Curriculum Vitae – Highlights

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Professional Summary

Internationally recognized quantitative biophysicist whose discoveries have defined microbial physiology and established quantitative frameworks now used worldwide, combining conceptual and technological innovation with proven leadership in building interdisciplinary research communities. One of 25 Bauer Fellows at Harvard's FAS Center for Systems Biology. Pioneer of single-cell physiology with the invention of the microfluidic mother machine. Leads an interdisciplinary research program spanning bacteria, archaea, and eukaryotes, with a forward vision to integrate question-driven research with high-throughput single-cell experimentation, advanced robotics, modeling, and data-guided discovery within an increasingly automated laboratory environment. Recognized with major international awards and fellowships, including the Michael and Kate Bárány Award (2022), Simons Pivot Fellowship (2025), and Pew Innovation Fund (2025).

Key Achievements

- Developed the entropy-driven chromosome segregation model in bacteria (2004–2012), a lasting conceptual advance.
- Invented the microfluidic "mother machine" (2010), pioneering single-cell physiology studies.
- Discovered the adder principle (2014) and elucidated its mechanistic basis (2019).
- Established a quantitative framework for cellular resource allocation across bacteria (2025).
- Drove expansion of UCSD's biological-physics program from 10 to 14 faculty members and mentored multiple trainees now in independent positions in the US, China, and Taiwan (Princeton, Carnegie Mellon, Westlake).
- Forged international collaborations with Kyushu University, Univ. of Copenhagen, Humboldt Univ., Univ. of Freiburg, and LMU Munich, supporting large-scale interdisciplinary research programs in quantitative microbial physiology.

Selected Honors & Awards

Allen Distinguished Investigator Award, the Paul G. Allen Family Foundation (cohort of 7 in the U.S.)	2013—2016
Pew Scholars Award, the Pew Charitable Trusts (cohort of 22 in the U.S.)	2013—2017
CAREER Award, National Science Foundation (NSF)	2013—2018
Michael and Kate Bárány Award, Biophysical Society (list of awardees)	2022
Pivot Fellow, The Simons Foundation (cohort of 8)	2025—2026
Pew Innovation Fund, the Pew Charitable Trusts [with Mike Rust (Univ. Chicago), cohort of 7 teams]	2025—2028

Selected Publications [total citations ~ 6400; average citations per paper ~170, H-index 32]

Single-cell physiology

1. **[Invention of the mother machine; ~1290 citations]**
   Wang *et al.*, Robust growth of *Escherichia coli*. **Curr Biol** 20, 1099–1103 (2010).
2. **[Cell-size control trilogy 1: discovery of the adder principle; ~870 citations]**
   Taheri-Araghi *et al.* Cell size control and homeostasis in bacteria. **Curr Biol** 25, 385-391 (2015).
3. **[Cell-size control trilogy 2: explanation of the origin of the cell-size law by Maaloe in 1958; ~270 citations]**
   Si *et al.* Invariance of the initiation mass and predictability of cell size in *E. coli*. **Curr Biol** 27, 1278–1287 (2017).
4. **[Cell-size control trilogy 3: mechanistic explanation of the adder principle; ~300 citations]**
   Si *et al.* Mechanistic origin of cell-size control and homeostasis in bacteria. **Curr Biol** 28, 1760–1770 (2019).
5. **[Extensive review of the field surveying over 1000 papers; ~230 citations]**
   Jun *et al.,* Fundamental Principles in Bacterial Physiology - History, Recent progress, and the Future with Focus on Cell Size Control: A Review. **Reports on Progress in Physics** 81, 056601 (2018).

Precision control

6. **[Replication initiation as a general class of precision control based on protein counting; ~20 citations]**
   Fu *et al.*, Bacterial Replication Initiation as Precision Control by Protein Counting, **PRX Life** 1, 013011 (2023).

Cellular resource allocation

7. **[First phase diagram for Min proteins in vivo, integrating quantitative physiology and biophysics]**
   Ren *et al.* Robust and resource-optimal dynamic pattern formation of Min proteins in vivo to physiological perturbations. **Nature Physics** (2025).
8. **[Presents new paradigm of cellular resource allocation beyond E. coli that has dominated the field since 2010]**
   Thiermann *et al.* Decoupling of global metabolic flux and proteome in bacteria. (**Science**, invited revision for expanded online version under review).

Current Funding

Directing $4 million USD in active awards (Simons Foundation, Pew, NIH, DARPA) and over $10 million competitively awarded overall, supporting large-scale, interdisciplinary research programs.