

# Griffin Chure, PhD | Curriculum Vitae

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Current as of February 19, 2024

He/Him/His  
Postdoctoral Scholar  
Department of Biology  
Stanford University  
Stanford, CA, USA

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## Education

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**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

*Thesis topic:* The Biochemical Assembly of the Bacterial Flagellar Motor

*Thesis adviser:* Professor David F. Blair

**ASc. General Studies**, Utah State University, 2009

## Professional Employment

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**January 2021 – Present:** Postdoctoral Scholar – Department of Biology, Stanford University, Stanford, CA, USA.

*Supervisor:* Asst. Prof. Jonas Cremer.

*Independently-Funded National Science Foundation Postdoctoral Fellow 2021 - 2023*

**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

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† contributed equally; \* corresponding author

16. **Griffin Chure\*** and Jonas Cremer (2024). "hplc-py: A Python Utility for Rapid Quantification of Complex Chemical Chromatograms." *Journal of Open Source Software* 9(94). doi:10.21105/joss.06270. [Software Documentation](#) and [GitHub repository](#)
15. Markus Arnoldini\*, Richa Sharma†, Claudia Moresi†, **Griffin Chure**, Julien Chabbey, Emma Slack, and Jonas Cremer\* (2024). "Quantifying the Daily Harvest of Fermentation Products From the Human Gut Microbiota." *Preprint on bioRxiv*. doi: 10.1101/2024.01.05.573977 [GitHub Repository](#) and [Paper Website](#)

14. **Griffin Chure**, Roshali T. de Silva, Richa Sharma, Michael C. Lanz, and Jonas Cremer\* (2023). "Stringent Control Over Cytoplasmic and Membrane Densities Defines Cell Geometry In *Escherichia coli*." **Preprint on bioRxiv**. doi: 10.1101/2023.10.28.564462. [GitHub Repository](#)
13. **Griffin Chure**\* and Jonas Cremer\* (2023). "An Optimal Regulation of Fluxes Dictates Microbial Growth In and Out of Steady-State." **eLife**. doi:10.7554/eLife.84878 [Paper website](#) and [GitHub repository](#)
  - Featured Spotlight Article: Avi I. Flamholz and Akshit Goyal (2023). "Matching metabolic supply to demand optimizes microbial growth." **Trends in Microbiology**. doi: 10.1016/j.tim.2023.06.003
12. **Griffin Chure**\* (2022). "Be Prospective, Not Retrospective: A Philosophy for Advancing Reproducibility in Modern Biological Research." **Preprint on ArXiv**. doi:10.48550/arXiv:2210.02593. [Template GitHub repository](#).
11. **Griffin Chure**<sup>†,\*</sup>, Rachel A. Banks<sup>†</sup>, 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." **Patterns** 3 doi: 10.1016/j.patter.2022.100552 [Anthroponumbers.org](#)
  - Selected as the cover article for the September 2022 issue.
  - Featured in "[Anthroponumbers.org compiles data about human-environment interactions into one website](#)" on EurekAlert.org by AAAS.
  - Featured in "[A Quantitative Snapshot of the Human Impact on the Planet](#)" by Lori Dajose at Caltech.
  - Featured in "[Striking Graphs That Show Humanity's Domination of the Earth](#)" by Matt Simon at Wired Magazine.
10. Nathan M. Belliveau<sup>†</sup>, **Griffin Chure**<sup>†</sup>, 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 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**<sup>†</sup>, Heun Jin Lee<sup>†</sup>, 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<sup>†</sup>, Stephanie L. Barnes<sup>†</sup>, Nathan M. Belliveau<sup>†</sup>, **Griffin Chure**<sup>†</sup>, Tal Einav<sup>†</sup>, 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

8. **Griffin Chure**, Roshali T. de Silva, and Jonas Cremer. "A Preservation of Macromolecular Densities Defines Cell Width in *Escherichia coli*." Oral Presentation at the Physics of Life autumn conference at the Chan-Zuckerberg Biohub (San Francisco, CA, USA), Oct. 2023.
7. **Griffin Chure**, Roshali T. de Silva, and Jonas Cremer. "A Preservation of Macromolecular Densities Defines Cell Width in *Escherichia coli*." Oral Presentation at the American Physical Society March Meeting (Las Vegas, NV, USA), Mar. 2023.
6. **Griffin Chure** and Jonas Cremer. "Hail to the Flux: or the Optimal Regulation of Cellular Resources Beyond Steady State" Oral Presentation at the Physics of Life winter conference at the Chan-Zuckerburg Biohub (San Francisco, CA, USA), Jan. 2023. [Video Recording](#)
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), Mar. 2022.
4. **Griffin Chure** and Rob Phillips. "The Molecular Biophysics of Adaptation". Poster Presentation at the Biophysical Society Annual Meeting (San Diego, CA), Jan. 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), Jul. 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) Dec. 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), Mar. 2018. [Online abstract](#)

## Invited Talks

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9. "The Form of Growth and Growth of Form: Understanding Cell Growth and Size Homeostasis From First Principles." Invited Seminar at the Colorado School of Mines for the Quantitative Biosciences and Engineering Seminar Series, 2024
8. "How To Live Forever: Recipes for Reproducibility in the Digital Age." Invited Lecture for a Reproducibility Workshop at UC Berkeley, Summer 2023.
7. "On Fundamental Limits, Degenerate Dimensions, and Serendipitous Consequence in Rapid Cellular Growth." Invited Seminar at the Chan-Zuckerberg Biohub, 2023
6. "The Anthroponumbers: Building Quantitative Literacy for a Human Dominated Planet." Invited lecture for Stanford Course ILAC 105: Climate Change and Latin American Naturecultures, 2023
5. "Hail to the Flux: How An Optimal Allocation of Resources Dictates Microbial Growth" Invited talk at the Cell Size and Growth online seminar series, 2022
4. "How To Live Forever or: How To Make Your Science At Least Outlive You." Invited Seminar at the New Science Foundation, 2022
3. "Boilerplating Reproducible Research in the Era of Digital Everything." Stanford University Ecology & Evolution Lunch Seminar, 2022
2. "The Anthropocene by the Numbers." Invited Speaker at the Carnegie Institute Department of Global Ecology Lunch Seminar Series, 2021.
1. "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. 2020 & 2021

## Academic Honors and Fellowships

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*Stanford University* (2021 – present):

- National Science Foundation – Postdoctoral Research Fellowship in Biology (\$230,000 USD, January 2021 – December 2023)

*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)

## Teaching

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### *California Institute of Technology*

- The Great Human Experiment by the Numbers (with Rob Phillips) – Teaching Assistant – 2020
  - Responsibilities included course development, direct instruction, and mentorship for research projects.
  - Mixed enrollment of graduate and undergraduate students.
- Evolution (with Rob Phillips and Victoria Orphan) – Teaching Assistant – 2020
  - Responsibilities included course development and direct instruction.
  - Undergraduate student enrollment.
- Physical Biology of the Cell (with Justin Bois) – Teaching Assistant – 2018
  - Responsibilities included direct instruction and grading.
  - Mixed enrollment of graduate and undergraduate students.
- Physical Biology Bootcamp (with Rob Phillips) – Optics TA – 2017, 2018, 2019
  - Responsibilities included hands-on instruction of practical optics and ground-up construction of optical tweezers, line-scan confocal, and TIRF microscopes.
  - Enrollment exclusively incoming graduate students.
- Bi1: Principles of Biology (with Rob Phillips) – Head TA – 2017
  - Responsibilities included development of course material, direct instruction, logistical coordination of large TA team, and reporting of final grades.
  - Enrollment exclusively undergraduate students.
- Data Analysis in the Biological Sciences (with Justin Bois) – TA – 2015, 2016
  - Responsibilities included course development, grading of complex research assignments, and direct instruction.
  - Mixed enrollment of undergraduates, graduate students, and auditing postdocs.
- Programming for the Biological Sciences (with Justin Bois) – TA – 2016
  - Responsibilities included course development, direct instruction, and on-the-fly troubleshooting.
  - Mixed enrollment by graduate students and postdocs.
- Bi1x: The Great Ideas of Biology (with Justin Bois) – Head TA – 2014, 2015
  - Responsibilities included development of course material, organization and preparation of laboratory experiments, direct instruction, grading, and maintenance of research grade microscopy resources.
  - Enrollment exclusively undergraduate students.

### **Extramural**

Unless otherwise noted, courses were mixed enrollment of graduate students and postdocs.

- CSHL (Cold Spring Harbor, NY, USA) Physical Biology of the Cell – Computation Instructor – 2023, 2015
- 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 – Undergraduate Students – Programming TA – 2016, 2017
- KITP (Santa Barbara, CA, USA) Evolutionary Cell Biology – Research and Programming TA – 2015

#### **University of Utah**

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

#### **Mentorship**

- Direct supervision and training of 10 rotation graduate students (7 at Caltech, 4 at Stanford)
- Direct supervision and training of 5 undergraduate researchers (2 at University of Utah, 3 at Caltech)

### **Service & Leadership**

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- Stanford Small Science Groups – Research Advisor – *Fall 2023*
- CZ Biohub Physics of Life Conference – Scientific Organizing Committee Member – *Winter and Fall 2023*
- ENVISION by WiSTEM International Science Competition – Proposal Judge – 2022, 2023
- 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