



Maria Barna

Assistant Professor of Genetics and of Developmental Biology

CONTACT INFORMATION

• Administrative Contact

Sergio Alcantara - Administrative Support

Email salcanta@stanford.edu

Tel 650-725-7657

Bio

BIO

Maria Barna is an Assistant Professor in the Departments of Developmental Biology and Genetics at Stanford University. Dr. Barna obtained her B.A. in Anthropology from New York University and her Ph.D. from Cornell University, Weill Graduate School of Medicine. She completed her thesis work in the lab of Dr. Lee Niswander in the Developmental Biology Department at Sloan Kettering Institute in 2007. Dr. Barna was subsequently appointed as a UCSF Fellow through the Sandler Fellows program, which enables exceptionally promising young scientists to establish independent research programs immediately following graduate school. In 2013, she received a dual appointment as an Assistant Professor in the Departments of Developmental Biology and Genetics at Stanford University. Dr. Barna has received a number of distinctions including being named a Pew Scholar, Alfred P. Sloan Research Fellow, and top '40 under 40' by the Cell Journal. She has received the Basil O' Connor Scholar Research Award and the NIH Directors New Innovator Award. In 2016, she was the recipient of the Rosalind Franklin Young Investigator Award, an award given to two female scientist in the world every three years in the field of genetics and the American Society for Cell Biology Emerging Leader Prize. She has also received the H.W. Mossman Award in Developmental Biology and the Tsuneko and Reiji Okazaki Award. She is presently a NYSCF Robertson Stem Cell Investigator.

ACADEMIC APPOINTMENTS

- Assistant Professor, Genetics
- Assistant Professor, Developmental Biology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)

HONORS AND AWARDS

- RNA Society Early Career Award, RNA Society (2019)
- Inaugural Elizabeth Hay Award, Society of Developmental Biology (2017)
- H.W. Mossman Award in Developmental Biology, American Association of Anatomists (2017)
- Tsuneko and Reiji 'Okazaki Award', Japan (2017)
- American Society for Cell Biology Emerging Leader Prize, ASCB (2016)

- Rosalind Franklin Young Investigator Award, Gruber Foundation and Genetics Society of America (2016)
- NYSCF Robertson Stem Cell Investigator, New York Stem Cell Foundation (2016)
- McCormick and Gabilan Fellow, Stanford University (2016)
- Alfred P. Sloan Research Fellow, Alfred P. Sloan Foundation (2014)
- Mallinckrodt Foundation Award, Edward Mallinckrodt Jr. Foundation (2014)
- Pew Scholars Award, Pew Charitable Trusts (2014)
- Top 40 under 40, Cell Press (2014)
- NIH Director's New Innovator Award, NIH (2011)
- Basil O'Connor Scholar Research Award, March of Dimes (2010)
- National Institutes of Child Health and Development Pediatric LRP, NIH (2009)
- UCSF Faculty Fellows Program, UCSF Program for Breakthrough Biomedical Research, University of California, San Francisco (2007)
- Nominated, Harold M. Weintraub Graduate Student Award, Cornell University (2006)
- Vincent du Vigneaud Award of Excellence for Graduate Research, Cornell University (2004)
- Outstanding Undergraduate Research Award, New York University (1996, 1997)

PROFESSIONAL EDUCATION

- Ph.D., Cornell University, Weill Graduate School of Medicine , Molecular and Cellular Biology (2007)
- B.A., New York University , Anthropology (1998)

LINKS

- Lab Site: <http://barnalab.stanford.edu>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our lab studies how intricate control of gene expression and cell signaling is regulated on a minute-by-minute basis to give rise to the remarkable diversity of cell types and tissue morphology that form the living blueprints of developing organisms. Work in the Barna lab is presently split into two main research efforts. The first is investigating ribosome-mediated control of gene expression genome-wide in space and time during cellular differentiation and organismal development. This research is opening a new field of study in which we apply sophisticated mass spectrometry, computational biology, genomics, and developmental genetics, to characterize a ribosome code to gene expression. Our research has shown that not all of the millions of ribosomes within a cell are the same and that ribosome heterogeneity can diversify how genomes are translated into proteomes. In particular, we seek to address whether fundamental aspects of gene regulation are controlled by ribosomes harboring a unique activity or composition that are tuned to translating specific transcripts by virtue of RNA regulatory elements embedded within their 5'UTRs. The second research effort is centered on employing state-of-the-art live cell imaging to visualize cell signaling and cellular control of organogenesis. This research has led to the realization of a novel means of cell-cell communication dependent on a dense network of actin-based cellular extension within developing organs that interconnect and facilitate the precise transmission of molecular information between cells. We apply and create bioengineering tools to manipulate such cellular interactions and signaling in-vivo.

Teaching

COURSES

2018-19

- Developmental Biology: DBIO 210 (Spr)

2017-18

- Developmental Biology: DBIO 210 (Spr)

2016-17

- Developmental Biology: DBIO 210 (Spr)

2015-16

- Developmental Biology: DBIO 210 (Spr)

STANFORD ADVISEES

Pallavi Krishnarao

Doctoral Dissertation Reader (AC)

Cameron Berry, Krissie Tellez

Postdoctoral Faculty Sponsor

Victoria Hung, Craig Kerr, Kathrin Leppek, Olena Zhulyn

Doctoral Dissertation Advisor (AC)

Gun Woo Byeon, Naomi Genuth, Gerald Tiu

Doctoral (Program)

Naomi Genuth

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Developmental Biology (Phd Program)
- Genetics (Phd Program)

Publications

PUBLICATIONS

- **Decoding the Function of Expansion Segments in Ribosomes.** *Molecular cell*
Fujii, K., Susanto, T. T., Saurabh, S., Barna, M.
2018; 72 (6): 1013
- **The Discovery of Ribosome Heterogeneity and Its Implications for Gene Regulation and Organismal Life.** *Molecular cell*
Genuth, N. R., Barna, M.
2018; 71 (3): 364–74
- **The Mammalian Ribo-interactome Reveals Ribosome Functional Diversity and Heterogeneity.** *Cell*
Simsek, D., Tiu, G. C., Flynn, R. A., Byeon, G. W., Leppek, K., Xu, A. F., Chang, H. Y., Barna, M.
2017; 169 (6): 1051-1065 e18
- **Heterogeneous Ribosomes Preferentially Translate Distinct Subpools of mRNAs Genome-wide.** *Molecular cell*
Shi, Z., Fujii, K., Kovary, K. M., Genuth, N. R., Röst, H. L., Teruel, M. N., Barna, M.
2017
- **RNA regulons in Hox 5' UTRs confer ribosome specificity to gene regulation.** *Nature*
Xue, S., Tian, S., Fujii, K., Kladwang, W., Das, R., Barna, M.
2015; 517 (7532): 33-38
- **Specialized filopodia direct long-range transport of SHH during vertebrate tissue patterning.** *Nature*
Sanders, T. A., Llagostera, E., Barna, M.
2013; 497 (7451): 628-632
- **Ribosome-Mediated Specificity in Hox mRNA Translation and Vertebrate Tissue Patterning** *CELL*

- Kondrashov, N., Pusic, A., Stumpf, C. R., Shimizu, K., Hsieh, A. C., Xue, S., Ishijima, J., Shiroishi, T., Barna, M.
2011; 145 (3): 383-397
- **Suppression of Myc oncogenic activity by ribosomal protein haploinsufficiency** *NATURE*
Barna, M., Pusic, A., Zollo, O., Costa, M., Kondrashov, N., Rego, E., Rao, P. H., Ruggero, D.
2008; 456 (7224): 971-U79
 - **Translation control of the immune checkpoint in cancer and its therapeutic targeting.** *Nature medicine*
Xu, Y., Poggio, M., Jin, H. Y., Shi, Z., Forester, C. M., Wang, Y., Stumpf, C. R., Xue, L., Devericks, E., So, L., Nguyen, H. G., Griselin, A., Gordan, et al
2019
 - **The p53 family members have distinct roles during mammalian embryonic development.** *Cell death and differentiation*
Van Nostrand, J. L., Bowen, M. E., Vogel, H., Barna, M., Attardi, L. D.
2017
 - **Pervasive translational regulation of the cell signalling circuitry underlies mammalian development** *NATURE COMMUNICATIONS*
Fujii, K., Shi, Z., Zhulyn, O., Denans, N., Barna, M.
2017; 8
 - **An emerging role for the ribosome as a nexus for post-translational modifications.** *Current opinion in cell biology*
Simsek, D., Barna, M.
2017; 45: 92–101
 - **Functional 5' UTR mRNA structures in eukaryotic translation regulation and how to find them.** *Nature reviews. Molecular cell biology*
Leppek, K., Das, R., Barna, M.
2017
 - **Translating the Genome in Time and Space: Specialized Ribosomes, RNA Regulons, and RNA-Binding Proteins.** *Annual review of cell and developmental biology*
Shi, Z., Barna, M.
2015; 31: 31-54
 - **Differential Requirements for eIF4E Dose in Normal Development and Cancer** *CELL*
Truitt, M. L., Conn, C. S., Shi, Z., Pang, X., Tokuyasu, T., Coady, A. M., Seo, Y., Barna, M., Ruggero, D.
2015; 162 (1): 59-71
 - **The ribosome prophecy.** *Nature reviews. Molecular cell biology*
Barna, M.
2015; 16 (5): 268
 - **Cis-regulatory RNA elements that regulate specialized ribosome activity.** *RNA biology*
Xue, S., Barna, M.
2015: 0
 - **Specialized filopodia: at the 'tip' of morphogen transport and vertebrate tissue patterning.** *Current opinion in genetics & development*
Fairchild, C. L., Barna, M.
2014; 27C: 67–73
 - **When the going gets tough: scientists' personal challenges.** *Cell*
Lengerke, C., Fernandez-Capetillo, O., Tolic-Norrelykke, I., Barna, M., Coleman, T., Zamboni, D.
2014; 159 (2): 225–26
 - **Tailor Made Protein Synthesis for HSCs.** *Cell stem cell*
Barna, M., Ruggero, D.
2014; 14 (4): 423–24
 - **Ribosomes take control** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Barna, M.
2013; 110 (1): 9-10

- **Specialized ribosomes: a new frontier in gene regulation and organismal biology** *NATURE REVIEWS MOLECULAR CELL BIOLOGY*
Xue, S., Barna, M.
2012; 13 (6): 355-369
- **Visualization of cartilage formation: Insight into cellular properties of skeletal progenitors and chondrodysplasia syndromes** *DEVELOPMENTAL CELL*
Barna, M., Niswander, L.
2007; 12 (6): 931-941
- **Gli3 and Plzf cooperate in proximal limb patterning at early stages of limb development** *NATURE*
Barna, M., Pandolfi, P. P., Niswander, L.
2005; 436 (7048): 277-281
- **Essential role of Plzf in maintenance of spermatogonial stem cells** *NATURE GENETICS*
Costoya, J. A., Hobbs, R. M., Barna, M., Cattoretti, G., Manova, K., Sukhwani, M., Orwig, K. E., Wolgemuth, D. J., Pandolfi, P. P.
2004; 36 (6): 653-659
- **Plzf mediates transcriptional repression of HoxD gene expression through chromatin remodeling** *DEVELOPMENTAL CELL*
Barna, M., Merghoub, T., Costoya, J. A., Ruggero, D., Branford, M., Bergia, A., Samori, B., Pandolfi, P. P.
2002; 3 (4): 499-510
- **Plzf regulates limb and axial skeletal patterning** *NATURE GENETICS*
Barna, M., Hawe, N., Niswander, L., Pandolfi, P. P.
2000; 25 (2): 166-172
- **Interleukin-12 promotes recovery from viral encephalitis** *VIRAL IMMUNOLOGY*
Komatsu, T., Barna, M., Reiss, C. S.
1997; 10 (1): 35-47
- **Activation of type III nitric oxide synthase in astrocytes following a neurotropic viral infection** *VIROLOGY*
Barna, M., Komatsu, T., Reiss, C. S.
1996; 223 (2): 331-343
- **Sex differences in susceptibility to viral infection of the central nervous system** *JOURNAL OF NEUROIMMUNOLOGY*
Barna, M., Komatsu, T., Bi, Z. B., Reiss, C. S.
1996; 67 (1): 31-39
- **Interleukin-12: Promotes enhanced recovery from viral infection of neurons in the central nervous system** *Conference on Interleukin-12 - Cellular and Molecular Immunology of an Important Regulatory Cytokine*
Reiss, C. S., Komatsu, T., Barna, M., Bi, Z. B.
NEW YORK ACAD SCIENCES.1996: 257-265
- **Host immune response to vesicular stomatitis virus infection of the central nervous system in C57BL/6 mice** *VIRAL IMMUNOLOGY*
CHRISTIAN, A. Y., Barna, M., Bi, Z. B., Reiss, C. S.
1996; 9 (3): 195-205
- **IL-12 PROMOTES ENHANCED RECOVERY FROM VESICULAR STOMATITIS-VIRUS INFECTION OF THE CENTRAL-NERVOUS-SYSTEM** *JOURNAL OF IMMUNOLOGY*
Bi, Z. B., QUANDT, P., Komatsu, T., Barna, M., Reiss, C. S.
1995; 155 (12): 5684-5689
- **VESICULAR STOMATITIS-VIRUS INFECTION OF THE CENTRAL-NERVOUS-SYSTEM ACTIVATES BOTH INNATE AND ACQUIRED-IMMUNITY** *JOURNAL OF VIROLOGY*
Bi, Z. B., Barna, M., Komatsu, T., Reiss, C. S.
1995; 69 (10): 6466-6472