

Randal Halfmann, Ph.D.

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EDUCATION

Massachusetts Institute of Technology, 2004 – 2010

Ph.D., Biology

Thesis: *Discovery and Characterization of Prions in Saccharomyces cerevisiae*

Texas A&M University, 2000-2004

B.S., Genetics, *summa cum laude*

HONORS

Endowed Scholar, UT Southwestern Medical Center, 2015 (declined)

CPRIT (Cancer Prevention Research Institute of Texas) Scholar, 2015 (declined)

NIH Director's Early Independence Award, 2011-2016

Sara and Frank McKnight Independent Postdoctoral Fellow, 2011-2015

Protein Society Young Investigator Travel Grants, 2011, 2013

Poster Competition winner, Genetics Society of America Yeast Genetics and Mol. Biology Meeting, 2010

William Asbjornsen Albert Memorial Fellowship nominee, MIT Biology Department, 2009

National Science Foundation Graduate Research Fellowship, 2004-2007

Sigma Genosys Award for Undergraduate Research, 2004

University Undergraduate Research Fellow, Texas A&M University, 2003-2004

Honors Thesis: *Improved cell cycle synchronization and chromosome doubling methods in cotton.*

University Scholar, Texas A&M University, 2001-2004

Lechner Honors Scholar, Texas A&M University, 2000-2004

RESEARCH EXPERIENCE AND INTERESTS

Stowers Institute for Medical Research

Assistant Investigator, Aug. 2015 to present

- Quantitative prion biology
- Contributions of nucleated protein phase separations to cell identity
- Metabolic divisions of labor in *S. cerevisiae* communities

University of Kansas Medical Center

Assistant Professor, April 2016 to present

Department of Molecular & Integrative Physiology

UT Southwestern Medical Center, 2011-2015

Sara and Frank McKnight Independent Postdoctoral Fellow, Dept. of Biochemistry

- Protein polymerization as a paradigm for gene regulation

Whitehead Institute for Biomedical Research, 2005-2010

Laboratory of Susan Lindquist, Ph.D.

- Cell and evolutionary biology of prions and prion regulation in *S. cerevisiae*
- Biochemistry of amyloidogenic proteins

Texas A&M University, 2002-2004

Laboratory of David Stelly, Ph.D.

- Plant cytogenetics
- Novel techniques for cell cycle manipulation

PUBLICATIONS

(corresponding authorship; *equal authorship)

RESEARCH PAPERS

Zhang XF, Sun R, Guo Q, Zhang S, Meulia T, **Halfmann R**, Li D, Qu F. (2017) A self-perpetuating repressive state of a viral replication protein blocks superinfection by the same virus. *PLoS Pathogens* 13(3): e1006253

Close DW, Don Paul C, Langan PS, Wilce MC, Traore DA, **Halfmann R**, Rocha R, Waldo GS, Payne RJ, Rucker JB, and Prescott M. (2015) TGP, an extremely stable, non-aggregating fluorescent protein created by structure-guided surface engineering. *Proteins: Structure, Function, and Bioinformatics* 83(7), 1225-1237.

Cai X, Chen J, Xu H, Liu S, Jiang Q, **Halfmann R**, and Chen ZJ. (2014) Prion-like polymerization underlies signal transduction in antiviral immune defense and inflammasome activation. *Cell* 156(6), 1207-1222.

Holmes DL, Lancaster AK, Lindquist S, and **Halfmann R**. (2013) Heritable remodeling of yeast multicellularity by an environmentally responsive prion. *Cell* 153(1), 153-165.

Wang G, Wang X, Yu H, Wei S, Williams N, Holmes DL, **Halfmann R**, Naidoo J, Wang L, Li L, Chen S, Harran P, Lei X, Wang X. (2013) Small-molecule activation of the TRAIL receptor DR5 in human cancer cells. *Nature Chemical Biology* 9, 84–89.

Halfmann R*, Wright J*, Alberti S, Lindquist S, Rexach M. (2012). Prion formation by a yeast GLFG nucleoporin. *Prion* 6(4).

Halfmann R*, Jarosz DF*, Jones SK, Chang A, Lancaster AK, Lindquist S. (2012). Prions are a common mechanism for phenotypic inheritance in wild yeasts. *Nature* 482(7385), 363-8.

Halfmann R*, Alberti S*, Krishnan R, Lyle N, Pappu R, Lindquist S. (2011). Opposing effects of glutamine and asparagine govern prion formation by intrinsically disordered proteins. *Molecular Cell* 43(1), 72-84.

O'Donnell CW, Waldispühl J, Lis M, **Halfmann R**, Devadas S, Lindquist S, Berger B. (2011). A method for probing the mutational landscape of amyloid structure. *Bioinformatics* 27(13):i34-42

Alberti S*, **Halfmann R***, King O, Kapila A, and Lindquist S. (2009). A systematic survey identifies prions and illuminates sequence features of prionogenic proteins. *Cell* 137, 146-58.

Halfmann R and Lindquist S. (2008). Screening for Amyloid Aggregation by Semi-Denaturing Detergent-Agarose Gel Electrophoresis. *Journal of Visualized Experiments* 17.

Douglas P, Treusch S, Ren H, **Halfmann R**, Duennwald M, Lindquist S, and Cyr D. (2008). Chaperone-dependent amyloid assembly protects cells from prion toxicity. *Proc. Natl. Acad. Sci. USA* 105, 7206-7211.

Halfmann R, Stelly DM, and Young DH. (2007). Towards Improved Cell Cycle Synchronization and Chromosome Preparation Methods in Cotton. *Journal of Cotton Science* 11:60–67.

REVIEWS AND PERSPECTIVES

Halfmann R. (2016). A glass menagerie of low complexity sequences. *Current Opinion in Structural Biology* 38, 9–16.

Halfmann R, Lindquist S. (2010). Epigenetics in the extreme: Prions and the inheritance of environmentally acquired traits. *Science* 330(6004), 629-32.

Alberti S, **Halfmann R**, and Lindquist S. (2010). Biochemical, cell biological and genetic assays to analyze amyloid and prion aggregation in yeast. For: *Guide to Yeast Genetics: Functional Genomics, Proteomics, and Other Systems Analysis, 2nd Ed. Methods in Enzymology* 470, 709-731.

Halfmann R, Alberti S, Lindquist S. (2010). Prions, protein homeostasis, and phenotypic diversity. *Trends in Cell Biology* 20, 125-33.

SELECTED TALKS

Collective Behavior in a Unicellular Eukaryote. Conflict and Cooperation in Cellular Populations. NCBS-Instem, Bangalore, India. 16 Oct. 2016

Quantitative Prion Biology. University of Pennsylvania, student-invited Biochemistry Seminar Series. Philadelphia, PA. 29 Sep. 2016

The Social Lives of Prions. FASEB Molecular Mechanisms and Physiological Consequences of Protein Aggregation. West Palm Beach, FL. 24 June 2015.

Functional prion-like signaling in mammals. Prion 2015. Fort Collins, CO. 29 May 2015

Detection and Functional Characterization of Prion-Like Protein Self-Assembly. NIH Common Fund High-Risk High-Reward Symposium. National Institutes of Health, Bethesda, MD. 17 Dec. 2014

Cheaters do Prosper: Reciprocal cheating drives epigenetic switching of facultative multicellularity. Genetics Society of America Yeast Genetics and Mol. Biology Meeting. Seattle, WA. 1 Aug. 2014

Social behaviors driven by protein aggregation in budding yeast. Invited talk. Harvard FAS Center for Systems Biology. Cambridge, MA. 25 Sep. 2013

Prion-driven multicellularity in budding yeast. Invited Talk. Gordon Conference on Stress Proteins in Growth, Development and Disease. Mt. Snow, VT. 10 July 2013

TEACHING, MENTORING, AND PUBLIC OUTREACH

Graduate Cell Biology: fall of 2015, 2016

- One of four regular lecturers on advanced topics in Cell Biology

Trainees

- Jianzheng Wu, KU Medical Center PhD student (05/2016 – present)

- Tejbir Kandola, Open University PhD student (02/2017 – present)
- Shriram Venkatesan, Postdoc (03/2016 – present)
- Tarique Khan, Postdoc (09/2013 – present)
- Xin Cai, UT Southwestern MD/PhD student, comentored (11/2011 – 06/2014)

Contributor to *The Scientist* magazine: 01/01/2014

- Authored "[The Bright Side of Prions](#)", an article that explains current topics in prion biology to a general audience.

Guest speaker for The TWiT Netcast Network: 06/04/2010

- [Futures in Biotech 57](#): Mechanisms Of Non-Mendelian Inheritance In Evolution.

iBioSeminars: 8/2009

- Authored online educational tools (lecture notes, questions, assignments) to accompany Susan Lindquist's lecture: "[The Surprising World of Prion Biology](#)"

Mentor, Undergraduate Research Opportunities Program: MIT, 2/2008 – 12/2008

- Provided guidance and training in molecular biology for a biology undergraduate.

Teaching Assistant: The Protein Folding Problem, MIT, fall 2007

- Prepared and delivered lectures and accompanying assignments on protein folding experimental techniques to undergraduate and graduate students.

Teaching Assistant: Experimental Molecular Biology: Biotechnology III, MIT, spring 2006

- Provided guidance and technical expertise for undergraduates while they developed independent semester-long projects in a molecular biology lab.

PROFESSIONAL

Memberships: Protein Society, Genetics Society of America, American Society for Cell Biology
 Ad Hoc Reviewer: NIH, Wellcome Trust, PNAS, Science, PLoS Genetics, PLoSOne, Prion, JoVE, FEMS Yeast Research, Proteomics, Seminars in Cell and Developmental Biology, Journal of Molecular Biology, Biology Open, Cell Reports

REFERENCES

Steven McKnight, PhD

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