Mark Bathe
Curriculum Vitae

Education

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

Postdoctoral Training

2006–08	Alexander von Humboldt Postdoctoral Fellow, University of Munich

Professional Experience

2020–present	Professor, Department of Biological Engineering, MIT
2016–2020	Associate Professor with Tenure, Department of Biological Engineering, MIT
2013–2016	Associate Professor without Tenure, Department of Biological Engineering, MIT
2012–present	Associate Member, Broad Institute of MIT & Harvard
2009–2013	Assistant Professor, Department of Biological Engineering, MIT
2006–08	Alexander von Humboldt Postdoctoral Fellow, University of Munich

Affiliations

Harvard Medical School Initiative for RNA Medicine
Broad Institute of MIT & Harvard
MIT Center for Environmental Health Sciences
MIT Department of Mechanical Engineering
MIT Center for Neurobiological Engineering

Awards

2019	MIT Class of 1960 Fellow
2015	Joy Cappel Young Investigator Award
2014	MIT Freshman Advising Award
2009	Samuel A. Goldblith Career Development Professorship
2006	Alexander von Humboldt Postdoctoral Research Fellow
2001	National Defense Science and Engineering Graduate Fellow
1998	Elected member of Sigma Xi and Pi Tau Sigma Academic Honor Societies

Professional Societies

American Chemical Society
Biophysical Society
Society for Neuroscience

Research Interests

Nucleic Acid Nanotechnology
Molecular & Cellular Biophysics
Computational Biology & Biophysics
Therapeutic Nucleic Acid Delivery

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Quantum Information Sensing & Processing

Publications

88. 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. Secondary structural ensembles of the SARS-CoV-2 RNA genome in infected cells. *Nature Communications*, 13: 1128 (2022).

87. Wang, X., Jun, H., **Bathe, M.** Programming 2D Supramolecular Assemblies with Wireframe DNA Origami. *J. Am. Chem. Soc.*, doi: 10.1021/jacs.1c11332 (2022).

86. Hart, S.M., Wang, X., Guo, J., **Bathe, M.**, Schlau-Cohen, G.S. Tuning Optical Absorption and Emission Using Strongly Coupled Dimers in Programmable DNA Scaffolds. *J Phys Chem Lett.*, doi: 10.1021/acs.jpclett.1c03848 (2022).

85. Afonin, K.A., Dobrovolskaia, M.A., Ke, W., Grodzinski, P., **Bathe, M.** Critical review of nucleic acid nanotechnology to identify gaps and inform a strategy for accelerated clinical translation. *Advanced drug delivery reviews*, 181: 114081 (2022).

84. Adendorff, M.R., Tang, G.Q., Millar, D.P., **Bathe, M.**, Bricker, W.P. Computational investigation of the impact of core sequence on immobile DNA four-way junction structure and dynamics. *Nucleic Acids Research*, 50: 717 (2022).

83. Berleant, J., Sheridan, K., Condon, A., Williams, V.V., **Bathe, M.** Isometric Hamming embeddings of weighted graphs. *arXiv*, arXiv:2112.06994 (2021).

82. Sheridan, K., Berleant, J., **Bathe, M.**, Condon, A., Williams, V.V. Factorization and pseudofactorization of weighted graphs. *arXiv*, arXiv:2112.06990 (2021).

81. Banal, J.L., **Bathe, M.** Scalable Nucleic Acid Storage and Retrieval Using Barcoded Microcapsules. *ACS Applied Materials and Interfaces*, 13: 49729 (2021).

80. Jun, H., Wang, X., Parsons, M.F., Bricker, W.P., John, T., Li, S., Jackson, S., Chiu, W., **Bathe, M.** Rapid prototyping of arbitrary 2D and 3D wireframe DNA origami. *Nucleic Acids Research*, 49: 10265 (2021).

79. Knappe, G.A., Wamhoff, E-C., Read, B.J., Irvine, D.J., **Bathe, M.** In Situ Covalent Functionalization of DNA Origami Virus-like Particles. *ACS Nano*, 15: 14316 (2021).

78. Tomov, M.L., O'Neil, A., Abbasi, H.S., Cimini, B.A., Carpenter, A.E., Rubin, L.L., **Bathe, M.** Resolving cell state in iPSC-derived human neural samples with multiplexed fluorescence imaging. *Nature Communications Biology*, 4: 786 (2021).

77. Lavi, R., **Bathe, M.**, Hosoi, A., Mitra, A., Crawley, E. The NEET ways of thinking: Implementing them at MIT and assessing their efficacy. *Advances in Engineering Education* (2021).

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76. Banal, J.L., Shepherd, T., Berleant, J., Reyes, M., Huang, H., Ackerman, C., Blainey, P., **Bathe, M.** Random access DNA memory using Boolean search in an archival file storage system. *Nature Materials*, 20: 1272 (2021).

75. **Bathe, M.**, Hernandez, R., Komiyama, T., Machiraju, R., Neogi, S. Autonomous computing materials. *ACS Nano*, 15: 3586 (2021).

74. **Bathe, M.** Nanoscale 2D and 3D patterning using programmed DNA assemblies. *Novel Patterning Technologies 2021,* 11610: 1161012 (2021).

73. 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. Engineering couplings for exciton transport using synthetic DNA scaffolds. *Chem*, 7: 752 (2021).

72. Danielson, E., de Arce, K.P., Cimini, B., Wamhoff, E-C., Singh, S., Cottrell, J.R., Carpenter, A.E., **Bathe, M.** Molecular diversity of glutamatergic and gabaergic synapses from multiplexed fluorescence imaging. *eNeuro*, 8: eneuro.0286-20.2020 1 (2021).

71. Lan, T.C.T., Allan, M.F., Malsick, L.E., Khandwala, S., Nyeo, S.S.Y., **Bathe, M.**, Griffiths, A., Rouskin, S. Insights into the secondary structural ensembles of the full SARS-CoV-2 RNA genome in infected cells. *bioRxiv* (2020).

70. Afonin, K.A., Dobrovolskaia, M.A., Church, G., **Bathe, M.** Opportunities, barriers, and a strategy for overcoming translational challenges to therapeutic nucleic acid nanotechnology. *ACS Nano*, 14: 9221 (2020).

69. Dobrovolskaia, M.A., **Bathe, M.** Opportunities and challenges for the clinical translation of structured DNA assemblies as gene therapeutic delivery and vaccine vectors. *WIREs Nanomedicine and Nanobiotechnology*, 13: e1657 (2020).

68. Pisharady, P.K., Eberly, L.E., Cheong, I., Manousakis, G., Guliani, G., Clark, H.B., **Bathe, M.**, Walk, D., Lenglet, C. Tract-specific analysis improves sensitivity of spinal cord diffusion MRI to cross-sectional and longitudinal changes in amyotrophic lateral sclerosis. *Nature Communications Biology*, 3: 370 (2020).

67. Veneziano, R., Moyer, T.J., Stone, M.B., Mukherjee, S., Shepherd, T.R., Das, J., Schief, W.R., Irvine, D.J., **Bathe, M.** Role of nanoscale antigen organization on B-cell activation probed using DNA origami. *Nature Nanotechnology*, 15: 716 (2020).

66. Wamhoff, E-C., Huang, H., Read, B.J., Ginsburg, E., Schief, W.R., Farrell, N., Irvine, D.J., **Bathe, M.** Controlling wireframe DNA origami nuclease degradation with minor groove binders. *bioRxiv* (2020).

65. Hart, S.M., Banal, J.L., **Bathe, M.**, and Schlau-Cohen, G.S. Identification of non-radiative decay pathways in CY3. *Journal of Physical Chemistry Letters* (2020).

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64. Jun, H., Wang, X., Bricker, W.P., **Bathe, M.** Automated sequence design of 2D wireframe DNA origami with honeycomb edges. *Nature Communications*, 10: 5419 (2019).

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.** Multiplexed and high-throughput neuronal fluorescence imaging with diffusible probes. *Nature Communications*, 10: 4377 (2019).

62. Wamhoff, E-C., Banal, J.L., Bricker, T.R., Parsons, M.F., Veneziano, R., Stone, M.B., Jun, H., Wang, X., **Bathe, M.** Programming structured DNA assemblies to probe biophysical processes. *Annual Review of Biophysics*, 48: 395 (2019).

61. Shepherd, T.R., Du, R., Huang, H., Wamhoff, E-C., **Bathe, M.** Bioproduction of pure, kilobase-scale single-stranded DNA. *Scientific Reports*, 9: 6121 (2019).

60. Kulikov, V., Guo, S-M., Stone, M.B., Goodman, A., Carpenter, A., **Bathe, M.**, Lempitsky, V., DoGNet: A deep architecture for synapse detection in multiplexed fluorescence images. *PLoS Computational Biology*, 15: e1007012 (2019).

59. Jun, H., Zhang, F., Shepherd, T., Ratalanert, S., Qi, X., Yan, H., **Bathe, M.** Autonomously designed free-form 2D DNA origami. *Science Advances*, 5: eaav0655 (2019).

58. Jun, H., Shepherd, T.R., Zhang, K., Bricker, W.P., Li, S., Chiu, W., **Bathe, M.** Automated sequence design of 3D polyhedral wireframe DNA origami with honeycomb edges. *ACS Nano*, 13: 2083 (2019).

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56. Holec, P.V., Berleant, J., **Bathe, M.**, Birnbaum, M.E. A Bayesian framework for high-throughput T cell receptor pairing. *Bioinformatics*, 149: 024905 (2018).

55. Bricker, W.P., Banal, J.L., Stone, M.B., **Bathe, M.** Molecular model of J-aggregated pseudoisocyanine fibers. *The Journal of Chemical Physics*, 149: 024905 (2018).

54. Guo, S-M., Li, L., Veneziano, R., Gordonov, S., Cottrell, J.C., **Bathe, M.** Multiplexed imaging of neuronal synapses using nucleic acid probe exchange. *Protocol Exchange*, doi:10.1038/protex.2018.066 (2018).

53. Veneziano, R., Shepherd, T., Ratanalert, S., Tao, C., **Bathe, M.** In vitro synthesis of gene-length single-stranded DNA. *Scientific Reports*, 8: 6548 (2018).

52. Boulais, E., Sawaya, N., Veneziano, R., Andreoni, A., Banal, J.L., Kondo, T., Mandal, S., Lin, S., Schlau-Cohen, G.S., Woodbury, N., Yan, H., Aspuru-Guzik, A., **Bathe, M.**

Programmed coherent coupling in a synthetic DNA-based excitonic circuit. *Nature Materials*, 17: 159 (2018).

51. **Bathe, M.** and Rothemund, P. DNA Nanotechnology: A foundation for programmable nanoscale materials. *MRS Bulletin*, doi: 10.1557/mrs.2017.279 (2017).

50. Banal, J.L., Kondo, T., Veneziano, R., **Bathe, M.**, Schlau-Cohen, G.S. Photophysics of J-aggregate-mediated energy transfer on DNA. *The Journal of Physical Chemistry Letters*, doi: 10.1021/acs.jpclett.7b01898 (2017).

49. Cunningham, P., Bricker, W., Diaz, S., Medintz, I., **Bathe, M.**, and Melinger, J.S. Optical determination of the electronic coupling and intercalation geometry of Thiazole Orange homodimer in DNA. *The Journal of Chemical Physics*, 147: 055101 (2017).

48. Pan, K., Bricker, W., Ratanalert, S., **Bathe, M.** Structure and conformational dynamics of scaffolded DNA origami nanoparticles. *Nucleic Acids Research* 45: 6284 (2017).

47. Su, K.C., Barry, Z., Schweizer, N., Maiato, H., **Bathe, M.**, Cheeseman, I. A regulatory switch alters chromosome motions at the metaphase to anaphase transition. *Cell Reports*, 17: 728 (2016).

46. Veneziano, R., Ratanalert, S., Zhang, K., Zhang, F., Yan, H., Chiu, W., **Bathe, M.** Designer nanoscale DNA assemblies programmed from the top down. *Science*, 352: 1534 (2016).

45. Wang, P., Gaitanaros, S., Lee, S., **Bathe, M.**, Shih, W.M., Ke, Y. Programming Self-Assembly of DNA Origami Honeycomb Lattices and Plasmonic Metamaterials. *JACS*, 138: 7733 (2016).

44. Katz, Z.B., English, B.P., Lionnet, T., Yoon, Y.J., Monnier, N., Ovryn, B., **Bathe, M.**, Singer, R.H. Mapping translation 'hot-spots' in live cells by tracking single molecules of mRNA and ribosomes. *eLife*, e10415 (2016).

43. Dhakal, S., Adendorff, M., Liu, M., Yan, H., **Bathe, M.**, Walter, N. Rational design of DNA-actuated enzyme nanoreactors guided by single molecule analysis. *Nanoscale*, 8: 3125 (2016).

42. Hogstrom, L., Guo, S.M., Murugadoss, K., **Bathe, M.** Advancing multiscale structural mapping of the brain through fluorescence imaging and analysis across length-scales. *Journal of The Royal Society Interface*, 6: 20150081 (2016).

41. Gordonov, S., Hwang, M.K., Wells, A., Gertler, F.B., Lauffenburger, D., **Bathe, M.** Time-series modeling of live-cell shape dynamics for image-based phenotypic profiling. *Integrative Biology*, 8: 73 (2016).

40. Sedeh, R., Pan, K., Adendorff, M., Hallatschek, O., Bathe, K.J., **Bathe, M.** Computing nonequilibrium conformational dynamics of structured nucleic acid assemblies. *Journal of Chemical Theory & Computation*, 12: 261 (2016).

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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.** Inferring transient particle transport dynamics in live cells. *Nature Methods*, 12: 838 (2015).

38. Sun, G., Guo, S.M., Teh, C., Korzh, V., **Bathe, M.**, Wohland, T. Bayesian model selection applied to the analysis of FCS data of fluorescent proteins in vitro and in vivo. *Analytical Chemistry*, 87: 4326 (2015).

37. Zhou, Z., Munteanu, E.L., He, J., Ursell, T., **Bathe, M.**, Huang, K.C., Chang, F. The contractile ring coordinates curvature dependent septum assembly during fission yeast cytokinesis. *Molecular Biology of the Cell*, 26: 78 (2015).

36. Pan, K., Kim, D.N., Zhang, F., Adendorff, M., Yan, H., **Bathe, M.** Lattice-free prediction of three-dimensional structure of programmed DNA assemblies. *Nature Communications*, 5: 5578 (2014).

35. Klingner, C., Cherian, A.V., Diesinger, P.M., Aufschnaiter, R., Maghelli, N., Keil, T., Beck, G., Tolic-Norrelykke, I., **Bathe, M.**, and Wedlich-Soldner, R. An isotropic acto-myosin network promotes organization of the apical cell cortex in epithelial cells. *The Journal of Cell Biology*, 207: 107-121 (2014).

34. Sun, W., Boulais, E., Hakobyan, Y., Wang, W., Guan, A., **Bathe, M.**, Yin, P. Casting inorganic structures with DNA molds. *Science*, 346: 717 (2014).

33. Mori, M., Somogyi, K., Kondo, H., Monnier, N., Falk, H., Machado, P., **Bathe, M.**, Nedelec, F., and Lenart, P. An Arp2/3 nucleated F-actin shell fragments nuclear membranes at nuclear envelope breakdown. *Current Biology*, 24: 1421-1428 (2014).

32. Oh, H.S., Bryant, K.F., Nieland, T., Mazumder, A., Bagul, M., **Bathe, M.**, Root, D.E. and Knipe, D.M. Targeted RNAi screen reveals novel epigenetic factors that regulate herpesviral gene expression in U2OS osteosarcoma cells. *mBio*, 5: e01086-13 (2014).

31. Guo, S.M., Bag, N., Mishra, A., Wohland, T., **Bathe, M.** Bayesian total internal reflection fluorescence correlation spectroscopy reveals hIAPP-induced plasma membrane domain organization in live cells. *Biophysical Journal*, 106: 190-200 (2014).

30. Pan, K., Boulais, E., Yang, L., **Bathe, M.** Structure-based model for light-harvesting properties of nucleic acid nanostructures. *Nucleic Acids Research*, doi: 10.1093/nar/gkt1269 (2013).

29. Mazumder, A., Pesudo, L.Q., McRee, S., **Bathe, M.**, Samson, L. Genome-wide single-cell-level screen for protein abundance and localization changes in response to DNA damage in S. cerevisiae. *Nucleic Acids Research*, 41: 9310-9324 (2013).

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dynamics to regulation of developmental gene expression programs during lineage commitment. *PLoS Genetics*, 9: e1003725 (2013).

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26. Mazumder, A., Tummler, K., **Bathe, M.**, Samson, L. Single-cell analysis of RNR transcriptional and translational response to DNA damage. *Molecular & Cellular Biology*, 33: 635–642 (2013).

25. Krishnan, Y. and **Bathe, M.** Designer nucleic acids to probe and program the cell. *Trends in Cell Biology*, 22: 624–633 (2012).

24. Schmidt, J.C., Haribabu, A., Boeszoermenyi, A., Dashkevich, N.M., Wilson-Kubalek, E., Monnier, N., Markus, M., Oberer, M., Milligan, R., **Bathe, M.**, Wagner, G., Grishchuk, E. L., Cheeseman, I.M. The kinetochore-bound Ska1 complex tracks depolymerizing microtubules by binding to curved protofilaments. *Developmental Cell*, 23: 968–980 (2012).

23. Monnier, N., Guo, S.M., Mori, M., He, J., Lenart, P., **Bathe, M.** Bayesian approach to MSD-based analysis of particle motion in live cells. *Biophysical Journal*, 103: 616–626 (2012).

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21. He, J., Guo, S.M., **Bathe, M.** Bayesian approach to the analysis of fluorescence correlation spectroscopy data I: Theory. *Analytical Chemistry*, 84: 3871–3879 (2012).

20. D.N. Kim, Kilchherr, F., Dietz, H., **Bathe, M.** Quantitative prediction of 3D solution shape and flexibility of nucleic acid nanostructures. *Nucleic Acids Research*, 40: 2862–2868 (2012).

19. M. Mori, Monnier, N., Daigle, N., **Bathe, M.**, Ellenberg, J., Lenart, P. Intracellular transport by an anchored homogeneously contracting F-actin meshwork. *Current Biology*, 21: 606–611 (2011).

18. Castro, C.E., Kilchherr, F., Kim, D.N., Lin Shiao, E., Wauer, T., Wortmann, P., **Bathe, M.**, Dietz, H. A primer to scaffolded DNA origami. *Nature Methods*, 8: 221–229 (2011).

17. Kim, D.N., Altschuler, J., Strong, C., McGill, G., **Bathe, M.** Conformational Dynamics Data Bank (CDDB): a database for conformational dynamics of proteins and supramolecular protein assemblies. *Nucleic Acids Research*, 39: D451–455 (2011).

16. Kim, D.N., Nguyen, C.T., **Bathe, M.** Conformational dynamics of supramolecular protein assemblies. *Journal of Structural Biology*, 173: 261–270 (2011).

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15. Strehle, D., Schnauss, J., Heussinger, C., Alvarado, J., **Bathe, M.**, Kaes, J., Gentry, B. Transiently crosslinked F-actin bundles. *European Biophysical Journal*, 40: 93–101 (2011).

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13. **Bathe, M.**, Chang, F. Cytokinesis and the contractile ring in fission yeast: towards a systems-level understanding. *Trends in Microbiology*, 18: 38–45 (2010).

12. Sedeh, R., **Bathe, M.**, Bathe, K.J. The subspace iteration method in protein normal mode analysis. *Journal of Computational Chemistry*, 31: 66–74 (2010).

11. **Bathe, M.**, Heussinger, C., Claessens, M.M.A.E., Bausch, A.R., and Frey, E. Cytoskeletal bundle mechanics. *Biophysical Journal*, 94: 2955–2964 (2008).

10. **Bathe, M.** A Finite element framework for computation of protein normal modes and mechanical response. *Proteins: Structure, Function, and Bioinformatics*, 70: 1595–1609 (2008).

9. Heussinger, C., **Bathe, M.**, and Frey, E. Statistical mechanics of wormlike bundles. *Physical Review Letters*, 99: Art. No. 048101 (2007).

8. Claessens, M.M.A.E., **Bathe, M.**, Frey, E., and Bausch, A.R. Actin-binding proteins sensitively mediate F-actin bundle stiffness. *Nature Materials*, 5: 748–753 (2006).

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4. Kaazempur-Mofrad, M.R., **Bathe, M.**, Karcher, H., Younis, H.F., Seong, H.C., Shim, E.B., Chan, R.C., Hinton, D.P., Isasi, A.G., Upadhyaya, A., Powers, M.J., Griffith, L.G., and Kamm, R.D. Role of simulation in understanding biological systems. *Computers & Structures*, 81: 715–726 (2003).

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3. **Bathe, M.** and Rutledge, G.C. Inverse Monte Carlo procedure for conformation determination of macromolecules. *Journal of Computational Chemistry*, 24: 876–890 (2003).

2. **Bathe, M.**, Shirai, A., Doerschuk, C.M., and Kamm, R.D. Neutrophil transit times through pulmonary capillaries: The effects of capillary geometry and fMLP-stimulation. *Biophysical Journal*, 83: 1917–1933 (2002).

1. **Bathe, M.** and Kamm, R.D. A fluid-structure interaction finite element analysis of pulsatile blood flow through a compliant stenotic artery. *Journal of Biomechanical Engineering*, 121: 361–369 (1999).

Patents

1. Zhang, F., Shepherd, T.R., Veneziano, R., **Bathe, M.**, Slaymaker, I., Zetsche, B. Nucleic 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.

2. 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.

3. **Bathe, M.**, Veneziano, R., Moyer, T., Irvine, D. Nucleic acid nanostructure platform for antigen presentation and vaccine formulations formed therefrom. U.S. Patent No. 62/796,472, filed Jan. 24, 2019.

4. 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 Pending US20180362969A1, filed Jun. 19, 2018, and published Dec. 20, 2018.

5. Veneziano, R., Ratanalert, S., Shepherd, T., Jun, H., **Bathe, M.** Stable nanoscale nucleic acid assemblies and methods thereof. International Patent Pending WO2017189870A1, filed Apr. 27, 2017, and published Nov. 2, 2017.

6. **Bathe, M.**, Ratanalert, S., Veneziano, R., Banal, J.L., Shepherd, T. Sequence-controlled polymer random access memory storage. International Patent Pending WO2017189914A1, filed Apr. 27, 2017, and published Nov. 2, 2017.

7. **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 Pending US20160103951A1, filed Oct. 3, 2015, and published Apr. 14, 2016.

8. **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.

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9. **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

1. Teach Me in 10 seminar on Vaccine Technologies, 2021.
2. MIT ILP R&D Conference, 2021.
3. EMBO Conference on Designing Functional Biomolecular Assemblies: Beyond Biology, 2021.
4. IBM Unconventional Computing Paradigms Workshop, 2021.
5. IUPAC CCCE 2021 – 104 Canadian Chemistry Conference, 2021.
6. LBL Molecular Foundry, Virtual Seminar, 2021.
7. SPIE Novel Patterning Technologies, Virtual Seminar, 2021.
8. MIT Biomaking Solutions, Virtual Seminar, 2020.
9. MIT Koch Institute, Virtual Seminar, 2020.
10. MIT Marble Center, Virtual Seminar, 2020.
11. NSF Bioeconomy Distinguished Lecture, Virtual Seminar, 2020.
12. CROI Boston, Virtual Seminar, 2020.
13. 4th Annual Genome Conference, Virtual Seminar, 2020.
14. Intracellular Dynamics of Molecules: Analysis and Models, Bordeaux, France, 2019.
15. MIT Computational Center for Engineering Symposium, Cambridge, MA, 2019.
16. MIT Research and Development Conference, Accelerating Big Impact Innovations, 2018.
17. Cryo-EM Center at MIT.nano Opening Symposium, Cambridge, MA, 2018.
18. 3rd Annual MIT-Skoltech Conference, Moscow, Russia, 2018.
19. 256th ACS National Meeting, Boston, MA, 2018.
20. Department of Pharmaceutical Sciences, Northeastern University, Boston, MA, 2017.

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21. Micron School of Materials Science and Engineering, Boise State University, Boise, ID, 2017.

22. Department of Chemical & Biomolecular Engineering, Vanderbilt University, Nashville, TN, 2017.

23. KoreaBIO, Seoul, South Korea, 2017.

24. Applied Math and Computational Science, University of Pennsylvania, Philadelphia, PA, 2017.

25. 72nd New England Complex Fluids Workshop, Brandeis University, Newton, MA, 2017.

26. First Conference on Biomotors, Virus Assembly, and Nanobiotechnology Applications, Ohio State University, Columbus, OH, 2017.

27. Department of Chemistry & Biochemistry, Georgia Institute of Technology, Atlanta, Georgia, 2017.

28. DNATEC, Dresden, Germany, 2017.

29. HYBER Symposium, Helsinki, Finland, 2017.

30. The Future of Integrative Structural Biology Workshop, Clemson University, Clemson, SC, 2017.

31. Frontiers in Imaging Science Workshop, Janelia Research Campus, Ashburn, VA, 2017.

32. Department of Chemistry, Carnegie Mellon University, Pittsburgh, PA, 2017.

33. Non-invasive Delivery of Macromolecules Conference, San Diego, CA, 2017.

34. Gordon Conference on RNA Nanotechnology, Ventura Beach, CA, 2017.

35. Frederick National Laboratory for Cancer Research, Frederick, MD, 2016.

36. SRC/IBM/ONR Workshop on Biological Pathways for Electronic Nanofabrication and Materials, San Jose, CA, 2016.

37. High Content Analysis and 3D Screening Conference, Boston, MA, 2016.

38. Allen Institute for Cell Science in Seattle, WA, 2016.

39. Department of Biology, Boston College, Chestnut Hill, MA, 2016.

40. American Chemical Society Annual Meeting, Philadelphia, PA, 2016.

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41. Conference on Excited State Processes, Santa Fe, New Mexico, 2016.
42. U.S. Naval Research Laboratory, Washington, D.C., 2016.
43. Ten Years of DNA Origami Symposium, Caltech, Pasadena, CA, 2016.
44. Modeling and Inference Workshop: From Single Molecules to Cells, Ohio State University, Columbus, OH, 2016.
45. Biozentrum at the University of Basel, Basel, Switzerland, 2015.
46. Department of Chemistry, University of Chicago, Chicago, IL, 2015.
47. Department of Chemistry, University of Michigan, Ann Arbor, MI, 2015.
48. Autodesk Research, Inc., San Francisco, CA, 2015.
49. Department of Biological Engineering, MIT, Cambridge, MA, 2015.
50. DNA21, Harvard University, Cambridge, MA, 2015.
51. Washington University, St. Louis, MO, 2015.
52. Department of Biomedical Engineering, University of Minnesota, Minneapolis, MN, 2015.
53. 14th European Conference on Computational Biology in Strasbourg, France, 2014.
54. Department of Cell & Molecular Biology, Uppsala University, Uppsala, Sweden, 2014.
55. Microscopy Graduate Workshop at Stowers Institute for Medical Research in Kansas City, MO, 2014.
56. 110th International Titisee Conference, Titisee, Germany, 2014.
57. Department of Physics, McGill University, Montreal, Canada, 2014.
58. SIAM Conference on the Life Sciences, Charlotte, NC, 2014.
59. World Congress of Biomechanics, Boston, MA, 2014.
60. World Congress of Biomechanics, Boston, MA, 2014.
61. Curie Institute, Paris, France, 2014.
62. DNATEC14, Dresden, Germany, 2014.
63. Foundations of NanoScience Conference, Snowbird, UT, 2014.

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64. GPU Technology Conference, San Jose, CA, 2014.

65. National Academy of Sciences Kavli Frontiers of Science & Engineering Symposium, Rio de Janeiro, Brazil, 2014.

66. Department of Biochemistry & Molecular Biology at Wayne State University School of Medicine, Detroit, MI, 2014.

67. Quantitative Bioimaging Conference at the University of New Mexico, Albuquerque, NM, 2014.

68. Physical Mathematics Seminar Series, MIT, Cambridge, MA, 2013.

69. Department of Physics, University of Maryland, College Park, MD, 2013.

70. Interdisciplinary Symposium on Advanced Nano/Biosystems: Design, Fabrication, and Characterization, University of Illinois at Urbana-Champaign, Champaign, IL, 2013.

71. Department of Chemistry and Biochemistry, Arizona State University, Phoenix, AZ, 2013.

72. National Centre for Biological Sciences TIFR, Bangalore, India, 2013.

73. Janelia Farm Research Campus, Ashburn, VA, 2013.

74. Department of Physics, Technical University of Munich, Munich, Germany, 2013.

75. International Workshop on Macromolecular Structure and Dynamics, Uppsala University, Uppsala, Sweden, 2013.

76. SciLifeLab, The Svedberg Seminar Series, Uppsala University, Uppsala, Sweden, 2013.

77. Department of Biochemistry and Molecular Biology, University of Chicago, Chicago, IL, 2013.

78. 57th Annual Biophysical Society Meeting, Philadelphia, PA, 2013.

79. Boston University, Integrative Systems Biology Seminar Series, Boston, MA, 2012.

80. Materials Research Society, Boston, MA, 2012.

81. NNIN/C Conference, Synergy Between Experiment and Computation in Energy – Looking to 2030, Harvard University, Cambridge, MA, 2012.

82. Ohio State University, Columbus, OH, 2012.

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83. Soft Matter Approaches to Biological Physics, KITP UCSB, Santa Barbara, CA, 2011.

84. Foundations of Nanoscience, Snowbird, UT, 2011.

85. Biophysical Society, Baltimore, MD, 2011.

86. Biophysical Society, Baltimore, MD, 2011.

87. EMBO Workshop on Modeling, Microscopy, and Biophysical Methods, EMBL Heidelberg, Heidelberg, Germany, 2010.

88. Department of Biochemistry-Biophysics, Brandeis University, Waltham, MA, 2010.

89. The Cellular Cytoskeleton, Pingree Park, CO, 2010.

90. Harvard Squishy Physics, Harvard University, Cambridge, MA, 2010.

91. MIT Graduate Student Council Alumni Speaker Series, Cambridge, MA, 2009.

92. MIT BMES Undergraduate Students Association, Cambridge, MA, 2009.

93. Annual Meeting of the United States Association for Computational Mechanics, Columbus, OH, 2009.

94. Annual Meeting of the Biophysical Society, Boston, MA, 2009.

95. WAM Seminar Series, Harvard University, Cambridge, MA, 2009.

96. Institute for Biomolecular Science, Gakushuin University, Tokyo, Japan, 2009.

97. 2009 MIT in Japan Conference, Tokyo, Japan, 2009.