Griffin Chure | Curriculum Vitae

Division of Chemistry & Chemical Engineering
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Education

ASc. General Studies, Utah State University, *2009*
BSc. Biology - Cell & Molecular Emphasis (Honors), University of Utah, *2013*
BSc. Chemistry - Biological Emphasis & Minor Physics, University of Utah, *2013*
PhD. Biochemistry & Molecular Biophysics - California Institute of Technology, *Expected 2019*
- *Thesis topic:* Predictive versatility of the Monod-Wyman-Changeux model of allostery in the context of transcriptional regulation.
- *Thesis adviser:* Professor Rob Phillips

Professional Employment

January 2010 - May 2013: Research assistant, Department of Biology, University of Utah. Biochemical assembly and architectural consequences of the bacterial flagellar motor. *Supervisor:* Prof. David F. Blair

May 2014 - Present: Graduate Student, Department of Chemistry & Chemical Engineering, California Institute of Technology. *Supervisor:* Prof. Rob Phillips. Faculty of both Physiology and Physical Biology of the Cell Summer Courses at the Marine Biological Laboratory, where we teach students the principles of computer programming and practical optics.

Academic Honors

University of Utah (2009 - 2013):

- Honors at Entrance Scholarship (2009 - 2013)
- Robert C. Byrd Scholarship (2009 - 2011)
- New Century Scholarship (2009 - 2013)

California Institute of Technology (2013 - Present):

- NIH Molecular Biology Training Grant (2014 - 2016)
- NSF GRFP Honorable Mention (2015)

Research Accomplishments

A predictive theory of allosteric induction

In this work, we present a statistical mechanical model of allostery in the context of transcriptional regulation using the Monod-Wyman-Changeux model. We rigorously tested predictions resulting from this model experimentally using a ubiquitous regulatory architecture found in bacteria, the simple

repression motif. The model quantiatively captures the diverse phenomenology of the induction profiles, allowing us to collapse all data onto a single master curve. This theory is presented in general terms, allowing it to be applied to a wide range of regulatory architectures. *Research performed with Manuel Razo-Mejia, Nathan M. Belliveau, Stephanie L. Barnes, Tal Einav, Mitchell Lewis, and Rob Phillips. Manuscript published as Razo-Mejia et al. in Cell Systems (6), 2018.*

Current Resarch

Physiological perturbations and thermodynamic models in Biology

Much of our theoretical work on transcriptional regulation has been tested in bacteria growing in a minimal medium supplemented with glucose held at 37°C while shaking at 225 RPM. Howefver, none of these specific growth conditions are captured in our models. I am currently trynig to perturb some of these "standard" growth conditions in a predictive manner such that changing to different carbon sources or temperatures does not require complete redetermination of the biophysical paramters. *Research peformed with Rob Phillips.*

Mapping mechanosensitive channel abundance to single-cell survival after hypo-osmotic shock

Rapid changes in extracellular osmolarity is a potentially fatal insult that microbes face on a daily basis. One mechanism to counter the flux of water across the cell membrane from a shock is through the opening of tension-sensing channels known as mechanosensitive channels. MscL is the most abundant mechanosensitive channel in *E. coli* and the most heavily studied, though it's contribution to cell survival rates remains enigmatic. In this work, we use single-cell quantitative microscopy to count the number of MscL channels per cell and directly map the copy number to a cell's probability of survival under hypo-osmotic shock. *Research performed with Heun Jin Lee and Rob Phillips. Manuscript in preparation.*

Publications

† *indicates equal contribution*

1. Manuel Razo-Mejia †, Stephanie L. Barnes †, Nathan M. Belliveau †, **Griffin Chure †**, Tal Einav †, Mitchell Lewis, Rob Phillips (2018) Tuning transcriptional regulation through signaling: A predictive theory of allosteric induction. *Cell Systems* (6). doi:10.1101/111013.

Conferences Attended

"A Predictive Theory of Allosteric Regulation in Transcription." American Physical Society 2018 March Meeting.

Teaching

California Institute of Technology

- Physical Biology of the Cell (with Justin Bois) - TA - *2018*
- Physical Biology Bootcamp (with Rob Phillips) - Optics TA - *2017, 2018*
- Bi1: Principles of Biology (with Rob Phillips) - Head TA - *2017*
- Data Analysis in the Biological Sciences (with Justin Bois) - TA - *2016, 2017*
- Programming for the Biological Sciences (with Justin Bois) - TA - *2016*

- Bi1x: The Great Ideas of Biology (with Justin Bois) - TA - *2014, 2015*

Extramural

- MBL Physical Biology of the Cell - Optics TA - *2018*
- MBL Physiology Course - MATLAB Instructor (with James Boedicker) - *2017*
- MBL Physiology Course - Research TA - *2015, 2016, 2017, 2018*
- GIST (Gwangju, PRK) Physical Biology of the Cell - Programming TA - *2016, 2017*
- KITP Evolutionary Cell Biology - Research and Programming TA - *2015*
- CSHL Physical Biology of the Cell - Programming TA - *2015*

University of Utah

- Advanced Biochemistry Lab (with David Goldenberg) - TA - *2013*
- Principles of Genetics (with J.S. Parkinson) - TA - *Sp. 2012, Fa. 2012*
- Biosciences Research Bootcamp (with Rosemary Gray) - TA - *2010*
- Introduction to Biology (with Tanya Vickers) - TA - *2010*

Service & Leadership

- Biochemistry & Molecular Biophysics Graduate Student Council - Co-chair - *2015-2018*
- Caltech RISE High School Mentoring Program - Biology & Physics Tutor - *2015-2016*
- Caltech SURF - Research Mentor - *2015*
- Caltech SURF - Presentation Judge - *2014*