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Education and Research Experience

2/08 - present	*Caltech*, Senior Research Associate
9/05 - 2/08	*Caltech*, Senior Research Fellow
9/04 - 9/05	*Caltech*, Senior Research Fellow, Center for Physics of Information
9/01 - 9/04	*Caltech*, Beckman Senior Research Fellow
8/95 - 9/01	*University of Southern California*, **Ph.D. in Computer Science.** Thesis Advisor: Professor Leonard Adleman. Title: Theory and Experiments in Algorithmic Self-assembly
6/94 - 4/95	Technician in geobiology with Professor Joseph Kirchvink, Caltech.
9/90 - 6/94	*California Institute of Technology*, **B.S. with honors, double major** in Biology and Engineering and Applied Science, concentration in Computer Science.
6/92 - 8/92	Summer Undergraduate Research Fellowship (SURF) in Chemistry with Professor Robert Grubbs.

Refereed Journal Publications

First author contributions or other important contributions are starred ($\star$) rather than bulleted ($\bullet$).

$\star$ H.T. Maune, S. Han, R.D. Barish, M. Bockrath, W.A. Goddard III, P.W.K. Rothemund, E. Winfree, "Self-assembly of carbon nanotubes into two-dimensional geometries using DNA origami templates" *Nature Nanotechnology*, 8 November, 2009.

$\star$ R.J. Kershner, L.D. Bozano, C.M. Micheel, A.H. Hung, A.R. Fornof, J.N. Cha, C.T. Rettner, M. Bersani, J. Frommer, P.W.K. Rothemund, G.M. Wallraff, "Placement and orientation of individual DNA shapes on lithographically patterned surfaces." *Nature Nanotechnology* (4) 557–561, 2009.

$\star$ R.D. Barish, R. Schulman, P.W.K. Rothemund, and E. Winfree, "An Information-Bearing Seed for Nucleating Algorithmic Self-Assembly." *Proceedings of the National Academies of Sciences (PNAS)* (106) 6054–6059, 2009.

$\star$ P.W.K. Rothemund, "Folding DNA to create nanoscale shapes and patterns" *Nature* (440) 297–302, 2006.

$\star$ P.W.K. Rothemund, N. Papadakis, E. Winfree, "Algorithmic Self-Assembly of DNA Sierpinski Triangles." *PLoS Biology* 2(12) e424, 2004.

$\star$ P.W.K. Rothemund, A. Ekani-Nkodo, N. Papadakis, A. Kumar, D.K. Fygenson, E. Winfree. "Design and Characterization of Programmable DNA Nanotubes." *Journal of the American Chemical Society* 126(50):16344-16353, 2004.

$\star$ P.W.K. Rothemund, "Using lateral capillary forces to compute by self-assembly." *Proceedings of the National Academy of Sciences (PNAS)*, 97(3): 984–989, 2000.

$\bullet$ S. Venkataraman, R.M. Dirks, P.W.K. Rothemund, E. Winfree and N.A.Pierce, "An autonomous polymerization motor powered by DNA hybridization", *Nature Nanotechnology*, 2: 490–494, 2007.

$\bullet$ P. O'Neill, P.W.K. Rothemund, A. Kumar, and D.K. Fygenson. "Sturdier DNA Nanotubes via Ligation", *Nano Letters* 6(7): 1379-1383, 2006.

$\bullet$ R.D. Barish, P.W.K. Rothemund, and E. Winfree, "Two Computational Primitives for Algorithmic Self-Assembly: Copying and Counting", *Nano Letters* 5(12): 2586-2592, 2005.

$\bullet$ R.S. Braich, N. Chelyapov, C. Johnson, P.W.K. Rothemund, L. Adleman, "Solution of a 20-variable 3-SAT problem on a DNA computer." *Science* 296 (5567): 499-502 April 19, 2002.

• L.M. Adleman, P.W.K. Rothemund, S. Roweis and E. Winfree, "On applying molecular computation to the Data Encryption Standard." *Journal of Computational Biology*, 6(1): 53–63, 1999.
• S. Roweis, E. Winfree, R. Burgoyne, N.V. Chelyapov, M.F. Goodman, P.W.K. Rothemund and L.M. Adleman, "A sticker-based architecture for DNA computation." *Journal of Computational Biology*, 5(4): 615–629, 1998.
• O. Fujimura, G.C. Fu, P.W.K. Rothemund and R.H. Grubbs, "Hydroxyl-directed, stereoselective olefination of ketones by transition-metal alkylidenes." *Journal of the American Chemical Society*, 117(8): 2355–2356, 1995.

Conference Publications

⋆ P.W.K. Rothemund and E. Winfree, "The program size complexity of self-assembled squares." *Symposium on the Theory of Computing*, May 21–23, 2000.
⋆ M. Cook, P.W.K. Rothemund, and E. Winfree. "Self-assembled circuit patterns" delivered at DNA computation 9, June 2003, published in Lecture Notes in Computer Science, 2943:91-107, 2004.
⋆ P.W.K. Rothemund, "A DNA and restriction enzyme implementation of Turing Machines." In *DNA Based Computers: Proceedings of a DIMACS Workshop, April 4, 1995, Princeton University* (Volume 27 in DIMACS). R.J. Lipton and E.B. Baum, editors. American Mathematical Society, 1996. 75–119.
• P.W.K. Rothemund, "Design of DNA origami ". In *Proceedings of the International Conference on Computer-Aided Design (ICCAD) 2005.*
• P.W.K. Rothemund, "DNA self-assembly with floppy motifs: single-crossover lattices" abstract in Proceedings of Foundations of Nanoscience 2005, held at Snowbird, Utah.
• L. Adleman, Q. Cheng, A. Goel, M. Huang, D. Kempe, P.M. de Espanes, P.W.K. Rothemund "Combinatorial optimization problems in self-assembly." *Proceedings of the Symposium on the Theory of Computing*, May 19–21, 2002.
• R.S. Braich, C. Johnson, P.W.K. Rothemund, D. Hwang, N. Chelyapov and L.M. Adleman, "Solution of a satisfiability problem on a gel-based DNA computer." In *Proceedings of the Sixth Annual Meeting on DNA Based Computers, held at Leiden University, June 13–17, 2000.*

Book Chapters

⋆ P.W.K. Rothemund, "Scaffolded DNA Origami: from Generalized Multicrossovers to Polygonal Networks", pages 3-21 in *Nanotechnology: Science and Computation*, J. Chen, N. Jonoska, and G. Rozenberg, (Eds.), Springer, 2006.

Academic talks

- Stanford University, EECS, (Palo Alto, September 22, 2010)
- Gordon Research Conference, Nanofabrication, (Tilton School, July 18-22 , 2010)
- Singularity University, NASA Ames, (Mountain View, July 14, 2010)
- University of California, San Diego, Nanoengineering, (San Diego, March 31, 2010)
- California Nanosystems Institute (CNSI) at UCLA, (Los Angeles, March 2, 2010)
- Pomona College/Harvey Mudd Physics Colloqium, (Claremont, November 17, 2009)
- Boise State University, Materials Science, (Boise, September 25, 2009)
- University of Texas, Austin, (Austin, September 15, 2009, 12:00 pm)
- Sematech, (Austin, September 15, 2009, 9:00 am)
- Semiconductor Research Corporation, Techcon, (Austin, September 14, 2009, 5:00 pm)
- Gordon Research Conference, Soft Condensed Matter, (Colby-Sawyer College, August 13, 2009)
- Marine Biological Laboratory (MBL) Physiology Course, (Woods Hole, July 29, 2009)
- University of California, Riverside, Electrical Engineering (Riverside, May 5, 2009)
- National Institute of Standards and Technology (NIST) (Gaithersburg, May 1, 2009)
- Materials Research Society Spring Conference, (San Francisco, April 15, 2009)
- Keck Graduate Institute, Biology on the Edge, (Pomona, September 10, 2008)
- UC Irvine Institute for Genomics and Bioinformatics, (Irvine, May 30, 2008)
- Cell Propulsion Lab, UCSF (San Francisco, February 25, 2008, afternoon)
- SPIE Advanced Lithography (San Jose, February 25, 2008, morning)
- W. M. Keck Center for Interdisciplinary Bioscience Training, (Houston, October 5, 2007)
- American Chemical Society Fall Meeting, (Boston, August 19-23, 2007)
- DNA Computation 13, (Memphis, June 4-8, 2007)
- Electron, ions, and photon beams in nanolithography (3BEAMS), (Denver, May 30- June 1, 2007)
- Physics Colloquium, Cal State Long Beach, (Long Beach, April 16, 2007)
- NanoTX '06, (Dallas, Sept. 27-28, 2006)
- Gordon Research Conference on Biopolymers, (Newport, June 11-16, 2006)
- Gordon Research Conference on Nucleic Acids, (Newport, June 4-9, 2006)
- Synthetic Biology 2.0, (UC Berkeley, May 20-22, 2006)
- Conference on Foundations of Nanoscience (FNANO), (Snowbird, Utah, April 23-27, 2006)
- American Chemical Society Spring Meeting, (Atlanta Georgia, March 26-30, 2006)
- Harvard Medical School, (January 11, 2006)
- Duke University, Nanoscience Seminar, (February 20, 2006)
- Columbia University, (December 16, 2006)
- IBM Research, (Almaden, November 11, 2006)
- International Conference on Computer Aided Design (ICCAD), (San Jose, November 6-10, 2006)
- Conversations in Biomolecular Stereodynamics, (Albany, June 14-18, 2005)
- UCLA, Physical Chemistry Seminar (January 31, 2005)
- Engineering a DNA World Workshop, (Caltech, January 6-8, 2005)
- Conference on Foundations of Nanoscience (FNANO), (Snowbird, Utah, April 21-23, 2004)
- First workshop on DNA Based Computers (Princeton, April 4, 1995)

Interdisciplinary conference and outreach talks

- Silicon Valley Caltech Alumni Luncheon, (Palo Alto, October 15, 2009)
- Talk to Pam Bjorkman's Biology 1 class, (Pasadena, June 3, 2009)
- Talk to elementary school students for Dramatic Results (Long Beach, March 11, 2009)
- Caltech Alumni Seminar Day, (Pasadena, May 17, 2008)
- Caltech Gnome service organization talk, (Pasadena, March 9, 2008)
- Technology, Entertainment, and Design (TED), (Monterey, February 27- March 1, 2008)
- IMPACT roundtable, business community, (Los Angeles, January 11, 2007)
- Pratt Institute, Michael Su's "Sensory Architecture" class, (New York, Nov. 6, 2007)
- Caltech Alumni College, with Winfree lab, mini-talk and panel, (Pasadena, Sept. 7, 2007)
- Google Science Foo Summer Camp, (Mountain View, August 3-5, 2007)
- Technology, Entertainment, and Design (TED), (Monterey, March 7-10, 2007)
- Caltech-MIT Enterprise Forum, "Will Biologists Give Moore More Life?" (Pasadena, Feb. 10, 2007)
- Google Science Foo Summer Camp, (Mountain View, August 13-16, 2006)

Society Memberships

- American Chemical Society (2007-2009)
- International Society for Nanoscale Science, Computation, and Engineering
- Materials Research Society (2009)

Awards, Recognition, Service

⋆ MacArthur Fellowship, 2007.
⋆ World Technology Network award, Biotechnology, 2006.
⋆ Feynman prizes for nanotechnology, in both theory and experiment, 2006.
⋆ Tulip award for DNA-based computation, 2006.
⋆ Caltech Center for the Physics of Information Fellow, 2005.
⋆ Beckman Fellowship, (2001–2004)
⋆ Work featured in MOMA's Design and the Elastic Mind, Feb. 24 - May 12, 2008.
⋆ US Patent 5,843,661, "Method for construction universal DNA based molecular Turing machine".
⋆ Research on DNA origami featured as Nature cover (March 16, 2006).
⋆ Research on surface tension-based self-assembly featured as PNAS cover, (February, 2000)

- Co-organizer, "Hierarchical Self-assembly...", Materials Research Society, Spring meeting 2010.
- Invited participant, German-American Kavli Frontiers of Science (Irvine, June 4-7, 2009)
- Chair ISNSCE awards committee, 2007-2010.
- Session chair, DNA/molecular electronics, NSF EMT nanoelectronics workshop, Oct. 2007.
- participant, Technology Roadmap for Productive Nanosystems, (PNNL, Dec. 3-6, 2006).
- Program Committee, Annual Conference on DNA-Based Computers, 1999, 2004, 2005, 2009.
- Foundations of Nanoscience, Snowbird Utah, Theory track co-chair 2005, chair 2009, 2010
- NSF review panelist, 2005.
- Judge/Session Chair, Caltech Summer Undergraduate Research Fellowships, 2004–2006
- Judge, California Science Fair, 2005–2007
- Big Brothers of Greater Los Angeles Mentor Program (1998–99)
- Caltech Summer Undergraduate Research Fellow (SURF, 1992)
- National Merit Scholar, Caltech Millikan Scholar, Laconia High School Valedictorian (1990)
- Champion, Granite State Challenge T.V. quiz show (1990)

Students advised

- Undergraduate students: Robert Barish
- Grad students: Rizal Hariadi, Siping Han, Hareem Tariq, Sungwook Woo
- Postdoc: Sungha Park
- Technicians: Kevin Young

Current Funding

- SRC FENA grant, $330K to P. Rothemund (PI), "Positioning and orienting DNA nanostructures on technological substrates"
- NSF EMT grant, $600K to P. Rothemund (PI), E. Winfree (Co-PI), M. Bockrath (Co-PI). "Integration of DNA nanotechnology with nanoelectronics"
- NSF Expeditions grant, $10M to E. Winfree (PI), P. Rothemund (Co-PI), Niles Pierce (Co-PI), Shuki Bruk (Co-PI), Richard Murray (co-PI), Eric Klavins (co-PI). "The Molecular Programming Project"
- NSF EMT grant, $1.2M to M. Bockrath (Co-PI), N. Pierce (Co-PI), P. Rothemund (Co-PI), E. Winfree (PI) and B. Yurke (Co-PI). "Towards universal bottom-up nanofabrication with DNA"

Past Funding

- SRC FENA grant, $330K to P. Rothemund (Co-PI) and E. Winfree (PI), "Nucleation of algorithmic self-assembly by DNA origami"
- Microsoft Seed Grant in Synthetic Biology, $100K to P. Rothemund (PI) and E. Winfree (Co-PI)
- NSF Seed grant, $50K to P. Rothemund (PI) and E. Winfree (Co-PI), "Exploration of new nucleic acid architectures: three-dimensional DNA origami and RNA origami"
- NSF Chemical Bonding Center: Center for Molecular Cybernetics, $1.5M phase I, associate member, full member for phase II. (https://digamma.cs.unm.edu/wiki/bin/view/CmcPublicWeb/WebHome)