



Daniel Jarosz

Associate Professor of Chemical and Systems Biology and of Developmental Biology

CONTACT INFORMATION

- **Administrative Contact**

Katie Field

Email kfield1@stanford.edu

Tel (650) 723-1380

Bio

BIO

Dr. Jarosz is an Associate 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. Dan 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, Dan 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. The Jarosz lab 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. Dan 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 Dan 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, Dan 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

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

ADMINISTRATIVE APPOINTMENTS

- Guest Professor, D-BIOL/Institut für Biochemie, ETH-Zürich, Switzerland, (2020-2020)

HONORS AND AWARDS

- Chipperfield Lecture, MIT (2020)
- Hogg Distinguished Lecture, MD Anderson Cancer Center (2018)
- Faculty Scholar, Bert and Kuggie Vallee Foundation (2017)
- Award for Research in Biological Mechanisms of Aging, Glenn Foundation (2016)
- Director's New Innovator Award, NIH (2015)
- Science and Engineering Fellow, David and Lucile Packard Foundation (2015)
- Kimmel Scholar, Sidney Kimmel Foundation for Cancer Research (2015)
- NSF-CAREER Award, National Science Foundation (2015)
- Searle Scholar, Kinship Foundation/Chicago Community Trust (2014)
- Pathway to Independence (K99/R00) Award, National Institutes of Health (2011)
- 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

2023-24

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)
- Advanced Seminar in Microbial Molecular Biology: BIO 346, CSB 346, GENE 346 (Spr)
- Foundations in Experimental Biology: BIOS 200 (Aut)
- Methods and Logic in the Biosciences: CSB 221 (Win)
- Public Speaking Bootcamp: How to Give a Stronger Presentation: BIOS 231 (Win)
- Research Seminar: CSB 270 (Aut, Win, Spr)

2022-23

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)
- Advanced Seminar in Microbial Molecular Biology: BIO 346, CSB 346, GENE 346 (Spr)
- Chemical and Systems Biology Bootcamp: CSB 201 (Aut)
- Foundations in Experimental Biology: BIOS 200 (Aut)
- Prions in Health & Disease: BIOS 277 (Aut)
- Public Speaking Bootcamp: How to Give a Stronger Presentation: BIOS 231 (Win)
- Research Seminar: CSB 270 (Aut, Win, Spr)

2021-22

- Advanced Cell Biology: BIO 214, BIOC 224, MCP 221 (Win)
- Advanced Seminar in Microbial Molecular Biology: BIO 346, CSB 346, GENE 346 (Win)
- 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)
- Proteostasis: guarding the proteome in health and disease: BIOS 287 (Win)
- Public Speaking Bootcamp: How to Give a Stronger Presentation: BIOS 231 (Win)
- Research Seminar: CSB 270 (Aut, Win, Spr)

2020-21

- Advanced Seminar in Microbial 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)
- Research Seminar: CSB 270 (Aut, Win, Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Gabriel Amador, Katie Ferrick, James Hemker, Jo-Hsi Huang, Christina Jensen, Joseph Park, Angela Pogson, Hannah Rosenblatt, Liesl Strand, John Vaughen, Ali Wilkening, Eric Wong, Olivia Zhou

Postdoctoral Faculty Sponsor

Wouter Huiting, Sandro Meier

Doctoral Dissertation Advisor (AC)

Andres Iglesias-Thome, Isabel Larus, Alex Van Elgort, Sifei Yin

Doctoral Dissertation Co-Advisor (AC)

Theo Yang

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

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

Publications

PUBLICATIONS

- **Defining the condensate landscape of fusion oncoproteins.** *Nature communications*
Tripathi, S., Shirnekhi, H. K., Gorman, S. D., Chandra, B., Baggett, D. W., Park, C. G., Somjee, R., Lang, B., Hosseini, S. M., Pioso, B. J., Li, Y., Iacobucci, I., Gao, et al
2023; 14 (1): 6008
- **Biomolecular Condensation: A New Phase in Cancer Research.** *Cancer discovery*
Chakravarty, A. K., McGrail, D. J., Lozanoski, T. M., Dunn, B. S., Shih, D. J., Cirillo, K. M., Cetinkaya, S. H., Zheng, W. J., Mills, G. B., Yi, S. S., Jarosz, D. F., Sahni, N.
2022: OF1-OF13
- **A colloidal polymer model for the condensate of intrinsically disordered proteins**
Yang, T., Jarosz, D., Zia, R. N.
CELL PRESS.2022: 199A
- **Massive QTL analysis identifies pleiotropic genetic determinants for stress resistance, aroma formation, and ethanol, glycerol and isobutanol production in *Saccharomyces cerevisiae*.** *Biotechnology for biofuels*
Ho, P., Piampongsant, S., Gallone, B., Del Cortona, A., Peeters, P., Reijbroek, F., Verbaet, J., Herrera, B., Cortebeek, J., Nolmans, R., Saels, V., Steensels, J., Jarosz, et al
2021; 14 (1): 211
- **Metabolites control stress granule disassembly.** *Nature cell biology*
Jakobson, C. M., Jarosz, D. F.
2021
- **Protein aggregation and the evolution of stress resistance in clinical yeast.** *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*
Chen, Y. R., Ziv, I., Swaminathan, K., Elias, J. E., Jarosz, D. F.
2021; 376 (1826): 20200127
- **Protein self-assembly: A new frontier in cell signaling.** *Current opinion in cell biology*
Saad, S., Jarosz, D. F.

2021; 69: 62–69

- **The hunt for ancient prions: Archaeal prion-like domains form amyloid-based epigenetic elements.** *Molecular biology and evolution*
Zajkowski, T. n., Lee, M. D., Mondal, S. S., Carbajal, A. n., Dec, R. n., Brennock, P. D., Piast, R. W., Snyder, J. E., Bense, N. B., Dzwolak, W. n., Jarosz, D. F., Rothschild, L. J.
2021
- **A prion accelerates proliferation at the expense of lifespan.** *eLife*
Garcia, D. M., Campbell, E. A., Jakobson, C. M., Tsuchiya, M., Shaw, E. A., DiNardo, A. L., Kaeberlein, M., Jarosz, D. F.
2021; 10
- **A Prion Epigenetic Switch Establishes an Active Chromatin State.** *Cell*
Harvey, Z. H., Chakravarty, A. K., Futia, R. A., Jarosz, D. F.
2020
- **Both ROSy and Grim: The Landscape of Protein Redox during Aging.** *Cell metabolism*
Chen, Y. R., Jarosz, D. F.
2020; 31 (4): 662–63
- **Phase separation: from phenomenon to function.** *Molecular biology of the cell*
Woodruff, J. n., Jarosz, D. n.
2020; 31 (6): 405
- **What Has a Century of Quantitative Genetics Taught Us About Nature's Genetic Toolkit?** *Annual review of genetics*
Jakobson, C. M., Jarosz, D. F.
2020
- **Widespread Prion-Based Control of Growth and Differentiation Strategies in *Saccharomyces cerevisiae*.** *Molecular cell*
Itakura, A. K., Chakravarty, A. K., Jakobson, C. M., Jarosz, D. F.
2019
- **A Non-amyloid Prion Particle that Activates a Heritable Gene Expression Program.** *Molecular cell*
Chakravarty, A. K., Smejkal, T., Itakura, A. K., Garcia, D. M., Jarosz, D. F.
2019
- **Molecular Origins of Complex Heritability in Natural Genotype-to-Phenotype Relationships** *CELL SYSTEMS*
Jakobson, C. M., Jarosz, D. F.
2019; 8 (5): 363–+
- **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
- **It's not magic-Hsp90 and its effects on genetic and epigenetic variation** *SEMINARS IN CELL & DEVELOPMENTAL BIOLOGY*
Zabinsky, R. A., Mason, G., Queitsch, C., Jarosz, D. F.
2019; 88: 21–35
- **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
- **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
- **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
- **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
- **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
- **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
- **Meeting Report on Experimental Approaches to Evolution and Ecology Using Yeast and Other Model Systems.** *G3 (Bethesda, Md.)*
Jarosz, D., Dudley, A. M.
2017
- **High-throughput Screening for Protein-based Inheritance in *S. cerevisiae*** *JOVE-JOURNAL OF VISUALIZED EXPERIMENTS*
Byers, J. S., Jarosz, D. F.
2017
- **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
- **Old moms say, no Sir.** *Science (New York, N.Y.)*
Gitler, A. D., Jarosz, D. F.
2017; 355 (6330): 1126–1127
- **Amyloid Prions in Fungi.** *Microbiology spectrum*
Saupe, S. J., Jarosz, D. F., True, H. L.
2016; 4 (6)
- **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
- **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
- **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
- **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
- **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 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

- **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

- **Characterization of Escherichia coli translesion synthesis polymerases and their accessory factors** *DNA REPAIR, PTA*

Beuning, P. J., Simon, S. M., Godoy, V. G., Jarosz, D. F., Walker, G. C.
2006; 408: 318-340