

MATTHEW LAKIN

Assistant Professor
Department of Computer Science
Center for Biomedical Engineering
University of New Mexico
Albuquerque, NM 87131

(505) 277-3351
mlakin@cs.unm.edu
<http://www.cs.unm.edu/~mlakin>

Research Interests

DNA nanotechnology, RNA synthetic biology, biological modeling languages, formal methods.

Education

- Ph.D. in Computer Science, University of Cambridge, 2010.
 - Thesis title: *“An executable meta-language for inductive definitions with binders.”*
 - Advisor: Prof. Andrew M. Pitts.
- M.A. (Cantab), University of Cambridge, 2009.
- B.A. (Hons) in Computer Science, University of Cambridge, 2005.

Positions

- 2017–present. Assistant Professor, Department of Computer Science, University of New Mexico.
- 2015–2017. Research Assistant Professor, Department of Computer Science, University of New Mexico.
- 2015–2017. Research Assistant Professor, Department of Chemical & Biological Engineering, University of New Mexico.
- 2011–2015. Postdoctoral Scholar, Department of Computer Science, University of New Mexico. Advisor: Prof. Darko Stefanovic.

- 2009–2011. Postdoctoral Researcher, Biological Computation Group, Microsoft Research, Cambridge. Advisor: Dr. Andrew Phillips.

Academic Affiliations and Awards

- 2014–present. Member, Center for Biomedical Engineering, University of New Mexico.
- 2013–2015. Postdoctoral Training Fellowship, New Mexico Cancer Nanoscience and Microsystems Training Center.
- 2007–2008. Queens' College Munro Studentship. (Awarded for teaching excellence.)
- 2005. Queens' College Foundation Scholarship. (Awarded for first class honors in Tripos examinations.)
- 2004. Queens' College Foundation Scholarship. (Awarded for first class honors in Tripos examinations.)
- 2003. Queens' College Exhibition. (Awarded for first class honors in Tripos examinations.)

Current Grant Support

- Co-Principal Investigator, National Science Foundation award 1935087, *"Synthetic cells that can learn without evolution."*
 - Total award amount: \$1,000,000. UNM portion: \$203,171.
 - Award period: 09/15/2019–08/31/2022.
 - PI: James Carothers (University of Washington); Co-PIs: Matthew Lakin, Irene Chen (UCLA), Pamela Peralta-Yahya (Georgia Tech), Emma Frow (ASU).
- Project Investigator, National Institutes of Health NIGMS grant P20GM103451 via NM-INBRE, *"Cell-free design and implementation of CRISPR guide RNA switches."*
 - Total award amount: \$35,622.
 - Award period: 05/01/2019–04/30/2020.
 - PI: Matthew Lakin.
- Co-Principal Investigator, National Science Foundation award 1843958, *"RoL: EAGER: DESYN-C³: Programmable control of metabolism in synthetic cells using intrinsically disordered proteins."*
 - Total award amount: \$299,986.

- Award period: 10/01/2018–09/30/2020.
- PI: Nick Carroll (UNM); Co-PI: Matthew Lakin.
- Principal Investigator, National Science Foundation award 1814906, “SHF: Small: Models and design tools for tethered molecular circuits.”
 - Total award amount: \$450,000.
 - Award period: 06/15/2018–05/31/2021.
 - PI: Matthew Lakin (sole investigator).
- Co-Principal Investigator, National Science Foundation award 1763718, “SHF: Collaborative Research: Biocompatible I/O interfaces for robust bioorthogonal molecular computing.”
 - Total award amount: \$300,000. UNM portion: \$200,000.
 - Award period: 10/01/2018–09/30/2021.
 - PI: Darko Stefanovic (UNM); Co-PIs: Matthew Lakin, Milan Stojanovic (Columbia University).
- Principal Investigator, National Science Foundation award 1525553, “AF: SHF: Small: Adaptive molecular computation using buffered strand displacement networks.”
 - Total award amount: \$449,999.
 - Award period: 09/01/2015–08/31/2018.
 - PI: Matthew Lakin; Co-PIs: Darko Stefanovic (UNM), Steven Graves (UNM).
- Co-Principal Investigator, National Science Foundation award 1518861, “AF: Large: Collaborative Research: Molecular computing for the real world.”
 - Total award amount: \$2,000,000. UNM portion: \$934,358.
 - Award period: 09/01/2015–08/31/2020.
 - PI: Darko Stefanovic (UNM); Co-PIs: Matthew Lakin, Steven Graves (UNM), Lydia Tapia (UNM), Milan Stojanovic (Columbia University), Sergei Rudchenko (Hospital for Special Surgery), Christof Teuscher (Portland State University).

Patents

- P4:** M. R. Lakin, C. W. Brown III, D. Stefanovic, and S. W. Graves, *Signal propagation biomolecules, devices and methods*, US patent number 10,221,446, 2019
- P3:** M. R. Lakin and N. J. Carroll, *Programmable control of metabolism in synthetic cells using intrinsically disordered proteins*, US provisional patent application, 2018

P2: M. R. Lakin and P. W. Davenport, *Engineering stimulus-responsive effectors for cell-specific control of gene expression*, US provisional patent application, 2018

P1: M. R. Lakin and A. Phillips, *Stochastic simulation of multi-language concurrent systems*, US patent application number 13/091,950, patent pending, 2011

Book Chapters

B1: M. R. Lakin, M. N. Stojanovic, and D. Stefanovic, "Implementing molecular logic gates, circuits, and cascades using DNAzymes," in *Advances in Unconventional Computing Volume 2: Prototypes, Models and Algorithms*, ser. Emergence, Complexity, and Computation, A. Adamatzky, Ed., vol. 23, Springer International Publishing, 2017, ch. 1, pp. 1–28. DOI: 10.1007/978-3-319-33921-4_1

Journal Publications

J22: C. Spaccasassi, M. R. Lakin, and A. Phillips, "A logic programming language for computational nucleic acid devices," *ACS Synthetic Biology*, vol. 8, no. 7, pp. 1530–1547, 2019. DOI: 10.1021/acssynbio.8b00229

J21: A. Fabry-Wood, M. E. Fetrow, A. Oloyede, K.-A. Yang, M. N. Stojanovic, D. Stefanovic, S. W. Graves, N. J. Carroll, and M. R. Lakin, "Microcompartments for protection and isolation of nanoscale DNA computing elements," *ACS Applied Materials and Interfaces*, vol. 11, no. 12, pp. 11 262–11 269, 2019. DOI: 10.1021/acsami.9b03143

J20: M. R. Lakin and A. Phillips, "Automated analysis of tethered DNA nanostructures using constraint solving," *Natural Computing*, vol. 17, no. 4, pp. 709–722, 2018. DOI: 10.1007/s11047-018-9693-y

J19: S. Pallikkuth, C. Martin, F. Farzam, J. S. Edwards, M. R. Lakin, D. S. Lidke, and K. A. Lidke, "Sequential super-resolution imaging using DNA strand displacement," *PLOS ONE*, vol. 13, no. 8, e0203291, 2018. DOI: 10.1371/journal.pone.0203291

J18: A. Fabry-Wood, M. E. Fetrow, C. W. Brown III, N. A. Baker, N. F. Oropeza, A. P. Shreve, G. A. Montañó, D. Stefanovic, M. R. Lakin, and S. W. Graves, "A microsphere-supported lipid bilayer platform for DNA reactions on a fluid surface," *ACS Applied Materials and Interfaces*, vol. 9, no. 35, pp. 30 185–30 195, 2017. DOI: 10.1021/acsami.7b11046

- J17:** M. R. Lakin and D. Stefanovic, "Supervised learning in adaptive DNA strand displacement networks," *ACS Synthetic Biology*, vol. 5, no. 8, pp. 885–897, 2016. DOI: 10.1021/acssynbio.6b00009
- J16:** D. Mo, M. R. Lakin, and D. Stefanovic, "Logic circuits based on molecular spider systems," *BioSystems*, vol. 146, pp. 10–25, 2016. DOI: 10.1016/j.biosystems.2016.03.008
- J15:** M. R. Lakin, D. Stefanovic, and A. Phillips, "Modular verification of chemical reaction network encodings via serializability analysis," *Theoretical Computer Science*, vol. 632, pp. 21–42, 2016. DOI: 10.1016/j.tcs.2015.06.033
- J14:** R. L. Petersen, M. R. Lakin, and A. Phillips, "A strand graph semantics for DNA-based computation," *Theoretical Computer Science*, vol. 632, pp. 43–73, 2016. DOI: 10.1016/j.tcs.2015.07.041
- J13:** C. W. Brown III, M. R. Lakin, A. Fabry-Wood, E. K. Horwitz, N. A. Baker, D. Stefanovic, and S. W. Graves, "A unified sensor architecture for isothermal detection of double-stranded DNA, oligonucleotides, and small molecules," *ChemBioChem*, vol. 16, no. 5, pp. 725–730, 2015. DOI: 10.1002/cbic.201402615
- J12:** M. R. Lakin, C. W. Brown III, E. K. Horwitz, M. L. Fanning, H. E. West, D. Stefanovic, and S. W. Graves, "Biophysically inspired rational design of structured chimeric substrates for DNAzyme cascade engineering," *PLOS ONE*, vol. 9, no. 10, e110986, 2014. DOI: 10.1371/journal.pone.0110986
- J11:** C. W. Brown III, M. R. Lakin, E. K. Horwitz, M. L. Fanning, H. E. West, D. Stefanovic, and S. W. Graves, "Signal propagation in multi-layer DNAzyme cascades using structured chimeric substrates," *Angewandte Chemie International Edition*, vol. 53, no. 28, pp. 7183–7187, 2014. DOI: 10.1002/anie.201402691
- J10:** M. R. Lakin, A. Minnich, T. Lane, and D. Stefanovic, "Design of a biochemical circuit motif for learning linear functions," *Journal of the Royal Society Interface*, vol. 11, no. 101, p. 20140902, 2014. DOI: 10.1098/rsif.2014.0902
- J9:** C. W. Brown III, M. R. Lakin, D. Stefanovic, and S. W. Graves, "Catalytic molecular logic devices by DNAzyme displacement," *ChemBioChem*, vol. 15, no. 7, pp. 950–954, 2014. DOI: 10.1002/cbic.201400047
- J8:** M. R. Lakin and A. M. Pitts, "Contextual equivalence for inductive definitions with binders in higher-order typed functional programming," *Journal of Functional Programming*, vol. 23, no. 6, pp. 658–700, 2013. DOI: 10.1017/S0956796813000245

- J7:** P. Banda, C. Teuscher, and M. R. Lakin, "Online learning in a chemical perceptron," *Artificial Life*, vol. 19, no. 2, pp. 195–219, 2013. DOI: 10.1162/ARTL_a_00105
- J6:** M. R. Lakin, D. Parker, L. Cardelli, M. Kwiatkowska, and A. Phillips, "Design and analysis of DNA strand displacement devices using probabilistic model checking," *Journal of the Royal Society Interface*, vol. 9, no. 72, pp. 1470–1485, 2012. DOI: 10.1098/rsif.2011.0800
- J5:** M. R. Lakin, L. Paulevé, and A. Phillips, "Stochastic simulation of multiple process calculi for biology," *Theoretical Computer Science*, vol. 431, pp. 181–206, 2012. DOI: 10.1016/j.tcs.2011.12.057
- J4:** M. R. Lakin, S. Youssef, L. Cardelli, and A. Phillips, "Abstractions for DNA circuit design," *Journal of the Royal Society Interface*, vol. 9, no. 68, pp. 460–486, 2012. DOI: 10.1098/rsif.2011.0343
- J3:** M. R. Lakin, S. Youssef, F. Polo, S. Emmott, and A. Phillips, "Visual DSD: A design and analysis tool for DNA strand displacement systems," *Bioinformatics*, vol. 27, no. 22, pp. 3211–3213, 2011. DOI: 10.1093/bioinformatics/btr543
- J2:** M. R. Lakin and A. M. Pitts, "Encoding abstract syntax without fresh names," *Journal of Automated Reasoning*, vol. 49, no. 2, pp. 115–140, 2012. DOI: 10.1007/s10817-011-9220-7
- J1:** M. R. Lakin, "Constraint solving in non-permutative nominal abstract syntax," *Logical Methods in Computer Science*, vol. 7, no. 3:06, pp. 1–31, 2011. DOI: 10.2168/LMCS-7(3:6)2011

Conference Publications

- C17:** M. R. Lakin and A. Phillips, "Automated, constraint-based analysis of tethered DNA nanostructures," in *Proceedings of the 23rd International Conference on DNA Computing and Molecular Programming*, R. Brijder and L. Qian, Eds., ser. Lecture Notes in Computer Science, vol. 10467, Springer, Cham, 2017, pp. 1–16. DOI: 10.1007/978-3-319-66799-7_1
- C16:** M. R. Lakin and D. Stefanovic, "Towards temporal logic computation using DNA strand displacement reactions," in *Unconventional Computation and Natural Computation 2017*, M. J. Patitz and M. Stannett, Eds., ser. Lecture Notes in Computer Science, vol. 10240, Springer, Cham, 2017, pp. 41–55. DOI: 10.1007/978-3-319-58187-3_4
- C15:** M. R. Lakin and D. Stefanovic, "Supervised learning in an adaptive DNA strand displacement circuit," in *Proceedings of the 21st International Conference on DNA Computing and Molecular Programming*, A. Phillips and P. Yin, Eds., ser. Lecture Notes in Computer Science,

vol. 9211, Springer International Publishing, 2015, pp. 154–167. DOI: 10.1007/978-3-319-21999-8_10

- C14:** D. Mo, M. R. Lakin, and D. Stefanovic, “Scalable design of logic circuits using an active molecular spider system,” in *Proceedings of the 10th International Conference on Information Processing in Cells and Tissues*, M. Lones, A. Tyrrell, S. Smith, and G. Fogel, Eds., ser. Lecture Notes in Computer Science, vol. 9303, Springer International Publishing, 2015, pp. 13–28. DOI: 10.1007/978-3-319-23108-2_2
- C13:** M. R. Lakin, R. Petersen, K. E. Gray, and A. Phillips, “Abstract modelling of tethered DNA circuits,” in *Proceedings of the 20th International Conference on DNA Computing and Molecular Programming*, S. Murata and S. Kobayashi, Eds., ser. Lecture Notes in Computer Science, vol. 8727, Springer International Publishing, 2014, pp. 132–147. DOI: 10.1007/978-3-319-11295-4_9
- C12:** M. R. Lakin and D. Stefanovic, “Pattern formation by spatially organized approximate majority reactions,” in *Unconventional Computation and Natural Computation 2014*, O. H. Ibarra, L. Kari, and S. Kopecki, Eds., ser. Lecture Notes in Computer Science, vol. 8553, Springer International Publishing, 2014, pp. 254–266. DOI: 10.1007/978-3-319-08123-6_21
- C11:** M. R. Lakin and A. Phillips, “Compiling DNA strand displacement reactions using a functional programming language,” in *Proceedings of Practical Aspects of Declarative Languages 2014*, M. Flatt and H.-F. Guo, Eds., ser. Lecture Notes in Computer Science, vol. 8324, Springer International Publishing Switzerland, 2014, pp. 81–86. DOI: 10.1007/978-3-319-04132-2_6
- C10:** A. Goudarzi, M. R. Lakin, D. Stefanovic, and C. Teuscher, “A model for variation- and fault-tolerant digital logic using self-assembled nanowire architectures,” in *Proceedings of the 2014 IEEE/ACM International Symposium on Nanoscale Architectures (NANOARCH)*, IEEE Press, 2014, pp. 116–121. DOI: 10.1109/NANOARCH.2014.6880504
- C9:** A. Goudarzi, M. R. Lakin, and D. Stefanovic, “Reservoir computing approach to robust computation using unreliable nanoscale networks,” in *Unconventional Computation and Natural Computation 2014*, O. H. Ibarra, L. Kari, and S. Kopecki, Eds., ser. Lecture Notes in Computer Science, vol. 8553, Springer International Publishing, 2014, pp. 164–176. DOI: 10.1007/978-3-319-08123-6_14
- C8:** M. R. Lakin, A. Phillips, and D. Stefanovic, “Modular verification of DNA strand displacement networks via serializability analysis,” in *Proceedings of the 19th International Conference on DNA Computing and Molecular Programming*, D. Soloveichik and B. Yurke, Eds.,

ser. Lecture Notes in Computer Science, vol. 8141, Springer-Verlag, 2013, pp. 133–146. DOI: 10.1007/978-3-319-01928-4_10

- C7:** A. Goudarzi, M. R. Lakin, and D. Stefanovic, “DNA reservoir computing: A novel molecular computing approach,” in *Proceedings of the 19th International Conference on DNA Computing and Molecular Programming*, D. Soloveichik and B. Yurke, Eds., ser. Lecture Notes in Computer Science, vol. 8141, Springer-Verlag, 2013, pp. 76–89. DOI: 10.1007/978-3-319-01928-4_6
- C6:** M. R. Lakin, A. Minnich, T. Lane, and D. Stefanovic, “Towards a biomolecular learning machine,” in *Unconventional Computation and Natural Computation 2012*, J. Durand-Lose and N. Jonoska, Eds., ser. Lecture Notes in Computer Science, vol. 7445, Springer-Verlag, 2012, pp. 152–163. DOI: 10.1007/978-3-642-32894-7_15
- C5:** M. R. Lakin and A. Phillips, “Modelling, simulating and verifying Turing-powerful strand displacement systems,” in *Proceedings of the 17th International Conference on DNA Computing and Molecular Programming*, L. Cardelli and W. Shih, Eds., ser. Lecture Notes in Computer Science, vol. 6937, Springer-Verlag, 2011, pp. 130–144. DOI: 10.1007/978-3-642-23638-9_12
- C4:** A. Phillips, M. R. Lakin, and L. Paulevé, “Stochastic simulation of process calculi for biology,” in *Membrane Computing and Biologically Inspired Process Calculi 2010*, G. Ciobanu and M. Koutny, Eds., ser. Electronic Proceedings in Theoretical Computer Science, vol. 40, 2010, pp. 1–5. DOI: 10.4204/EPTCS.40.1
- C3:** L. Paulevé, S. Youssef, M. R. Lakin, and A. Phillips, “A generic abstract machine for stochastic process calculi,” in *CMSB 2010: Proceedings of the 8th International Conference on Computational Methods in Systems Biology, Trento, Italy*, ACM, 2010, pp. 43–54. DOI: 10.1145/1839764.1839771
- C2:** M. R. Lakin and A. M. Pitts, “Resolving inductive definitions with binders in higher-order typed functional programming,” in *18th European Symposium on Programming (ESOP '09)*, G. Castagna, Ed., ser. Lecture Notes in Computer Science, vol. 5502, Springer, 2009, pp. 47–61. DOI: 10.1007/978-3-642-00590-9_4
- C1:** M. R. Lakin and A. M. Pitts, “A metalanguage for structural operational semantics,” in *Trends in Functional Programming, Volume 8*, M. T. Morazán, Ed., Intellect, 2008, pp. 19–35

Media Coverage

- 2015. “Molecular computing at UNM” article on UNM Newsroom website:

- <http://news.unm.edu/news/molecular-computing-at-unm>
- 2014. “Computational chemicals” article on Royal Society of Chemistry’s Chemistry World website:
 - <http://www.rsc.org/chemistryworld/2014/02/computational-chemicals-learning-network-turing>

Teaching

- 2016–present. Instructor of Record, Department of Computer Science, University of New Mexico. Multiple courses (9 total):
 - Fall 2019: Computer Science postgraduate course CS 558: “Software Foundations.”
 - Fall 2019: Computer Science postgraduate course CS 592: “Colloquium.”
 - Spring 2019: Computer Science undergraduate course CS 251: “Intermediate Programming.”
 - Spring 2019: Biomedical Engineering postgraduate course BME 556: “Protein and Nucleic Acid Engineering.” This course was cross-listed as BME 556, CBE 499, CBE 515, and CS 591.
 - Fall 2018: Computer Science postgraduate course CS 558: “Software Foundations.”
 - Spring 2018: Computer Science undergraduate course CS 365: “Introduction to Scientific Modeling.”
 - Fall 2017: Computer Science postgraduate course CS 558: “Software Foundations.”
 - Spring 2017: Computer Science undergraduate course CS 293: “Social and Ethical Issues in Computing.”
 - Fall 2016: Computer Science postgraduate course CS 558: “Software Foundations.”
- 2012–2015. Guest lecturer, University of New Mexico. Multiple courses (5 total):
 - Computer Science postgraduate course CS 558: “Software Foundations.”
 - Biomedical Engineering postgraduate course BME 556: “Protein and Nucleic Acid Engineering.”
 - Nanoscience and Microsystems Engineering postgraduate course NSMS 518: “Synthesis of Nanostructures.”
 - Chemical Engineering undergraduate course CHNE 361: “Biomolecular Engineering.”
 - Chemical Engineering undergraduate CBE 417 / Biomedical Engineering postgraduate course BME 517: “Applied Biology for Biomedical Engineers.”

- 2005–2011. Computer Science supervisor, University of Cambridge. Served as teaching assistant for multiple courses (10 total):
 - Programming in Java, Databases, Discrete Mathematics, Specification and Verification, Logic and Proof, Semantics of Programming Languages, Computation Theory, Types, Topics in Concurrency, Natural Language Processing.
- 2007–2009. Computer Science introductory programming laboratory supervisor, University of Cambridge.

Mentoring

- Postdoctoral scholar mentor, University of New Mexico. Scholars mentored (1 total):
 - Peter Davenport (2018–present).
- Graduate student mentor, University of New Mexico. Students mentored (16 total):
 - Randi Smith (Biomedical Engineering Ph.D. student, 2019–present).
 - Sarika Kumar (Computer Science Ph.D. student, 2018–present).
 - Tracy Mallette (Biomedical Engineering Ph.D. student, 2017–present).
 - David Arredondo (Nanoscience and Microsystems Engineering Ph.D. student, 2017–present).
 - Also mentored as a post-baccalaureate student, 2016–2017.
 - Kage Weiss (Computer Science M.S. student, 2019–present).
 - James C. Boney (Biomedical Engineering M.S. student, 2018–present).
 - Aurora Fabry-Wood (Biomedical Engineering Ph.D. student, 2013–present).
 - Co-adviser, Ph.D. thesis committee member.
 - Adán Myers y Gutiérrez (Biomedical Engineering Ph.D. student, 2013–present).
 - Ph.D. thesis committee member.
 - Lee Jensen (Computer Science Ph.D. student, 2019–present).
 - Ph.D. thesis committee member.
 - Dandan Mo (Computer Science Ph.D. student, 2013–2016).
 - Ph.D. thesis committee member.
 - Thesis title: *“Molecular Circuits based on Molecular Spider System.”*
 - Alireza Goudarzi (Computer Science Ph.D. student, 2013–2016).
 - Subsequently a postdoctoral researcher at the RIKEN Brain Science Institute, Wakō, Japan.

- Andre Appert (Student intern, 2015–2016).
- Carl W. Brown, III (Biomedical Sciences Ph.D. student, 2011–2015).
 - Graduated with a Ph.D. with distinction in June 2014.
 - Subsequently a postdoctoral researcher at the Naval Research Laboratory, Washington, DC and a staff scientist at the Wyss Institute, Harvard Medical School, Boston, MA.
 - Now at Sherlock Biosciences.
- David Mohr (Computer Science Ph.D. student, 2013–2015).
 - Ph.D. thesis committee member.
 - Thesis title: *“Stella: A Python-based Domain-Specific Language for Simulations.”*
 - Subsequently at Google, Boulder, CO.
- Amanda Minnich (Computer Science Ph.D. student, 2011–2014).
 - Now at Lawrence Livermore National Laboratory, Livermore, CA.
- Geoffrey Reedy (Computer Science M.S. student, 2013).
 - M.S. thesis committee member.
 - Thesis title: *“Design and Implementation of a Scala Compiler Backend Targeting the Low Level Virtual Machine.”*
- Undergraduate student mentor, University of New Mexico. Students mentored (12 total):
 - Kelsie Herzer (Chemical Engineering student, 2017–present).
 - Christopher Fetrow (Chemistry / Physics undergraduate student, 2016–present).
 - Danielsen Moreno (General Engineering undergraduate student, Central New Mexico Community College, 2018).
 - Julian Weisburd (Computer Science undergraduate student, 2017).
 - Madalyn Fetrow (Chemistry undergraduate student, summer 2014–2018).
 - Mische Hubbard (Chemical Engineering undergraduate student, 2016–2017).
 - Nicholas A. Baker (Chemical Engineering undergraduate student, 2014–2016).
 - Dominic Medina (Biochemistry undergraduate student, summer 2015).
 - Cameron Degani (Chemical Engineering undergraduate student, summer 2015).
 - Erin Sosebee (Computer Science undergraduate student, summer 2013).
 - Eli K. Horwitz (Chemical Engineering undergraduate student, 2012–2014).
 - Hannah E. West (Chemical Engineering undergraduate student, 2011).
- High school intern mentor, University of New Mexico. Students mentored (7 total):

- Christian Poncho (Fall 2018–Spring 2019) Adityo Paul (Summer 2018), Priyanka Jain (Summer 2015), Holly Liu (Summer 2015), Rebecca DeLand (Summer 2014), Katherine Jordan (Summer 2013), Megan Williams (Summer 2013).
- Mentor for student team in postgraduate course BME 598: “Biodesign”, University of New Mexico. Students mentored (7 total):
 - Fall 2018: Amanda Sanchez, Neema Naeemi, Rohan Choraghe, Christopher Buksa, Marshall Klee, Daniel Sikora, Ushnik Ghosh. My team won \$50,000 in funding from the UNM School of Engineering and the UNM Clinical & Translational Science Center to develop their invention, a wheelchair attachment for stroke patients.

Service

- 2018–present. Organizing committee member, International Conference on Engineering Synthetic Cells and Organelles, Santa Fe, NM, May 2020.
- 2018–present. Program committee member, 24th and 25th International Conferences on DNA Computing and Molecular Programming (DNA24, DNA25).
- 2017–2018. Program committee member, 9th and 10th International Workshops on Biodesign Automation (IWBD 2017, 2018).
- 2017. Reviewer, British Computer Society Distinguished Dissertation award.
- 2017. Poster and oral presentation judge, UNM STEM Research Symposium.
- 2015–present. Ad hoc reviewer for National Science Foundation.
- 2014–present. Review editorial board member, Frontiers in Computational Intelligence (a specialty of Frontiers in Robotics and AI).
- 2014. Session chair, Workshop on Computing with Biomolecules: From Network Motifs to Complex and Adaptive Systems (satellite workshop of ALife 2014 conference).
- 2014–2015. Program committee member, 1st and 2nd International Workshops on Verification of Engineered Molecular Devices and Programs (VEMDP 2014, 2015).
- 2008–present. Invited peer reviewer for multiple journals (24 total):
 - Proceedings of the National Academy of Sciences of the USA.
 - Nature Communications.
 - Bioinformatics.

- ACS Synthetic Biology.
- Nucleic Acids Research.
- ACS Nano.
- Nano Letters.
- Angewandte Chemie International Edition.
- Theoretical Computer Science.
- Journal of the Royal Society Interface.
- Interface Focus.
- RSC Advances.
- Information & Computation.
- IEEE Transactions on NanoBioscience.
- IEEE Transactions on Nanotechnology.
- IEEE Life Sciences Letters.
- IEEE Access.
- Natural Computing.
- BMC Bioinformatics.
- BioSystems.
- Journal of Symbolic Computation.
- Theory of Computing Systems.
- Interdisciplinary Sciences—Computational Life Sciences.
- International Journal of Molecular Sciences.
- 2008–present. Invited peer reviewer for multiple conferences (7 total):
 - International Conference on DNA Computing and Molecular Programming.
 - International Conference on Unconventional Computation and Natural Computation.
 - International Conference on Functional Programming.
 - International Colloquium on Automata, Languages, and Programming.
 - European Symposium on Programming.
 - IEEE International Symposium on Logic in Computer Science.
 - International Workshop on Biodesign Automation.

Professional Society Memberships

- 2018–present. Member, American Association for the Advancement of Science (AAAS).
- 2018–present. Member, American Chemical Society (ACS).
- 2016–present. Member, Institute of Electrical and Electronics Engineers (IEEE).
- 2014–present. Member, Association for Computing Machinery (ACM).
- 2011–present. Member, International Society for Nanoscale Science, Computation and Engineering (ISNSCE).

Selected Talks

- *“Automated, constraint-based analysis of tethered DNA nanostructures”* International Conference on DNA Computing and Molecular Programming, Austin, Texas, September 2017.
- *“Towards temporal logic computation using DNA strand displacement reactions”*. International Conference on Unconventional Computation and Natural Computation, Fayetteville, Arkansas, June 2017.
- *“Supervised learning in an adaptive DNA strand displacement circuit”*. International Conference on DNA Computing and Molecular Programming, Boston, Massachusetts, August 2015.
- *“Modular verification of chemical reaction networks via serializability analysis”*. Invited keynote speaker, 2nd International Workshop on Verification of Engineered Molecular Devices and Programs (VEMDP 2015), San Francisco, California, July 2015.
- *“Theory and practice of molecular computing”*. Biochemistry & Molecular Biology Seminar, University of New Mexico School of Medicine, Albuquerque, New Mexico, March 2015.
- *“Abstract modelling of tethered DNA circuits”*. International Conference on DNA Computing and Molecular Programming, Kyoto, Japan, September 2014.
- *“Pattern formation by spatially organized approximate majority reactions”*. International Conference on Unconventional Computation and Natural Computation, London, Ontario, July 2014.
- *“Compiling DNA strand displacement reactions using a functional programming language”*. International Symposium on Practical Aspects of Declarative Languages, San Diego, California, January 2014.

- “Modular verification of DNA strand displacement networks via serializability analysis”. International Conference on DNA Computing and Molecular Programming, Tempe, Arizona, September 2013.
- “Towards a biomolecular learning machine”. International Conference on Unconventional Computation and Natural Computation, Orléans, France, September 2012.
- “Modelling, simulating and verifying Turing-powerful strand displacement systems”. International Conference on DNA Computing and Molecular Programming, Pasadena, California, September 2011.
- “Resolving inductive definitions with binders in higher-order typed functional programming”. European Symposium on Programming, York, United Kingdom, March 2009.

Selected Poster Presentations

- Matthew Lakin, Julian M. Weisburd, and Sarika Kumar. “Structure sampling for rate estimation in tethered molecular circuits.” International Conference on DNA Computing and Molecular Programming, Seattle, Washington, August 2019.
- Carlo Spaccasassi, Matthew Lakin, and Andrew Phillips. “A logic programming language for computational nucleic acid devices”. International Workshop on Biodesign Automation, Cambridge, UK, July 2019. International Conference on DNA Computing and Molecular Programming, Austin, Texas, September 2017.
- Keith Lidke, Diane Lidke, Cheyenne Martin, Farzin Farzam, Jeremy Edwards, Matthew Lakin. “Multi-structure super-resolution imaging using sequential imaging and DNA strand displacement”. 2018 Conference on Quantitative BioImaging in Göttingen, Germany, January 2018.