

Kate E Galloway

SYNTHETIC BIOLOGY · STEM CELLS · MOLECULAR SYSTEMS BIOLOGY

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Biography

Katie Galloway is the W. M. Keck Career Development Professor in Biomedical Engineering and Chemical Engineering at the Massachusetts Institute of Technology. Her lab focuses on developing integrated gene circuits and elucidating the systems-level principles that govern cell-fate transitions with the goal of engineering cell and gene therapies. Galloway earned a PhD and an MS in Chemical Engineering from the California Institute of Technology, and a BS in Chemical Engineering from University of California at Berkeley. She completed her postdoctoral work at the University of Southern California. Her research has been featured in *Science*, *Cell Stem Cell*, *Cell Systems*, *Cell Reports*, and *Development*. She has won multiple fellowships and awards including the NSF CAREER, the BMES Cellular and Molecular Bioengineering Rising Star Award, Princeton's CBE Saville Lecture Award, NIH Maximizing Investigators' Research Award, the NIH F32, the C. Michael Mohr Award for Undergraduate Teaching in Chemical Engineering at MIT, and Caltech's Everhart Award.

Education

California Institute of Technology

Pasadena, CA

PHD CHEMICAL ENGINEERING, MINOR BIOLOGY

2007 - 2012

- Advisor: Dr. Christina D Smolke
- Thesis: Development of RNA-based control systems and their application to the *Saccharomyces cerevisiae* pheromone-responsive MAPK pathway

California Institute of Technology

Pasadena, CA

MS CHEMICAL ENGINEERING

2005 - 2007

University of California, Berkeley

Berkeley, CA

BS CHEMICAL ENGINEERING

2001 - 2005

- Graduated with Honors; NCAA Women's Crew Team; NCAA Women's Soccer Team

Primary Publications

Principal Investigator

10. Peterman EL, Ploessl, DS, Love KS, Sanabria, V, Daniels, RF, Johnstone CP, Godavarti, DR, Kabaria, KS, Oakes, CG, Pai, A, and **Galloway, KE**, High-resolution profiling reveals coupled transcriptional and translational regulation of transgenes. *bioRxiv*. 2024. [Link](#)
9. Beitz AM, Teves, J, Oakes, CG, Johnstone, CP Wang, NB, Brickman, JM and **Galloway, KE**. Cells transit through a quiescent-like state to convert to neurons at high rate. *bioRxiv*. 2024. [Link](#)
8. Wang NB, Lende-Dorn BA, Adewumi HO, Beitz AM, O'Shea TM, and **Galloway, KE**. Compact transcription factor cassettes generate functional, engraftable neurons by direct conversion. *bioRxiv*. 2023. [Link](#) *In revision at Cell Systems*. *Splitting from 2023 pre-print*
7. Blanch-Asensio, A, Ploessl, DS, Wang, NB, Mummery, CL, **Galloway, KE***, Davis, RP*. STRAIGHT-IN Dual: a platform for dual, single-copy integrations of DNA payloads and gene circuits into human induced pluripotent stem cells. *bioRxiv*. 2024. *Co-corresponding. [Link](#)
6. A Zouein, B Lende-Dorn, **KE Galloway**, T Ellis, F Ceroni. Engineered Transcription Factor Binding Arrays for DNA-based Gene Expression Control in Mammalian Cells. *bioRxiv*. 2024. [Link](#)
5. I. Incer, A. Pandey, E. Peterman, N. Nolan, **K. E. Galloway**, R. M. Murray, E. D. Sontag, and D. Del Vecchio. Guaranteeing system-level properties in genetic circuits subject to context effects. *In Proc. 2024 63rd IEEE Conference on Decision and*

Control (CDC), 2024. [Link](#)

4. Kabaria, KS, Bae, Y, Ehmann, ME, Beitz, AM, Lende-Dorn, BA, Peterman, EL, Love, KS, Ploessl, DS, and **Galloway, KE**. Programmable promoter editing for precise control of transgene expression. *bioRxiv*. 2024. [Link](#)
3. Love KS, Johnstone CP, Peterman EL, Gaglione S, and **Galloway, KE**. Model-guided design of microRNA-based gene circuits supports precise dosage of transgenic cargoes into diverse primary cells. *bioRxiv*. 2024. [Link](#)
2. Wang NB, Lende-Dorn BA, Adewumi HO, Beitz AM, Han P, O'Shea TM, and **Galloway, KE**. Proliferation history and transcription factor levels drive direct conversion. *bioRxiv*. 2023. [Link](#) *In revision at Cell Systems*.
1. Johnstone, CP and **Galloway, KE**. Supercoiling-mediated feedback rapidly couples and tunes transcription. *Cell Reports*. 2022. [Link](#)

Pre-MIT

Babos, KN*, **Galloway, KE***,†, Kisler, K, Zitting, M, Li, Y, Shi, Y, Quintino, B, Chow, RH, Zlokovic, BV, and Ichida, JK.† Mitigating antagonism between transcription and proliferation allows near-deterministic cellular reprogramming. *Cell Stem Cell*. 2019. *These authors contributed equally to this work. †Co-corresponding. [Link](#)

Ichida, JK, Staats, KA, Davis-Dusenbery, BN, Clement, K, **Galloway, KE**, Babos, KN, Son, EY, Kiskinis, E, Atwater, N, Gu, H, Gnirke, A, Meissner, A, and Eggan, K. Comparative genomic analysis of embryonic, lineage-converted, and stem cell-derived motor neurons. *Development*. 2018. [Link](#)

Galloway, KE, Franco, E, and Smolke, CD. Dynamically reshaping signaling networks to program cell fate via genetic controllers. *Science*. 2013 [Link](#)

Kostal, J, Mulchandani, A, **Gropp, KE**, and Chen, WA. Temperature Responsive Biopolymer for Mercury Remediation. *Environmental Science & Technology*. 2003. [Link](#)

Reviews and Commentary

Principal Investigator

12. Johnstone, CP and **Galloway, KE**. Bringing neural networks to life. *Science*. Accepted. [Link](#)
11. Rivnay, J, Jacob Robinson, J, Ritu Raman, R, **Galloway, KE** Veisheh, O, Christian Schreib, C, and Cohen-Karni, T. Integrating bioelectronics with cell-based synthetic biology. *Nature Reviews Bioengineering*. Accepted. [Link](#)
10. Peterman, EL, Ploessl, DS, and **Galloway, KE**. Accelerating diverse cell-based therapies through scalable design. *Annual Review of Chemical and Biomolecular Engineering*. 2024. [Link](#)
9. **Galloway, KE**. Rewinding the tape to identify intrinsic determinants of reprogramming potential. *Cellular Reprogramming*. 2024. [Link](#)
8. **Galloway, KE**. Changes in cell-cycle rate drive diverging cell fates. *Nature Reviews Genetics*. 2024. [Link](#)
7. Takahashi, K, and **Galloway, KE**. RNA-based controllers for engineering gene and cell therapies. *Current Opinion in Biotechnology*. 2023. [Link](#)
6. Cabera, A*, Edelstein, HI*, Glykofrydis, F*, Love, KS*, Palacios, S* Tycko, J*, Zhang, M*, Lensch, S, Shields, CE, Livingston, M, Weiss, R, Zhao, H, Haynes, KA, Morsut, L, Chen, YY, Khalil, AS, Wong, WW, Collins, JJ, Rosser, SJ, Karen Polizzi, K, Elowitz, MB, Fussenegger, M, Hilton, IB, Leonard, JN, Bintu, L, **Galloway, KE**, Deans, TL. The sound of silence: transgene silencing in mammalian cell engineering. *Cell Systems*. 2022. [Link](#)
5. Wang, NB and **Galloway, KE**. Evaluation of Lee et al.: Clarity and interpretation of mutual information in promoter transfer functions. *Cell Systems*. 2021. [Link](#)
4. Beitz, AM, Oakes, CG, and **Galloway, KE**. Synthetic gene circuits as tools for drug discovery. *Trends In Biotechnology*. 2021. [Link](#)
3. Johnstone, CP and **Galloway, KE**. Engineering cellular symphonies out of transcriptional noise. *Nature Reviews Molecular Cell Biology* 2021. [Link](#)
2. Johnstone, CP*, Wang, NB*, Sevier, SA, and **Galloway, KE**. Understanding and engineering chromatin as a dynamical system across length and time scales. *Cell Systems*. 2020. *These authors contributed equally to this work. [Link](#)
1. Wang, NB, Beitz, AM, and **Galloway, KE**. Engineering cell fate: Applying synthetic biology to cellular reprogramming. *Current Opinion in Systems Biology*. 2020. [Link](#)

Pre-MIT

Galloway, KE and Ichida, JK. Modeling neurodegenerative diseases and neurodevelopmental disorders with reprogrammed cells. *Stem Cells, Tissue Engineering and Regenerative Medicine*. D.A. Warburton, Ed. (World Scientific, New Jersey, 2015).

Franco, E and **Galloway, KE**. Feedback loops in biological networks. *Computational Methods in Synthetic Biology*. M. A. Marchisio, Ed. (Springer New York, 2015). [Link](#)

Chen, YY*, **Galloway, KE***, and Smolke, CD. Synthetic biology: advancing biological frontiers by building synthetic systems. *Genome Biology*. 2012. *These authors contributed equally to this work. [Link](#)

Teaching Experience

2019-2024	10.10: Introduction to Chemical Engineering , Instructor, 6.5/7	MIT
2021-2022	10.521: Design Principles in Mammalian Systems + Synthetic Biology , Instructor, 6.5/7	MIT
2020-2024	UROP: "How to Science" + Computational modeling of gene circuits , Instructor	MIT

Awards & Honors

2024	Frontiers of Engineering 2024 Selected Attendee , National Academy of Engineering
2024	C. Michael Mohr Award for Undergraduate Teaching , MIT Chemical Engineering
2024	NSF CAREER Award , National Science Foundation
2023	Dudley A. Saville Lecturer , Department of Chemical and Biological Engineering, Princeton
2023	Rosalind Franklin Medal Finalist , Rosalind Franklin Society
2023	Cellular and Molecular Bioengineering Rising Star , Biomedical Engineering Society
2022-2025	W. M. Keck Career Development Professor in Biomedical Engineering , MIT ChemE
2019-2022	Charles and Hilda Roddey Career Development Chair , MIT ChemE
2017-2019	Maggie McKnight Russell Memorial Postdoctoral Fellow Award , ARCS ARCS, Awarded to one outstanding USC postdoctoral scholar
2018	2nd Place at the Annual UCI Postdoctoral Symposium , University of California, Irvine UCI, TED talk-style competition for open to all Southern California postdocs
2017	1st Place at the Annual Postdoctoral Symposium , USC Postdoctoral Association USC, TED talk-style competition
2011	Everhart Lecturer , Caltech Everhart Committee Caltech, Awarded yearly to three graduate students for research excellence
2006	Honorable Mention , National Science Foundation NSF, Graduate Research Fellowship Program
2001-2005	Scholar , Reagent's and Chancellor's Scholarship University of California, Berkeley, Top 1% of incoming students
2001-2005	Most Valuable Student , Elks Foundation Elks National Foundation, Top 500 students nationally

Professional Memberships

American Chemical Society
American Institute of Chemical Engineers
Biomedical Engineering Society
Society for Biological Engineering
International Society for Stem Cell Research

Professional Activities

2022-2024 **Founder and Organizer**, Boston Mammalian Synthetic Biology Symposium
2022-2024 **Advisory Board**, Cell Reports
2022-2024 **Early Career Advisory Board**, Stem Cell Reports
2020-2024 **Organizing committee**, Mammalian Synthetic Biology Workshop (mSBW)
2020-2023 **Organizing committee**, Epigenetics and Bioengineering (EpiBio)
2022-2023 **Conference Chair**, International Conference on Biomolecular Engineering (ICBE)
2022-2023 **Organizing committee**, Synthetic Biology, Evolution, Engineering, and Design (SEED)
2022-2024 **Organizing committee**, Synthetic Biology for Future Health-Wellcome Trust
2019-2023 **Theme and session chair**, AIChE Annual Meeting, Bioengineering (Division 15)
2021-2023 **Session chair**, American Chemical Society (ACS)-BIOT
Adhoc reviewer, Science, PNAS, Cell Systems, Nucleic Acids Research, Nature
2019-2023 Communications, Cell Chemical Biology, Science Advances, Cell Reports, ACS Synthetic Biology, eLife, Oxford Synthetic Biology, Current Opinion in Biomedical Engineering

Outreach

2021-2024 **Faculty Host**, Graduate Women in Chemical Engineering (GWiCHE) monthly coffee hour
2019-2024 **Mentor**, MIT Chemical Engineering Rising Stars Program
2020-2024 **Developer and instructor**, Tutorial series: Modeling gene circuits + basic research methods
2020-2024 **STEM Speaker**, Warren High School AVID club; college-prep for first-gen students