

Mark Bathe, Ph.D.

Curriculum Vitae

Education

2004	Ph.D., Mechanical Engineering, MIT
2001	M.Sc., Mechanical Engineering, MIT
1998	B.Sc., Mechanical Engineering, MIT

Postdoctoral Training

2006–2008	Alexander von Humboldt Postdoctoral Fellow, University of Munich
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Professional Experience

2026	Member, Microsystems Exploratory Council, DARPA
2022–present	SAB Member, Cache DNA, Inc.
2022–present	SAB Member, Kano Therapeutics, Inc.
2022–2023	Director, MIT New Engineering Education Transformation
2022	Co-Founder, Cache DNA, Inc.
2022	Co-Founder, Kano Therapeutics, Inc.
2021–present	Member, Harvard Medical School Initiative for RNA Medicine
2020–present	Professor, Department of Biological Engineering, MIT
2016–2020	Associate Professor with Tenure, Department of Biological Engineering, MIT
2013–2016	Associate Professor, Department of Biological Engineering, MIT
2012–present	Associate Member, Broad Institute of MIT & Harvard
2009–2013	Assistant Professor, Department of Biological Engineering, MIT
2006–2008	Alexander von Humboldt Postdoctoral Fellow, University of Munich

Affiliations

Associate Member, Broad Institute of MIT & Harvard
Member, Harvard Medical School Initiative for RNA Medicine

Research Interests

Active Immunotherapeutics
Central Nervous System Disorders
Excitonic Materials
Molecular Computing
Nanofabrication
Nanotechnology
Neurotherapeutics
Optoelectronic Materials
Particulate Vaccines
Photonic Materials
Quantum Information Science & Technology
Therapeutic Nucleic Acid Delivery

Academic Service

2025	Chair, Gordon Research Conference on RNA Nanotechnology
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2023	Vice Chair, Gordon Research Conference on RNA Nanotechnology
2020	NIH Gene Delivery Study Section, Ad Hoc Review Panelist
2019	NIH Nanotechnology Study Section, Review Panelist
2019	NIH BRAIN Initiative Review Panel, Review Panelist
2019	NIH Fellowship Review Panel in Cell Biology, Developmental Biology, and Bioengineering, Ad Hoc Review Panelist
2021–2023	Director, MIT New Engineering Education Transformation
2020–2021	Co-Director, MIT New Engineering Education Transformation
2019–2021	Editorial Board Member, Scientific Reports
2017–2019	Chair, MIT Committee on Student Life
2017–2019	MIT New Engineering Education Transformation Core Committee
2017–2018	Chair, MIT Department of Biological Engineering Graduate Academic Program
2017	NIH, Cellular and Molecular Technologies Study Section, Review Panelist
2017	NIH, Synthetic and Biological Chemistry A Study Section, Review Panelist
2016–present	MIT Department of Biological Engineering Graduate Admissions Committee
2016–2020	SRC Roadmap Committee on Synthetic Biology Steering Committee
2015–2019	MIT Institute Committee on Community Giving
2015–2023	MIT Department of Biological Engineering Teaching Awards Committee
2015–2016	MIT Institute for Medical Engineering & Science Faculty Search Committee
2014–2018	MIT Department of Biological Engineering Seminar Series Organizing Committee
2014	MIT Department of Biological Engineering Retreat Organizing Committee
2013–2017	MIT Department of Biological Engineering Undergraduate Program Committee
2011–2012	MISTI Global Seed Funds Evaluation Committee
2011–2012	MIT Department of Mechanical Engineering Graduate Admissions Committee
2009–2017	MIT Computational & Systems Biology Graduate Program Admissions Committee
2009–2016	MIT Computational & Systems Biology Graduate Program Committee
2009–2013	MIT Department of Biological Engineering Graduate Admissions Committee
2008–2013	MIT Department of Biological Engineering Graduate Program Committee

Publications

114. **Bathe, M.** (2026). Reinventing the Triple Helix: A National Tiered Network of Federated Translational Biotechnology Institutes. *SSRN Electronic Journal* DOI: <https://dx.doi.org/10.2139/ssrn.7345540>
113. Kim, H-M., Omer, M., Knappe, G.A., McMullen, P., Le, D.A., Pasupathy, A., Anderson, D.G., **Bathe, M.** (2026). Programmable Lipid Functionalization of Nucleic Acid Nanoparticles Modulates Liver Cell-Type Targeting. *ACS Applied Materials & Interfaces* 18: 18721.

112. Shah, A., Lee, X.K., Li, K., Knappe, G.A., **Bathe, M.**, Barbastathis, G., Doyle, P.S. (2026). Interpretable Deep Learning for Single-Molecule Nanopore Fingerprinting Using Physics-Guided Preprocessing. *ACS Sensors* 40 (XXX), XXX.
111. Berleant, J.D., Banal, J.L., Rao, D.K., **Bathe, M.** (2026). Enabling global-scale nucleic acid repositories through versatile, scalable biochemical selection from room-temperature archives. *Nature Communications* 17, 2807.
110. Romanov, A., Knappe, G.A., Ronsard, L., Cottrell, C.A., Zhang, Y.J., Suh, H., Duhamel, L., Omer, M., Chapman, A.P., Spivakovsky, K., Skog, P., Flynn, C.T., Lee, J.H., Kalyuzhniy, O., Liguori, A., Parsons, M.F., Lewis, V.R., Canales, J., Reizis, B., Tingle, R.D., Schiffner, T., Schief, W.R., Lingwood, D., **Bathe, M.**, Irvine, D.J. (2026). DNA origami vaccines program antigen-focused germinal centers. *Science* 391 (6785), eadx6291.
109. Scott, M.N., Banal, J.L., Chen, W.J., Brooks, C., Wang, X., Hart, S.M., Dodin, A., **Bathe, M.**, Willard, A.P., Schlau-Cohen, G.S. (2025). Transport of Delocalized Excitons through DNA-Based Molecular Photonic Wires. *ACS Nano* 19: 44.
108. Wei, X., Mo, Q., Chen, C., **Bathe, M.**, Hernandez, R. (2025). DNA Origami Nanostructures Observed in Transmission Electron Microscopy Images can be Characterized through Convolutional Neural Networks. *Journal of Chemical Information and Modeling* DOI: 10.1021/acs.jcim.5c00330
107. Knappe, G.A., Gorman, J., Bigley, A.N., Harvey, S.P., **Bathe, M.** (2025). Heterovalent Click Reactions on DNA Origami. *Bioconjugate Chemistry* 2025 36 (3), 476-485 DOI: <https://doi.org/10.1021/acs.bioconjchem.4c00552>
106. Luo, X., Ranno, L., Sverko, T., Lee, J.Y., Sbalbi, N., Jones, A., Chen, C., Bawendi, M.G., Hu, J., Macfarlane, R.J., **Bathe, M.** (2025). DNA origami directed integration of colloidal nanophotonic materials with silicon photonics *bioRxiv*, 2025.01.23.634416
105. Chen, C., Luo, X., **Bathe, M.** (2024). Versatile Dehydration-Assisted Functionalization of Quantum Dots and Rods. *Angew Chem Int Ed* 2024, 63, e202410247
104. Falkovich, R., Aryal, S., Wang, J., Sheng, M., **Bathe, M.** (2024). Synaptic composition, activity, mRNA translation and dynamics in combined single-synapse profiling using multimodal imaging. *bioRxiv*, 2024.10. 28.620504
103. Ofoegbu, P.C., Knappe, G.A., Romanov, A., Draper, B.E., **Bathe, M.**, Jarrold, M.F. (2024). Charge Detection Mass Spectrometry Enables Molecular Characterization of Nucleic Acid Nanoparticles *ACS Nano* 18 (34), 23301-23309.
102. Berleant, J.D., Banal, J.L., Rao, D.K., **Bathe, M.** (2024). Scalable search of massively pooled nucleic acid samples enabled by a molecular database query language. *medRxiv* DOI: <https://doi.org/10.1101/2024.04.12.24305660>

101. Allan, M.F., Aruda, J., Plung, J.S., Grote, S.L., Martin, Y.J., de Lajarte, A.A., **Bathe, M.**, Rouskin, S. (2024). Discovery and Quantification of Long-Range RNA Base Pairs in Coronavirus Genomes with SEARCH-MaP and SEISMIC-RNA. *bioRxiv* DOI: <https://doi.org/10.1101/2024.04.29.591762>
100. Kim, H-M., **Bathe, M.** Force-free activation of Notch with DNA origami. (2024). *Trends in Genetics* DOI: <https://doi.org/10.1016/j.tig.2024.03.001>
99. Gorman, J., Hart, S.M., John, T., Castellanos, M.A., Harris, D., Parsons, M.F., Banal, J.L., Willard, A.P., Schlau-Cohen, G.S., **Bathe, M.** (2024). Sculpting photoproducts with DNA origami. *Chem* DOI: <https://doi.org/10.1016/j.chempr.2024.03.007>
98. Wamhoff, E-C., Ronsard, L., Feldman, J., Knappe, G.A., Hauser, B.M., Romanov, A., Case, J.B., Sanapala, S., Lam, E.C., St. Denis, K.J., Boucay, J., Barczak, A.K., Balazs, A.B., Diamond, M.S., Schmidt, A.G., Lingwood, D., **Bathe, M.** (2024). Enhancing antibody responses by multivalent antigen display on thymus-independent DNA origami scaffolds. *Nature Communications* 15: 795.
97. Chen, C., Luo, X., Kaplan, A.E.K., Bawendi, M.G., Macfarlane, R.J., **Bathe, M.** (2023). Ultrafast dense DNA functionalization of quantum dots and rods for scalable 2D array fabrication with nanoscale precision. *Science Advances*, 32: eadh8508.
96. Hart, S.M., Gorman, J., **Bathe, M.**, Schlau-Cohen, G.S. (2023). Engineering Exciton Dynamics with Synthetic DNA Scaffolds. *Accounts of Chemical Research*, 56: 2051.
95. Falkovich, R., Danielson, E.W., Perez de Arce, K., Wamhoff, E-C., Strother, J., Lapteva, A.P., Sheng, M., Cottrell, J.R., **Bathe, M.** (2023). A synaptic molecular dependency network in knockdown of autism- and schizophrenia-associated genes revealed by multiplexed imaging. *Cell Reports*, 42: 112430.
94. Wamhoff, E-C., Knappe, G.A., Burds, A.A., Du, R.R., Neun, B., Difilippantonio, S., Sanders, C., Edmondson, E., Matta, J.L., Dobrovolskaia, M., **Bathe, M.** (2023). Evaluation of non-modified wireframe DNA origami for acute toxicity and biodistribution in mice. *ACS Applied Bio Materials*, 6: 1960.
93. Sheridan, K., Berleant, J., **Bathe, M.**, Condon, A., Williams, V.V. (2023). Factorization and pseudofactorization of weighted graphs. *Discrete Applied Mathematics*, 337: 81.
92. Berleant, J., Sheridan, K., Condon, A., Williams, V.V., **Bathe, M.** (2023). Isometric Hamming embeddings of weighted graphs. *Discrete Applied Mathematics*, 332: 119.
91. Parsons, M.F., Allan, M.F., Li, S., Shepherd, T.R., Ratanaalert, S., Zhang, S., Pullen, K.M., Chiu, W., Rouskin, S., **Bathe, M.** (2023). 3D RNA-scaffolded wireframe origami. *Nature Communications*, 14: 382.
90. Knappe, G.A., Wamhoff, E-C., **Bathe, M.** (2023). Functionalizing DNA origami to investigate and interact with biological systems. *Nature Reviews Materials*, 8: 123.

89. Du, R.R., Cedrone, E., Romanov, A., Falkovich, R., Dobrovolskaia, M.A., **Bathe, M.** (2022). Innate immune stimulation using 3D wireframe DNA origami. *ACS Nano*, 16: 20340.
88. Chen, C., Wei, X., Parsons, M.F., Guo, J., Banal, J.L., Zhao, Y., Scott, M.N., Schlau-Cohen, G.S., Hernandez, R., **Bathe, M.** (2022). Nanoscale 3D spatial addressing and valence control of quantum dots using wireframe DNA origami. *Nature Communications*, 13: 4935.
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85. Lan, T.C.T., Allan, M.F., Malsick, L.E., Woo, J.Z., Zhu, C., Zhang, F., Khandwala, S., Nyeo, S.S.Y., Sun, Y., Guo, J.U., **Bathe, M.**, Näär, A., Griffiths, A., Rouskin, S. (2022). Secondary structural ensembles of the SARS-CoV-2 RNA genome in infected cells. *Nature Communications*, 13: 1128.
84. Wei, X., Chen, C., Zhao, Y., Harazinska, E., **Bathe, M.**, Hernandez, R. (2022). Molecular structure of single-stranded DNA on the ZnS surface of quantum dots. *ACS Nano*, 16: 6666.
83. Wang, X., Jun, H., **Bathe, M.** (2022). Programming 2D supramolecular assemblies with wireframe DNA origami. *Journal of the American Chemical Society*, 144: 4403.
82. Hart, S.M., Wang, X., Guo, J., **Bathe, M.**, Schlau-Cohen, G.S. (2022). Tuning optical absorption and emission using strongly coupled dimers in programmable DNA scaffolds. *The Journal of Physical Chemistry Letters*, 13: 1863.
81. Afonin, K.A., Dobrovolskaia, M.A., Ke, W., Grodzinski, P., **Bathe, M.** (2022). Critical review of nucleic acid nanotechnology to identify gaps and inform a strategy for accelerated clinical translation. *Advanced Drug Delivery Reviews* 181: 114081.
80. Adendorff, M.R., Tang, G.Q., Millar, D.P., **Bathe, M.**, Bricker, W.P. (2022). Computational investigation of the impact of core sequence on immobile DNA four-way junction structure and dynamics. *Nucleic Acids Research* 50: 717.
79. Lavi, R., **Bathe, M.**, Hosoi, A., Mitra, A., Crawley, E. (2021). The NEET ways of thinking: Implementing them at MIT and assessing their efficacy. *Advances in Engineering Education*.
78. **Bathe, M.** (2021). Nanoscale 2D and 3D patterning using programmed DNA assemblies. *Novel Patterning Technologies 2021* 11610: 1161012.

77. Banal, J.L., and **Bathe, M.** (2021). Scalable nucleic acid storage and retrieval using barcoded microcapsules. *ACS Applied Materials & Interfaces* 13: 49729.
76. Jun, H., Wang, X., Parsons, M.F., Bricker, W.P., John, T., Li, S., Jackson, S., Chiu, W., **Bathe, M.** (2021). Rapid prototyping of arbitrary 2D and 3D wireframe DNA origami. *Nucleic Acids Research* 49: 10265.
75. Knappe, G.A., Wamhoff, E-C., Read, B.J., Irvine, D.J., **Bathe, M.** (2021). *In situ* covalent functionalization of DNA origami virus-like particles. *ACS Nano* 15: 14316.
74. Tomov, M.L., O'Neil, A., Abbasi, H.S., Cimini, B.A., Carpenter, A.E., Rubin, L.L., **Bathe, M.** (2021). Resolving cell state in iPSC-derived human neural samples with multiplexed fluorescence imaging. *Communications Biology* 4: 786.
73. Banal, J.L., Shepherd, T.Y., Berleant, J., Huang, H., Reyes, M., Ackerman, C.M., Blainey, P.C., **Bathe, M.** (2021). Random access DNA memory using Boolean search in an archival file storage system. *Nature Materials* 20: 1272.
72. **Bathe, M.**, Hernandez, R., Komiyama, T., Machiraju, R. and Neogi, S. (2021). Autonomous Computing Materials. *ACS Nano* 15: 3586.
71. Hart, S.M., Chen, W.J., Banal, J.L., Bricker, W.P., Dodin, A., Markova, L., Vyborna, Y., Willard, A.P., Häner, R., **Bathe, M.**, Schlau-Cohen, G.S. (2021). Engineering couplings for exciton transport using synthetic DNA scaffolds. *Chem* 7: 752.
70. Danielson, E., Perez de Arce, K., Cimini, B., Wamhoff, E-C., Singh, S., Cottrell, J.R., Carpenter, A.E., **Bathe, M.** (2020). Molecular diversity of glutamatergic and GABAergic synapses from multiplexed fluorescence imaging. *eNeuro* 8: ENEURO.0286-20.2020.
69. Afonin, K.A., Dobrovolskaia, M.A., Church, G., **Bathe, M.** (2020). Opportunities, barriers, and a strategy for overcoming translational challenges to therapeutic nucleic acid nanotechnology. *ACS Nano* 14: 9221.
68. Dobrovolskaia, M.A., **Bathe, M.** (2020). Opportunities and challenges for the clinical translation of structured DNA assemblies as gene therapeutic delivery and vaccine vectors. *WIREs Nanomedicine and Nanobiotechnology* 13: e1657.
67. Pisharady, K.P., Eberly, L.E., Cheong, I., Manousakis, G., Guliani, G., Clark, H.B., **Bathe, M.**, Walk, D., Lenglet, C. (2020). Tract-specific analysis improves sensitivity of spinal cord diffusion MRI to cross-sectional and longitudinal changes in amyotrophic lateral sclerosis. *Communications Biology* 3: 370.
66. Veneziano, R., Moyer, T.J., Stone, M.B., Mukherjee, S., Shepherd, T.R., Das, J., Schief, W.R., Irvine, D.J., **Bathe, M.** (2020). Role of nanoscale antigen organization on B-cell activation probed using DNA origami. *Nature Nanotechnology* 15: 716.
65. Hart, S.M., Banal, J.L., **Bathe, M.**, and Schlau-Cohen, G.S. (2020). Identification of non-radiative decay pathways in CY3. *The Journal of Physical Chemistry Letters* 11: 5000.

64. Jun, H., Wang, X., Bricker, W.P., & **Bathe, M.** (2019). Automated sequence design of 2D wireframe DNA origami with honeycomb edges. *Nature Communications* 10: 5419.
63. Guo, S-M., Veneziano, R., Gordonov, S., Li, L., Danielson, E., Perez de Arce, K., Park, D., Kulesa, A.B., Wamhoff, E-C., Blainey, P.C., Boyden, E.S., Cottrell, J.R., **Bathe, M.** (2019). Multiplexed and high-throughput neuronal fluorescence imaging with diffusible probes. *Nature Communications* 10: 4377.
62. Wamhoff, E-C., Banal, J.L., Bricker, T.R., Parsons, M.F., Veneziano, R., Stone, M.B., Jun, H., Wang, X., **Bathe, M.** (2019). Programming structured DNA assemblies to probe biophysical processes. *Annual Review of Biophysics* 48: 395.
61. Shepherd, T.R., Du, R.R., Huang, H., Wamhoff, E-C., **Bathe, M.** (2019). Bioproduction of pure, kilobase-scale single-stranded DNA. *Scientific Reports* 9: 6121.
60. Kulikov, V., Guo, S-M., Stone, M.B., Goodman, A., Carpenter, A., **Bathe, M.**, Lempitsky, V. (2019). DoGNet: A deep architecture for synapse detection in multiplexed fluorescence images. *PLoS Computational Biology* 15: e1007012.
59. Jun, H., Zhang, F., Shepherd, T., Ratalanert, S., Qi, X., Yan, H., **Bathe, M.** (2019). Autonomously designed free-form 2D DNA origami. *Science Advances* 5: eaav0655.
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55. Bricker, W.P., Banal, J.L., Stone, M.B., **Bathe, M.** (2018). Molecular model of J-aggregated pseudoisocyanine fibers. *The Journal of Chemical Physics* 149: 024905.
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39. Monnier, N., Barry, Z., Park, H.Y., Su, K.C., Katz, Z., English, B., Dey, A., Pan, K., Cheeseman, I., Singer, R., **Bathe, M.** (2015). Inferring transient particle transport dynamics in live cells. *Nature Methods* 12: 838.
38. Sun, G., Guo, S.M., Teh, C., Korzh, V., **Bathe, M.**, Wohland, T. (2015). Bayesian model selection applied to the analysis of FCS data of fluorescent proteins in vitro and in vivo. *Analytical Chemistry* 87: 4326.
37. Zhou, Z., Munteanu, E.L., He, J., Ursell, T., **Bathe, M.**, Huang, K.C., Chang, F. (2015). The contractile ring coordinates curvature dependent septum assembly during fission yeast cytokinesis. *Molecular Biology of the Cell* 26: 78.
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19. Castro, C.E., Kilchherr, F., Kim, D.N., Lin Shiao, E., Wauer, T., Wortmann, P., **Bathe, M.**, Dietz, H. (2011). A primer to scaffolded DNA origami. *Nature Methods* 8: 221.
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16. Kim, D.N., Nguyen, C.T., **Bathe, M.** (2011). Conformational dynamics of supramolecular protein assemblies. *Journal of Structural Biology* 173: 261.
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12. Sedeh, R., **Bathe, M.**, Bathe, K.J. (2010). The subspace iteration method in protein normal mode analysis. *Journal of Computational Chemistry* 31: 66.
11. **Bathe, M.**, Heussinger, C., Claessens, M.M.A.E., Bausch, A.R., and Frey, E. (2008). Cytoskeletal bundle mechanics. *Biophysical Journal* 94: 2955.
10. **Bathe, M.** (2008). A Finite Element framework for computation of protein normal modes and mechanical response. *Proteins: Structure, Function, and Bioinformatics* 70: 1595.
9. Heussinger, C., **Bathe, M.**, and Frey, E. (2007). Statistical mechanics of wormlike bundles. *Physical Review Letters* 99: 048101.
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6. **Bathe, M.**, Rutledge, G.C., Grodzinsky, A.J., and Tidor, B. (2005). A coarse-grained molecular model for glycosaminoglycans: Application to chondroitin, chondroitin sulfate, and hyaluronic acid. *Biophysical Journal* 88: 3870.
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2. **Bathe, M.**, Shirai, A., Doerschuk, C.M., and Kamm, R.D. (2002). Neutrophil transit times through pulmonary capillaries: The effects of capillary geometry and fMLP-stimulation. *Biophysical Journal* 83: 1917.

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Patents

22. Banal, J., **Bathe, M.**, Gorman, J., Knappe, G.A., Luo, X. Method and System for Massively Parallel Integration of Diverse Nanomaterials Using Orthogonally-Encoded DNA Templates. US Provisional Patent No. 63/815834 Jun. 1, 2025.
21. **Bathe, M.**, Dam, K.U., Knappe, G.A., Sirianni, R., Nucleic Acid Nanoparticle Delivery System for Targeted Delivery of Therapeutics and Vaccines to the Central Nervous System. US Provisional Patent No. 63/808429 May 19, 2025.
20. **Bathe, M.**, Veneziano, R., Wamhoff, E.-C., Moyer, T., Read, B.J., Romanov, A., Knappe, G.A., Irvine, D.J. Compositions of nucleic acid nanostructures for vaccines and methods of use thereof. US Patent App. No. 19/257,179. Jul. 1, 2025.
19. **Bathe, M.**, Falkovich, R., Multimodal and Network Phenotyping based on Single-Organellar In Situ Multiplexed Imaging. US Provisional Patent No. 63/706172 Oct., 11, 2024.
18. **Bathe, M.**, Ratanaalert, S., Veneziano, R., Banal, J., Shepherd, T. Sequence-controlled polymer random access memory storage. US Patent App. 18/589,141. Feb. 27, 2024.
17. **Bathe, M.**, Chen, C., Luo, X., Macfarlane, R.J., Ultrafast Single-Step High-Density Conjugation of Quantum Dots and Rods with 2D Lattice Templated Array Alignment using DNA Origami. US Patent No. PCT/US2024/016144 Feb., 16, 2024.
16. Banal, J., Berleant, J.D., Shepherd, T., **Bathe, M.** Automated methods for scalable, parallelized enzymatic biopolymer synthesis and modification using microfluidic devices. US Patent App. 18/506,027. Nov. 9, 2023.
15. **Bathe, M.**, Du, R., Irvine, D.J., Moyer, T., Read, B., Veneziano, R., Wamhoff, E.-C., Nucleic acid nanostructure platform for programming immune stimulation. US Patent App. No. 17/819,204. Aug. 11, 2022.
14. Veneziano, R., Ratanaalert, S., Shepherd, T., Jun, H., **Bathe, M.** Stable nanoscale nucleic acid assemblies and methods thereof. US Patent App. No. 17/816,883. Aug. 2, 2022.
13. **Bathe M.**, Shepherd, T., Parsons, M.F., RNA scaffolded wireframe origami and methods thereof. US Patent App. No. 18/191,723. Mar. 28, 2023.
12. Banal, J.L., Berleant, J., Leiserson, C.E., Schardl, T., B., **Bathe, M.** Sequence-controlled polymer storage. US Patent No. PCT/US2022/032831. Jun. 9, 2022.

11. **Bathe, M.**, Veneziano, R., Wamhoff, E.-C., Moyer, T., Read, B., Irvine, D. Nucleic acid nanostructure platform for antigen presentation and vaccine formulations formed therefrom. US Patent No. US 11,419,932 B2. Aug. 23, 2022.
10. Hart, S.M., Wang, X., **Bathe, M.**, Schlau-Cohen, G.S., Guo, J. DNA-dye assembly based single-molecule fluorescence lifetime imaging probes. US Patent No. PCT/US2022/078972. Nov. 1, 2021.
9. Zhang, F., Shepherd, T.R., Veneziano, R., **Bathe, M.**, Slaymaker, I., Zetsche, B. Nucleic acid assemblies for use in targeted delivery. U.S. Patent No. WO/2020/051507, published Dec. 3, 2020.
8. Shepherd, T., Du, R., **Bathe, M.** Microbial production of pure single stranded nucleic acids. U.S. Patent No. US10940171B2, filed Nov. 19, 2017, and published March 9, 2021.
7. Banal, J.L., Berleant, J.D., Shepherd, T., **Bathe, M.** Automated methods for scalable, parallelized enzymatic biopolymer synthesis and modification using microfluidic devices. U.S. Patent No. US 11,851,651 B2, filed Jun. 19, 2018, issued Dec. 26, 2023.
6. **Bathe, M.**, Du, R., Shepherd, T.R., Bacterial Production of Custom Sequence and Length ssDNA. U.S. Patent PCT/US2018/060727, Nov. 13, 2018.
5. Veneziano, R., Ratanalert, S., Shepherd, T., Jun, H., **Bathe, M.** Stable nanoscale nucleic acid assemblies and methods thereof. US Patent No. 11,410,746 B2, filed Apr. 27, 2017, issued Aug. 9, 2022.
4. **Bathe, M.**, Ratanalert, S., Veneziano, R., Banal, J.L., Shepherd, T. Sequence-controlled polymer random access memory storage. US Patent No. 11,961,008 B2, filed Apr. 27, 2017, issued Oct. 18, 2022.
3. **Bathe, M.**, Pan, K., Kim, D.-H. Techniques for controlling spatial structure of nucleic acid structures based on lattice-free, three-dimensional junction coordinates. U.S. Patent No. US 10,289,799 B2, filed Oct. 3, 2015, issued May 14, 2019.
2. **Bathe, M.**, Kim, D.-N., Dietz, H. 2012. Method and apparatus for controlling properties of nucleic acid nanostructures. U.S. Patent US20120166152A1, filed Dec. 22, 2010, and published Jun. 28, 2012.
1. **Bathe, M.**, He, J., Guo, S.-M., Monnier, N. 2012. Bayesian inference of particle motion and dynamics from single particle tracking and fluorescence correlation spectroscopy. U.S. Patent US20120155725A1, filed Dec. 16, 2011, and published Jun. 21, 2012.

Invited Talks and Seminars

126. 1st International Symposium on Nanotechnology for Healthcare, Fiocruz, Rio de Janeiro, Brazil, 2026.

125. 2026 Global Startup Workshop, Daegu, Korea, 2026.
124. 35th Annual Meeting of the Society of Virology, Heidelberg, Germany, 2026.
123. Foundations of Nanoscience, Munich, Germany, 2026.
122. MIT Industrial Liaison Program, Seoul, Korea, 2026.
121. MIT Industrial Liaison Program, Tokyo, Japan, 2026.
120. MIT Club of Japan, Tokyo, Japan, 2026.
119. Molecular Frontiers, NYC, NY, 2025.
118. New Trends in DNA Data Storage, Prague, CZ, 2025.
117. Tay Sachs & Related Disorders, Dallas, TX, 2025.
116. Keynote Seminar, FNANO, Snowbird Utah, 2024.
115. MIT Madrid Symposium, Ramon Areces Foundation, Madrid, Spain, 2023.
114. Wellcome Centre for Cell Biology, Edinburgh, Scotland, Virtual Seminar, 2023.
113. MIT ILP Seminar to USGA, Cambridge, MA 2023.
112. NIH Pioneer Interview, Virtual, 2023.
111. MIT ILP Seminar to Lonza, Inc., Cambridge, MA 2023.
110. Karolinska Institute, Stockholm, Sweden, 2023.
109. Army Research Office Basic Research Forum, Virtual Seminar, 2023.
108. Department of Chemistry, Rutgers University, Camden, NJ, 2022.
107. PEGS Gene Therapy R&D Analytics, Boston, MA, 2022.
106. OneChemistry, Johns Hopkins University, Virtual Seminar, 2022.
105. National Academy of Sciences, Using Biology for Communication and Information Transmission, Virtual Seminar, 2022.
104. Multivalency in Biology, Copenhagen, Denmark, Virtual Seminar, 2022.
103. ISBioTech Nucleic Acids, Development, Analysis, and Production of mRNA & DNA, Virtual Seminar, 2022.

102. MIT ILP Seminar to Evonik, Inc., Cambridge, MA 2022.
101. DNA Technology Days: Massive Data Workshop, Reston, VA, 2022.
100. Novo Nordisk, Virtual Seminar, 2021.
99. Harvard Medical School Initiative for RNA Medicine, 2021.
98. Northrup Grumman Corporation, Virtual Seminar, 2021.
97. Teach Me in 10 Seminar on Vaccine Technologies, Virtual Seminar, 2021.
96. MIT ILP R&D Conference, Virtual Seminar, 2021.
95. EMBO Conference on Designing Functional Biomolecular Assemblies: Beyond Biology, Virtual Seminar, 2021.
94. IBM Unconventional Computing Paradigms Workshop, Virtual Seminar, 2021.
93. IUPAC CCCE 2021 – 104 Canadian Chemistry Conference, Virtual Seminar, 2021.
92. LBL Molecular Foundry, Virtual Seminar, 2021.
91. SPIE Novel Patterning Technologies, Virtual Seminar, 2021.
90. MIT Biomaking Solutions, Virtual Seminar, 2020.
89. MIT Koch Institute, Virtual Seminar, 2020.
88. MIT Marble Center, Virtual Seminar, 2020.
87. NSF Bioeconomy Distinguished Lecture, Virtual Seminar, 2020.
86. CROI Boston, Virtual Seminar, 2020.
85. 4th Annual Genome Conference, Virtual Seminar, 2020.
84. Intracellular Dynamics of Molecules: Analysis and Models, Bordeaux, France, 2019.
83. MIT Computational Center for Engineering Symposium, Cambridge, MA, 2019.
82. MIT Research and Development Conference, Accelerating Big Impact Innovations, 2018.
81. Cryo-EM Center at MIT.nano Opening Symposium, Cambridge, MA, 2018.
80. 3rd Annual MIT-Skoltech Conference, Moscow, Russia, 2018.

79. 256th ACS National Meeting, Boston, MA, 2018.
78. Department of Pharmaceutical Sciences, Northeastern University, Boston, MA, 2017.
77. Micron School of Materials Science and Engineering, Boise State University, Boise, ID, 2017.
76. Department of Chemical & Biomolecular Engineering, Vanderbilt University, Nashville, TN, 2017.
75. KoreaBIO, Seoul, South Korea, 2017.
74. Applied Math and Computational Science, University of Pennsylvania, Philadelphia, PA, 2017.
73. 72nd New England Complex Fluids Workshop, Brandeis University, Newton, MA, 2017.
72. First Conference on Biomotors, Virus Assembly, and Nanobiotechnology Applications, Ohio State University, Columbus, OH, 2017.
71. Department of Chemistry & Biochemistry, Georgia Institute of Technology, Atlanta, Georgia, 2017.
70. DNATEC, Dresden, Germany, 2017.
69. HYBER Symposium, Helsinki, Finland, 2017.
68. The Future of Integrative Structural Biology Workshop, Clemson University, Clemson, SC, 2017.
67. Frontiers in Imaging Science Workshop, Janelia Research Campus, Ashburn, VA, 2017.
66. Department of Chemistry, Carnegie Mellon University, Pittsburgh, PA, 2017.
65. Non-invasive Delivery of Macromolecules Conference, San Diego, CA, 2017.
64. Gordon Conference on RNA Nanotechnology, Ventura Beach, CA, 2017.
63. Frederick National Laboratory for Cancer Research, Frederick, MD, 2016.
62. SRC/IBM/ONR Workshop on Biological Pathways for Electronic Nanofabrication and Materials, San Jose, CA, 2016.
61. High Content Analysis and 3D Screening Conference, Boston, MA, 2016.
60. Allen Institute for Cell Science in Seattle, WA, 2016.

59. Department of Biology, Boston College, Chestnut Hill, MA, 2016.
58. American Chemical Society Annual Meeting, Philadelphia, PA, 2016.
57. Conference on Excited State Processes, Santa Fe, New Mexico, 2016.
56. U.S. Naval Research Laboratory, Washington, D.C., 2016.
55. Ten Years of DNA Origami Symposium, Caltech, Pasadena, CA, 2016.
54. Modeling and Inference Workshop: From Single Molecules to Cells, Ohio State University, Columbus, OH, 2016.
53. Biozentrum at the University of Basel, Basel, Switzerland, 2015.
52. Department of Chemistry, University of Chicago, Chicago, IL, 2015.
51. Department of Chemistry, University of Michigan, Ann Arbor, MI, 2015.
50. Autodesk Research, Inc., San Francisco, CA, 2015.
49. Department of Biological Engineering, MIT, Cambridge, MA, 2015.
48. DNA21, Harvard University, Cambridge, MA, 2015.
47. Washington University, St. Louis, MO, 2015.
46. Department of Biomedical Engineering, University of Minnesota, Minneapolis, MN, 2015.
45. 14th European Conference on Computational Biology in Strasbourg, France, 2014.
44. Department of Cell & Molecular Biology, Uppsala University, Uppsala, Sweden, 2014.
43. Microscopy Graduate Workshop at Stowers Institute for Medical Research in Kansas City, MO, 2014.
42. 110th International Titisee Conference, Titisee, Germany, 2014.
41. Department of Physics, McGill University, Montreal, Canada, 2014.
40. SIAM Conference on the Life Sciences, Charlotte, NC, 2014.
39. World Congress of Biomechanics, Boston, MA, 2014.
38. World Congress of Biomechanics, Boston, MA, 2014.
37. Curie Institute, Paris, France, 2014.

36. DNATEC14, Dresden, Germany, 2014.
35. Foundations of NanoScience Conference, Snowbird, UT, 2014.
34. GPU Technology Conference, San Jose, CA, 2014.
33. National Academy of Sciences Kavli Frontiers of Science & Engineering Symposium, Rio de Janeiro, Brazil, 2014.
32. Department of Biochemistry & Molecular Biology at Wayne State University School of Medicine, Detroit, MI, 2014.
31. Quantitative Bioimaging Conference at the University of New Mexico, Albuquerque, NM, 2014.
30. Physical Mathematics Seminar Series, MIT, Cambridge, MA, 2013.
29. Department of Physics, University of Maryland, College Park, MD, 2013.
28. Interdisciplinary Symposium on Advanced Nano/Biosystems: Design, Fabrication, and Characterization, University of Illinois at Urbana-Champaign, Champaign, IL, 2013.
27. Department of Chemistry and Biochemistry, Arizona State University, Phoenix, AZ, 2013.
26. National Centre for Biological Sciences TIFR, Bangalore, India, 2013.
25. Janelia Farm Research Campus, Ashburn, VA, 2013.
24. Department of Physics, Technical University of Munich, Munich, Germany, 2013.
23. International Workshop on Macromolecular Structure and Dynamics, Uppsala University, Uppsala, Sweden, 2013.
22. SciLifeLab, The Svedberg Seminar Series, Uppsala University, Uppsala, Sweden, 2013.
21. Department of Biochemistry and Molecular Biology, University of Chicago, Chicago, IL, 2013.
20. 57th Annual Biophysical Society Meeting, Philadelphia, PA, 2013.
19. Boston University, Integrative Systems Biology Seminar Series, Boston, MA, 2012.
18. Materials Research Society, Boston, MA, 2012.
17. NNIN/C Conference, Synergy Between Experiment and Computation in Energy – Looking to 2030, Harvard University, Cambridge, MA, 2012.

16. Ohio State University, Columbus, OH, 2012.
15. Soft Matter Approaches to Biological Physics, KITP UCSB, Santa Barbara, CA, 2011.
14. Foundations of Nanoscience, Snowbird, UT, 2011.
13. Biophysical Society, Baltimore, MD, 2011.
12. Biophysical Society, Baltimore, MD, 2011.
11. EMBO Workshop on Modeling, Microscopy, and Biophysical Methods, EMBL Heidelberg, Heidelberg, Germany, 2010.
10. Department of Biochemistry-Biophysics, Brandeis University, Waltham, MA, 2010.
9. The Cellular Cytoskeleton, Pingree Park, CO, 2010.
8. Harvard Squishy Physics, Harvard University, Cambridge, MA, 2010.
7. MIT Graduate Student Council Alumni Speaker Series, Cambridge, MA, 2009.
6. MIT BMES Undergraduate Students Association, Cambridge, MA, 2009.
5. Annual Meeting of the United States Association for Computational Mechanics, Columbus, OH, 2009.
4. Annual Meeting of the Biophysical Society, Boston, MA, 2009.
3. WAM Seminar Series, Harvard University, Cambridge, MA, 2009.
2. Institute for Biomolecular Science, Gakushuin University, Tokyo, Japan, 2009.
1. 2009 MIT in Japan Conference, Tokyo, Japan, 2009.

Archival Journal Referee

Accounts of Chemical Research
ACS Nano
Analytical Chemistry
Angewandte Chemie
Biophysical Journal
Biopolymers
Cell
Chemical Reviews
E-life
European Physical Journal
Integrative Biology

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Journal of the American Chemical Society
Journal of Biological Chemistry
Journal of Cell Biology
Journal of Cell Science
Journal of Chemical Information and Modeling
Journal of Chemical Physics
Journal of Computational Chemistry
Journal of Computational and Theoretical Nanoscience
Journal of Visualized Experiments
Nano Letters
Nanoscale
Nature
Nature Biotechnology
Nature Communications
Nature Materials
Nature Methods
Nature Nanotechnology
Nucleic Acids Research
Physical Biology
Physical Review E
PLoS Computational Biology
PLoS ONE
PNAS
Science

Teaching

Term	Course Number	Course Title	Role	Course Type
Fall 2026	20.380	Biological Engineering Design	Lecturer	Lecturer
Fall 2026	20.389J	The Bioeconomy and Society	Lecturer	Lecturer
Fall 2025	STS.059[J]	The Bioeconomy and Society	Lecturer	Lecturer
Spring 2025	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Fall 2023	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture

Spring 2023	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Fall 2022	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Spring 2022	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Fall 2021	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Spring 2021	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Fall 2020	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Spring 2020	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Spring 2019	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Fall 2017	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Fall 2017	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Spring 2017	20.315/20.415	Physical Biology	Lecturer	Lecture
Fall 2016	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Spring 2016	20.310	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
Fall 2015	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Fall 2015	20.416	Topics in Biophysics & Physical Biology	Lecturer	Lecture

Spring 2015	20.415	Physical Biology	Lecturer	Lecture
Fall 2014	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Fall 2014	20.416	Topics in Biophysics & Physical Biology	Lecturer	Lecture
Spring 2014	20.415	Physical Biology	Lecturer	Lecture
Fall 2013	20.416	Topics in Biophysics & Physical Biology	Lecturer	Lecture
Spring 2013	20.416	Topics in Biophysics & Physical Biology	Lecturer	Lecture
Spring 2013	20.415	Physical Biology	Lecturer	Lecture
Fall 2013	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Fall 2012	CSB.100	Topics in Computational & Systems Biology	Lecturer	Lecture
Fall 2012	20.416	Current Research in Biophysics	Lecturer	Lecture
Fall 2012	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Spring 2012	20.415	Physical Biology	Lecturer	Lecture
Fall 2011	20.110	Thermodynamics of Biomolecular Systems	Lecturer	Lecture
Fall 2011	20.416	Current Research in Biophysics	Lecturer	Lecture
Fall 2010	20.430	Fields, Forces, & Flows in Biological Systems	Lecturer	Lecture
Spring 2010	20.415	Physical Biology	Lecturer	Lecture
Fall 2009	20.110	Thermodynamics of Biomolecular Systems	Lecturer	Lecture

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Spring 2009	20.410	Molecular, Cell, and Tissue Biomechanics	Lecturer	Lecture
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Current Graduate Students

Name	Prior University	Training Period	Project Area	Current Position
Duy An Le	UCSD	2025–present	CNS Therapeutics	Graduate Student, MIT

Past Graduate Students

Name	Prior University	Training Period	Project Area	Current Position
Philip Bransford	University of Minnesota	2009–2011	Dynamics and evolution of cadherins and actin-bundling proteins	Senior Scientist, Vertex Pharmaceuticals, Inc.
Syuan-Ming Guo	National Taiwan University	2009–2016	Bayesian inference and super-resolution imaging of membrane dynamics	Senior Machine Learning Scientist, Insitro
Nilah Monnier Ioannidis	Harvard University (B.A.); University of Cambridge (M.Phil.)	2009–2012	Bayesian inference approaches for particle trajectory analysis in cell biology	Assistant Professor, University of California Berkeley
Reza Sedeh	Tehran University	2009–2012	Contributions to the analysis of proteins	AI Privacy & Governance, Meta
Matthew Adendorff	Rhodes University	2011–2015	DNA nanotechnology	Data Science Lead & CTO, Open Cities Lab
Zachary Barry	Georgia Institute of Technology	2012–2017	Bayesian analysis of peptidoglycan synthesis	Senior Machine Learning Scientist, Spring Discovery

Simon Gordonov	Rutgers University (B.Sc.); Cambridge University (M.Phil.)	2012–present	Analysis & modeling of cell migration	Scientist, Vertex Pharmaceuticals, Inc.
Sakul Ratanaalert	Cornell University	2013–2018	Structural DNA nanotechnology sequence design	Lecturer, Johns Hopkins University
Joseph Berleant	California Institute of Technology	2017–2023	DNA nanotechnology for computing and data search	Postdoctoral Research Associate, MIT
Rebecca Du	California Institute of Technology	2017–2022	DNA nanotechnology for innate immune stimulation	Cell Culture Scientist, Culture Biosciences
Molly Parsons	Iowa State University	2017–2022	RNA nanotechnology	Research Fellow, Boston Children's Hospital
Matthew Allan	Penn State University	2018–2023	RNA nanotechnology	Postdoctoral Research Associate, HMS
Andy (Hyun-Min) Kim	Caltech	2019–2025	DNA nanotechnology for therapeutic delivery	Postdoctoral Research Associate, MIT
Grant Knappe	University of Maryland	2019–2024	DNA nanotechnology for active immunotherapeutics	Postdoctoral Research Associate, MIT
Beny (Reuven) Falkovich	Technion University	2020–2025	Neuronal phenotyping	Postdoctoral Research Associate, MIT
Anna Romanov	Georgia Tech	2020–2025	DNA nanotechnology for vaccines	Postdoctoral Research Associate, MIT

Kristin Sheridan	MIT	2020–2021	DNA nanotechnology for computing and memory	Doctoral Student, UT Austin
Julia Wu	MIT	2020–2021	Neuronal data analysis	Software Engineer, Google

Current Postdoctoral Research Associates

Name	Doctoral University	Training Period	Project Area	Current Position
Beny (Reuven) Falkovich	Technion University	2025–present	Neuronal phenotyping	Postdoctoral Research Associate
Anna Romanov	Georgia Tech	2026–present	Particulate vaccines for HIV	Postdoctoral Research Associate
Xin Luo	McGill University	2022–present	Nanofabrication for quantum devices	Senior Postdoctoral Research Associate
Marjan Omer	Aarhus University	2023–present	DNA nanotechnology for vaccines and therapeutics	Postdoctoral Research Fellow
Grant Knappe	University of Maryland	2024–present	Active immunotherapy platform technology	Postdoctoral Research Associate
Selma Piranej	Emory University	2024–present	Lithographic DNA patterning for diagnostics and computing	Postdoctoral Research Fellow
Sarah Al Abdullatif	Emory University	2025–present	CNS biodistribution and delivery of DNA therapeutics	Postdoctoral Research Fellow
Tyler Brown	McGill University	2026–present	Chemical approaches to quantum information science & technology	Postdoctoral Research Associate

Peter Satterthwaite	Massachusetts Institute of Technology	2026–present	Nanofabrication for quantum sensing and computing	Postdoctoral Research Associate
Matteo Tollemeto	The Technical University of Denmark	2026–present	Mucosal immunization strategies with DNA nanotechnology	Postdoctoral Research Fellow

Former Postdoctoral Research Associates

Name	Doctoral University	Training Period	Project Area	Current Position
Jun He	Brown University	2009–2011	Bayesian approach to imaging-based spectroscopy	Data Science Manager, Adobe, Inc.
Aprotim Mazumder	NCBS – TIFR Bangalore, India	2009–2014	Single-cell DNA Damage Response	Assistant Professor, TCIS, TIFR
Philipp Diesinger	Institute of Theoretical Physics, University of Heidelberg	2010–2011	Quantitative analysis of cytoskeletal dynamics	Boston Consulting Group
Do-Nyun Kim	MIT	2011–2014	Predicting 3D structure of DNA origami	Professor, Seoul National University
Keyao Pan	Rice University	2011–2016	DNA nanostructure solution shape prediction	Research Data Scientist, Meta, Inc.
Lun Yang	Carnegie Mellon University	2012–2013	Modeling nanoscale excitonic networks	Quantitative Research Analyst, Exodus Point Capital Management
Etienne Boulais	École Polytechnique de Montréal	2013–2015	Excitonic properties of DNA-dye assemblies	Radar and Antenna Engineer, Canadian Space Agency
Yera Hakobyan	Cornell University	2013–2014	Structure-based mechanical modeling of DNA origami	Data Science Architect, 3M
Pramod Pisharady	National University of Singapore	2013–2014	Bayesian reconstruction of structural MRI data	Assistant Professor & CZI Imaging Scientist,

				University of Minnesota Medical School
Changsun Eun	University of California San Diego (Postdoc) - University of North Carolina at Chapel Hill (Ph.D.)	2014–2014	DNA scaffolded multi-enzyme cascades	Assistant Professor, Hankuk University of Foreign Studies
Stavros Gaitanaros	University of Texas at Austin	2014–2015	DNA nanostructure solution shape and mechanics	Assistant Professor, Johns Hopkins University
Remi Veneziano	Institute Charles Gerhardt	2014–2018	Membrane-associated biomolecular structure and dynamics	Assistant Professor, George Mason University
William Bricker	Washington University	2015–2019	Computational modeling of DNA-based excitonic assemblies	Assistant Professor, University of New Mexico
Hyungmin Jun	Korea Advanced Institute of Science and Technology	2015–2019	Structural DNA nanotechnology	Professor, Jeonbuk National University
Tyson Shepherd	University of Iowa	2015–2018	RNA nanostructures	Research Scientist, Inscripta, Inc.
James Banal	University of Melbourne	2016–2021	Programmable excitonic systems on DNA nanostructures	Co-Founder, Cache DNA, Inc.
Syuan-Ming Guo	National Taiwan University	2016–2018	Bayesian inference and super-resolution imaging of membrane dynamics	Machine Learning Scientist, Insitro
Martin Tomov	Colleges of Nanoscale Science and Engineering, SUNY Polytechnic Institute /	2016–2018	Multiplexed fluorescence imaging of stem cell-derived neurons	Postdoctoral Fellow, Emory University

	University at Albany-SUNY			
Jessica Wu	University of California, Irvine, Irvine, CA	2016–2016	Phenotypic profiling of synaptic proteins and mRNAs	Principal Scientist II, AbbVie, Inc.
Mathew Stone	University of Michigan	2017–2018	Quantitative fluorescence imaging of neurons and B-cells	Associate Predictive Modeler, Auto-Owners Insurance
Eike Wamhoff	Max Planck Institute of Colloids and Interfaces	2017–2022	DNA nanoparticle vaccines	Research Scientist, BioNTec, GMBH
Eric Danielson	Medical College of Wisconsin	2018–2020	Phenotypic profiling of neuronal models of Schizophrenia	Senior Scientist II, NewCo
Xiao Wang	New York University	2018–present	Structural DNA nanotechnology	Assistant Professor, Southeast University, China
Chi Chen	University of Paris Sud	2020–2024	DNA-based photonic materials	Professor, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences
Floris Engelhardt	TU Munich	2020–2021	Single-stranded DNA design and production	CEO and Co-Founder, KanoTx, Inc.
Jeffrey Gorman	University of Cambridge	2020–2025	Biomimetic light-harvesting materials	Assistant Professor, University of Durham, UK
Torsten John	Leipzig University	2020–2023	DNA-based excitonic materials	Assistant Professor, Constructor University, Germany

Doctoral Thesis Committee Reader

2009 BoBae Lee (DMSE), Thesis Committee Member

2011 Ishan Barman (ME), Thesis Committee Member
 2011 Fei Liang (BE), Thesis Committee Member
 2013 Sungmin Son (ME), Thesis Committee Member
 2013 Dimitrios Tzeranis (ME), Thesis Committee Member
 2013 Dhiraj Devidas Bhatia (NCBS), Thesis Committee Member
 2014 Christopher Negron (CSB), Thesis Committee Member
 2015 Thomas Gurry (CSB), Thesis Committee Member
 2015 Chia-Ching Chou (CEE), Thesis Committee Member
 2015 Joyce Yang (HMS), Thesis Committee Member
 2016 William Hesse (BE), Thesis Committee Chair
 2016 Kelly Brock (CSB), Thesis Committee Member
 2016 Rotem Gura (CSB), Thesis Committee Member
 2016 Kento Masayuma (AA), Thesis Committee Member
 2017 Eric Ma (BE), Thesis Committee Chair
 2018 Anthony Kulesa (BE), Thesis Committee Chair
 2018 Stavros Chatzieleeftheriou (NTUA), Thesis Committee Member
 2019 Alex Wesselhoeft (Biology), Thesis Committee Member
 2019 Aaron Dy (BE), Thesis Committee Chair
 2019 Paul Reginato (BE), Thesis Committee Chair
 2020 Luke Funk (HST), Thesis Committee Chair
 2021 Marjan Omer (Aarhus), Thesis Opponent
 2022 Yang Wang (Karolinska), Thesis Opponent
 2025 Farhan Khodae (ME), Thesis Committee Chair
 2026 Eyal Perry, Media Arts & Sciences, Thesis Committee Member
 2026 Eyal Perry, Media Arts & Sciences, Thesis Committee Member
 2026 Fan Xue, Electrical Engineering & Computer Science, Thesis Committee Member

Funded Research Awards

MIT CEHS NIH P30-ES002109 **9/1/2010–3/31/2012**
 Role: Pilot Project PI \$40,991
 MIT CEHS Pilot Project Program/NIH P30 EHSCC
 CEHS Pilot: Single-cell Analysis of Transcriptional and Translational Regulation of Genes
 Essential for DNA-Damage Response

DOD-MURI W911NF-12-1-0420 **7/1/2012–8/19/2018**
 Role: Co-I (PI Yan) \$624,750
 Arizona State University/Navy-ONR
 Translating Biochemical Pathways to Non-Cellular Environments

ONR DURIP N00014-13-1-0664 **6/15/2013–6/14/2014**
 Role: PI (Equipment Grant) \$313,969
 Navy-ONR DURIP
 DURIP: High Performance Computing for Nucleic Acids Nanotechnology

NSF DMREF CMMI-1334109 **1/15/2014–12/31/2018**
 Role: PI (Co-I Yan and Yin) (Total Award) \$1,706,468
 NSF DMREF (Bathe Portion) \$817,106

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Computational Design Principles for Functional DNA-based Materials
(Subcontracts: Arizona State University and Harvard University)

NSF PoLS PHY-1305537

4/1/2014–3/31/2018

Role: PI

\$540,000

NSF PoLS

Inferring the Physics of Living Systems from Dynamic Light Microscopy Data

HFSP RGP0029/2014

5/1/2014–4/30/2018

Role: Co-I (PI Krishnan)

\$337,500

Human Frontier Science Program

Dissecting the Mechanochemistry of Membrane Invagination with Designer DNA-Based Probes

ONR N00014-12-1-0621 & N00014-14-1-0609 & N00014-16-1-2181

5/15/2014–8/14/2017

Role: PI

\$1,418,207

Navy-ONR

Computer-Aided Engineering for Nucleic Acid-Based Nanotechnology

NIH U01-MH106011

9/26/2014–11/30/2017

Role: Co-I (PI Boyden)

(Total Award) \$2,154,250

NIH BRAIN

(Bathe Portion) \$714,195

Ultra-Multiplexed Nanoscale In Situ Proteomics for Understanding Synapse Types

Anonymous Foundation

12/29/2014–12/31/2016

Role: PI (Equipment Grant)

\$650,000

Anonymous Foundation

Purchase of a Light-sheet Fluorescence Microscope for Advanced Multi-scale Imaging at MIT

DOE-Chicago DE-SC0001088

8/1/2015–2/28/2017

Role: Co-I (PI Baldo)

(Bathe Portion) \$329,893

DOE

RLE-Center for Excitonics

NSF EAGER CCF-1547999

8/1/2015–7/31/2019

Role: PI

\$155,000

NSF EAGER

EAGER: Collaborative Research: Algorithmic Design Principles for Programmed DNA

Nanocages

ONR DURIP N00014-15-1-2830

9/29/2015–9/28/2016

Role: PI (Equipment Grant)

\$179,676

Navy-ONR DURIP

DURIP: High Performance Computing for Nucleic Acid Nanotechnology

NSF CCF-1564025

4/1/2016–3/31/2021

Role: PI

\$638,493

NSF CCF

AF: Medium: Collaborative Research: Top-down Algorithmic Design of Structured Nucleic Acid Assemblies

ONR DURIP N00014-16-1-2506

7/15/2016–8/31/2017

Role: PI (Equipment Grant)

\$162,843

Navy-ONR DURIP

DURIP: High-throughput Assembly and Characterization Tools for Structural DNA

Nanotechnology

ONR N00014-16-1-2953

9/1/2016–8/31/2019

Role: PI (Co-I Chiu)

(Total Award) \$786,856

Navy-ONR

(Bathe Portion) \$561,856

DNA Origami Scaffolds for Single-particle Cryo-Electron Microscopy of Viral RNA

(Subcontract: Baylor College of Medicine)

Skoltech 1911/R

12/1/2016–11/30/2019

Role: Co-I (PI Lempitsky)

(Bathe Portion) \$492,945

Skolkovo Institute of Science and Technology

Deep Learning Toolbox for Cell Image Analysis

NIH R01-MH112694

4/1/2017–2/28/2022

Role: PI (Co-I Cottrell)

(Total Award) \$2,018,175

NIH R01

(Bathe Portion) \$1,547,000

Simultaneous Multiplexed in Situ Fluorescence Imaging of Neuronal Proteins and Messenger RNAs

(Subcontract: The Broad Institute)

DOE DE-SC0016353

6/15/2017–6/14/2019

Role: Co-I (PI Yan)

(Bathe Portion) \$213,388

Arizona State University/DOE

DNA Nanostructure Directed Designer Excitonic Networks

ONR N00014-17-1-2609

8/1/2017–7/31/2021

Role: PI

\$661,663

Navy-ONR

Hierarchical Nanoscale Materials Programmed using Structured DNA Nanoparticles

NSF PHY-1707999

8/15/2017–7/31/2024

Role: PI

\$720,000

NSF PoLS

Inferring the Physics of mRNA Trafficking in Neuronal Systems

MIT Deshpande MOU

9/1/2017–2/15/2019

Role: PI

\$50,000

MIT Deshpande Center

Structured DNA Nanoparticles as a Therapeutic Delivery Platform

NSF CBET-1729397

1/1/2018–12/31/2021

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Role: PI (Co-I Yan and Yin) (Total Award) \$1,600,000
NSF DMREF (Bathe Portion) \$770,500
DMREF: Computational Design of Next-generation Nanoscale DNA-based Materials
(Subcontracts: Arizona State University and Harvard Medical School)

ONR DURIP N00014-18-1-2290 **6/1/2018–5/31/2019**
Role: PI (Equipment Grant) \$364,186
Navy-ONR DURIP
DURIP: DNA Synthesizer for the Development of New Modalities for DNA Nanostructures

NIH R21-EB026008 **8/15/2018–12/20/2022**
Role: PI (Co-I on Supplement Lingwood and Schmidt) (Total Award) \$796,348
NIH R21 and Supplement (Bathe Portion) \$588,303
Structured DNA Nanoparticles Therapeutic mRNA and CRISPR/Cas9 Delivery
NIH R21-EB026008 Revision Supplement - DNA Nanoparticle Vaccine for COVID-19
(Subcontract on Supplement: Ragon Institute)

i-Corps W911NF1810436 **9/10/2018–9/9/2021**
Role: PI \$70,000
Army-ARO
Assessment of Nanoparticle Assemblies for Efficient Gene Therapy Vehicles

NSF CHE-1839155 **9/15/2018–8/31/2023**
Role: PI (Total Award) \$1,000,000
NSF RAISE (Bathe Portion) \$321,772
RAISE-TAQS: Room-Temperature Quantum Sensing and Computation using DNA-based
Excitonic Circuits

UC Santa Barbara Funding under W911NF-19-2-0026 **12/1/2018–11/30/2019**
Role: Seed PI (PI Lauffenburger) \$90,000
UC Santa Barbara/DOD
Programmable DNA-based Meta-materials

ONR DURIP N00014-19-1-2344 **6/1/2019–5/31/2021**
Role: PI (Equipment Grant) \$453,000
Navy-ONR DURIP
DURIP: Combinatorial DNA nanoparticle libraries for structural biology and materials research

DOE DE-SC0019998 **8/1/2019–7/31/2022**
Role: Co-I (PI Schlau-Cohen) (Bathe Portion) \$390,000
DOE
Controlling Exciton Dynamics with DNA Origami for Quantum Information Science

NSF HDR OAC-1940231 **10/1/2019–9/30/2021**
Role: PI \$334,231
NSF HDR
Collaborative Research: Autonomous Computing Materials

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UC Santa Barbara Funding under W911NF-19-2-0026

Role: Co-PI (PI McFarlane)

DOD UARC

Controlling Electromagnetic Properties of DNA-based Metamaterials

12/1/2019–11/30/2023

(Total Award) \$677,844

(Bathe Portion) \$338,922

MIT ISN Seed Funding under W911NF-13-D-0001

Role: Co-PI (PI Irvine)

MIT ISN/DOD

Pilot Project: Enzyme-Encapsulated Nucleic Acid Vaccines

12/1/2019–12/31/2022

(Bathe Portion) \$139,904

ONR N00014-20-1-2084

Role: PI (Co-I Chiu)

Navy-ONR

Synthetic Nucleic Acid Nanoparticles for RNA Structural & Synthetic Biology

(Subcontract: Stanford University)

1/15/2020–1/14/2023

(Total Award) \$798,730

(Bathe Portion) \$639,830

ONR DURIP N00014-20-1-2202

Role: PI (Equipment Grant)

Navy-ONR DURIP

DURIP: Expansion of Combinatorial DNA Nanoparticle Libraries for Materials Research & Structural Biology

4/1/2020–8/1/2023

\$552,061

SPARK Therapeutics, Inc.

Role: PI

SPARK Therapeutics, Inc.

Evaluation of phagemid-produced single-strand DNA

3/11/2020–9/26/2021

\$10,570

Fast Grant Award

Role: PI (Co-I Lingwood and Schmidt)

Mercatus Center at George Mason University

COVID-19 Fast Grant

(Subcontract: Ragon Institute)

4/15/2020–4/30/2021

(Total Award) \$150,000

(Bathe Portion) \$70,000

NSF CCF-1956054

Role: PI

NSF CCF

AF Medium: DNA-based Data Storage and Computing Materials

5/1/2020–4/30/2024

\$900,000

ONR N00014-21-1-4013

Role: PI

Navy-ONR

Hierarchical Nanoscale Materials Programmed using Structured DNA Nanoparticles

11/2/2020–11/1/2023

\$711,687

NIH R01-AI162307

Role: Co-PI (PI Irvine)

NIH R01

8/2/2021–7/31/2025

(Total Award) \$1,551,000

(Bathe Portion) \$705,484

Investigation of Synthetic DNA-based Viral Particles for Spatially Controlled Antigen Presentation

ACX Grant

1/6/2022–1/6/2025

Role: PI

\$25,000

Centre for Effective Altruism

Project for novel platform for screening and development of psychiatric drugs, including therapeutic adaptations of psychedelics

GanNa Bio, Inc.

3/24/2022–1/31/2023

Role: PI

\$10,430

GanNa Bio, Inc.

Collaboration with the Bathe Lab at MIT and GanNa Bio, Inc.

ONR DURIP N00014-22-1-2317

4/1/2022–12/31/2023

Role: PI (Equipment Grant)

\$417,550

Navy-ONR DURIP

DURIP: Accelerating the Discovery of DNA Based Materials using High-Performance Computing and Structural Biology

Novo Nordisk Agreement

6/29/2022–6/29/2023

Role: PI

\$50,000

Novo Nordisk

Next-generation gene therapeutic delivery platform using DNA origami

NIH R21-MH130624

7/1/2022–6/30/2024

Role: PI

\$418,370

NIH R21

Investigation of the Synaptic Molecular Network using Multiplexed Imaging

DOE DE-SC0019998

8/1/2022–7/31/2024

Role: Co-I (PI Schlau-Cohen)

Bathe Portion \$487,500

DOE

Synthesizing functionality in excitonic systems using DNA origami

NSF CMMI-2240309

5/1/2023–4/30/2025

Role: PI

Total Award \$300,000

NSF EAGER

Bathe Portion \$204,600

EAGER: Quantum Manufacturing: Bottom-up Molecular Qubit Arrays using DNA Origami

MIT ISN-5 Project W911NF2320121

7/1/2023–6/30/2028

Role: PI

\$470,000

MIT ISN

ISN 5.1: Enzyme-Encapsulation and Performance of Nucleic Acid Nanoparticles

ONR DURIP N00014-24-1-2254

3/1/2024–2/28/2025

Role: PI (Equipment Grant)

\$202,412

Navy-ONR DURIP

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DURIP: Combinatorial nucleic acid nanoparticle libraries for materials research and molecular catalysis

MIT Project W911NF2320121

Role: Co-I (PI Steven Harvey)

MIT ILIR

Enhancement of Nerve Agent Catalysis with DNA Origami

4/1/2024–3/31/2025

\$17,500

NSF FET-2403100

Role: PI

Next-generation DNA-based Computing and Memory Materials

7/1/2024–06/30/2028

\$1,150,730

NIH R01-MH112694

Role: PI

Simultaneous profiling of neuronal synapse activities, proteins, and messenger RNAs at the single-cell level (Subcontract: The Broad Institute)

11/30/2024–12/31/2029

\$2,024,750

Navy-ONR N000142512217

Role: PI

DNA-templated Materials for Quantum Information Science and Technology

3/1/2025–2/28/2028

\$924,523

The Simons Foundation SFI-AN-AR-Pilot-00009691

Role: PI

Multimodal synaptic profiling of patient-derived neuronal samples for the discovery of ASD therapeutics

3/1/2025–2/28/2027

\$150,000

NSF MCB-2428308

Role: PI

FMSG BIO: Next-generation Sub-10nm Manufacturing Framework for Photonic Quantum Technologies using DNA

5/1/2025–4/30/2027

\$500,000

Eli Lilly and Company

Role: PI

Collaboration and MTA with Bathe Lab

06/11/2025–06/11/2026

\$100,000

NSF DMR-2522798

Role: Co-I (PI Adam Willard)

DMREF: Data-driven high-throughput design of DNA nanomaterials for next-generation optoelectronic and quantum technologies

10/1/2025–09/30/2029

\$308,000

NIH R21-AG099044

Role: PI

Pilot of a new non-viral vector for therapeutic nucleic acid delivery to the CNS (Subcontract: UMASS Medical Center)

2/1/2026–1/31/2028

\$466,340

MIT Deshpande

Role: PI

A preventative active immunotherapy for Alzheimer's Disease Momentum Grant Heals

2/1/2026–1/31/2027

\$124,740

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NIH R01-AI162307

Role: PI

Investigation of Synthetic DNA-based Viral Particles for Spatially Controlled Antigen
Presentation (Subcontract: Ragon MGH and Scripps Institute)

2/9/2026–1/31/2031

\$4,096,910