

**FELIX BARBER, PH.D.**

POSTDOCTORAL RESEARCH ASSOCIATE, ROJAS LAB, NEW YORK UNIVERSITY

[felixbarber@nyu.edu](mailto:felixbarber@nyu.edu) | +1 (617) 955-1685 | [felixbarber.com](http://felixbarber.com)**EDUCATION****HARVARD UNIVERSITY**

Cambridge, MA, USA

**Ph.D. in Molecular and Cellular Biology, 2014-2020***Advisors:* Dr. Andrew W. Murray and Dr. Ariel Amir.*Secondary Field:* Computational Science and Engineering.*Honors:* **Harvard Quantitative Biology Student Award (2019); Graduate Society Term-time Research Fellowship (2018); James Mills Peirce Fellowship (2014); William Georgetti Scholarship (2014).***Teaching experience:* Two-time recipient of the **Derek Bok Center Certificate of Distinction in Teaching** as a teaching Fellow for Life Sciences 1A (2015) and for Systems Biology 200 (2016). Life Sciences Teaching Workshop.**UNIVERSITY OF CAMBRIDGE**

Cambridge, Cambridgeshire, UK

**Master of Advanced Study in Theoretical Physics (MASt), 2013-2014***Honors:* **Distinction (equivalent to magna cum laude); Gates-Cambridge Scholarship; Bateman Scholars Prize.***Thesis:* The Bose-Einstein Condensate to BCS Crossover, supervised by Prof. Ben Simons.**VICTORIA UNIVERSITY OF WELLINGTON**

Wellington, NZ

**Bachelor of Science with Honors (BSc Hons), 2009-2013****Majors:** Physics and Mathematics.*Selected Honors:* **University Medal** (equivalent to *summa cum laude*); **First Class Honors** in Physics.*Teaching experience:* **Creativity in Teaching Prize** (2011), lab instructor in PHYS 114 (introductory physics, 2011), lab instructor in PHYS 223 (classical physics, 2013), senior tutor in MATH 244 (differential equations, 2013), senior tutor in MATH 243 (multivariable calculus, 2013).**RESEARCH EXPERIENCE**

2020 - present

**ROJAS LAB, NEW YORK UNIVERSITY**

New York, NY, USA

**Postdoctoral Research Associate—Quantitative Microbiology**

I am presently a postdoc in the lab of Assistant Professor Enrique Rojas, researching the role of wall teichoic acids in fostering rapid growth and cell shape in the Gram-positive bacterium, *Bacillus subtilis*. My research has thus far led to **two forthcoming research articles**: one first-author experimental work, and one second-author theoretical work. My research approach is informed by my background as a physicist and a molecular biologist, and I am primarily driven by the underlying biological question rather than by the application of any specific technique. As such, I use a broad array of experimental, theoretical and computational tools. Experimentally, I am an expert in quantitative microscopy (phase contrast, epifluorescence, confocal, TIRF), genetic engineering (PCR, Sanger sequencing, bacterial transformations, genome sequencing etc.), immunoblot analysis (Western blots, SDS PAGE), and various *in vivo* chemical and enzymatic manipulations. Theoretical and computational techniques that I use include the stochastic mathematical modelling, machine learning, numerical simulation, data analytics, quantitative image analysis, and genomics data analysis. My position provides constant opportunities to mentor and assist junior lab members, and I enjoy this responsibility greatly.

2015 - 2020

**AMIR GROUP AND MURRAY LAB, HARVARD UNIVERSITY**

Cambridge, MA, USA

**PhD Candidate—Quantitative Microbiology**

Working with Professors Andrew Murray and Ariel Amir, I researched the nature of size regulation in budding yeast through a combination of computational, theoretical and experimental approaches. My work resulted in three first-author publications in internationally regarded journals. I developed greatly as a scientist under Andrew's and Ariel's mentorship, gaining expertise in designing and executing advanced microbiology experiments such as yeast genetic manipulations and quantitative live cell microscopy (phase contrast and spinning disc confocal). I also developed theoretically, using stochastic modelling and numerical simulations to understand microbial physiology. Finally, I developed computational expertise in analyzing biological data and developing custom image processing routines that are publicly available for download from my [GitHub page](#).

2015

**PHYSIOLOGY COURSE, MARINE BIOLOGICAL LABORATORY  
Student Participant—Microbial Physiology**

Woods Hole, MA, USA

The MBL Physiology course provided my rigorous grounding in experimental microbiology. There, I used modern microscopy techniques to study diverse biological systems including tardigrades with Professor Bob Goldstein, ctenophores with Professor Alison Sweeney, and the human oral microbiome with Professor Gary Borisy. Specific techniques included fluorescence *in-situ* hybridization, scanning electron microscopy, quantitative fluorescence microscopy, and quantitative image analysis.

- 2013- 2014     **PART III MATHEMATICS, UNIVERSITY OF CAMBRIDGE**     Cambridge, Cambridgeshire, UK  
**Masters Student—Condensed Matter Physics**  
 I reviewed the mathematical formulation of the Bose-Einstein Condensate to BCS Superconducting Crossover under the supervision of Professor Ben Simons. For this project (equivalent to a Master's thesis), and my performance in associated coursework, I was awarded the MAST degree with Distinction.
- 2013     **ETCHEGOIN LAB, VICTORIA UNIVERSITY OF WELLINGTON**     Wellington, NZ  
**Research Assistant—Raman Spectroscopy**  
 In the Etchegoin Lab, I extended their work on Surface Enhanced Raman Spectroscopy in the Kretschmann configuration.
- 2010-2012     **TALLON LAB, INDUSTRIAL RESEARCH LIMITED**     Wellington, NZ  
**Research Student—High Temperature Superconductivity**  
 I worked with Professor Tallon on two projects. First, I extracted superconducting energy gap values from thermodynamic datasets of high-temperature superconductors, finding that, contrary to commonly held beliefs, the superconducting energy gap persisted *below* the critical superconducting temperature. **My contribution led to a second-author research publication.** Additionally, I used neutron diffraction to test the hypothesis that lattice-vibrations could drive the isotope-dependent changes in the critical temperature of high-temperature superconductors.
- 2012     **LEKNER GROUP, VICTORIA UNIVERSITY OF WELLINGTON**     Wellington, NZ  
**Research Student—Electromagnetism**  
 I worked with Professor Lekner to develop new mathematical conservation identities on the properties of electromagnetic Gaussian beams.
- 2011     **VISSER GROUP, VICTORIA UNIVERSITY OF WELLINGTON**     Wellington, NZ  
**Research Student—General Relativity**  
 I worked with Professor Visser to research maximum-entropy constraints on black holes.

## MENTORSHIP EXPERIENCE

- 2022-2024     **MENTOR**     New York, NY, USA  
**Rojas Lab, New York University**  
 I served as the day-to-day mentor for a former Master's student at NYU, Tristan, while he completed his thesis in the Rojas Lab. I continued to mentor Tristan following his graduation, when he joined the Rojas Lab as a Research Assistant. Finally, I was happy to coach Tristan as he applied and prepared for graduate school applications and interviews. Tristan was highly successful in this process, receiving several offers from R1 universities before ultimately joining NYU's Biology PhD program. Tristan is listed as a co-author on our forthcoming paper.
- 2022     **MENTOR, SUMMER UNDERGRADUATE RESEARCH PROGRAM**     New York, NY, USA  
**Rojas Lab, New York University**  
 I selected and mentored two summer research students, Hillary and Fahad, while they completed an experimental research project of my own design. I have maintained contact with both students following their exit from the SURP program, and continue to help them as they progress in their careers. Hillary is applying to medical school this year, and I am proud to be one of her referees. Both Hillary and Fahad come from communities typically underrepresented in science.

## TEACHING EXPERIENCE

- 2023     **GUEST LECTURER, NEW YORK UNIVERSITY**     New York, NY, USA  
**Genetic Circuits 924**

I presented on mathematical models of cell growth and proteome allocation to NYU undergraduates.

- 2016 **OUTREACH GUEST LECTURER, HARVARD UNIVERSITY** Cambridge, MA, USA  
I presented my Ph.D. research to a class of high school students visiting Harvard.
- 2015-2016 **TEACHING FELLOW, HARVARD UNIVERSITY** Cambridge, MA, USA  
**Systems Biology 200, Life Sciences 1A**  
As a teaching fellow for these graduate and undergraduate courses, I selected reading materials from scientific literature, ran small-group discussion-based sections, ran tutorials, held office hours, directed laboratory sessions and assessed in-class presentations. **I received the Bok Center Certificate of Distinction in Teaching twice, for both courses.**
- 2015 **LIFE SCIENCES TEACHING WORKSHOP, HARVARD UNIVERSITY** Cambridge, MA, USA  
This two-day workshop coached me in teaching methodology to ensure student participation, while also helping me to better understand the teacher-student relationship.
- 2014 **GUEST SPEAKER, CAMBRIDGE UNIVERSITY** Cambridge, Cambridgeshire, UK  
I presented my master's research in an outreach lecture as part of the Trinity Hall Scholars Seminar series.
- 2013 **STUDY GUIDE AUTHOR, INSPIRATION EDUCATION** Wellington, NZ  
I wrote commercial-grade, high-school leaver physics study guides for Inspiration Education, a Wellington-based tutoring agency. Doing so required comprehensively evaluating and condensing the NZ National Certificate of Educational Achievement in Physics curriculum into a readily accessible format for high school students.
- 2010-2013 **TEACHING ASSISTANT AND LAB INSTRUCTOR, VICTORIA UNIVERSITY OF WELLINGTON** Wellington, NZ  
**PHYS 114, PHYS 223, MATH 244, MATH 243, Te Āwhina, Laulotaha.**  
I taught and instructed junior courses consistently throughout my undergraduate studies. My responsibilities included running help desks, tutorial sessions, managing active lab components and grading. In addition to formal roles with specific courses, I also taught through Te Āwhina, an academic group dedicated to fostering and celebrating academic performance by Māori students, and Laulotaha, a community program dedicated to increasing academic performance within Wellington's Tongan community.
- 2011 **TEACHING SEMINAR, VICTORIA UNIVERSITY OF WELLINGTON** Wellington, NZ  
This day-long seminar coached me in teaching methodology and academic integrity. As part of this workshop, **I received a prize for my innovative approach to teaching circular motion.**
- 2009-2013 **PRIVATE TUTORING** Wellington, NZ  
I provided private tutoring with tailored study approaches to several high school students throughout my undergrad, preparing them for both high-school leaver and scholarship-level exams.

## ACADEMIC PUBLICATIONS

**Barber, F., Yuan, Z., Akbary, Z., Biboy, J., Vollmer, W., Rojas, E. R.** (2024) Wall teichoic acids regulate peptidoglycan synthesis by paving cell wall microstructure. Preprint at  *biorxiv.org*, <https://doi.org/10.1101/2024.09.02.610702>

Bardetti, P., **Barber, F.**, Rojas, E. R. (2024) Non-linear stress-softening of the bacterial cell wall confers cell shape homeostasis. Preprint at  *biorxiv.org*, <https://doi.org/10.1101/2024.09.03.611099>

**Barber, F.**, Min, J., Murray, A. W., Amir, A. (2021) Modeling the impact of single-cell stochasticity and size control on the population growth rate in asymmetrically dividing cells.  *PLOS Computational Biology*, 17(6), e1009080.

**Barber, F.**, Amir, A., Murray, A. W. (2020). Cell size regulation in budding yeast does not depend on linear accumulation of Whi5.  *Proceedings of the National Academy of Sciences*, 117(25) 14243-14250.

**Barber, F.**, Ho, P. Y., Murray, A., & Amir, A. (2017). Details Matter: noise and model structure set the relationship between cell size and cell cycle timing.  *Frontiers in Cell and Developmental Biology*, 5, 92.

Tallon, J. L., **Barber, F.**, Storey, J. G., & Loram, J. W. (2013). Coexistence of the superconducting energy gap and pseudogap above and below the transition temperature of cuprate superconductors. *Physical Review B*, 87(14), 140508.

## SELECTED TALKS AND POSTER PRESENTATIONS

**Barber, F.**, Zhe, Y., Rojas, E. R. Teichoic acids as master coordinators of growth in *Bacillus subtilis*. *Subtillery* (online). 2024. **Talk.**

**Barber, F.**, Zhe, Y., Rojas, E. R. Teichoic acids as master coordinators of growth in *Bacillus subtilis*. *Bacterial Cell Surfaces Gordon Research Conference*, Portland, Maine, USA. 2024. **Talk and poster.**

**Barber, F.**, Zhe, Y., Rojas, E. R. Teichoic acids as organizing centers for growth in *Bacillus subtilis*. *APS March Meeting*, Las Vegas, USA, 2023. **Talk and poster.**

**Barber, F.**, Amir, A., Murray, A. W. Cell size regulation in budding yeast does not depend on linear accumulation of Whi5. *Northeast Cell Size Meeting*, Cambridge, USA, 2019. **Talk.**

**Barber, F.**, Ho, P. Y., Murray, A., & Amir, A. Details Matter: noise and model structure set the relationship between cell size and cell cycle timing. *FASEB Yeast Chromosome Biology and Cell Cycle Meeting*, Steamboat Springs, USA, 2018. **Poster.**

**Barber, F.**, Ho, P. Y., Murray, A., & Amir, A. Details Matter: noise and model structure set the relationship between cell size and cell cycle timing. *International Physics of Living Systems Annual Meeting*, Rice University, USA, 2018. **Poster.**

**Barber, F.**, Ho, P. Y., Murray, A., & Amir, A. Details Matter: noise and model structure set the relationship between cell size and cell cycle timing. *ASCB | EMBO Meeting*, Philadelphia, USA, 2017. **Poster.**

**Barber, F.** The BEC-BCS Crossover. *Trinity Hall Scholars Seminars*, Cambridge, UK 2014. **Talk.**

## FUNDING AWARDS

2019-2020	<b>Harvard Quantitative Biology Student Award.</b> 50% tuition and stipend coverage for a full academic year at Harvard University.
2018-2019	<b>Graduate Society Term-time Research Fellowship.</b> Complete tuition and stipend coverage for a full academic term at Harvard University.
2014-2017	<b>William Georgetti Trust Scholarship.</b> \$65,000.00 NZD per year for a period of four years, to be used at an institution of my choosing.
2013-2014	<b>Gates Cambridge Scholarship.</b> Full tuition, fees and stipend to complete a postgraduate degree at the University of Cambridge.

## ACADEMIC AWARDS

▪ Harvard Quantitative Biology Student Award	(Harvard, 2019)
▪ <b>Graduate Society Term-time Research Fellowship</b>	(Harvard, 2018)
▪ <b><u>Bok Center Certificate of Distinction in Teaching</u></b>	(Harvard, 2016)
▪ <b><u>Bok Center Certificate of Distinction in Teaching</u></b>	(Harvard, 2015)
▪ Marine Biological Laboratory (MBL) Summer Student Scholarship	(MBL, 2015)
▪ <b>James Mills Peirce Fellowship</b>	(Harvard, 2014)
▪ Distinction in Part III Mathematics	(Cambridge, 2013)
▪ <b><u>Gates-Cambridge Scholarship</u></b>	(Cambridge, 2013)
▪ Bateman Scholars Prize	(Cambridge, 2013)
▪ William Georgetti Trust Scholarship	(2013)

- Gates Cambridge Scholarship (VUW, 2013)
- **VUW Medal for Academic Excellence** (VUW, 2013)
- First Class Honors in Physics (VUW, 2013)
- Victoria Graduate Award (VUW, 2012)
- Australian Institute of Nuclear Science and Engineering (AINSE) Honours Scholarship (AINSE, 2012)
- Florance Prize (VUW, 2012)
- Dan F Jones Scholarship in Science (VUW, 2012)
- Summer Research Scholarship (VUW, 2012)
- Macmorran Prize for Mathematics (VUW, 2011)
- Noel Ryder Prize (VUW, 2011)
- Emily L Johnston Scholarship (VUW, 2011)
- Australian Institute of Nuclear Science and Engineering (AINSE) Winter Scholarship (AINSE, 2011)
- Dean's List for Academic Excellence (VUW, 2011)
- **Teaching Prize in Physics** (VUW, 2011)
- Bruce Dall Prize (VUW, 2010)
- John P Good Memorial Prize (VUW, 2010)
- Victoria School Leaver Award for Academic Excellence (VUW, 2009)
- New Zealand Scholarship Awards in Physics, Calculus and Chemistry (2008)