Kate E Galloway

Synthetic biology · Cell fate engineering · Molecular systems biology

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Biography

Katie Galloway is an associate professor of Chemical Engineering at the Massachusetts Institute of Technology. Her lab focuses on developing integrated gene circuits and identifying the systems-level principles that govern cell-fate transitions with the goal of engineering cell and gene therapies. Galloway earned her PhD 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 USC Stem Cell in the Keck School of Medicine. Her research has been featured in *Science, Nature Biotechnology, Cell Stem Cell, Nature Biomedical Engineering, Cell Systems, Nucleic Acids Research, Development, and Cell Reports*. She has won multiple fellowships and awards including the NSF CAREER, the Pershing Square MIND Prize, the BMES Cellular and Molecular Bioengineering Rising Star Award, Princeton's CBE Saville Lecture Award, NIH Maximizing Investigators' Research Award, the C. Michael Mohr Award for Undergraduate Teaching in Chemical Engineering at MIT, and Caltech's Everhart Award.

Education

2007 - 2012	**PhD Chemical Engineering, minor Biology**, California Institute of Technology | Pasadena, CA
2005 - 2007	**MS Chemical Engineering** , California Institute of Technology | Pasadena, CA
2001 - 2005	**BS Chemical Engineering** , University of California, Berkeley | Berkeley, CA

Publications

Published

37. Wang NB*, Ehmann ME*, Blanch-Asensio A, Cevasco H, Ploessl DS, Gumustop DR, Castellanos MF, Lende-Dorn BA, Sanchez-Rivera FJ, O'Shea TO, **Galloway KE**. Programmable nanobody circuits for cell selection. *Nature Biotechnology.* 2026. Link. **These authors contributed equally to this work.*

36. Della Santina CM*, Ploessl DS*, Lindsay-Mosher N, Brown CG, Ehmann ME, Blanch-Asensio A, Kim EC, Boyden ES, **Galloway KE†**, Boyer LA†. Self-amplifying RNA enables rapid, durable, integration-free programming of hiPSCs. *Cell Reports Methods*. 2026. *†Co-corresponding.* Link. **These authors contributed equally to this work.*

35. **Galloway KE**. Luck favors the prepared in hepatic reprogramming. *Stem Cell Reports*. 2026. Link.

34. Blanch-Asensio A, Gumustop DR, Wang NB, Peterman EL, Ploessl DS, and **Galloway KE**. Engineering STRAIGHT-IN single and dual lines in the male iPS11 parental line for programmable DNA integration. *Stem Cell Research*. 2026. Link.

33. Johnstone CP, Love KS, Kabaria SK, Jones RD, Blanch-Asensio A, Peterman EL, Ploessl DS, Lee J, Yun J, Oakes CG, Mummery CL, Davis RP, DeKosky BJ, Zandstra PW, and **Galloway KE**. Gene syntax defines supercoiling-mediated transcriptional feedback. *Science*. 2026. Link.

32. Blanch-Asensio A, Ploessl DS, Johnson BB, Cascione S, Berndsen MRM, Wang NB ,Orlova VV, Alemany A , Mummery CL, **Galloway KE†** and Davis RP†. STRAIGHT-IN Dual: A platform for dual single-copy integrations of DNA payloads and gene circuits into human induced pluripotent stem cells. *Nature Biomedical Engineering*. 2026. *†Co-corresponding.* Link.

31. Love, KS, and **Galloway, KE**. Modulating RNA condensates to control cell fate. *Nature Biotechnology*. 2025. Link.

30. Chaikof EL, Chen J, Gillette MU, Boyer LA, Deans TL, Li P, Hilton IB, Daniels K, Goyal Y, Mei Y, Linghu C, Loveless TB, Truong DM, Blatchley MR, Gu M, Bashor CJ, Yang JH, Raman R, Reddy AB, Saha K, Davis J, Gupta K, Gao XJ†, **Galloway KE†**Integrating synthetic biology to understand and engineer the heart, lung, blood, and sleep systems. *Cell Systems*. 2025. *†Co-corresponding.* Link.

29. Nolan N, E. Peterman EL, **Galloway KE**, Murray RM, Sontag ED, and Del Vecchio D. Guaranteed Multistability in a microRNA-Based Genetic Network by Formal Methods *In Proc. 2025 63rd IEEE Conference on Decision and Control (CDC)*, 2025.

Link.

28. Kabaria, KS, Bae, Y, Beitz AM Lende-Dorn BA Ehmann, ME, Ehmann,Peterman, EL, Love KS, Ploessl, DS, and **Galloway, KE**. Programmable promoter editing for precise control of transgene expression. *Nature Biotechnology*. 2025. Link.

27. Lende-Dorn BA, Atkinson JC, Bae Y, and **KE Galloway**. Chemogenetic tuning reveals optimal MAPK signaling for cell fate programming. *Cell Reports*. 2025. Link.

26. Peterman EL, Love KS, Sanabria, V, Daniels, RF, Johnstone CP, Ploessl, DS, Kabaria, KS, Godavarti, DR, Oakes, CG, Pai, A, and **KE Galloway**. High-resolution profiling reveals coupled transcriptional and translational regulation of transgenes. *Nucleic Acids Research*. 2025. Link.

25. Love KS, Johnstone CP, Peterman EL, Gaglione S, Birnbaum, ME and **Galloway, KE**. Model-guided design of microRNA-based gene circuits supports precise dosage of transgenic cargoes into diverse primary cells. *Cell Systems*. 2025. Link

24. 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. *Trends in Biotechnology*. 2025. Link

23. Wang NB, Adewumi HO, Lende-Dorn BA, Beitz AM, O'Shea TM, and **Galloway, KE**. Compact transcription factor cassettes generate functional, engraftable neurons by direct conversion. *Cell Systems*. 2025.Link

22. 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 to motor neurons. *Cell Systems*. 2025. Link

21. Rivnay, J, Raman, R, Robinson, JT Christian Schreib, C, Tzahi Cohen-Karni, T, **KE Galloway**, Omid Veiseh, O. Integrating bioelectronics with cell-based synthetic biology. *Nature Review Bioengineering*. 2025. Link

20. **Galloway, KE** and Johnstone, CP. Bringing neural networks to life. *Science*. 2024. Link

19. Incer I, Pandey A, Peterman EL, Nolan N, **Galloway KE**, Murray RM, Sontag ED, and Del Vecchio D.Guaranteeing system-level properties in genetic circuits subject to context effects *In Proc. 2024 63rd IEEE Conference on Decision and Control (CDC)*, 2024. Link

18. **Galloway, KE**. Rewinding the tape to identify intrinsic determinants of reprogramming potential. *Cellular Reprogramming*. 2024. Link

17. Peterman, EL, Ploessl, DS, and **Galloway, KE**. Accelerating diverse cell-based therapies through scalable design. *Annual Review of Chemical and Biomolecular Engineering*. 2024. Link

16. **Galloway, KE**. Changes in cell-cycle rate drive diverging cell fates. *Nature Reviews Genetics*. 2024. Link

15. Takahashi, K, and **Galloway, KE**. RNA-based controllers for engineering gene and cell therapies. *Current Opinion in Biotechnology*. 2023. Link

14. Johnstone, CP and **Galloway, KE**. Supercoiling-mediated feedback rapidly couples and tunes transcription. *Cell Reports*. 2022. Link

13. 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 **These authors contributed equally to this work.*

12. Wang, NB and **Galloway, KE**. Evaluation of Lee et al.: Clarity and interpretation of mutual information in promoter transfer functions. *Cell Systems*. 2021. Link

11. Beitz, AM, Oakes, CG, and **Galloway, KE**. Synthetic gene circuits as tools for drug discovery. *Trends In Biotechnology*. 2021. Link

10. Johnstone, CP and **Galloway, KE**. Engineering cellular symphonies out of transcriptional noise. *Nature Reviews Molecular Cell Biology* 2021. Link

9. 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

8. Wang, NB, Beitz, AM, and **Galloway, KE**. Engineering cell fate: Applying synthetic biology to cellular reprogramming. *Current Opinion in Systems Biology*. 2020. Link

Pre-prints

A. Love, KS, Lende-Dorn, BA, and **Galloway, KE**. Engineering high-titer lentiviral vectors for robust expression of RNA-based gene circuits. *bioRxiv.* 2026. Link *In revision at Nucleic Acids Research.*

B. 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 rates. *bioRxiv*. 2024. Link. *In Revision at Cell Systems.*

C. Peterman, EL, Nolan N, Naydenkov, PM, Godavarti, DR, Del Vecchio, D, and **Galloway, KE**. Model-guided design of single-cargo, dual-attractor gene circuits. *bioRxiv*. 2026. Link *In Review at Cell Systems.*

Postdoctoral

7. 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

6. 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

5. **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).

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

Graduate and Pre-graduate

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

2. 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

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

Teaching Experience

2019-2026	**10.10: Introduction to Chemical Engineering**, Instructor, 6.1/7	*MIT*
2021-2026	**10.521: Design Principles in Mammalian Systems + Synthetic Biology**, Instructor, 6.5/7	*MIT*
2026-2026	**10.494A: Bioprocess optimization of monoclonal antibodies**, Instructor, 6.4/7	*MIT*
2020-2026	**UROP: "How to Science" + Computational modeling of gene circuits**, Instructor	*MIT*

Select Awards & Honors

2026	**Prize Finalist**, MIT-Royalty Pharma Faculty Founder Initiative
2025	**MIND Prize Awardee**, Pershing Square Foundation
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
2017	**1st Place at the Annual Postdoctoral Symposium**, USC Postdoctoral Association
2011	**Everhart Lecturer**, Caltech Everhart Committee
2006	**Honorable Mention**, NSF Graduate Research Fellowship Program
2001-2005	**Reagent's and Chancellor's Scholar**, University of California, Berkeley

Patents

5. Kasey S Love, Derin Gumustop, **Kate Galloway**. ComMAND Tag. Application: 64/063,290. Provisional Filed. May 2026.

4. Nathan B Wang, Albert Blanch-Asensio, **Kate Galloway**. Destabilized Nanobody Circuits for Antigen-Dependent Cell Selection (DASIT). Provisional Filed. Jan 2026.

3. Sneha Kabaria, Yunbeen Bae, Mary Ehmann, **Kate Galloway**. DIAL: Programmable promoter editing to generate defined, heritable setpoints of gene expression. US Filed as PCT/US2025/030574. Patent pending; Filed 2024.

2. Justin Ichida, Kimberley N Babos, **Kate E Galloway**. Methods for enhancing direct reprogramming of cells., Patent No. 17472424. Patent pending; Filed 2021.

1. Win MN, **Galloway KE**, Smolke CD. Modular aptamer-regulated ribozymes. Patent No. 8,603,996. Issued 2012.

Professional Activities

2022-2026	**Founder and Organizer**, Boston Mammalian Synthetic Biology Symposium
2024	**Conference Chair**, Mammalian Synthetic Biology Workshop (mSBW)
2020-2025	**Organizing committee**, Mammalian Synthetic Biology Workshop (mSBW)
2022-2025	**Early Career Advisory Board**, Stem Cell Reports
2022-2025	**Organizing committee**, Synthetic Biology, Evolution, Engineering, and Design (SEED)
2020-2023	**Organizing committee**, Epigenetics and Bioengineering (EpiBio)
2023	**Conference Chair**, International Conference on Biomolecular Engineering (ICBE)
2022-2026	**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
2022-2026	**Advisory Board**, Cell Reports
2019-2026	**Ad hoc reviewer**, Science, Cell, Nature Biotechnology, Cell Systems, Nucleic Acids Research, PNAS, Molecular cell, Nature Communications, Cell Chemical Biology, Science Advances, Cell Reports, ACS Synthetic Biology, eLife, Oxford Synthetic Biology

Presentations

85. July 2026. Chan-Zuckerberg Institute Synthetic Biology and Immunology Meeting. **Invited.** New York City, NY

84. July 2026. International Society for Stem Cell Research (ISSCR) Annual Meeting. **Invited.** Montreal, Canada

83. June 2026. Cell State Transitions and Fate (in)decisions. National Institute for Theory and Mathematics in Biology. **Invited.** Chicago, IL

82. June 2026. Leibnitz Institute for Immunotherapy (LIT) “Synthetic Immunology / Synthetic Biology”. **Invited.** Regensberg, Germany

81. June 2026. BioElectronic Therapeutics (BETx). **Invited.** Paris, France

80. June 2026. European Society for the Advancement of Cell Technology.**Invited Keynote Speaker.** Salzburg, Austria

79. March 2026. Synthetic Biology for Future Health and Sustainability. Cambridge, England

78. January 2026. MASSIV. **Invited Keynote Speaker.** Vancouver, Canada

77. November 2025. Workshop on Biological Control Systems. **Invited Keynote Speaker.** Online.

76. November 2025. School of Biotechnology and Biomolecular Sciences. University of New South Wales. **Invited.** Sydney, Austrlia

75. October 2025. Department of Chemical and Biomolecular Engineering. University of Wisconsin. **Invited.** Madison, WI

74. September 2025. Cell Fate Transitions. **Invited.** Cold Spring Harbor, NY

73. September 2025. International Workshop on Biodesign Automation. **Invited.** Worcester, MA

72. Aug 2025. Picower Institute Faculty Lunch. **Invited.** Cambridge, MA

71. July 2025. NSF Genome Architecture and Function Summer School and Workshop. **Invited.** Sophia, Bulgaria.

70. May 2025. Single Cell Proteomics. Northeastern University. **Invited.** Boston, MA
69. May 2025. SynbioBeta. **Invited.** San Jose, CA
68. April 2025. American Society for Biochemistry and Molecular Biology (ASBMB) Annual Meeting. **Invited.** Chicago, IL
67. April 2025. Chan-Zuckerberg Institute (CZI) Cell Science Grantee Meeting. **Invited.** Chicago, IL
66. April 2025. McGovern Institute for Brain Research Faculty Lunch. **Invited.** Cambridge, MA
65. March 2025. ACS BIOT. **Invited.** San Diego, CA
64. March 2025. Harvard Medicine Department of Surgery Surgical Horizon's Seminar. **Invited.** Boston, MA
63. March 2025. UC Berkeley Department of Chemical Engineering. **Invited.** Berkeley, CA
62. February 2025. Pershing Square MIND prize finalist. **Invited.** NYC, NY
61. February 2025. Winter Quantitative Biology (q-bio). Oahu, Hawaii
60. December 2024. VIB Next-Generation Synthetic Biology. **Invited.** Ghent, Belgium
59. October 2024. DTU BioSUSTAIN. **Invited.** Copenhagen, Denmark
58. October 2024. University of Pennsylvania, Stem Cell Club. **Invited.** Philadelphia, PA
57. September 2024. Discovery on Target: Synthetic Biology for Drug Discovery and Therapy. **Invited.** Boston, MA
56. July 2024. Biochemical and Molecular Engineering XXIII. **Invited.** Dublin, Ireland
55. June 2024. Synthetic Biology, Engineering, Evolution, and Design (SEED). **Invited.** Atlanta, GA
54. April 2024. Syn-BYSS: SynBio Young Speaker Series. **Invited.** Virtual Seminar Series
53. April 2024. Caltech Department of Chemical Engineering. **Invited.** Pasadena, CA
52. April 2024. Stanford Department of Chemical Engineering. **Invited.** Stanford, CA
51. March 2024. Fragile Nucleosome. **Invited.** Virtual Seminar Series
50. January 2024. University of Toronto Department of Chemical Engineering. **Invited.** Toronto, Canada
49. January 2024. University of Stanford, Genetics Retreat . **Invited.** Stanford, CA
48. January 2024. University of Massachusetts Department of Systems Biology. **Invited.** Amherst, MA
47. December 2023. Boston University Department of Biology. **Invited.** Boston, CA
46. November 2023. USC Michelson Center Convergent STEM Seminar. **Invited.** *Programming cell fate*. Los Angeles, CA
45. November 2023. USC Department of Quantitative and Computational Biology. **Invited.** Los Angeles, CA
44. November 2023. Massachusetts General Hospital Cancer Center. **Invited.** Boston, MA
43. November 2023. Northwestern Synthetic Biology Retreat. **Invited Keynote Speaker.** Boston, MA
42. October 2023. Princeton Department of Chemical and Biological Engineering . **Invited Saville Lecture.** Princeton, NJ
41. October 2023. Cornell Department of Biomedical Engineering and Center for Vertebrate Genomics. **Invited.** Ithaca, NY
40. September 2023. Cytiva-Danaher Q3 2023 Scientific Advisory Board. **Invited.** Virtual
39. July 2023. Genome Writer Guild Conference. **Invited award lecture.** Minneapolis, Minnesota
38. July 2023. Gordon Research Conference Synthetic Biology. **Invited.** Boston, MA
37. April 2023. Northeastern Synthetic Biology Symposium. **Invited Keynote Speaker.** Boston, MA
36. March 2023. Iowa State Department of Chemical Engineering Seminar. **Invited.** Ames, Iowa
35. March 2023. Ohio State Department of Biomedical Engineering Seminar. **Invited.** Columbus, Ohio
34. March 2023. American Physical Society; Division of Biological Physics (DBIO). **Invited Keynote Speaker.** Las Vegas, NV
33. February 2023. Harvard Topics in Bioengineering. **Invited Speaker.** Cambridge, MA
32. January 2023. BMES Cellular and Molecular Bioengineering (CMBE). **Rising Star Awardee + Speaker.** Palm Springs, CA

31. December 2022. NIBIB Synthetic Biology Consortium Meeting. **Invited.** NIBIB, Virtual
30. December 2022. Dana-Farber Center for Functional Cancer Epigenetics. **Invited.** Boston, MA
29. November 2022. Australian Mathematical Sciences Institute BioInfoSummer. **Invited Keynote Speaker.** Melbourne, AU
28. October 2022. Biomedical Engineering Society Annual Meeting. San Antonio, Texas
27. October 2022. International Conference on Stem Cell Engineering. **Invited.** Cambridge, MA
26. August 2022. Merck Discovery Biologics. **Invited.** Rahway, NJ
25. August 2022. CHSL Synthetic Biology Course. **Invited.** Cold Spring Harbor, NY
24. July 2022. mammalian Synthetic Biology Workshop. **Invited.** Edinburgh, Scotland
23. June 2022. GRC Bioanalytical **Invited.** Newport, RI
22. May 2022. National Institute of Health Heart, Lung, and Blood (NHLBI) WORKSHOP. **Invited.** Virtual
21. May 2022. Synthetic Biology: Engineering, Evolution, and Design. Arlington, Virgina
20. April 2022. 48th Annual Northeast Bioengineering Conference at Columbia University. **Invited.** Columbia University
19. Jan 2022. Advanced Systems and Synthetic Biology. **Invited.** University of Washington
18. Dec 2021. BU BME Graduate Student Research Symposium. **Keynote Speaker.** Boston University
17. Dec 2021. Squishy Physics seminar series, **Invited.** Harvard University
16. Dec 2021. 8th International Conference on Stem Cell Engineering, **Invited (postponed).** *postponed
15. Nov 2021. AIChE Annual Meeting. **Invited.** Boston, MA.
14. Nov 2021. AIChE Annual Meeting. Boston, MA.
13. Nov 2021. AIChE Annual Meeting. Boston, MA.
12. Sept 2021. DNA Topology in genomic transactions, EMBO Workshop. Virtual.
11. Sept 2021. NIH Epigenetics and Stem Cell Biology Laboratory. **Invited.** Virtual.
10. July 2021. Mammalian Synthetic Biology Workshop. **Invited.** Virtual.
9. June 2021. International Society for Stem Cell Research (ISSCR) Annual Meeting. **Invited.** Virtual.
8. Mar 2021. Keystone Single Cell Biology.**Invited.** Virtual.
7. Dec 2020. Mammalian Synthetic Biology Workshop Virtual. **Invited** Virtual.
6. Nov 2020. AIChE Annual Meeting Virtual.
5. Oct 2020. Epigenetics and Bioengineering (EpiBio). Virtual.
4. Jun 2020. International Society for Stem Cell Research (ISSCR) Annual Meeting.Virtual.
3. May 2020. Mammalian Synthetic Biology Workshop 7.0. **Invited.** Delayed:Covid-19
2. May 2020. Gene Expression And Regulation (GEARS) Symposium. **Invited.** HMS, Boston, MA. Delayed:Covid-19
1. Mar 2020. Koch Institute for Integrative Cancer Research Seminar. **Invited.** MIT, Cambridge, MA.