

Griffin Chure, PhD | Curriculum Vitae

Current as of March 8, 2022

NSF Postdoctoral Research Fellow
Department of Biology
Stanford University
Stanford, CA, USA

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Education

PhD. Biochemistry & Molecular Biophysics – California Institute of Technology, 2020
Thesis topic: The Molecular Biophysics of Physiological and Evolutionary Adaptation
Thesis adviser: Professor Rob Phillips

BSc. Chemistry – Biological Emphasis & Minor Physics, University of Utah, 2013

BSc. Biology – Cell & Molecular Emphasis (Honors), University of Utah, 2013

ASc. General Studies, Utah State University, 2009

Professional Employment

January 2021 – Present: NSF Postdoctoral Research Fellow – Department of Biology, Stanford University, Stanford, CA, USA.
Supervisor: Asst. Prof. Jonas Cremer.

July 2020 – December 2020: Postdoctoral Scholar – Department of Applied Physics and Materials Science, California Institute of Technology, Pasadena, CA, USA.
Supervisor: Prof. Rob Phillips.

September 2013 – June 2020: Graduate Student – Division of Biology and Biological Engineering, California Institute of Technology, Pasadena, CA, USA.
Supervisor: Prof. Rob Phillips.

January 2010 – May 2013: Research assistant, Department of Biology, University of Utah, Salt Lake City, UT, USA.
Supervisor: Prof. David F. Blair.

Publications

↗ contributed equally

- Griffin Chure**[↗], Rachel A. Banks[↗], Avi I. Flamholz, Nicholas S. Sarai, Mason Kamb, Ignacio Lopez-Gomez, Yinon M. Bar-On, Ron Milo, and Rob Phillips (2022). "Anthroponumbers.org: A Quantitative Database of Human Impacts on Planet Earth." *preprint on bioRxiv* doi: 10.1101/2022.03.04.483053. [Anthroponumbers.org](https://anthroponumbers.org)
- Griffin Chure** and Jonas Cremer (2022). "An Optimal Regulation of Fluxes Dictates Microbial Growth In and Out of Steady-State." *preprint on bioRxiv*. doi: 10.1101/2022.01.27.477569 [Paper website](#) and [GitHub repository](#)
- Nathan M. Belliveau[↗], **Griffin Chure**[↗], Christina L. Heuschen, Hernan G. Garcia, Jane Kondev, Daniel S. Fisher, Julie A. Theriot, and Rob Phillips (2021). "Fundamental limits on the rate of bacterial growth and their influence on proteomic composition." *Cell Systems* **12**. doi: 10.1016/j.cels.2021.06.002 [Paper website](#) and [GitHub repository](#).
 - Selected as the cover article for the September 2021 Issue.

9. **Griffin Chure**, Rachel A. Banks, Avi I. Flamholz, Nicholas S. Sarai, Mason Kamb, Ignacio Lopez-Gomez, Yinon M Bar-On, Ron Milo, and Rob Phillips (2020). "The Anthropocene by the Numbers: A Quantitative Snapshot of Humanity's Influence on the Planet". *Preprint on the arXiv*. arXiv:2101.09620. [Graphical Version](#) and [The Human Impacts Database](#)
8. Manuel Razo-Mejia, Sarah S. Marzen, **Griffin Chure**, Muir Morrison, Rachel Taubman, and Rob Phillips (2020). "First-principles prediction of the information processing capacity of a simple genetic circuit." *Physical Review E*. **102**, 022404. doi: 10.1103/PhysRevE.102.022404. [Paper website](#) and [GitHub repository](#)
 - Identified as an "Editor's Suggestion" for August 2020 issue
7. **Griffin Chure**, Zofii A. Kaczmarek, and Rob Phillips (2019). "Physiological Adaptability and Parametric Versatility in a Simple Genetic Circuit." *Preprint on bioRxiv*. doi: 10.1101/2019.12.19.878462. [Paper website](#) and [GitHub repository](#)
6. Soichi Hirokawa, **Griffin Chure**, Nathan M. Belliveau, Geoffrey A. Lovely, Michael Anaya, David G. Schatz, David Baltimore, and Rob Phillips (2019). "Sequence-Dependent Dynamics of Synthetic and Endogenous RSSs in V(D)J Recombination." *Nucleic Acids Research*. doi: 10.1093/nar/gkaa418. [Paper website](#) and [GitHub repository](#)
5. Kathrin S. Laxhuber, Muir J. Morrison, **Griffin Chure**, Nathan M. Belliveau, Charlotte Strandkvist, Kyle L. Naughton, and Rob Phillips (2020). "Theoretical investigation of a genetic switch for metabolic adaptation." *PLoS ONE*. 15(5). doi: 10.1371/journal.pone.0226453.g001
4. **Griffin Chure**, Manuel Razo-Mejia, Nathan M. Belliveau, Tal Einav, Zofii Kaczmarek, Stephanie L. Barnes, Mitchell Lewis, and Rob Phillips (2019). "Predictive shifts in free energy couple mutations to their phenotypic consequences." *PNAS*. 116(35). doi: 10.1073/pnas.1907869116. [Paper website](#) and [GitHub repository](#)
3. Rob Phillips, Nathan M. Belliveau, **Griffin Chure**, Manuel Razo-Mejia, Clarissa Scholes, and Hernan G. Garcia (2019). "Figure 1 Theory Meets Figure 2 Experiments in the Study of Gene Expression." *Annual Reviews of Biophysics*, Volume 48. doi:10.1146/annurev-biophys-052118-115525
2. **Griffin Chure**, Heun Jin Lee, Akiko Rasmussen, and Rob Phillips (2018). "Connecting the dots between osmotic shock, mechanosensitive channel abundance, and survival at single-cell resolution." *Journal of Bacteriology*. 200(23). doi: 10.1128/JB.00460-18. [Paper website](#) and [GitHub repository](#)
 - Selected as "an article of significant interest" for the December 2018 issue.
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. [Paper website](#) and [GitHub repository](#)
 - Featured in "Splitting the World with Absolute Measurements: A Call for Collaborations in Physical Biology." by Quincey Justman. *Cell Systems* (6), 2018.

Theses

2. **Griffin Chure** (2020). "The Molecular Biophysics of Evolutionary and Physiological Adaptation." Doctoral Thesis at the California Institute of Technology. doi: 10.7907/q8h6-xr92. [Open Access PDF](#), [Online Version](#), and [GitHub Repository](#)
1. **Griffin Chure** (2013). "FlhE influences cellular morphology through control of flagellar assembly in *Escherichia coli*." Undergraduate Honors Thesis at the University of Utah. ARK ID: [87278/s6cc490z](#).

Conference Presentations

5. **Griffin Chure** and Jonas Cremer. "Analytical Descriptions of Fundamental Constraints in Protein Synthesis and Microbial Growth." Oral Presentation at the American Physical Society March Meeting (Chicago, IL, USA), 2022.

4. **Griffin Chure** and Rob Phillips. "The Molecular Biophysics of Adaptation". Poster Presentation at the Biophysical Society Annual Meeting (San Diego, CA), 2020. doi: 10.1016/j.bpj.2019.11.2983
3. **Griffin Chure**. "The Energetics of Molecular Adaptation". Oral Presentation at the summer course "From Molecular Basis to Predictability and Control of Evolution" at NORDITA (Stockholm, Sweden), 2019.
2. **Griffin Chure**, Manuel Razo-Mejia, Stephanie L. Barnes, Nathan M. Belliveau, Tal Einav, Mitch Lewis, and Rob Phillips. "Mutations, Epistasis, and Allostery from a thermodynamic perspective: A predictive theory for transcriptional regulatory networks." Poster presentation at American Society of Cell Biology (San Diego, CA, USA) 2018. Abstract Number P3369
1. **Griffin Chure**, Manuel Razo-Mejia, Stephanie L. Barnes, Nathan M. Belliveau, Tal Einav, Mitch Lewis, and Rob Phillips. "A Predictive Theory of Allosteric Regulation in Transcription." Poster presentation at the American Physical Society March Meeting (Los Angeles, CA, USA), 2018. [Online abstract](#)

Invited Talks

2. **Griffin Chure**. "The Anthropocene by the Numbers." Invited Talk at the Carnegie Institute Department of Global Ecology, 2021.
1. **Griffin Chure**. "How To Live Forever or: How To Make Your Science At Least Outlive You." Invited talk for BEBi103a: Data Analysis in the Biological Sciences at the California Institute of Technology. 2021

Academic Honors and Fellowships

Stanford University (2021 – present):

- National Science Foundation – Postdoctoral Research Fellowship in Biology (2021 – present)

California Institute of Technology (2013 – 2020):

- National Institutes of Health – Molecular Biology Training Grant (2014 – 2016)
- Amgen – Research Fellowship (2015)
- National Science Foundation – Graduate Research Fellowship Honorable Mention (2015)

University of Utah (2009 – 2013):

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

Wet-Lab Skills

- Careful cultivation of bacterial samples for quantitative physiological experiments.
- Modern molecular biology including PCR, multi-fragment Gibson assembly, chromosomal integration, and other skills of genetic engineering.
- High throughput flow cytometry and plate reader operation.
- Practical optics including the ground-up construction of optical tweezers, Total Internal Reflection Fluorescence (TIRF), and line-scan confocal microscopes.
- Extensive experience with time-lapse epifluorescence microscopy of microbial samples.
- Protocol optimization and efficient time management.

Dry-Lab Skills

- Knowledge of equilibrium statistical mechanics, kinetics, probability theory, and their various applications to biological questions.
- Proficient in Bayesian and frequentist statistical inference including high-dimensional hierarchical modeling with Markov chain Monte Carlo.
- Fluent computer programming in Python, Stan, JavaScript, Matlab, and Shell. Intermediate knowledge of R and Julia. Fluent in web-development languages such as Liquid, Sass, Django, and HTML/CSS. Fluent in using LaTeX and Markdown for typesetting.
- Skilled in data presentation/visualization. Can quickly build interactive dashboards for rapid exploration and presentation of high-dimensional data using Python and JavaScript.
- Experienced in computer-aided illustration. Fluent in using Adobe Illustrator to generate publication and textbook quality scientific illustrations.

Teaching

California Institute of Technology

- The Great Human Experiment by the Numbers (with Rob Phillips) – 2020
- Evolution (with Rob Phillips and Victoria Orphan) – 2020
- Physical Biology of the Cell (with Justin Bois) – 2018
- Physical Biology Bootcamp (with Rob Phillips) – Optics TA – 2017, 2018, 2019
- Bi1: Principles of Biology (with Rob Phillips) – 2017
- Data Analysis in the Biological Sciences (with Justin Bois) – 2015, 2016
- Programming for the Biological Sciences (with Justin Bois) – 2016
- Bi1x: The Great Ideas of Biology (with Justin Bois) – 2014, 2015

Extramural

- IBDM (Marseille, FR) Cell Biology by the Numbers – Programming TA – 2018
- MBL (Woods Hole, MA, USA) Physical Biology of the Cell – Optics TA – 2018
- MBL (Woods Hole, MA, USA) Physiology Course – MATLAB Instructor (with James Boedicker)– 2017
- MBL (Woods Hole, MA, USA) Physiology Course – Research TA – 2015, 2016, 2017, 2018
- GIST (Gwangju, PRK) Physical Biology of the Cell – Programming TA – 2016, 2017
- KITP (Santa Barbara, CA, USA) Evolutionary Cell Biology – Research and Programming TA – 2015
- CSHL (Cold Spring Harbor, NY, USA) Physical Biology of the Cell – Programming TA – 2015

University of Utah

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

Service & Leadership

- ENVISION by WiSTEM International Science Competition – Proposal Judge – *2022*
- 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*