Curriculum Vitae

Enrique R. Rojas, Ph.D.

Assistant Professor
New York University
Department of Biology
12 Waverly Place
New York, NY 10003

Phone: (415) 819-2582
Email: rojas@nyu.edu
Web: rojaslab.com

Disciplinary Fields: Microbiology, Biophysics, Cell Mechanics, Mathematical Biology

Education

- **Ph.D. Physics**, 2010
  Harvard University, Cambridge, MA
  Ph.D. Thesis Advisor: Jacques Dumais
- **B.S. Physics and Mathematics**, 2004
  University of Pennsylvania, Philadelphia, PA

Employment

- **2018 – Present** — Assistant Professor
  Department of Biology, New York University, New York, NY
- **2017 – 2018** — Visiting Professor
  Department of Microbiology, New York University, New York, NY
  Host: Victor Torres
- **2011 – 2017** — Postdoctoral Researcher
  Departments of Bioengineering and Biochemistry, Stanford University, Stanford, CA
  Advisors: Julie Theriot and K.C. Huang
- **2013 – 2014** — Visiting Scientist in the Molecular Genetics Laboratory at the Institute of Diarrheal Disease Research, Bangladesh
  Host Advisor: Shah Faruque
- **2010 – 2011** — Faculty of Biomedical Physics the Patan Academy of Health Sciences, Patan, Nepal

Awards & Fellowships

- **2019** — NYU Whitehead Fellowship
- **2013** — NIH-Fogarty Global Health Equity Scholars Fellowship

- **2011** — NIH Simbios Distinguished Postdoctoral Fellowship
- **2006** — NSF-IGERT Biomechanics Training Fellowship

External Research Support

- National Science Foundation 2047404 (CAREER)
  "Mechanical control of cellular physiology in bacteria"
  2/1/21-1/31/26
  Role: PI Direct costs: $629,000
- National Institutes of Health 5R35GM143057 (MIRA-ESI)
  "Exploring mechanical mechanisms of antibiotic resistance"
  7/1/21-6/31/26
  Direct costs: $1,250,000
- Packard Fellowship for Science and Engineering
  "Microbes as living materials: understanding the function of the mechanical properties of bacteria during cell growth"
  11/1/21-10/3/26
  Role: PI
  Direct costs: $875,000
- National Institutes of Health 1R01AI168159
  "Mechanistic basis of how L,D-transpeptidases protect against outer membrane defects"
  3/8/22-2/8/27
  Role: co-PI (PI Joseph Boll (UT Dallas), co-PI Waldemar Vollmer (U of Queeensland))
  Direct costs: $258,712

Publications

1. Bardetti P, Barber F, **Rojas ER** (2024) Non-linear stress-softening of the bacterial cell wall confers cell shape homeostasis. *bioRxiv*.

2. Barber F, Yuan Z, Akbary Z, Biboy J, Vollmer W, **Rojas ER** (2024) Wall teichoic acids regulate peptidoglycan synthesis by paving cell wall microstructure. *bioRxiv*.

3. Fitzmaurice DR, Amador A, Starr T, Hocky GM, **Rojas ER** (2024) β-barrel proteins dictate the effect of core oligosaccharide composition on outer membrane mechanics. *bioRxiv*. Accepted with minor revisions at *Biophysical Journal*

4. Benn G, Borrelli, Prakaash D, Johnson ANT, Fideli VA, Starr T, Fitzmaurice DR, Combs AN, Wuhr M, **Rojas ER**, Khalid S, Hoogenboom BW, Silhavy TJ (2024) OmpA controls order in the outer membrane and shares the mechanical load. In press at *Proceedings of the National Academy of Sciences*

5. Ohairwe ME, Zivanovic BE, **Rojas ER** (2024) A fitness landscape instability governs the morphological diversity of tip-growing cells. *Cell Reports* 113961.

6. Kado T, Akbary Z, Motooka D, Sparks IL, Melzer ES, Nakamura S, **Rojas ER**, Morita YS, Siegrist MS (2023) A cell wall synthase accelerates plasma membrane partitioning in mycobacteria. *eLife*. 12:e81924.

7. Mason G, Footer MJ, **Rojas ER** (2023) Mechanosensation induces persistent bacterial growth during bacteriophage predation. *mBio* 14(6):e02766-22.

8. Williams MC, Reker AE, Margolis SR, Liao J, Wiedmann M, **Rojas ER**, Meeske AJ (2023) Restriction endonuclease cleavage of phage DNA enables resuscitation from Cas13-induced bacterial dormancy. *Nature Microbiology* 1-10.

9. al-Mosleh S, Gopinathan A, Santangelo C, Huang KC, **Rojas ER** (2022) Feedback linking cell envelope stiffness, curvature, and synthesis enables robust rod-shaped bacterial growth. *Proceedings of the National Academy of Sciences* 119(41):e2200728119.

10. Gomez D, Peña Ccoa WJ, Singh Y, **Rojas ER**, Hocky GM (2021) Molecular Paradigms for Biological Mechanosensing. *The Journal of Physical Chemistry B*. 125(44):12115-12124.

11. Cesar S, Anjur-Dietrich M, Yu B, Li E, **Rojas ER**, Neff N, Cooper TF, Huang KC (2020) Bacterial Evolution in High-Osmolarity Environments. *mBio*. 11(4):e01191-20.

12. **Rojas ER** (2020) The mechanical properties of bacteria and why they matter. In: Physical Microbiology, Springer. 1-14.

13. Knapp BD, Odermatt P, **Rojas ER**, Cheng W, He X, Huang KC, Chang F (2019) Decoupling of rates of protein synthesis from cell expansion leads to supergrowth. *Cell Systems*. 9(5):434-445.

14. Oudah Y, **Rojas ER**, Riordan DP, Capostagno S, Kuo CS, Krasnow MA (2019) A subpopulation of pulmonary neuroendocrine cells are reserve stem cells regulated by the tumor suppressors Rb, p53, and Notch. *Cell*. 179(2): 403-416.

15. Masuda I, Matsubara R, Christian T, **Rojas ER**, Yadavalli SS, Zhang L, Goulian M, Foster LF, Huang KC, Hou Y-M (2019) tRNA Methylation Is a Global Determinant of Bacterial Multi-drug Resistance. *Cell Systems*. 8(4):302-314.

16. **Rojas ER**, Billings G, Odermatt PD, Auer GK, Zhu L, Miguel A, Chang F, Weibel DB, Theriot JA, Huang KC (2018) The outer membrane is an essential load-bearing element in Gram-negative bacteria. *Nature*. 559:617-621

17. **Rojas ER**, Huang KC (2018) Regulation of microbial growth by turgor pressure. *Current Opinion in Microbiology*. 42:62-70

18. **Rojas ER**, Huang KC, Theriot JA (2017) Homeostatic cell growth is accomplished mechanically through membrane tension inhibition of cell-wall synthesis. *Cell Systems*. 5:578-590

19. van Hemelryck M, Bernal R, **Rojas ER**, Dumais J, Kroeger J (2017) A fresh look at growth oscillations in pollen tubes: kinematic and mechanistic descriptions. In *Pollen Tube Growth*. 369-389.

20. Zhou X*, Halladin DK*, **Rojas ER***, Koslover EF, Lee TK, Huang KC, Theriot JA (2015) Mechanical crack propagation drives millisecond daughter cell separation in *Staphylococcus aureus*. *Science*. 348(6234):574-578
*Equal contributions

21. **Rojas ER**, Theriot JA, Huang KC (2014) Response of *Escherichia coli* growth rate to osmotic shock. *Proceedings of the National Academy of Sciences of the USA*. 111(21): 7807-7812

22. Misra G, **Rojas ER**, Gopinathan A, Huang KC (2013) Mechanical consequences of cell-wall turnover in the elongation of Gram-positive bacterium. *Biophysical Journal*. 104(11): 2342-2352

23. Campas O*, **Rojas ER***, Dumais J, Mahadevan L (2011) Strategies for cell shape control in tip-growing cells. *American Journal of Botany*. 99(9):1577-1582
*Equal contributions

24. **Rojas ER**, Hotton S, Dumais J (2011) Chemically mediated mechanical expansion of the pollen tube cell wall. *Biophysical Journal*. 101(8):1844-1853
25. Bernal R, **Rojas ER**, Dumais J (2007) The mechanics of tip growth morphogenesis: what we have learned from rubber balloons. *Journal of Mechanics of Materials and Structures*. 2:1157-1168
26. Islam MF, **Rojas ER**, Bergey DM, Johnson AT, Yodh AG (2003) High weight fraction surfactant solubilization of single-wall carbon nanotubes. *Nano Letters*. 3:269-273

Invited Seminars

- **2024** — Harvard University, Department of Microbiology
- **2024** — Washington University, Department of Physics
- **2024** — Plant and Microbial Cytoskeleton Gordon Research Conference
- **2024** — New York University, Department of Physics
- **2024** — Biophysical Society Annual Meeting
- **2024** — Sensory Transduction in Microorganisms Gordon Research Conference
- **2023** — American Society for Cell Biology Annual Meeting
- **2023** — Carnegie Institute, Biosphere Science and Engineering
- **2023** — Marine Biological Laboratories Cytoskeleton Seminar Series
- **2023** — EMBL Life at the Periphery: Mechanobiology of the Cell Surface
- **2023** — Bacterial Cell Biology Gordon Research Conference
- **2023** — University of California, Berkeley, Department of Plant and Microbial Biology
- **2023** — EMBO Bacterial Morphogenesis, Survival, and Virulence.
- **2022** — University of Toronto, Department of Cell and Systems Biology
- **2022** — Delft University of Technology, Bionanoscience
- **2022** — Tufts University, Department of Physics
- **2022** — Rutgers University Camden, Center for Computational and Integrative Biology
- **2020** — Columbia University, Department of Biology
- **2020** — Georgia Institute of Technology, Department of Physics
- **2020** — New Physical Models for Cell Growth, Aspen Center for Physics
- **2019** — Texas A&M University, Department of Biology
- **2019** — InspireScience, New York University School of Medicine
- **2019** — Niels Bohr Institute
- **2019** — New Insights into Structure and Antimicrobial Targets, Keynote Lecture
- **2019** — New York Bacillus Interest Group (NYBIG), Keynote Lecture
- **2019** — University of Oslo, Department of Biosciences
- **2018** — University of Florida, College of Medicine
- **2018** — University of Massachusetts, Department of Microbiology
- **2018** — New York State Department of Health, Wadsworth Center

- **2018** — Brooklyn College, Department of Biology
- **2018** — Bacterial Cell Surfaces Gordon Research Conference
- **2018** — American Society for Microbiology Annual Meeting
- **2018** — American Physical Society March Meeting
- **2018** — University of Pennsylvania, Department of Physics
- **2017** — Massachusetts Institute of Technology, Department of Biology
- **2017** — University of California, San Francisco, Department of Microbiology & Immunology
- **2017** — Johns Hopkins University, Department of Biomolecular Engineering
- **2017** — Cornell University, Department of Biomedical Engineering
- **2017** — Dartmouth College, Department of Microbiology & Immunology
- **2017** — New York University, Department of Biology
- **2017** — McGill University, Department of Biology
- **2017** — Barnard College, Department of Biology
- **2017** — Hunter College, Department of Physics
- **2017** — Northeastern University, Department of Bioengineering
- **2017** — Max Planck Society
- **2017** — Institut Curie, Unité Physico-Chimie
- **2017** — École Polytechnique Fédérale de Lausanne, Department of Physics
- **2017** — University of Illinois, Chicago, Department of Microbiology & Immunology
- **2017** — Swarthmore College, Department of Biology
- **2016** — Swarthmore College, Department of Physics
- **2016** — Boston University, Department of Bioengineering
- **2016** — Vanderbilt University, Department of Biology
- **2015** — Consortium of Universities for Global Health, Boston, MA
- **2015** — Stanford University, Department of Microbiology and Immunology
- **2015** — Stanford University, Department of Biochemistry
- **2010** — Smith College, Department of Mathematics
- **2011** — Wellesley College, Departments of Biochemistry and Biology
- **2004** — University of Puerto Rico, Department of Physics

Teaching Experience

- **2024-Present** — What is Life?, NYU Prison Education Project, Wallkill Correctional Facility (designed and taught)
- **2023-Present** — Genetic Circuits, NYU Department of Biology (designed and taught)
- **2020-Present** — Contagion: Conversation in the Time of COVID-19, Queensboro Correctional Facility (designed and taught)

- **2019-Present** — Frontiers in Microbiology: Principles of Genetic Circuit Design, NYU Department of Biology (designed and taught)
- **2019** — Visiting Faculty for the Emory-Tibet Science Initiative, Karnataka, India
- **2011** — Teaching Assistant at the Woods Hole Physiology Course, Woods Hole, MA
- **2010 – 2011** — Faculty of Biomedical Physics the Patan Academy of Health Sciences, Patan, Nepal
- **2009** — Teaching Assistant for Mechanics, Elasticity, Fluids and Diffusion, Department of Physics, Harvard University
- **2008** — Teaching Assistant for Comparative Biomechanics, Department of Organismic and Evolutionary Biology, Harvard University
- **2007** — Teaching Assistant for Electricity and Magnetism, Department of Physics, Harvard University

Community Outreach

- **2020 – 2022** — Professor of "Contagion: Conversations in the Time of COVID-19"
  A college-level course taught to inmates of Queensboro Correctional Facility
- **2018 – Present** — Weekly Volunteer in the Petey Greene Program, New York, NY
  Tutoring incarcerated men as they take college classes
- **2019** — Volunteer Faculty for the Emory-Tibet Science Initiative, Karnataka, India
  Teaching Buddhist monastic students biology
- **2011 – 2017** — Weekly Volunteer at Project Open Hand, San Francisco, CA
  Preparing food for the homebound critically ill
- **2012** — Regular Volunteer at East Palo Alto Charter School, East Palo Alto, CA
  Providing mentorship to elementary school children at an afterschool science program
- **2010 – 2011** — Visiting Faculty of Biomedical Physics the Patan Academy of Health Sciences, Patan, Nepal
  Teaching science to underserved communities in Nepal
- **2008 – 2010** — Weekly volunteer at Harvard Square Homeless Shelter, Cambridge, MA
  Preparing food for the homeless
- **2008** — Weekly volunteer at Kennedy-Longfellow Middle School , Cambridge, MA
  Tutoring science students
- **2007** — Weekly volunteer at Lincoln High School, Lincoln, MA
  Providing mentorship to a student during her science fair project
- **2000 – 2004** — Weekly volunteer at afterschool programs in Northeast Philadelphia, PA
  Providing mentorship to elementary school children, coordinated by the League of United Latin American Citizens
- **2001** — Weekly volunteer with the West Philadelphia Tutoring Project, Philadelphia, PA
  Providing reading mentorship to elementary school children

(Last updated: December 25, 2024)