Avi I. Flamholz Ph.D.

Assistant Professor & Head of Lab · The Rockefeller University

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Summary

I am excited when physical and mathematical principles help explain the behavior and evolution of cells, organisms and ecosystems. When possible, I strive to connect theory and laboratory experiments to real-world environments. I am focused on Earth's carbon cycle and working towards quantitative understanding of the metabolic rates of spatially-structured microbial communities in 3D environments like soils. Beyond understanding, we must also build technologies that erase our impacts on the Earth. I apply synthetic biology towards developing an engineered microbial agriculture with radically reduced land, water and emissions.

Education

University of California, Berkeley *Berkeley, CA*

PhD, Molecular and Cell Biology *2013 - 2019*

- Dissertation: "Analysis and Reconstitution of a Bacterial CO_2-Concentrating Mechanism"; Advisor: Prof. David Savage

Princeton University *Princeton, NJ*

B.S.E., Computer Science *2003 - 2007*

- Graduated *magna cum laude*, certificate in Applied & Computational Mathematics; Thesis advisor: Prof. Kai Li

Professional Experience

2025- **Asst. Prof. & Head of The Laboratory of Environmental Microbiology**, The Rockefeller University
2020-2024 **Postdoctoral Scholar in Biology & Bioengineering**, Dianne Newman & Rob Phillips Groups, Caltech
2013-2019 **Graduate Student Researcher**, David Savage Group, UC Berkeley
2012-2013 **Founding Technical Lead**, Via Transportation, New York City
2010-2012 **Pre-doctoral Researcher**, Ron Milo Group, Weizmann Institute, Israel
2007-2010 **Software Engineer II**, Google, New York City

Awards & Honors

2025-2029 **Irma T. Hirschl Trust**, Career Scientist Award
2024-2029 **Burroughs Wellcome Fund**, Careers at the Scientific Interface Transitional Award
2023 **Caltech Center for Environmental Microbial Interactions**, CEMI Travel Award
2022 **Western Photosynthesis Annual Meeting**, Best Talk Award
2021-2024 **Jane Coffin Childs Memorial Foundation**, Postdoctoral Fellowship
2020 **Caltech Center for Environmental Microbial Interactions**, CEMI Pilot Award
2015 **UC Berkeley MCB Department**, Travel Award
2019 **American Chemical Society**, Editor's Choice Award (Flamholz et al. Biochem.)
2014-2019 **National Science Foundation**, Graduate Research Fellowship
2007 **Princeton University Department of Computer Science**, Department Service Award
2007 **Elected to Sigma Xi**, Research Honors Society

Publications

[*]equal contribution, [+]mentored undergraduate, [^]mentored graduate student

Lovat S, Ben-Nissan R, Milshtein E, Leger D, **Flamholz AI**, Tzachor A, Noor E, Milo R. *Electro-microbial production techno-economic viability and environmental implications*. Nature Biotechnology. 2025; doi:10.1038/s41587-025-02632-w

Eshel G, **Flamholz AI**, Shepon A, Milo R. *US grass-fed beef is as carbon intensive as industrial beef and ≈10-fold more intensive than common protein-dense alternatives*. PNAS. 2025; 122 (12): e2404329122. doi:10.1073/pnas.2404329122

Prywes N, Phillips NR, Oltrogge LM, Lindner S, Tsai YCC, de Pins B, Cowan AE, Taylor-Kearney LJ, Chang HA, Hall LN, Bellieny-Rabelo D, HM Nisonoff, Weissman RF, **Flamholz AI**, Ding D, Bhat AY, Shih PM, Mueller-Cajar O, Milo R, Savage DF. *A map of the rubisco biochemical landscape*. Nature. 2025; 1-6. doi:10.1038/s41586-024-08455-0

Flamholz AI, Goyal A, Fischer WW, Newman DK, Phillips R. *The proteome is a terminal electron acceptor*. PNAS. 2025; 122 (1): e2404048121. doi:/10.1073/pnas.2404048121.

Flamholz AI, Goldford J, Richter PA, Larsson EM, Jinich A, Fischer WW, Newman DK. *Annotation-free prediction of microbial oxygen utilization.* mSystems. 2024; e0076324. doi:10.1128/msystems.00763-24.

Goyal A, **Flamholz AI**, Petroff A, Murugan A. *Closed ecosystems extract energy through self-organized nutrient cycles*. PNAS. 2024; 120: e2309387120. doi:10.1073/pnas.2309387120

Wang RZ[^], Nichols RJ, Liu AK, **Flamholz AI**, Artier J, Banda DM, Savage DF, Eiler JM, Shih PM, Fischer WW. *Carbon isotope fractionation by an ancestral rubisco suggests biological proxies for CO_2 through geologic time should be re-evaluated.* PNAS. 2023; 120: e2300466120. doi:10.1073/pnas.2300466120
Commentary by Sven Kranz in PNAS.

Flamholz AI, Goyal A. *Spotlight: Matching metabolic supply to demand optimizes microbial growth*. Trends Microbiol. 2023; 31, 769–771. doi:10.1016/j.tim.2023.06.003

Lammers NC, **Flamholz AI**, Garcia HG. *Competing constraints shape the nonequilibrium limits of cellular decision-making*. PNAS. 2023;120: e2211203120 doi:10.1073/pnas.2211203120

Flamholz AI[*], Dugan E[*+], Panich J, Desmarais JJ, Oltrogge LM, Fischer WW, Singer SW, Savage DF. *Trajectories for the evolution of bacterial CO_2-concentrating mechanisms*. PNAS. 2022;119: e2210539119. doi:10.1073/pnas.2210539119
Highlighted by Phys.org, Caltech News, & InnovativeGenomics.org.

Flamholz AI, Saccomano S, Cash K, Newman DK. *Optical O_2 Sensors Also Respond to Redox Active Molecules Commonly Secreted by Bacteria*. MBio. 2022; e0207622. doi:10.1128/mbio.02076-22

Chure G[*], Banks RA[*], **Flamholz AI**, Sarai NS, Kamb M, Lopez-Gomez I, Bar-On Y, Milo R, Phillips R. Anthroponumbers.org: A quantitative database of human impacts on Planet Earth. Patterns. 2022;3: 100552. doi:10.1016/j.patter.2022.100552
Highlighted in Wired, Phys.org, & ScienceDaily.

Noor E[*], **Flamholz AI[*]**, Jayaraman V[*], Ross BL[*], Cohen Y, Patrick WM, Gruic-Sovulj I, Tawfik DS. *Uniform binding and negative catalysis at the origin of enzymes*. Protein Science. 2022;31: e4381. doi:10.1002/pro.4381
Special issue posthumously honoring Dan Salah Tawfik.

Goldford JE, George AB, **Flamholz AI**, Segrè D. *Protein cost minimization promotes the emergence of coenzyme redundancy*. PNAS. 2022;119: e2110787119. doi:10.1073/pnas.2110787119

Flamholz AI, Newman DK. *Microbial communities: The metabolic rate is the trait*. Current Biology. 2022;32: R215–R218. doi:10.1016/j.cub.2022.02.002

Beber ME, Gollub MG, Mozaffari D, Shebek KM, **Flamholz AI**, Milo R, Noor E. *eQuilibrator 3.0: a database solution for thermodynamic constant estimation*. Nucleic Acids Research. 2021;50: D603–D609. doi:10.1093/nar/gkab1106

Greenwald HD, Kennedy LC, Hinkle A, Whitney ON, Fan VB, Crits-Christoph A, Harris-Lovett S, **Flamholz AI**, Al-Shayeb B, Liao LD, Beyers M, Brown D, Chakrabarti AR, Dow J, Frost D, Koekemoer M, Lynch C, Sarkar P, White E, Kantor R, Nelson KL. *Tools for interpretation of wastewater SARS-CoV-2 temporal and spatial trends demonstrated with data collected in the San Francisco Bay Area*. Water Research X. 2021;12: 100111. doi:10.1016/j.wroa.2021.100111

Sender R, Bar-On YM, Gleizer S, Bernshtein B, **Flamholz AI**, Phillips R, Milo R. *The total number and mass of SARS-CoV-2 virions*. PNAS. 2021;118: e2024815118. doi:10.1073/pnas.2024815118

Crits-Christoph A, Kantor RS, Olm MR, Whitney ON, Al-Shayeb B, Lou YC, **Flamholz AI**, Kennedy LC, Greenwald H, Hinkle A, Hetzel J, Spitzer S, Koble J, Tan A, Hyde F, Schroth G, Kuersten S, Banfield JF, Nelson KL. *Genome sequencing of sewage detects regionally prevalent SARS-CoV-2 variants*. MBio. 2021;12: e02703–20. doi:10.1128/mBio.02703-20

Claassens NJ, Scarinci G, Fischer A, **Flamholz AI**, Newell W, Frielingsdorf S, Lenz O, Bar-Even A. *Phosphoglycolate salvage in a chemolithoautotroph using the Calvin cycle*. PNAS. 2020;117: 22452–22461. doi:10.1073/pnas.2012288117

Flamholz AI, Dugan E[+], Blikstad C, Gleizer S, Ben-Nissan R, Amram S, Antonovsky N, Ravishankar S, Noor E, Bar-Even A, Milo R, Savage DF. *Functional reconstitution of a bacterial CO_2 concentrating mechanism in Escherichia coli*. Elife. 2020;9: e59882.
Commentary by Franklin & Jonikas in ELife, highlighted in Nature, Faculty Opinions.

Davidi D, Shamshoum M, Guo Z, Bar-On YM, Prywes N, Oz A, Jablonska J, **Flamholz AI**, Wernick DG, Antonovsky N, De Pins B, Shachar L, Hochhauser D, Peleg Y, Albeck S, Sharon I, Mueller-Cajar O, Milo R. *Highly active rubiscos discovered by systematic interrogation of natural sequence diversity*. EMBO Journal. 2020;39: e104081. doi:10.15252/embj.2019104081

Flamholz AI, Shih PM. *Cell biology of photosynthesis over geologic time*. Current Biology. 2020;30: R490–R494. doi:10.1016/j.cub.2020.01.076

Bar-On YM, **Flamholz AI**, Phillips R, Milo R. *Science Forum: SARS-CoV-2 (COVID-19) by the numbers*. Elife. 2020;9: e57309.
Highlighted in Small Things Considered.

Desmarais JJ[^], **Flamholz AI**, Blikstad C, Dugan EJ[+], Laughlin TG, Oltrogge LM, Chen AW[+], Wetmore K, Diamond S, Wang JY, Savage DF. *DABs are inorganic carbon pumps found throughout prokaryotic phyla. Nature Microbiology*. 2019;4: 2204–2215. doi:10.1038/s41564-019-0520-8
Commentary by Price, Long & Forster in Nature Microbiology

Flamholz AI, Prywes N, Moran U, Davidi D, Bar-On YM, Oltrogge LM, Alves R, Savage DF, Milo R. *Revisiting trade-offs between Rubisco kinetic parameters*. Biochemistry. 2019;58: 3365–3376. doi:10.1021/acs.biochem.9b00237
Editor's Choice Award

Blikstad C, **Flamholz AI**, Oltrogge LM, Savage DF. *Learning to Build a β-Carboxysome*. Biochemistry. 2019. pp. 2091–2092.

Jinich A, **Flamholz AI**, Ren H, Kim S-J, Sanchez-Lengeling B, Cotton CAR, Noor E, Aspuru-Guzik A, Bar-Even A. *Quantum chemistry reveals thermodynamic principles of redox biochemistry*. PLoS Comput Biology. 2018;14: e1006471. doi:10.1371/journal.pcbi.1006471

Noor E, **Flamholz AI**, Bar-Even A, Davidi D, Milo R, Liebermeister W. *The protein cost of metabolic fluxes: prediction from enzymatic rate laws and cost minimization*. PLoS Comput Biology. 2016;12: e1005167. doi:10.1371/journal.pcbi.1005167

Mangan NM[*], **Flamholz AI[*]**, Hood RD, Milo R, Savage DF. *pH determines the energetic efficiency of the cyanobacterial CO_2 concentrating mechanism*. PNAS. 2016;113: E5354–E5362. doi:10.1073/pnas.1525145113

Hood RD, Higgins SA, **Flamholz AI**, Nichols RJ, Savage DF. *The stringent response regulates adaptation to darkness in the cyanobacterium Synechococcus elongatus*. PNAS. 2016;113: E4867–E4876. doi:10.1073/pnas.1524915113

Nadler DC, Morgan S-A, **Flamholz AI**, Kortright KE, Savage DF. *Rapid construction of metabolite biosensors using domain-insertion profiling*. Nature Communications. 2016;7: 12266. doi:10.1038/ncomms12266

Oakes BL, Nadler DC, **Flamholz AI**, Fellmann C, Staahl BT, Doudna JA, Savage DF. *Profiling of engineering hotspots identifies an allosteric CRISPR-Cas9 switch*. Nature Biotechnology. 2016;34: 646–651. doi:10.1038/nbt.3528

Davidi D, Noor E, Liebermeister W, Bar-Even A, **Flamholz AI**, Tummler K, Barenholz U, Goldenfeld M, Shlomi T, Milo R. *Global characterization of in vivo enzyme catalytic rates and their correspondence to in vitro k_{cat} measurements*. PNAS. 2016;113: 3401–3406.

Flamholz AI, Phillips R, Milo R. *The quantified cell*. Molecular Biology of the Cell. 2014;25: 3497–3500. doi:10.1091/mbc.E14-09-1347

Liebermeister W, Noor E, **Flamholz AI**, Davidi D, Bernhardt J, Milo R. *Visual account of protein investment in cellular functions*. PNAS. 2014;111: 8488–8493. doi:10.1073/pnas.1314810111

Noor E, Bar-Even A, **Flamholz AI**, Reznik E, Liebermeister W, Milo R. *Pathway thermodynamics highlights kinetic obstacles in central metabolism*. PLoS Computational Biology. 2014;10: e1003483. doi:10.1371/journal.pcbi.1003483

Noor E, **Flamholz AI**, Liebermeister W, Bar-Even A, Milo R. *A note on the kinetics of enzyme action: a decomposition that highlights thermodynamic effects*. FEBS Letters. 2013;587: 2772–2777. doi:10.1016/j.febslet.2013.07.028

Flamholz AI[*], Noor E[*], Bar-Even A, Liebermeister W, Milo R. *Glycolytic strategy as a tradeoff between energy yield and protein cost*. PNAS. 2013;110: 10039–10044. doi:10.1073/pnas.1215283110
Commentary by Stettner & Segre in PNAS

Zelcbuch L, Antonovsky N, Bar-Even A, Levin-Karp A, Barenholz U, Dayagi M, Liebermeister W, **Flamholz AI**, Noor E, Amram S, Brandis A, Bareia T, Yofe I, Jubran H, Milo R. *Spanning high-dimensional expression space using ribosome-binding site combinatorics*. Nucleic Acids Research. 2013;41: e98–e98. doi:10.1093/nar/gkt151

Bar-Even A, **Flamholz AI**, Noor E, Milo R. *Thermodynamic constraints shape the structure of carbon fixation pathways*. Biochimica et Biophysica Acta (BBA)-Bioenergetics. 2012;1817: 1646–1659. doi:10.1016/j.bbabio.2012.05.002

Noor E, Bar-Even A, **Flamholz AI**, Lubling Y, Davidi D, Milo R. *An integrated open framework for thermodynamics of reactions that combines accuracy and coverage*. Bioinformatics. 2012;28: 2037–2044. doi:10.1093/bioinformatics/bts317

Bar-Even A, Noor E, **Flamholz AI**, Milo R. *Design and analysis of metabolic pathways supporting formatotrophic growth for electricity-dependent cultivation of microbes*. Biochimica et Biophysica Acta (BBA)-Bioenergetics. 2012;1827: 1039–1047. doi:10.1016/j.bbabio.2012.10.013

Flamholz AI, Noor E, Bar-Even A, Milo R. *eQuilibrator—the biochemical thermodynamics calculator*. Nucleic Acids Research. 2012;40: D770–D775.

Bar-Even A, **Flamholz AI**, Noor E, Milo R. *Rethinking glycolysis: on the biochemical logic of metabolic pathways*. Nature Chemical Biology. 2012;8: 509–517.

Bar-Even A, **Flamholz AI**, Noor E, Milo R. *Thermodynamic constraints shape the structure of carbon fixation pathways*. Bioenergetics. 2012.

Bar-Even A, Noor E, **Flamholz AI**, Buescher JM, Milo R. *Hydrophobicity and charge shape cellular metabolite concentrations*. PLoS Comput Biology. 2011;7: e1002166. doi:10.1371/journal.pcbi.1002166

Huttenhower C, **Flamholz AI**, Landis JN, Sahi S, Myers CL, Olszewski KL, Hibbs MA, Siemers NO, Troyanskaya OG, Coller HA. *Nearest Neighbor Networks: clustering expression data based on gene neighborhoods*. BMC Bioinformatics. 2007;8: 1–13. doi:10.1186/1471-2105-8-250

Funded Research Proposals

June 2025. *Towards a microbial platform for sustainable production*. **Rockefeller SNF Institute** Idea Grant.

January 2025. *Understanding and engineering microbial contributions to the global carbon cycle*. **Irma T. Hirschl Trust** Careers Scientist Award.

June 2023. *Predicting microbial CO_2 production in global soils*. **Burroughs Wellcome Fund** Careers at the Scientific Interface Transitional Fellowship.

February 2023. *Predicting the Fate of Carbon in Soils using Language Models on Sequence Data from Microbial Communities*. **Schmidt Academy for Software Engineering.** With W. Fischer; supporting Philippa Richter for 2 years.

July 2021. *Developing bacterial biofilms as a model for predicting tissue metabolism*. **Jane Coffin Childs Memorial Foundation** Postdoctoral Fellowship.

September 2020. *Experimental and theoretical approaches to studying the physiology of single cells in structured environments*. **Caltech Center for Emerging Microbial Interactions** Pilot Grant.

May 2020. *Early detection of COVID-19 reemergence via wastewater surveillance of SARS-CoV-2* written with Profs. Kara Nelson & Jill Banfield's groups. **Innovative Genomics Institute at UC Berkeley** Rapid Response COVID-19 Research Grant.

September 2018. *Mapping sequence-function landscapes to isolate improved Rubiscos* with Prof. David Savage. **National Science Foundation** award #1818377

September 2013. *Interrogating Overflow Metabolism with Laboratory Evolution* **National Science Foundation** Graduate Research Fellowship

Presentations

Seminars and Conference Talks

July 2025. *The proteome is a terminal electron acceptor.* Metabolic Pathway Analysis 2025 meeting, University of Vienna (Invited)

April 2025. *The proteome is a terminal electron acceptor.* The Ohio State University Department of Microbiology (Invited)

March 2025. *Quantitative Relationships between Environments and Genome.* ENIGMA Group at Rutgers University (Invited)

March 2025. *Using engineered bacteria to study the history of Earth's atmosphere.* Yale University Department of Molecular, Cellular and Developmental Biology (Invited)

March 2025. *The proteome is a terminal electron acceptor.* Economic Principles in Cell Physiology international online forum (Invited)

November 2024. *Using engineered bacteria to study the history of Earth's atmosphere.* Salk Institute (Invited)

November 2024. *The proteome is a terminal electron acceptor.* USC Systems Biology Guest Lecture (Invited)

November 2024. *Using engineered bacteria to study the history of Earth's atmosphere.* USC Department of Marine and Environmental Sciences (Invited)

Oct 2024. *The proteome is a terminal electron acceptor.* Joint BioEnergy Institute (Invited)

May 2024. *The evolution of bacterial CO_2-concentrating mechanisms.* Caltech Center for Evolutionary Science

April 2024. *The proteome is a terminal electron acceptor.* Southern CA Geobiology meeting

April 2024. *Studying microbial physiology to predict the fate of soil carbon.* MIT Department of Earth and Planetary Sciences (Invited)

March 2024. *The function and evolution of bacterial CO_2 concentrating mechanisms.* Rockefeller University (Invited)

March 2024. *The proteome is a terminal electron acceptor.* American Physical Society annual meeting (Invited)

February 2024. *Understanding and engineering the carbon cycle with synthetic biology.* Stanford University Department of Bioengineering (Invited)

February 2024. *Understanding and engineering the carbon cycle with synthetic biology.* Harvard Medical School Department of Systems Biology (Invited)

February 2024. *Studying microbial physiology to predict the fate of soil carbon.* Rockefeller University (Invited)

December 2023. *Studying microbial physiology to predict the fate of soil carbon* Caltech Division of Geology and Planetary Sciences (Invited)

March 2023. *Engineering microbes to learn about the Earth: lessons for the global carbon cycle* MIT Department of Earth and Planetary Sciences (Invited)

March 2023. *The proteome is a terminal electron acceptor*. American Physical Society annual meeting

July 2022. *Using engineered bacteria to study the history of Earth's atmosphere*. CCM10 Conference, Princeton University (Invited)

May 2022. *Trajectories for the evolution of bacterial CO_2-concentrating mechanisms*. Caltech Center for Emerging Microbial Interactions monthly seminar

March 2022. *Building a bacterial CO_2 concentrating mechanism*. Western Photosynthesis Virtual Conference. *"Best Talk" award.*

July 2021. *Microbial energy conservation when O_2 is scarce*. Jointly delivered with Prof. Dianne Newman. Microbial Ecology and Evolution summer course, Kavli Institute for Theoretical Physics at UC Santa Barbara (Invited).

August 2020. *Building a bacterial CO_2 concentrating mechanism*. Online seminar. Department of Plant Biology at Australian National University, Canberra, Australia (Invited)

July 2020. *Building a bacterial CO_2 concentrating mechanism*. Online seminar. Department of Plant Biology at York University, York, United Kingdom (Invited).

December 2019. *An engineered E. coli fixes CO_2 from ambient air*. West Coast Bacterial Physiology Meeting, Asilomar, CA.

July 2018. *Rubisco: Why are you not better?* International Geobiology Course, Catalina Island, CA (Invited).

May 2017. *The cost of protein production*. Amyris Inc, Emeryville, CA (Invited).

January 2017. *Carboxysomes: What are they good for?* UC Berkeley MCB Department, Biochemistry, Biophysics & Structural Biology (BBS) Divisional Retreat

November 2013. *Thermodynamic Tradeoffs in Glycolysis* UC San Francisco Theory Lunch (Invited).

September 2013. *Thermodynamic Tradeoffs in Glycolysis* Metabolic Pathway Analysis Conference, Oxford, UK (Invited).

Teaching Experience

Fall 2024	**The history and future of atmospheric dioxygen**, Co-teaching with Woody Fischer	*Caltech*
Sum. 2019	**The Microverse**, Introduction to microscopy & programming, Clubes de Ciencia	*Monterrey, MX*
Spring 2016	**Biochemistry: Pathways, Mechanisms, and Regulation**, Graduate Student Instructor	*UC Berkeley*
Sum. 2015	**QB3 Python Programming Bootcamp**, Teaching Assistant	*UC Berkeley*
Fall 2015	**General Microbiology**, Graduate Student Instructor	*UC Berkeley*
Fall 2011	**English as a Second Language**, Mesila program for refugees	*Tel Aviv, Israel*
Fall 2009	**Introduction to Programming, 5th-8th Grades**, Citizen Schools Volunteer	*Brooklyn, NY*
2005-2007	**Head laboratory teaching assistant for intro courses**, Dept. of Computer Science	*Princeton*

Formal Mentorship

2025	**Albert Li**, Chemers Neustein SURF Summer Student	*Rockefeller*
2025-	**James Wang**, Graduate Student	*Rockefeller*
2025-	**Sophia Adami-Sampson**, Research Assistant	*Rockefeller*
2022-	**Philippa Richter**, Schmidt Scholar in in the Fischer Lab	*Caltech*
2022	**Gia Han Vuong**, Caltech CEMI-WAVE Summer Research Fellow in the Newman Lab	*Caltech*
2021	**Elin Larsson**, Rotation student in the Newman Lab - *joined for PhD*	*Caltech*
2019	**Alejandra Zapata**, UCB Transfers to Excellence Summer Research Fellow in the Savage Lab	*UC Berkeley*
2017	**Edward Koleski**, Rotation student in the Savage Lab	*UC Berkeley*
2017	**Julia Borden**, Rotation student in the Savage Lab - *joined for PhD*	*UC Berkeley*
2015-2020	**Eli Dugan**, Savage Lab undergrad & technician - *now a PhD student at UCSF Tetrad Program*	*UC Berkeley*
2016-2018	**Allen Chen**, Savage Lab Undergraduate Researcher - *now a PhD student at Caltech*	*UC Berkeley*
2015-2016	**Sumedha Ravishankar**, Savage Lab Undergrad Researcher - *now a postdoc at UCSD*	*UC Berkeley*
2015	**Dylan McLung**, Rotation student in the Savage Lab	*UC Berkeley*

Service and Outreach

2011-Present. *Maintain and develop eQuilibrator - the biochemical thermodynamics calculator*. With Elad Noor; 500-1000 students and researchers use eQuilibrator each month. `equilibrator.weizmann.ac.il`

Summer 2022. *Caltech PCC CEMI-WAVE summer research mentor*. Volunteer mentor for a summer program bringing Pasadena Community College students to Caltech for paid summer research.

Summer 2019. *Clubes de Ciencias, Monterrey, Mexico*. Volunteer teacher. Designed and co-taught "The Microverse" - a one-week course on microscopy and introductory programming for 20 students. With Alejandro Balderas of Tecnológico de Monterrey.

Summer 2019. *UC Berkeley Transfers to Excellence*. Volunteer mentor for a summer program bringing prospective transfer students to UC Berkeley for paid research internships.

2018. *Student representative to Graduate Admissions Committee*. UC Berkeley Department of Molecular and Cell Biology.

2017. *Student representative to "host-microbe interactions" Faculty Search Committee*. UC Berkeley Department of Molecular and Cell Biology.

2017-2019. *Primary organizer of annual 100-person campus-wide symposium "Photosynthesis, Carbon-Fixation and the Environment."* UC Berkeley.

2017. *Student organizer of Biophysics, Biochemistry and Structural Biology divisional retreat*. UC Berkeley Department of Molecular and Cell Biology.

2013-2017. *Primary organizer of UC Berkeley Systems Biology Reading Group*.

Peer Review

I have refereed papers for *ACS Synthetic Biology, Biophysical Journal, BioEssays, Cell, Current Opinion in Chemical Biology, ELife, Free Radical Biology and Medicine, mSystems, Nature, PLoS One, PNAS* and *Science*.

Advisors

B.S.E Junior Research Paper **Prof. Hilary Coller**, Princeton University, Department of Molecular Biology (now UCLA)

B.S.E. Senior Thesis **Prof. Kai Li**, Princeton University, Department of Computer Science

Pre-doctoral Research Mentor **Prof. Ron Milo**, Weizmann Institute for Science, Department of Plant and Environmental Sciences

PhD Mentor **Prof. David Savage**, University of California, Berkeley, Department of Molecular and Cell Biology

Postdoc Co-mentors at Caltech

Prof. Dianne Newman Divisions of Biology & Biological Engineering, Geological and Planetary Science
Prof. Rob Phillips Department of Physics, Division of Biology and Biological Engineering
Woodward Fischer, Professor of Geobiology, California Institute of Technology