and proteins onto surfaces by using three-dimensional microfluidic systems. **Proc Natl Acad Sci U. S. A.** 97: 2408-2413 (2000).

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26. Jousen MA, Huang S, Camphausen K, Beecken WD and Adamis AP. In vivo Gene Expression Profile Analysis of early Diabetic Retinopathy. *Invest Ophthalmol Vis Sci* 42:3047-57 (2001).
27. Numaguchi Y, Huang S, Polte E, Eichler G, Wang N and Ingber DE. Caldesmon-dependent switching between capillary endothelial cell growth and apoptosis through modulation of cell shape and contractility *Angiogenesis* 6:55-64 (2003).
28. Eichler G., Huang S. and Ingber D.E. Gene Expression Dynamics Inspector (GEDI) A program for integrated analysis of expression profiles. *Bioinformatics* 19: 2321-2322 (2003).
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30. Wilhelm T, Nasheuer HP, Huang S. Physical and functional modularity of the protein network in yeast. *Mol Cell Proteomics* 2:292-298 (2003).
31. Mammoto A, Huang S, Moore K, Oh P, Ingber DE. Role of RhoA, mDia, and ROCK in cell shape-dependent control of the Skp2-p27kip1 pathway and the G1/S transition. *J Biol Chem* 279:26323-26330 (2004).
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33. De Bivort B, Huang S, Bar-Yam Y. Dynamics of cellular level function and regulation derived from murine expression array data. *Proc Natl Acad Sci U S A* 101:17687-17692 (2004).
34. Maliackal JP., Brock A., Ingber DE and Huang, S. High “betweenness” proteins in the yeast protein interaction network. *J. Biomed. Biotechnol.* 2005:96-103 (2005).
35. Huang S, Eichler G, Bar-Yam Y, Ingber D. Cell fate as a high-dimensional attractor of a complex gene regulatory network. *Phys. Rev. Lett.* 94:128701 (2005)
36. Huang S, Brangwynne CP, Parker KK, Ingber DE. Symmetry-breaking in mammalian cell cohort migration during tissue pattern formation: role of random-walk persistence. *Cell Motil Cytoskeleton* 61:201-213 (2005)
37. Barnes CM, Huang S, Kaipainen A et al. Evidence by molecular profiling for a placental origin of hemangioma. *Proc Natl Acad Sci U S A* 102:19097-19102 (2005)
38. Chang H, Oh P, Ingber DE, Huang S. Multi-stable and multi-step dynamics in neutrophil cell differentiation. *BMC Cell Biol.* 7:11 (2006).
39. Guo, Y, Eichler, GS, Feng Y, Ingber, D, Huang S. Towards a holistic, yet gene-centered analysis of gene expression profiles: a case study of human lung cancers. *J Biomed Biotechnol* 2006: 69141 (2006)
40. Kaipainen A, Kieran M, Huang S, Butterfield C, Bielenberg D, Mostoslavsky G, Mulligan R, Folkman J & Panigrahy D. PPAR- α deficiency in inflammatory cell infiltrates suppresses angiogenesis and tumor growth via thrombospondin-1. *PLoS One* 2:e260 (2007).
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42. Huang S, Guo YP, May G, Enver T. Bifurcation dynamics in lineage-commitment in bipotent progenitor cells. *Dev Biol* 305:695-713 (2007).
43. Maliackal JP, Ingber DE, Huang S. Chaotic mean field dynamics of a Boolean network with random connectivity. *Int J Mod Phys C.* 18: 1459-1473 (2007).
44. de Bivort B, Huang S, Bar-Yam Y. Empirical multi-scale networks of cellular regulation. *PLoS Comput Biol* 3:1968-78 (2007).
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46. Chang H, Hemberg M, Barahona B, Ingber D and Huang S. Transcriptome-wide noise controls lineage choice in mammalian progenitor cells. *Nature* 453:544-547 (2008).
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49. Sheehy SP, Huang S, Parker KK. Time-warped comparison of gene expression in adaptive and maladaptive cardiac hypertrophy. *Circ Cardiovasc Genet* 2:116-124 (2009).
50. Foster DV, Foster JG, Huang S, Kauffman SA. A model of sequential branching in hierarchical cell fate determination. *J Theor Biol* 260:589-597 (2009).

51. Bracha AL, Ramanathan A, Huang S, Ingber DE, Schreiber SL. Carbon metabolism-mediated myogenic differentiation. **Nature Chem Biol.** 6:202-204 (2010)
52. Jin W, Xu L, Wang E, Huang S. The potential landscape of genetic circuits imposes the arrow of time in stem cell differentiation. **Biophysical J**, 99:29-39 (2010).
53. Zhou JX, Brusch L, and Huang S. Predicting pancreas cell fate decisions and reprogramming with a hierarchical multi-attractor model. **PLoS ONE** 6, e14752 (2011).
54. Andrecut M, Halley JD, Winkler DA, Huang S. A general model for binary cell fate decision gene circuits with degeneracy: Indeterminacy and switch behavior in the absence of cooperativity. **PLoS One** 6: e19358 (2011).
55. Guo Y, Feng Y, Trivedi NS, Huang S. Medusa structure of the gene regulatory network: dominance of transcription factors in cancer subtype classification. **Exp Biol Med** 236:628-636 (2011).
56. Panigrahy D, Edin ML, Lee CR, Huang S, et al. Epoxyeicosanoids stimulate multiorgan metastasis and tumor dormancy escape in mice. **J Clin Invest** 122:178-91 (2012).
57. Zhou JX, Aliyu MS, Aurell E and Huang S. Quasi-potential landscape in complex multi-stable systems. **J R Soc Interface.** 9: 3539-3553 (2012)
58. Torres-Sosa C, Huang S, Aldana M. Criticality is an emergent property of genetic networks that exhibit evolvability. **PLoS Comput Biol** 8 e1002669 (2012).
59. Heinäniemi M, Nykter M, Kramer R, Wienecke-Baldacchino A, Sinkkonen L, Zhou JX, Kreisberg R, Kauffman SA, Huang S, Shmulevich I. Gene-pair expression signatures reveal lineage control. **Nature Methods** 10:577-583 (2013).
60. Panigrahy D, Kalisha BT, Huang S*, Bielenberg BR, et al. Epoxyeicosanoids promote organ and tissue regeneration. **Proc Natl Acad Sci U S A.** 110:13528-33 (2013)* *Co-First and Co-Senior author*
61. Brock A, Pisco A, Zhou J. X., Mojtahedi M, Jackson D, Huang S. Non-Darwinian dynamics in therapy-induced cancer drug resistance. **Nature Commun** 4:2467 (2013).

■ Reviews, Editorials, Commentaries (selected)

62. Huang S. Gene expression profiling, genetic networks and cellular states: an integrating concept for tumorigenesis and drug discovery. **J Mol Med** 77: 469-480 (1999).
63. Huang S, Ingber DE. Structural and mechanical complexity in cell-growth control. **Nature Cell Biol** 1: E131-138 (2000).
64. Huang S. Complexity: The practical problems of postgenomic biology. **Nature Biotechnol.** 18: 471-472 (2000)
65. Huang S. Metabolic networks: The bigger picture. **Trends Biotechnol** 19: 4-5 (2001).
66. Huang S. Molecular evolution enters the stage of proteomics. **Trends Biotechnol** 19: 202-203 (2001).
67. Huang S. Proteomics in context. **Trends Biotechnol** 19: 435 (2001).
68. Huang S. Post-genomic Biology: Gene expression profiles, Cluster analysis and beyond. **Graft** 4: 326-337 (2001).
69. Brock A. and Huang S. A novel trap for dynamic protein interactions in cytokine signaling. **Trends Biotechnol** 20:145 (2002).
70. Jousen AM, Huang S. Possibilities of broad spectrum analysis of gene expression patterns with cDNA arrays. **Ophthalmology** 98:568-753 (2001).
71. Huang S. Genomics, complexity and drug discovery: Insights from boolean network models of cellular regulation. **Pharmacogenetics** 2:203-222 (2001).
72. Huang S. Rational drug discovery: what can we learn from regulatory networks? **Drug Discovery Today** 7: S163-169 (2002).
73. Zhu H, Huang S, Dhar P. The next step in systems biology: simulating the temporospatial dynamics of molecular network. **Bioessays** 26:68-72 (2003).
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75. Zhu H, Huang S, Dhar P. Cellular automata with object-oriented features for parallel molecular network modeling. **IEEE Transact Nanobioscience** 4: 141-148 (2004).
76. Huang S and Ingber DE. Cell tension, matrix mechanics and cancer development. **Cancer Cell** 8:175-176 (2005)
77. Panigrahy D, Huang S, Kieran MW, Kaipainen A. PPAR γ as a therapeutic target for tumor angiogenesis and metastasis. **Cancer Biol. Ther.** 4: 687-693 (2005).
78. Huang S, Wikswo PJ. Five dimensions of systems biology. **Rev Physiol, Biochem, Pharmacol.** 157: 81-104 (2006).
79. Huang S, Ingber DE. A non-genetic basis for cancer progression and metastasis: self-organizing attractors in cell regulatory networks. **Breast Disease** 26:27-54 (2006-2007).
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81. Brock A, Chang H, Huang S Non-genetic heterogeneity - a mutation-independent driving force for the somatic evolution of tumours. **Nat Rev Genet.** 10:336-342 (2009).
82. Huang S. Reprogramming cell fates: reconciling rarity with robustness. **BioEssays** 31:546-60. (2009)

83. Huang S, Ernberg I, Kauffman S. Cancer attractors: a systems view of tumors from a gene network dynamics and developmental perspective. *Semin Cell Dev Biol.* 20:869-876 (2009).
84. Panigrahy D, Kaipainen A, Kieran MW, Huang S. PPARs: A Double-Edged Sword in Cancer Therapy? *PPAR Res.* 2008:350351 (2009).
85. Huang S. Non-genetic heterogeneity of cells in development: More than just noise. *Development* 136: 3853-3862 (2009)
86. Huang S. Cell Lineage Determination in State Space: A Systems View Brings Flexibility to Dogmatic Canonical Rules. *PLoS Biol* 8(5):e1000380 (2010).
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88. Zhou, J.X., and Huang, S. Understanding gene circuits at cell-fate branch points for rational cell reprogramming. *Trends Genet* 2010 Dec 10 (2010).
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91. Huang S. Systems biology of stem cells: three useful perspectives to help overcome the paradigm of linear pathways. *Philos Trans R Soc Lond B (Biol Sci)*. 366:2247-2259 (2011).
92. Huang S. On the intrinsic inevitability of cancer: From foetal to fatal attraction. *Semin Cancer Biol* 21:183-99 (2011).
93. Huang S. The molecular and mathematical basis of Waddington's epigenetic landscape: A framework for post-Darwinian biology. *Bioessays* 34, 149-155 (2012).
94. Huang S. Tumor progression: chance and necessity in Darwinian and Lamarckian somatic (mutationless) evolution. *Progr Biophys Mol Bio* 110, 69-86 (2012).
95. Huang S. When peers are not peers and don't know it: The Dunning-Kruger effect and self-fulfilling prophecy in peer-review. *BioEssays* 35: 414-6 (2013).
96. Huang S. Genetic and non-genetic instability in tumor progression: link between the fitness landscape and the epigenetic landscape of cancer cells. *Cancer Metastasis Rev.* in press [Epub ahead of print] (2013)
97. Huang S, Kauffman S. How to escape the cancer attractor: Rationale and limitations of multi-target drugs. *Semin Cancer Biol* 23: 270-278 (2013).
98. Huang S. Hybrid T-helper cells: Stabilizing the moderate center in a polarized system. *PLoS Biol* 11:e1001632 (2013)
99. Huang S. When correlation and causation coincides. *Bioessays*, in press (2014)

■ Chapters in Books

100. Goldmann W, Alonso JL, Bojanowski K, Brangwynne C, Chen CS, Chicurel M, Dike L, Huang S, Kyung ML, Maniotis A, Mannix R, McNamee H, Meyer C, Naruse K, Parker KK, Plopper G, Polte T, Wang N, Yan L, Ingber DE. Cell Shape Control and Mechanical Signaling through the Cytoskeleton. In: Carraway, K, ed. *The Cytoskeleton and Signaling: A Practical Approach*. Oxford, England: Oxford University Press (1999).
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102. Huang S and Ingber DE. From Stem Cell to Functional Tissue Architecture: What are the signals and how are they processed? In: Sell S, ed. *Stem Cell Handbook*, Humana Press (2003).
103. Huang S, Sultan C, Ingber DE. Tensegrity, Dynamic Networks and Complex Systems Biology: Emergence in Structural and Information Networks within Living Cells. In: Deisboeck TS, Kresh JY and Kepler TB, eds. *Complex Systems Science in Biomedicine*, New York: Kluwer Academic Publishers (2006).
104. Huang S. Multistability and Multicellularity: Cell Fates as High-dimensional Attractors of Gene Regulatory Networks. In: *Computational Systems Biology*, Eds: Kriete A, Eils R. Elsevier Academic Press (2005).
105. Ingber DE and Huang S. A complex systems approach to understand how cells control their shape and make cell fate decisions. In: Jorde, LB, Little P, Dunn, M, Subramaniam S, eds. *Encyclopedia of Genetics, Genomics, Proteomics and Bioinformatics* London: John Wiley (2005).
106. Huang S. and Kauffman S. Gene Regulatory Networks - From Structure to Biological Observable: Cell fate Determination. In: *Encyclopedia of Complexity*: Springer (2009).
107. Zhou XJ and Huang S. Theoretical Considerations for Reprogramming Multicellular Systems. In: *Computational and Theoretical Tools in Synthetic Biology (in press)*

■ Patents

1. Anderson JR, Chiu DT, Choi IS, Huang S, Ingber DE, Jeon NL, Kane R, Whitesides G, inventors. "Patterning of Surfaces Utilizing Microfluidic Stamps Including Three-Dimensionally Arrayed Channel Networks."
2. Eichler G, Huang S, Ingber DE. "A method and apparatus for displaying information."
3. Orgill DP, Eichbaum QG, Huang S, Hwang CW, Ingber DE, Saxena V, Garfein ES. "Methods and apparatus for application of micro-mechanical forces to tissues"

V. TEACHING

- 2004-2006 *Genetic networks and cell fate control* (senior and graduate students annual one week lectures in Cellular Engineering). Harvard University
- 2008-2010 *Introduction to DNA lab techniques* (3rd year biochemistry undergraduates. Annual, ½ semester). University of Calgary;
- 2008-2010 *Drug discovery in complex dynamical systems* (3rd, 4th year, special lecture to bioengineers)
- 2008, 2009 *Introduction to Systems Biology* (4th year biology undergraduates, newly created 1-semester course University of Calgary
- 2009-2011 *Cell fate regulation – a systems biology approach* (4th year biology undergraduates, annual 2-week lectures). University of Calgary;
- 2010 *Non-linear Dynamics: Practical Applications for Cell Biology* (graduate level, 1-semester), University of Calgary
- 2011 *Introduction to non-linear Dynamics and Biocomplexity* (senior undergrad, graduate level, 1-semester course, University of Calgary