

KRISHANU SAHA

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RESEARCH INTERESTS

My interests lie in using human stem cells together with emerging engineering methods in material science and synthetic biology to make smarter therapeutics, model human disease, and advance personalized medicine.

EDUCATION

Cornell University (Ithaca, NY USA)

B.S., Chemical Engineering and Chemistry, 2001 (*Magna Cum Laude*)
Minor in Materials Science and Engineering

University of Cambridge (Cambridge, United Kingdom)

M. Phil., Biotechnology (Biological Sciences), 2002 (Advisor: Electra Gizeli)

University of California at Berkeley (Berkeley, CA USA)

Ph.D., Chemical Engineering, 2007 (Advisors: David Schaffer/Kevin Healy)
Minor in Neuroscience

Whitehead Institute for Biomedical Research / MIT (Cambridge, MA USA)

Postdoctoral Fellow, Stem Cell Biology, 2007 - 2012 (Advisor: Rudolf Jaenisch)

Harvard University, JFK School of Government (Cambridge, MA USA)

Science, Technology and Society Fellow, 2009 - 2012 (Advisor: Sheila Jasanoff)

PROFESSIONAL POSITIONS

- 2012-present Assistant Professor, Departments of Biomedical Engineering and Medical History & Bioethics, Wisconsin Institute for Discovery, University of Wisconsin-Madison
- 2007-2012 Jaenisch & Langer/Anderson Groups, Whitehead Institute / MIT
- 2009-2012 Science, Technology and Society Fellow, Kennedy School of Government, Harvard University
- 2002-2007 Schaffer & Healy Groups, Chemical Engineering, Bioengineering, and Materials Science Departments, University of California, Berkeley. Thesis title: "Quantitative experimental and numerical studies of cell fate decisions along the neural lineage."
- 2001-2002 Electra Gizeli Group, Institute of Biotechnology, Biological Sciences Dept., University of Cambridge. Developed, modeled, and conducted experiments on acoustic biosensors.
- 1998-2001 Shefford Baker Group, Materials Science Department, Cornell University
Investigated mechanical behavior of metal thin films.
- 1999 Research Intern, Catalyst Research & Development Department, Mobil Chemical, Edison, NJ. Tested polyethylene polymerization mechanisms with various catalysts.

OTHER EXPERIENCE AND PROFESSIONAL MEMBERSHIPS

- 2012 Architectures for Life workshop co-organizer, Harvard University (www.architectures4life.com)
- 2005- Ad Hoc Reviewer, *Nature Biotechnology*, *Journal of Clinical Investigation*, *Nature Methods*, *Nature Communications*, Parkinson's UK, and Netherlands Organisation for Scientific Research.
- 2008 Steering Committee Member for "Institutional Landscape in Stem Cell Research: Problems & Solutions" workshop at University of California-Berkeley
- Various Member, American Institute of Chemical Engineers (2003-07,2010), International Society for Stem Cell Research (2005-2010), Biomedical Engineering Society (2006, 2011), Materials Research Society (2003-06), American Chemical Society (2002-03)

RESEARCH SUPPORT - AWARDED

- (1) Branco Weiss Fellowship; *Society in Science Foundation* (Switzerland); Sept-2009 to Nov-2014; "Constructing and deconstructing disease in a dish"; *Principal Investigator: Krishanu Saha*.
⇒ This fellowship provides a platform for researchers in the natural sciences and engineering who are aiming to extend their scientific work to cover specific social and cultural questions and perspectives. One to four fellows are selected per year worldwide for their ability to propose a bold and innovative project that crosses disciplinary boundaries.

- (2) Science, Technology, and Society Program; *National Science Foundation* (USA); Sept-2011 to Sept-2013; “Life in the Gray Zone: Governance of New Biology in Europe and the United States”; *served as grant coauthor; Principal Investigator Sheila Jasanoff.*
⇒ Using an innovative cross-national research design, focusing primarily on the US, UK, and Germany, the project follows legal, ethical, and social responses to two novel biological constructs: animal-human chimeras and the synthetic organism called *Mycoplasma mycoides JCVI-syn1.0.*
- (3) Bioethics grant; *Greenwall Foundation* (USA); Sept-2010 to Dec-2011; “The Constitutional Foundations of Bioethics: A Cross-National Comparison”; *served as grant coauthor; Principal Investigator Sheila Jasanoff.*
⇒ The project addresses the changing landscape of the biosciences and bioethics across Western nations with a strong commitment to biomedical and biotechnological research. Our project focuses on newer areas of concern, including stem cell biology, regenerative medicine, and synthetic biology.
- (4) Uses and Abuses of Biology Program; *The Faraday Institute* (UK); Sept-2012 to Sept-2014; “Biology and the Law”; *served as grant coauthor; Principal Investigator Sheila Jasanoff.*
⇒ This work deepens cross-national research on the new life sciences from grants (2) and (3).

RESEARCH SUPPORT – PENDING

- (1) RFA-RM-12-017, NIH Director's Transformative Research Awards (R01); *National Institutes of Health* (USA); Applied Sept-2012; “*In vivo* targeted mutagenesis to accelerate development of stem cell therapies”; *Principal Investigator: Krishanu Saha.*
⇒ The primary emphasis of this initiative is to support research on bold, paradigm-shifting, but untested ideas. We propose to develop breakthrough stem cell production strategies based on technology we recently developed in budding yeast for the repeated and controllable, targeted mutagenesis *in vivo* of multiple genes. Advancing this technology into human cells will enable rapid and simultaneous *in vivo* mutagenesis of multiple reprogramming factors or cell adhesion proteins followed by selection for phenotypes desirable for human stem cell bioprocessing.
- (2) Pew Scholars Program in the Biomedical Sciences; *Pew Charitable Trusts* (USA); Applied Nov-2012; “Reprogramming cells and biomaterials together”; *Principal Investigator: Krishanu Saha.*
⇒ This program provides funding to young investigators of outstanding promise in science relevant to the advancement of human health. My proposal aims to fractionate reprogramming cultures through differential cell adhesion and material coupling with gene programs.

SELECTED HONORS and AWARDS

2013	Rising Star Award, Biomedical Engineering Society, Cellular & Molecular Bioengineering Group
2012	Sage Bionetworks Young Investigator Award
2009-2014	Society in Science: Branco Weiss Fellowship
2009	Ruth L. Kirschstein Individual Postdoctoral National Research Service (F32) Award (declined)
2001-2005	National Science Foundation Graduate Research Fellowship (deferred for 2002-05)
2001-2002	Winston Churchill Scholarship
2001	J. William Fulbright Graduate Student Award for United Kingdom (declined)
2000	Barry F. Goldwater Scholarship

SELECTED PUBLICATIONS

- (1) Armond J.W., **Saha K.**, Oates C. Rana A., Jaenisch R., Nicodemi M., and Mukherjee S. (in review) “A stochastic model dissects cellular states and heterogeneity in transition processes.”
- (2) **Saha K.***, Mei Y.*, Reisterer C.M., Pyzocha N., Yang J., Muffat J., Mitalipova M., Alexander M.R., Langer R., Anderson D.G. and Jaenisch R. (2011) “Surface engineered substrates for improved human pluripotent stem cell culture under fully defined conditions.” *Proceedings of the National Academy of Sciences of the USA*. 108(46), 18714-9. [*equal contribution]
- (3) **Saha K.** and Hurlbut J.B. (2011) “Treat donors as partners in biobank research.” *Nature*. 478, 312-313.
- (4) Mathews D.J.H., Graff G.D., **Saha K.**, and Winickoff D.E. (2011) “Access to stem cells and data: persons, property rights, and scientific progress.” *Science*. 331, 725-727.
- (5) **Saha K.** and J.B. Hurlbut (2011) “Disease modeling using pluripotent stem cells: making sense of disease from bench to bedside.” *Swiss Medical Weekly*. 141.

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- (6) Mei Y.*, **Saha K.***, Bogatyrev S.R., Yang J., Hook A.L., Kalcioğlu Z.I., Cho S.W., Mitalipova M., Pyzocha N., Rojas F., van Vliet K.J., Davies M.C., Alexander M.R., Langer R., Jaenisch R., and Anderson D.G. (2010) "Combinatorial development of biomaterials for clonal growth of human pluripotent stem cells." *Nature Materials*. 9, 768-778. [***equal contribution**]
- (7) Hanna J., **Saha K.**, and Jaenisch R. (2010) "Pluripotency and cellular reprogramming: facts, hypotheses, unresolved issues." *Cell*. 143, 508-525.
- (8) **Saha K.**, Kim J., Irwin E., Yoon J., Momin F., Trujillo V., Schaffer D.V., Healy K.E., and R.C. Hayward (2010) "Surface creasing instability of soft polyacrylamide cell culture substrates." *Biophysical Journal*. 99(12) L94-L96.
- (9) Hanna J.*, **Saha K.***, Pando B., van Zon J., Lengner C.J., Creighton M.P., van Oudenaarden A., and Jaenisch R. (2009) "Direct cell reprogramming is a stochastic process amenable to acceleration." *Nature*. 462, 595-601. [***equal contribution**]
- (10) **Saha K.** and R. Jaenisch (2009) "Technical challenges in using human induced pluripotent stem cells to model disease." *Cell Stem Cell*. 5, 584-595.
- (11) Carey B.W., Markoulaki S., Hanna J., **Saha K.**, Gao Q., Mitalipova M., and Jaenisch R. (2009) "Reprogramming of murine and human somatic cells using a single polycistronic vector." *Proceedings of the National Academy of Sciences of the USA*. 106(1), 157-162.
- (12) Winickoff D.W.*, **Saha K.***, and Graff G.* (2009) "Opening Life Sciences Research and Development: Integrative Management of Data, IP and Ethics in Stem Cells" *Yale Journal of Health Policy, Law and Ethics*. 9(1), 52-127. [***equal contribution**]
- (13) **Saha K.**, Keung A., Irwin E.F., Li Y., Schaffer D.V. and Healy K.E. (2008) "Substrate modulus directs neural stem cell behavior." *Biophysical Journal*. 95(9), 4426-4438.
- (14) Wall S.T., **Saha K.**, Ashton R.S., Kam K.R., Schaffer D.V. and Healy K.E. (2008) "Multivalency of Sonic hedgehog conjugated to linear polymer chains modulates protein potency." *Bioconjugate Chemistry*. 19(4), 806-812.
- (15) **Saha K.***, Pollock J.F.*, Schaffer D.V., and Healy K.E. (2007) "Designing synthetic materials to control stem cell phenotype." *Current Opinion in Chemical Biology*. 11(4), 381-7. [***equal contribution**]
- (16) **Saha K.**, Irwin E.F., Kozhukh J., Healy K.E., and Schaffer D.V. (2007) "Biomimetic interfacial interpenetrating polymer networks control neural stem cell behavior." *Journal of Biomedical Materials Research: Part A*. 81A:1.
- (17) **Saha K.** and D.V. Schaffer (2006) "Signaling dynamics in Sonic hedgehog tissue patterning." *Development*. 133, 889-900.
- (18) **Saha K.**, Bender F., Rasmuson A., and Gizeli E. (2003) "Probing the viscoelasticity of protein layers with acoustic waveguide devices." *Langmuir*. 19(4), 1304-1311.
- (19) **Saha K.**, Bender F., and Gizeli E. (2003) "Comparative study of IgG binding to bacterial proteins G and A: Non-equilibrium kinetic binding constant determination with the acoustic waveguide device." *Analytical Chemistry*. 75(4), 835-842.

PATENTS

- (1) **Saha K.**, Mei Y., Bogatyrev S.R., Anderson D.G., Jaenisch R., Langer R.S., Alexander M., Davies M., Yang J., Kastrup C.J., and Urquhart A. "Substrates and Methods for Culturing Stem Cells." *U.S. Patent Application* 61/171,175 (pending).
- (2) Healy K.E., Irwin E.F., Pollock J.F., Schaffer D.V., **Saha K.**, Li Y., and Wall S. "Controlling Stem Cell Destiny with Tunable, Semi-Interpenetrating Polymer Networks (sIPNs)." *U.S. Patent Application* 60/666,734 (pending).
- (3) Healy K.E., Wall S., and **Saha K.** "Polypeptide-Polymer Conjugates and Methods of Use Thereof." *USSN* 12/933,655 (PCT/US2009/038446); Japanese Patent Application No. 2011-502070; Chinese Patent Application No. 200980120124.0.

SELECTED TEACHING EXPERIENCE and OUTREACH

Contributor to *The Scientist*, Lecturer for Harvard Business School reunion event, Advisory committee member for ethics education website of the Canadian Stem Cell Network, Whitehead Partner in Whitehead's Partnership for Science Education program, Encourage Youth Educate Society Team Leader, Youth tennis and basketball coach