

Lulu Qian

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Academic Positions

Professor of Bioengineering

California Institute of Technology, Pasadena

January, 2019 – present

Assistant Professor of Bioengineering

California Institute of Technology, Pasadena

July, 2013 – December, 2018

Visiting Fellow at the Wyss Institute

Harvard Medical School, Boston

Host: *Peng Yin*

February, 2012 – November, 2012

Senior Postdoctoral Scholar in Bioengineering

California Institute of Technology, Pasadena

Advisor: *Jehoshua Bruck*

January, 2011 – June, 2013

Postdoctoral Scholar in Bioengineering

California Institute of Technology, Pasadena

Advisors: *Erik Winfree and Jehoshua Bruck*

January, 2008 – December, 2010

Education

Ph.D. in Biochemistry and Molecular Biology

Shanghai Jiao Tong University, Shanghai

Advisor: *Lin He*

September, 2004 – November, 2007

B.Eng. in Biomedical Engineering

Southeast University, Nanjing

September, 1998 – June, 2002

Honors

1. Feynman Prize for Excellence in Teaching, 2023
2. Schmidt Science Polymath Award, 2022

3. Foresight Institute Feynman Prize in Nanotechnology, 2019
4. Rozenberg Tulip Award in DNA Computing, 2019
5. Journal of the American Chemical Society (JACS) Young Investigator, 2019
6. Associated Students of Caltech (ASCIT) Teaching Award, 2019
7. National Science Foundation Faculty Early Career Development Award, 2013
8. Okawa Foundation Research Award, 2013
9. Burroughs Wellcome Fund Career Award at the Scientific Interface, 2012

Refereed Publications

1. N. Sarraf, K. R. Rodriguez, and L. Qian. Modular reconfiguration of DNA origami assemblies using tile displacement. *Science Robotics* **8**(77), eadf1511 (2023).
2. A. P. Lapteva, N. Sarraf, and L. Qian. DNA strand-displacement temporal logic circuits. *JACS* **144**, 12443–12449 (2022).
3. A. T. Glynn, S. R. Davidson, and L. Qian. Developmental self-assembly of a DNA ring with stimulus-responsive size and growth direction. *JACS* **144**, 10075–10079 (2022).
4. K. R. Rodriguez, N. Sarraf, and L. Qian. A loser-take-all DNA circuit. *ACS Synthetic Biology* **10**, 2878–2885 (2021).
5. D. N. Taylor, S. R. Davidson, and L. Qian. A cooperative DNA catalyst. *JACS* **143**, 15567–15571 (2021).
6. R. F. Johnson, and L. Qian. Simplifying chemical reaction network implementations with two-stranded DNA building blocks. *DNA Computing and Molecular Programming, LIPIcs* **174**, 2:1–2:14 (2020).
7. S. Clamons, L. Qian, and E. Winfree. Programming and simulating chemical reaction networks on a surface. *Journal of the Royal Society Interface* **17**, 20190790 (2020).
8. P. Petersen, G. Tikhomirov, and L. Qian. Information-based autonomous reconfiguration in systems of interacting DNA nanostructures. *Nature Communications* **9**, 5362 (2018).
9. G. Tikhomirov, P. Petersen, and L. Qian. Triangular DNA origami tilings. *JACS* **140**, 17361–17364 (2018).
10. K. M. Cherry, and L. Qian. Scaling up molecular pattern recognition with DNA-based winner-take-all neural networks. *Nature* **559**, 370–376 (2018).
11. D. Wilhelm, J. Bruck, and L. Qian. Probabilistic switching circuits in DNA. *PNAS* **115**, 903–908 (2018).
12. G. Tikhomirov, P. Petersen, and L. Qian. Fractal assembly of micrometre-scale DNA origami arrays with arbitrary patterns. *Nature* **552**, 67–71 (2017).
News and Views: “DNA self-assembly scaled up” by Fei Zhang and Hao Yan, *Nature* **552**, 34–35.
13. A. J. Thubagere, W. Li, R. F. Johnson, Z. Chen, S. Doroudi, Y. L. Lee, G. Izatt, S. Wittman, N. Srinivas, D. Woods, E. Winfree, and L. Qian. A cargo-sorting DNA robot. *Science* **357**, eaan6558 (2017).
Perspective: “DNA robots sort as they walk” by John Reif, *Science* **357**, 1095–1096.
14. A. J. Thubagere, C. Thachuk, J. Berleant, R. F. Johnson, D. A. Ardelean, K. M. Cherry, and L. Qian. Compiler-aided systematic construction of large-scale DNA strand displacement circuits using unpurified components. *Nature Communications* **8**, 14373 (2017).
15. G. Tikhomirov, P. Petersen, and L. Qian. Programmable disorder in random DNA tilings. *Nature Nanotechnology* **12**, 251–259 (2017).

News and Views: “DNA origami tiles: Nanoscale mazes” by Fei Zhang, Fan Hong and Hao Yan, *Nature Nanotechnology* **12**, 189–190.

16. [L. Qian](#) and E. Winfree. Parallel and scalable computation and spatial dynamics with DNA-based chemical reaction networks on a surface. *DNA Computing and Molecular Programming, LNCS* **8727**, 114–131 (2014).
17. [L. Qian](#), E. Winfree, and J. Bruck. Neural network computation with DNA strand displacement cascades. *Nature* **475**, 368–372 (2011).
News and Views: “DNA and the brain” by Anne Condon, *Nature* **475**, 304–305.
18. [L. Qian](#) and E. Winfree. Scaling up digital circuit computation with DNA strand displacement cascades. *Science* **332**, 1196–1201 (2011).
Perspective: “Scaling up DNA computation” by John Reif, *Science* **332**, 1156–1167.
News and Views: “DNA computes a square root” by Yaakov Benenson, *Nat. Nanotechnol.* **6**, 465–467.
19. [L. Qian](#) and E. Winfree. A simple DNA gate motif for synthesizing large-scale circuits. *Journal of the Royal Society Interface* **8**, 1281–1297 (2011).
20. [L. Qian](#), D. Soloveichik, and E. Winfree. Efficient Turing-universal computation with DNA polymers. *DNA Computing and Molecular Programming, LNCS* **6518**, 123–140 (2011).
21. Z. Zhang, Y. Wang, C. Fan, C. Li, Y. Li, [L. Qian](#), Y. Fu, Y. Shi, J. Hu, and L. He. Asymmetric DNA origami for spatially addressable and index-free solution-phase DNA chips. *Advanced Materials* **22**, 2672–2675 (2010).
22. [L. Qian](#), J. Zhao, Y. Shi, X. Zhao, G. Feng, F. Xu, S. Zhu, and L. He. Brain-derived neurotrophic factor and risk of schizophrenia: an association study and meta-analysis. *Biochemical and biophysical research communications* **353**, 738–743 (2007).
23. J. Zhao, [L. Qian](#), Q. Liu, Z. Zhang, and L. He. DNA addition using linear self-assembly. *Chinese Science Bulletin* **52**, 1462–1467 (2007).
24. [L. Qian](#), Y. Wang, Z. Zhang, J. Zhao, D. Pan, Y. Zhang, Q. Liu, C. Fan, J. Hu, and L. He. Analogic China map constructed by DNA. *Chinese Science Bulletin* **51**, 2973–2976 (2006).
25. J. Xie, Y. Bai, [L. Qian](#), L. Cui, X. Sun, and Z. Lu. A computer simulation system of DNA-binding protein experiment based on dsDNA microarray. *Acta Biophysica Sinica* **19**, 156–160 (2003).

[Google Scholar citation](#)

Recent Academic Talks

1. Schmidt Science Polymaths 2024 Convening (New York, May 2024)
2. Hamilton Institute Seminar, Maynooth University (Online, April 2024)
3. Aspen Winter Conference on Computing with Physical Systems (Aspen, January 2024)
4. Feynman Teaching Prize Seminar (Pasadena, December 2023)
5. 29th International Conference on DNA Computing and Molecular Programming (Sendai, Japan, September 2023)
6. Schmidt Science Polymaths 2023 Convening (Rhinebeck, May 2023)
7. Ned Seeman Memorial Symposium (New York, December 2022)

8. 19th Annual Conference on the Foundations of Nanoscience (Online, April 2022)
9. Molecular Machines Seminar, Foresight Institute (Online, May 2021)
10. Physical Chemistry Seminar, UNC Chapel Hill (Online, May 2021)
11. Bioengineering Departmental Seminar, Imperial College London (Online, December 2020)
12. ASPSM on Artificial Intelligence in Synthetic Biology (Burlington, MA, November 2019)
13. SFI Workshop “What is biological computation?” (Santa Fe, NM, September 2019)
14. Molecular Programming Symposium (Pasadena, CA, June 2019)
15. Physics Seminar, UC Merced (Merced, CA, May 2019)
16. James Franck Institute (JFI) Seminar, University of Chicago (Chicago, IL, April 2019)
17. Frontiers in Biology Seminar, Stanford University (Stanford, CA, March 2019)
18. Institute for Protein Design, University of Washington (Seattle, WA, November 2018)
19. Plenary: 24th International Conference on DNA Computing and Molecular Programming (Jinan, China, September 2018)
20. 9th Annual Wyss International Symposium: Molecular Robotics (Boston, MA, September 2018)
21. Department of Physics, University of Oxford (Oxford, England, July 2018)
22. Experimental Biology Annual Meeting (San Diego, CA, April 2018)
23. Physics Colloquium, Caltech (Pasadena, CA, April 2018)
24. Keynote: 15th Annual Conference on the Foundations of Nanoscience (Snowbird, UT, April 2018)
25. American Mathematical Society Sectional Meeting (Orlando, FL, September 2017)
26. Biology & Biological Engineering Annual Retreat, Caltech (Long Beach, CA, September 2017)
27. Thermodynamics of Computation in Chemical and Biological Systems (Santa Fe, NM, August 2017)
28. Bioengineering Seminar Series, UCLA (Los Angeles, CA, May 2017)

Academic Service

1. President of the International Society of Nanoscale Science, Computation and Engineering (ISNSCE) since 2023, Vice President 2021–2023, and Secretary of ISNSCE 2015–2021.
2. Burroughs wellcome Fund (BWF) Career Awards at the Scientific Interface (CASI) advisory committee member since 2022.
3. Program committee co-chair for the 23rd International Conference on DNA Computing and Molecular Programming in 2017, and program committee member since 2015.
4. Reviewer and panelist for the National Science Foundation (NSF).
5. Referee for *Science*, *Science Robotics*, *Nature*, *Nature Nanotechnology*, *Nature Biotechnology*, *Nature Chemistry*, *Nature Communications*, *Proceedings of the National Academy of Sciences*, *Angewandte Chemie*, *Nucleic Acids Research*, *Journal of the American Chemical Society*, *ACS Synthetic Biology*, *Chemical Science*, *Neural Computation*, *Theoretical Computer Science*, and *Scientific Reports*.