



Daniel Jarosz

Assistant Professor of Chemical and Systems Biology and of Developmental Biology

CONTACT INFORMATION

- **Administrative Contact**

Cynthia Leyva

Email danjarosz.aa@gmail.com

Tel (650) 498-1310

Bio

BIO

Dr. Jarosz is an Assistant Professor of Chemical and Systems Biology and of Developmental Biology at Stanford University. He is also a fellow of ChEM-H and a member of the Stanford Cancer Institute, Stanford Neurosciences Institute, and Bio-X. Dr. Jarosz received his B.S. in Chemistry from the University of Washington, where he also minored in Physics as part of the Early Entrance Program. He then moved to MIT to obtain a PhD in Biochemistry, where his thesis work established the function of a low-fidelity DNA polymerase with roles in cancer and infectious disease, and identified means through which its activity is regulated in normal biology and disease states.

Following his graduation in 2007, Dr. Jarosz pursued postdoctoral training in genetics and cell biology as a Damon Runyon Cancer Research Foundation Fellow at the Whitehead Institute for Biomedical Research. Here his work centered on the molecular chaperone Hsp90 – the so called ‘cancer chaperone’ – and its relationship to the capacity of genetic variation to produce new phenotypes. He also pioneered high throughput screening methods to investigate the physiological consequences of prion-like protein aggregation.

In 2013, Dr. Jarosz joined the Stanford faculty where the long-term goal of his NIH- and NSF-funded research program is to understand how some biological systems can remain unaltered for long periods, whereas others that are genetically identical undergo rapid diversification. This paradox lies at the heart of how neurons can be killed by improper expression of a single aggregation-prone protein, how cancer cells can tolerate accumulating mutation burden, and how disease-associated mutations have devastating consequences in some individuals, but no effect in others. Dr. Jarosz’s work employs multidisciplinary approaches ranging from chemical biology to systems-level quantitative genetics and uses models as diverse as baker’s yeast and the African turquoise killifish. He has been named an NIH New Innovator and has received scholarships from the Searle, Glenn, Packard, Kimmel, and Vallee Foundations, but is proudest of the Louis Pasteur Prize from the Belgian Brewing Society.

In addition to his research activities Dr. Jarosz runs graduate admissions for the Chemical & Systems Biology Department and co-directs Foundations in Experimental Biology, the flagship course for incoming biosciences PhD students in the School of Medicine. He also serves on the Executive Committee of the School of Medicine Faculty Senate and as a mentor for the Vice Provost of Graduate Education’s Solidarity, Leadership, Inclusion, and Diversity (SoLID) Mentorship program. Outside of Stanford, Dr. Jarosz enjoys hiking, skiing, and just about any way of spending time with his wife, Mirna, and their three young children, Mark, Justin, and Phoebe.

ACADEMIC APPOINTMENTS

- Assistant Professor, Chemical and Systems Biology
- Assistant Professor, Developmental Biology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Stanford Cancer Institute
- Faculty Fellow, Stanford ChEM-H
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Faculty Scholar, Bert and Kuggie Vallee Foundation (2017)
- Award for Research in Biological Mechanisms of Aging, Glenn Foundation (2016)
- New Innovator, NIH (2015-present)
- Science and Engineering Fellow, David and Lucile Packard Foundation (2015-present)
- Kimmel Scholar, Sidney Kimmel Foundation for Cancer Research (2015-present)
- NSF-CAREER Award, National Science Foundation (2015-present)
- Searle Scholar, Kinship Foundation/Chicago Community Trust (2014-present)
- Pathway to Independence (K99/R00) Award, National Institutes of Health (2011-present)
- Postdoctoral Fellowship, Damon Runyon Cancer Research Foundation (2008-2010)
- Transition School/Early Entrance Program, University of Washington (1996-2001)

PROFESSIONAL EDUCATION

- Postdoctoral, Whitehead Institute for Biomedical Research , Genetics and Cell Biology (2012)
- Ph.D., MIT , Biological Chemistry (2007)
- B.S., University of Washington , Chemistry and Biochemistry (2001)

LINKS

- Jarosz Laboratory: <http://jarosz.stanford.edu/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Survival in changing environments requires the acquisition of new heritable traits. However, mechanisms that safeguard the fidelity of DNA replication often limit the source of such novelty to relatively modest changes in the genetic code. Thus, the acquisition of new forms and functions is thought to be driven by rare variants that occur at random, and are enriched during times of stress. We have begun to study an intriguing alternative hypothesis: that intrinsic links between protein folding and virtually every biological trait provide multiple avenues through which environmental stress can directly elicit heritable variation that drives evolution, disease, and development.

Our aim is to identify and characterize these mechanisms at the molecular level, integrating our findings to gain insight into the interplay among genetic variation, phenotypic diversity, and environmental fluctuations in complex cellular systems. Much of our work centers on the specific influence of molecular chaperones, proteins that help other proteins fold. Other projects focus on the induction of epigenetic variation that can be passed from one generation to another via self-perpetuating changes in protein conformation. Our work employs multidisciplinary approaches including biochemistry, genome-scale analyses, high-throughput screening

methodologies, live cell imaging, microfluidics, and quantitative genetic techniques. Ultimately we seek to not only to understand mechanisms that link environmental stress to the acquisition of biological novelty, but also to identify means of manipulating them for therapeutic benefit and harnessing their power to engineer synthetic signaling networks.

Teaching

COURSES

2019-20

- Advanced Seminar on Prokaryotic Molecular Biology: BIO 346, CSB 346, GENE 346 (Aut, Win, Spr)
- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Foundations in Experimental Biology: BIOS 200 (Aut)
- Methods and Logic in Chemical and Systems Biology: CSB 221 (Win)
- Prions in Health & Disease: BIOS 277 (Aut)
- Research Seminar: CSB 270 (Aut, Win, Spr)

2018-19

- Advanced Seminar on Prokaryotic Molecular Biology: BIO 346, CSB 346, GENE 346 (Aut, Win, Spr)
- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Foundations in Experimental Biology: BIOS 200 (Aut)
- Methods and Logic in Chemical and Systems Biology: CSB 221 (Win)
- Prions in Health & Disease: BIOS 277 (Aut)
- Research Seminar: CSB 270 (Aut, Win)

2017-18

- Advanced Seminar on Prokaryotic Molecular Biology: BIO 346, CSB 346, GENE 346 (Aut, Win)
- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Methods and Logic in Chemical and Systems Biology: CSB 221 (Win)
- Research Ethics: CSB 272 (Aut)
- Research Seminar: CSB 270 (Aut, Win)

2016-17

- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Esha Atolia, Michael Bocek, Trisha Chong, Yanniv Dorone, Bo Gu, Mike Guernsey, Ian Heller, Sam Kimmey, Garrett Kingman, Nicole Moyen, Kelsey Roberts, Owen Smith, Michael Tran, John Vaughen, Wendy Wenderski, Jeremy Work, Adele Xu

Postdoctoral Faculty Sponsor

Jose Aguilar Rodriguez, Anupam Chakravarty, Rebecca Freilich, Christopher Jakobson, Shady Saad, Lucy Xie, Rebecca Zabinsky

Doctoral Dissertation Advisor (AC)

Edgar Campbell, Yiwen Chen, Ray Futia, Zachary Harvey, Andres Iglesias-Thome, Alan Itakura, Thomas Lozanoski, Jonathan Mares, Thomas Silvers, Alexandria Van Elgort

Orals Evaluator

Bo Gu, Zachary Harvey

Doctoral (Program)

Ray Futia, Alan Itakura

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Chemical and Systems Biology (Phd Program)
- Developmental Biology (Phd Program)

Publications

PUBLICATIONS

- **Molecular Origins of Complex Heritability in Natural Genotype-to-Phenotype Relationships** *CELL SYSTEMS*
Jakobson, C. M., Jarosz, D. F.
2019; 8 (5): 363–+
- **Pervasive function and evidence for selection across standing genetic variation in *S. cerevisiae*.** *Nature communications*
Jakobson, C. M., She, R., Jarosz, D. F.
2019; 10 (1): 1222
- **It's not magic - Hsp90 and its effects on genetic and epigenetic variation.** *Seminars in cell & developmental biology*
Zabinsky, R. A., Mason, G. A., Queitsch, C., Jarosz, D. F.
2018
- **It Pays To Be in Phase** *BIOCHEMISTRY*
Itakura, A. K., Futia, R. A., Jarosz, D. F.
2018; 57 (17): 2520–29
- **Mapping Causal Variants with Single-Nucleotide Resolution Reveals Biochemical Drivers of Phenotypic Change** *CELL*
She, R., Jarosz, D. F.
2018; 172 (3): 478–+
- **Protein-Based Inheritance: Epigenetics beyond the Chromosome** *MOLECULAR CELL*
Harvey, Z. H., Chen, Y., Jarosz, D. F.
2018; 69 (2): 195–202
- **Specification of Physiologic and Disease States by Distinct Proteins and Protein Conformations** *CELL*
Jarosz, D. F., Khurana, V.
2017; 171 (5): 1001–14
- **Comprehensive and quantitative mapping of RNA-protein interactions across a transcribed eukaryotic genome** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
She, R., Chakravarty, A. K., Layton, C. J., Chircus, L. M., Andreasson, J. O., Damaraju, N., McMahon, P. L., Buenrostro, J. D., Jarosz, D. F., Greenleaf, W. J.
2017; 114 (14): 3619-3624
- **A common bacterial metabolite elicits prion-based bypass of glucose repression.** *eLife*
Garcia, D. M., Dietrich, D., Clardy, J., Jarosz, D. F.
2016; 5
- **Intrinsically Disordered Proteins Drive Emergence and Inheritance of Biological Traits.** *Cell*
Chakrabortee, S., Byers, J. S., Jones, S., Garcia, D. M., Bhullar, B., Chang, A., She, R., Lee, L., Fremin, B., Lindquist, S., Jarosz, D. F.
2016; 167 (2): 369-381 e12
- **Hsp90: A Global Regulator of the Genotype-to-Phenotype Map in Cancers.** *Advances in cancer research*
Jarosz, D.
2016; 129: 225-247

- **Cross-kingdom chemical communication drives a heritable, mutually beneficial prion-based transformation of metabolism.** *Cell*
Jarosz, D. F., Brown, J. C., Walker, G. A., Datta, M. S., Ung, W. L., Lancaster, A. K., Rotem, A., Chang, A., Newby, G. A., Weitz, D. A., Bisson, L. F., Lindquist, S.
2014; 158 (5): 1083-1093
- **An Evolutionarily Conserved Prion-like Element Converts Wild Fungi from Metabolic Specialists to Generalists.** *Cell*
Jarosz, D. F., Lancaster, A. K., Brown, J. C., Lindquist, S.
2014; 158 (5): 1072-1082
- **Cryptic Variation in Morphological Evolution: HSP90 as a Capacitor for Loss of Eyes in Cavefish** *SCIENCE*
Rohner, N., Jarosz, D. F., Kowalko, J. E., Yoshizawa, M., Jeffery, W. R., Borowsky, R. L., Lindquist, S., Tabin, C. J.
2013; 342 (6164): 1372-1375
- **Prions are a common mechanism for phenotypic inheritance in wild yeasts** *NATURE*
Halfmann, R., Jarosz, D. F., Jones, S. K., Chang, A., Lancaster, A. K., Lindquist, S.
2012; 482 (7385): 363-U1507
- **Hsp90 and Environmental Stress Transform the Adaptive Value of Natural Genetic Variation** *SCIENCE*
Jarosz, D. F., Lindquist, S.
2010; 330 (6012): 1820-1824
- **Protein Homeostasis and the Phenotypic Manifestation of Genetic Diversity: Principles and Mechanisms** *ANNUAL REVIEW OF GENETICS, VOL 44*
Jarosz, D. F., Taipale, M., Lindquist, S.
2010; 44: 189-216
- **A single amino acid governs enhanced activity of DinB DNA polymerases on damaged templates** *NATURE*
Jarosz, D. F., Godoy, V. G., Delaney, J. C., Essigmann, J. M., Walker, G. C.
2006; 439 (7073): 225-228
- **Remembering the past: a new form of protein-based inheritance**
Jarosz, D. F.
TAYLOR & FRANCIS INC.2019: 10
- **Molecular Origins of Complex Heritability in Natural Genotype-to-Phenotype Relationships.** *Cell systems*
Jakobson, C. M., Jarosz, D. F.
2019
- **Molecular drivers and epigenetic modifiers of complex heritability revealed by a natural genotype-to-phenotype map**
Jakobson, C., Aguilar-Rodriguez, J., Jarosz, D.
AMER CHEMICAL SOC.2019
- **More than Just a Phase: Prions at the Crossroads of Epigenetic Inheritance and Evolutionary Change** *JOURNAL OF MOLECULAR BIOLOGY*
Chakravarty, A. K., Jarosz, D. F.
2018; 430 (23): 4607-18
- **Mutations, protein homeostasis, and epigenetic control of genome integrity.** *DNA repair*
Xie, J. L., Jarosz, D. F.
2018
- **More than Just a Phase: Prions at the Crossroads of Epigenetic Inheritance and Evolutionary Change.** *Journal of molecular biology*
Chakravarty, A. K., Jarosz, D. F.
2018
- **Organizing biochemistry in space and time using prion-like self-assembly.** *Current opinion in systems biology*
Jakobson, C. M., Jarosz, D. F.
2018; 8: 16-24
- **High-throughput Screening for Protein-based Inheritance in *S. cerevisiae*** *JOVE-JOURNAL OF VISUALIZED EXPERIMENTS*
Byers, J. S., Jarosz, D. F.
2017

- **Old moms say, no Sir.** *Science (New York, N.Y.)*
Gitler, A. D., Jarosz, D. F.
2017; 355 (6330): 1126-1127
- **Meeting Report on Experimental Approaches to Evolution and Ecology Using Yeast and Other Model Systems.** *G3 (Bethesda, Md.)*
Jarosz, D., Dudley, A. M.
2017
- **Pernicious pathogens or expedient elements of inheritance: the significance of yeast prions.** *PLoS pathogens*
Byers, J. S., Jarosz, D. F.
2014; 10 (4)
- **Pernicious pathogens or expedient elements of inheritance: the significance of yeast prions.** *PLoS pathogens*
Byers, J. S., Jarosz, D. F.
2014; 10 (4)
- **Rebels with a cause: molecular features and physiological consequences of yeast prions** *FEMS YEAST RESEARCH*
Garcia, D. M., Jarosz, D. F.
2014; 14 (1): 136-147
- **HSP90 at the hub of protein homeostasis: emerging mechanistic insights** *NATURE REVIEWS MOLECULAR CELL BIOLOGY*
Taipale, M., Jarosz, D. F., Lindquist, S.
2010; 11 (7): 515-528
- **A DinB variant reveals diverse physiological consequences of incomplete TLS extension by a Y-family DNA polymerase** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Jarosz, D. F., Cohen, S. E., Delaney, J. C., Essigmann, J. M., Walker, G. C.
2009; 106 (50): 21137-21142
- **Song: SOS (To the Tune of ABBA's "SOS").** *Biochemistry and molecular biology education*
Simon, S. M., Waters, L. S., Jarosz, D. F., Beuning, P. J.
2009; 37 (5): 316-?
- **UmuD and RecA directly modulate the mutagenic potential of the Y family DNA polymerase DinB** *MOLECULAR CELL*
Godoy, V. G., Jarosz, D. F., Simon, S. M., Abyzov, A., Ilyin, V., Walker, G. C.
2007; 28 (6): 1058-1070
- **DNA polymerase V allows bypass of toxic guanine oxidation products in vivo** *JOURNAL OF BIOLOGICAL CHEMISTRY*
Neeley, W. L., Delaney, S., Alekseyev, Y. O., Jarosz, D. F., Delaney, J. C., Walker, G. C., Essigmann, J. M.
2007; 282 (17): 12741-12748
- **Proficient and accurate bypass of persistent DNA lesions by DinB DNA polymerases** *CELL CYCLE*
Jarosz, D. F., Godoy, V. G., Walker, G. C.
2007; 6 (7): 817-822
- **Y-family DNA polymerases in Escherichia coli** *TRENDS IN MICROBIOLOGY*
Jarosz, D. F., Beuning, P. J., Cohen, S. E., Walker, G. C.
2007; 15 (2): 70-77
- **Y-family DNA polymerases respond to DNA damage-independent inhibition of replication fork progression** *EMBO JOURNAL*
Godoy, V. G., Jarosz, D. F., Walker, F. L., Simmons, L. A., Walker, G. C.
2006; 25 (4): 868-879
- **Characterization of Escherichia coli translesion synthesis polymerases and their accessory factors** *DNA REPAIR, PT A*
Beuning, P. J., Simon, S. M., Godoy, V. G., Jarosz, D. F., Walker, G. C.
2006; 408: 318-340