

# Laura Landweber

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## PERSONAL

Born November 6, 1967.

## EDUCATION

**Princeton University**, A.B. in Molecular Biology, *summa cum laude*, June, 1989.  
**Harvard University**, M.A. in Biology, November, 1991.  
**Harvard University**, Ph.D. in Biology from the Department of Cellular and Developmental Biology, June, 1993. Topic of doctoral dissertation: "RNA editing and the evolution of mitochondrial DNA in kinetoplastid protozoa." (Graduate advisors: Walter Gilbert and Richard Lewontin)

## POSITIONS HELD

**Princeton University**, Associate Professor with Tenure, July 2001 – present.  
**California Institute of Technology**, Visiting Associate in Chemical Engineering, Sept. 2001 – Jan. 2002.  
**Princeton University**, Assistant Professor of Ecology and Evolutionary Biology, 1994 – 2001.  
**Princeton University**, Associate Faculty, Department of Molecular Biology, 1994 – present.  
**Harvard University**, Junior Fellow of the Society of Fellows, 1993 – 1994.  
**Massachusetts General Hospital**, Assistant in Molecular Biology, 1993 – 1994.  
**Harvard University**, Parker Graduate Fellow in Cellular and Developmental Biology, 1992 – 1993.  
**Harvard University**, Teaching Fellow (tutorial on Molecular Biology of Protozoa: organized and designed a year long course for advanced undergraduate students) 1991 – 1992.

## HONORS & AWARDS

The New York Academy of Sciences 2008 Blavatnik Award for Young Scientists.  
Elected Councilor, Society for Molecular Biology and Evolution, 2007-2009.  
Elected Fellow of AAAS in Biological Sciences, 2005 "for probing the diversity of genetic systems in microbial eukaryotes, including scrambled genes, RNA editing, variant genetic codes, and comparative genomics in protists".  
Nominated for a Graduate Mentoring Award, 2005, 2006.  
Faculty of 1000, 2002 – present.  
Tulip Prize for DNA Computing, 2001.  
NSF CAREER Award in Computational Biology, 1999.  
Sigma Xi's first Young Investigator Award in the life and social sciences, 1999.  
Elected to Santa Fe Institute Science Board, 1999-2004.  
Santa Fe Institute Fellow-at-Large, 1999-2000.  
Burroughs Wellcome Fund New Investigator Award in Molecular Parasitology, 1994.  
Harvard University, William F. Milton Fund Award, 1993.  
Harvard University Society of Fellows, Junior Fellowship, 1992.  
Life Sciences Research Foundation Postdoctoral Fellowship, 1992 (declined).  
Harvard University Graduate School of Arts and Sciences Merit Fellowship, 1992  
Howard Hughes Medical Institute predoctoral fellowship, 1990–1993.  
National Science Foundation predoctoral fellowship, 1989–1990.  
Sigma Xi Book Award (highest distinction) and membership in Sigma Xi, Molecular Biology, 1989.  
Genetics Society of America research fellowship, 1988.

## BOOKS

- Landweber, L. F.** and Baum, E. B., eds. (1998) DNA Based Computers II. DIMACS Series in Discrete Mathematics and Theoretical Computer Science, vol.44, American Mathematical Society.
- Landweber, L. F.** and Dobson, A., eds. (1999) Genetics and the Extinction of Species. Princeton University Press.
- Landweber, L. F.** and Winfree, E., eds. (2002) Evolution as Computation. Springer-Verlag.

## REFEREED RESEARCH ARTICLES

(111 PUBLISHED ARTICLES, REVIEWS, OR BOOK CHAPTERS)

- Kreitman, M. and **L. F. Landweber** (1989) A strategy for producing single-stranded DNA in the polymerase chain reaction: a direct method for genomic sequencing. Gene Analysis Techniques 6: 84-88.
- Landweber, L. F.** (1992) The evolution of RNA editing in kinetoplastid protozoa. BioSystems 28: 41-45.
- Landweber, L. F.** and M. Kreitman (1993) Producing Single-Stranded DNA in Polymerase Chain Reaction for Direct Genomic Sequencing. Methods in Enzymology 218: 17-26.
- Landweber, L. F.** and W. Gilbert (1993) RNA editing as a source of genetic variation. Nature 363: 179-182.
- Landweber, L. F.**, Fiks, A. G., and W. Gilbert (1993) The Boundaries of Partially Edited Cytochrome c Oxidase III Transcripts are Not Conserved in Kinetoplastids: Implications for the Guide RNA Model of Editing. Proc. Natl. Acad. Sci. USA 90: 9242-9246.
- Landweber, L. F.** and W. Gilbert (1994) Phylogenetic analysis of RNA editing: A primitive genetic phenomenon. Proc. Natl. Acad. Sci. USA 91: 918-921.
- Orr, A. T., Rabets, J. C., Horton, T. L., and **L. F. Landweber**. (1997) RNA Editing Missing in Mitochondria. RNA 3: 335-336.
- Knight, R. D. and **L. F. Landweber**. (1998) Rhyme or Reason: RNA-Arginine Interactions and the Genetic Code. Chemistry and Biology. 5: R215-220.
- Landweber, L. F.** and I. D. Pokrovskaya. (1999) Emergence of a Dual Catalytic RNA with Metal Specific Cleavage and Ligase Activities: The Spandrels of RNA Evolution. Proc. Natl. Acad. Sci. USA 96: 173-178.
- Freeland, S. J., Knight, R. D., and **L. F. Landweber**. (1999). Do Proteins Predate DNA? Science 286: 690-692.
- Faulhammer, D., Cukras, A. R., Lipton, R. J. and **L. F. Landweber** (2000) Molecular Computation: RNA Solutions to Chess Problems. Proc. Natl. Acad. Sci. USA. 97:1385-1389.
- Landweber, L. F.**, Kuo, T.-C., and E. Curtis (2000) Evolution and Assembly of an Extremely Scrambled Gene. Proc. Natl. Acad. Sci. USA. 97: 3298-3303.
- Ronneberg, T. A., **Landweber, L. F.** and S. J. Freeland (2000) Testing a Biosynthetic Theory of the Genetic Code: Fact or Artifact? Proc. Natl. Acad. Sci. USA 97(25): 13690-13695.
- Knight, R. D. and **L. F. Landweber**. (2000) Guilt by Association: The Arginine Case Revisited. RNA 6:499-510.
- Freeland, S. J., Knight, R. D., **Landweber, L. F.**, and L. D. Hurst (2000) Early Fixation of an Optimal Genetic Code. Molecular Biology and Evolution. 17(4): 511-518.
- Hagedorn, T. R. and **L. F. Landweber** (2000) Phylogenetic Invariants and Geometry. Journal of Theoretical Biology 205: 365-376.
- Horton, T. L. and **L. F. Landweber** (2000) Evolution of Four Types of RNA Editing in Myxomycetes. RNA 6: 1339-1346.
- Horton, T. L. and **L. F. Landweber** (2000) Mitochondrial RNAs of Myxomycetes terminate with non-encoded 3' poly(U) tails. Nucleic Acids Research 28(23): 4750-4754.
- Katz, L. A., Curtis, E., Pfunder, M., and **L. F. Landweber** (2000) Characterization of Novel Sequences from Distantly Related Taxa by Walking PCR. Mol. Phylogenet. Evol., 14: 318-321.
- Lozupone, C. A., Knight, R. D., and **L. F. Landweber** (2001) The Molecular Basis for Nuclear Genetic Code Change in Ciliates. Current Biology, 11: 65-74.
- Faulhammer, D., Lipton, R. J. and **L. F. Landweber** (2001) Fidelity of enzymatic ligation for DNA

- computing. J. Comp. Biol. 7(6):839-48.
- Ronneberg, T. A., Freeland, S. J., and **L. F. Landweber** (2001) **Genview** and **Gencode**: A Pair of Programs to Test Theories of Genetic Code Evolution. Bioinformatics 17(3):280-1.
- Knight, R. D., Freeland, S. J., and **L. F. Landweber** (2001) A Simple Model Based On Mutation and Selection Explains Codon and Amino Acid Usage Trends Within and Across Genomes. Genome Biology 2(4):RESEARCH0010 ([genomebiology.com/2001/2/4/research/0010/](http://genomebiology.com/2001/2/4/research/0010/)).
- Knight, R. D., **Landweber, L. F.**, and M. Yarus (2001) How Mitochondria Redefine the Code. J. Mol. Evol. 53(4-5):299-313.
- Ruben, A. J., Freeland, S. J., and **L. F. Landweber** (2002) PUNCH: An Evolutionary Algorithm for Optimizing Bit Set Selection. Lecture Notes in Computer Science 2340:150-160.
- Doak, T. G., A.R.O. Cavalcanti, N.A. Stover, D.M. Dunn, R. Weiss, G. Herrick, **L. F. Landweber**. (2003) Sequencing the *Oxytricha trifallax* macronuclear genome: a pilot project. Trends in Genetics 19(11):603-7.
- Ardell, D. H., C. A. Lozupone, and **L. F. Landweber** (2003) Polymorphism, Recombination and Alternative Unscrambling in the DNA Polymerase  $\alpha$  Gene of the Ciliate *Stylonychia lemnae*. Genetics 165:1761-77.
- Cavalcanti, A.R.O., **L. F. Landweber**. (2004) **Gene Unscrambler** for detangling scrambled genes in ciliates, Bioinformatics 20(5):800-2.
- Vlassov, A. V., Johnston, B. H., **Landweber, L. F.**, and S. A. Kazakov (2004) Ligation activity of fragmented ribozymes in frozen solution: implications for the RNA world. Nucleic Acids Research 32(9):2966-74.
- van Noort, D. and **Landweber, L. F.** (2004) Towards a re-configurable DNA computer. Lecture Notes in Computer Science 2943:190-197.
- Livstone, M. S. and **Landweber, L. F.** (2004) Mathematical Considerations in the Design of Microreactor-Based DNA Computers. Lecture Notes in Computer Science 2943:180-189.
- Chang, W.-J., Stover, N. A., Addis, V. M., and **L. F. Landweber**. (2004) A Micronuclear Locus Containing Three Protein-coding Genes Remains Linked During Macronuclear Development in the Spirotrichous Ciliate *Holosticha*. Protist, 155(2):245-255.
- Cavalcanti, A.R.O., N.A. Stover, L. Orecchia, T.G. Doak and **L. F. Landweber** (2004) Coding properties of *Oxytricha trifallax* (*Sterkiella histriomuscorum*) macronuclear chromosomes: analysis of a pilot genome project. Chromosoma, 113:69-76.
- Cavalcanti, A.R.O., D. M. Dunn, R. Weiss, **L. F. Landweber**, T. G. Doak. (2004) Sequence features of *Oxytricha trifallax* (class Spirotrichia) macronuclear telomeric and subtelomeric sequences, Protist, 155(3): 311-322.
- van Noort, D., Z. Tang and **L. F. Landweber** (2004) Fully controllable microfluidics for molecular computers. J. Association Laboratory Automation (JALA) 9(5): 285-290.
- Cavalcanti, A.R.O., T. H. Clarke, and **L. F. Landweber** (2005) MDS\_IES\_DB: a database of macronuclear and micronuclear genes in spirotrichous ciliates. Nucleic Acids Res. 33 Database Issue:D396-8.
- Liang, H., J. Wong, Q. Bao, Cavalcanti, A.R.O. and **L. F. Landweber** (2005) Decoding the decoding region: analysis of eukaryotic release factor stop codon-binding residues, J. Mol. Evol. 60: 337-44.
- Liang, H., Cavalcanti, A. R. O., and **L. F. Landweber** (2005) Conservation of tandem stop codons in yeasts. Genome Biology 6(4):R31-R31.8.
- Stover, N. A., A. R. O. Cavalcanti, A. J. Li, B. C. Richardson, and **L. F. Landweber**. (2005) Reciprocal fusions of two genes in the formaldehyde detoxification pathway in ciliates and diatoms. Mol Biol Evol. 22(7):1539-42.
- Liang, H. and **L. F. Landweber** (2005) Molecular mimicry: quantitative methods to study structural similarity between protein and RNA. RNA 11(8):1167-72.
- Vlassov, A. V., Kazakov, S. A. Johnston, B. H. and **L. F. Landweber**, (2005) The RNA World on Ice: A New Scenario for the Emergence of RNA Information. J. Mol Evol. 61(2):264-73.
- Chang, W.-J., Bryson, P. D., Liang, H., Shin, M.-K. and **L. F. Landweber** (2005) The evolutionary origin of a complex scrambled gene. Proc Natl Acad Sci U S A. 102(42):15149-54.

- Liang, H., **L. F. Landweber**, and J. R. Fresco (2005) Are stop codons recognized by base triplets in the large ribosomal RNA subunit? RNA 11(10):1478-84.
- van Noort, D. and **L. F. Landweber** (2005) Towards a re-programmable DNA computer. Natural Computing 4:163-175.
- Kuo, S., W.-J. Chang, and **L. F. Landweber** (2006) Complex Germline Architecture: Two Genes Intertwined on Two Loci. Mol. Biol. Evol. 23:4-6.
- Liang, H. and **L. F. Landweber** (2006) A Genome-wide Study of Dual Coding Regions in Human Alternatively Spliced Genes. Genome Research 16:190-196.
- Chang, W.-J., S. Kuo, and **L. F. Landweber** (2006) A new scrambled gene in the ciliate *Uroleptus*. Gene 368:72-77.
- Cavalcanti, A.R.O., N. A. Stover and **L. F. Landweber** (2006) On the paucity of duplicated genes in *Caenorhabditis elegans* operons. J. Mol. Evol. 62:765-771.
- McFarland, C.P., W.-J. Chang, S. Kuo, and **L. F. Landweber** (2006) Conserved linkage of two genes on the same macronuclear chromosome in spirotrichous ciliates. Chromosoma 115:129-138.
- Wong, L.-C. and **L. F. Landweber** (2006) Evolution of Programmed DNA Rearrangements in a Scrambled Gene. Mol. Biol. Evol. 23:756-763.
- Livstone, M. S., R. Weiss, and **L. F. Landweber** (2006) Automated Design and Programming of a Microfluidic DNA Computer. Natural Computing 5:1-13.
- Möllenbeck, M., A. R. O. Cavalcanti, F. Jönsson, H. J. Lipps, and **L. F. Landweber** (2006) Interconversion of germline-limited and somatic DNA in a scrambled gene. J. Mol. Evol. 63(1):69-73.
- Liang, H., W. Zhou, and **L. F. Landweber** (2006) **SWAKK**: a web server for detecting positive selection in proteins using a sliding window substitution rate analysis. Nucleic Acids Res. 34:W382-4.
- Liang, H. and **L. F. Landweber** (2007) Hypothesis: RNA Editing of MicroRNA Target Sites in Humans? RNA 13:463-7.
- Zhou, Y. and **L. F. Landweber** (2007) **BLASTO**: a tool for searching orthologous groups. Nucleic Acids Res. 35:W678-82.
- Chang, W.-J., V. M. Addis, A. J. Li, E. Axelsson, D. H. Ardell, and **L. F. Landweber** (2007) Intron Evolution and Information processing in the DNA polymerase alpha gene in spirotrichous ciliates: a hypothesis for interconversion between DNA and RNA deletion. Biol. Direct Feb 1;2:6.
- Angeleska, A., N. Jonoska, M. Saito, and **L. F. Landweber** (2007) RNA-guided DNA assembly. J. Theor. Biol. 248:706-20.
- Nowacki, M., V. Vijayan, Y. Zhou, K. Schotanus, T. G. Doak, and **L. F. Landweber** (2008) RNA-mediated epigenetic programming of a genome-rearrangement pathway. Nature 451, 153-158.
- Möllenbeck, M., Y. Zhou, A. R. O. Cavalcanti, F. Jönsson, B. P. Higgins, W.-J. Chang, S. Juranek, T. G. Doak, G. Rozenberg, H. J. Lipps, and **L. F. Landweber** (2008) The pathway to detangle a scrambled gene. PLoS ONE 3(6):e2330.
- Nowacki, M., Maquilan, G., Higgins, B. P., Swart, E., Doak, T. G. and **L. F. Landweber**. A functional role for transposases in a large eukaryotic genome (*Science*, in revision).
- Zhou, Y. and **L. F. Landweber** (submitted) **GENOME UNSCRAMBLER**: A tool for finding the K-best rearrangement maps for sequences with frequent deletions and duplications.

#### REFEREED REVIEW ARTICLES OR COMMENTARY

- Landweber, L. F.** and L. A. Katz. (1998) Evolution: Lost Worlds. Trends Ecol. Evol. 13: 93-94.
- Landweber, L. F.**, Simon, P. J., and T. A. Wagner. (1998) Ribozyme Design and Early Evolution. BioScience 48: 94-103.
- Landweber, L. F.** (1999) Testing Ancient RNA-Protein Interactions. Proc. Natl. Acad. Sci. USA 96: 11067-11068.
- Knight, R. D., Freeland, S. J., and **L. F. Landweber**. (1999) Selection, History, and Chemistry: The Three Faces of the Genetic Code. Trends in Biochemical Sciences 24(6):241-247.
- Forbes, N. A. and **L. F. Landweber**. (1999) Computer Science and Meta-Evolution. Trends in Genetics. 15(6):220-221.

- Landweber, L. F.** (1999) Experimental RNA Evolution. Trends Ecol. Evol. 14: 353-358.
- Kari, L. and **L. F. Landweber.** (1999) Computing with DNA. Methods in Molecular Biology 132:413-430.
- Forbes, N. A. and **L. F. Landweber.** (1999) Computer Science and the Evolution of Genetic Information. Computing in Science and Engineering 1(5):12-15.
- Landweber, L. F.** (1999) Something Old for Something New: The Future of Ancient DNA in Conservation Biology. In Genetics and the Extinction of Species. **L. F. Landweber** and A. Dobson, eds. Princeton University Press, 163-186.
- Knight, R. D., and **L. F. Landweber** (2000) The Early Evolution of the Genetic Code Cell 101: 569-572.
- Freeland, S. J., Knight, R. D., and **L. F. Landweber** (2000) Measuring adaptation in the genetic code. Trends in Biochemical Sciences 25(2): 44-5.
- Ruben, A. J. and **L. F. Landweber** (2000) The Past, Present, and Future of Molecular Computing. Nature Reviews Molecular Cell Biology, inaugural October issue 1: 69-72.
- Horton, T. L. and **L. F. Landweber** (2000) Nucleic Acid Biodiversity. In Encyclopedia of Biodiversity. S. A. Levin, ed. Adademic Press 4: 415-426.
- Faulhammer, D., Lipton, R. J. and **L. F. Landweber** (2000) When the knight falls: On constructing an RNA computer. In DNA Based Computers V, E. Winfree, D. Gifford, eds. DIMACS Series in Discrete Mathematics and Theoretical Computer Science, American Mathematical Society, 54: 1-7.
- Beech, P. L., **Landweber, L. F.** and P. R. Gilson. (2000) Protist News: Meeting Report: XIIIth Meeting of the International Society for Evolutionary Protistology, České Budejovice, Czech Republic, July 31–August 4, 2000 Protist 151: 299-305.
- Knight, R. D., Freeland, S. J., and **L. F. Landweber** (2001) Rewiring the Keyboard: Evolvability of the Genetic Code. Nature Reviews Genetics 2: 49-58.
- Landweber, L. F.** (2002) Custom Codons come in Threes, Fours, and Fives. Chemistry and Biology. 9(2):143.
- Horton, T. L. and **L. F. Landweber** (2002) Rewriting the information in DNA: RNA editing in kinetoplasts and myxomycetes Current Opinion in Microbiology 5: 620–626.
- Knight, R. D., **Landweber, L. F.**, and M. Yarus (2002) Tests of a Stereochemical Code. In Translation Mechanisms, Lapointe, J. and Brakier-Gingras, L., eds., Landes Bioscience.
- Livstone, M., van Noort, D., and **L. F. Landweber** (2003) Molecular computing revisited: a Moore's law? Trends in Biotechnology. 21: 98-101.
- Cavalcanti, A.R.O. and **Landweber, L. F.** . (2003) Genetic code: what nature missed. Current Biology 13(22):R884-5.
- Knight, R. D., Freeland, S. J., and **L. F. Landweber** (2004) Adaptive Evolution of the Genetic Code. In The Genetic Code and the Origin of Life. Ribas de Pouplana, L., ed., Landes Bioscience.
- Cavalcanti, A.R.O. and **L. F. Landweber** (2004) Genetic code. Current Biology 14: R147.
- Koonin, E. V., **L. F. Landweber**, D. J. Lipman (2006) A community experiment with fully open and published peer review. Biol Direct 1:1.
- Koonin, E. V., **L. F. Landweber**, D. J. Lipman, R. Dignon (2006) Reviving a culture of scientific debate. Nature doi:10.1038/nature05005, [www.nature.com/nature/peerreview/debate/nature05005.html](http://www.nature.com/nature/peerreview/debate/nature05005.html)
- Landweber, L. F.** (2007) Why genomes in pieces? Science 318:405-407.
- Landweber, L. F.** (2008) Making sense of scrambled genomes. Science 319:901-902.

#### CONFERENCE PROCEEDINGS AND OTHER PUBLICATIONS

- Landweber, L. F.** and M. Kreitman (1995) Producing Single-Stranded DNA in Polymerase Chain Reaction for Direct Genomic Sequencing. In Recombinant DNA Methodology II, Ray Wu, ed., pp.579-588.
- Landweber, L. F.** and R. J. Lipton. (1997) DNA<sup>2</sup>DNA Computations: A potential 'killer app'? In *24th International Colloquium on Automata, Languages and Programming (ICALP)*, Lecture Notes in Computer Science, pages 672-683, Springer-Verlag.
- Landweber, L. F.** (1997) This Tree of Life: A meeting brief. HMS Beagle (BioMedNet) Issue 1 (Feb. 1).
- Landweber, L. F.** (1997) RNA Based Computing. DIMACS Technical Report 97-83.
- Landweber, L. F.** (1998) The Evolution of DNA Computing: Nature's Solution to a Path Problem. *IEEE*

- Proceedings of Symposia on Intelligence and Systems '98*, May 21-23, 1998. IEEE Computer Society Press, 133-139.
- Landweber, L. F.** and L. Kari. (1998) The Evolution of DNA Computing: Nature's Solution to a Computational Problem. *1998 Genetic Programming Conference Proceedings*, John Koza *et al.*, eds., Morgan Kaufmann Publishers, Inc., 700-708.
- Landweber, L. F.** (1998) RNA Based Computing. In *DNA Based Computers II*, **L. F. Landweber** and E. B. Baum, eds. DIMACS Series in Discrete Mathematics and Theoretical Computer Science, American Mathematical Society, 181-189.
- Landweber, L. F.** and L. A. Katz. (1998) Evolution: Lost Worlds. A meeting brief. *HMS Beagle* (BioMedNet) Issue 26 (Mar. 6).
- Landweber, L. F.**, Lipton, R. J. and M. O. Rabin. (1999) DNA<sup>2</sup>DNA Computations: A Potential "Killer App"? In *DNA Based Computers III*, H. Rubin and D.H. Wood, eds. DIMACS Series in Discrete Mathematics and Theoretical Computer Science, American Mathematical Society, vol 48, 161-172.
- Landweber, L. F.** and L. Kari. (1999) The Evolution of Cellular Computing: Nature's Solution to a Computational Problem, In *DNA Based Computers IV*, L. Kari, ed. *Biosystems* 52:3-13
- Cukras, A. R., Faulhammer, D., Lipton, R. J. and **L. F. Landweber** (1999) Chess Games: A Model for RNA Based Computation. In *DNA Based Computers IV*, L. Kari, ed. *Biosystems* 52:35-45.
- Faulhammer, D., Lipton, R. J. and **L. F. Landweber** (1999) Counting DNA: Estimating the complexity of a test tube of DNA. In *DNA Based Computers IV*, L. Kari, ed. *Biosystems* 52:193-6.
- Landweber, L. F.** (1999) The Evolution of Cellular Computing. *The Biological Bulletin* 196: 324-326.
- Knight, R. D. and **L. F. Landweber** (1999) Is the Genetic Code Really a Frozen Accident? New Evidence from *In Vitro* Selection. In *Molecular Strategies in Biological Evolution*. *Annals New York Acad. Sci.*, 870:408-410.
- Curtis, E. and **L. F. Landweber** (1999) The Evolution of Gene Scrambling in Ciliate Micronuclear Genes. In *Molecular Strategies in Biological Evolution*. *Annals New York Acad. Sci.* 870: 349-350.
- Kari, L. and **L. F. Landweber** (1999) L'ordinateur biologique, pour demain? Le Calcul par ADN (*Computing with DNA*) *Les Cahiers de Science & Vie*, Octobre, 53: 88-93.
- Kari, L., Kari, J., and **L. F. Landweber**. (1999) Reversible molecular computation in ciliates. in *Jewels are Forever*, Karhumaki, J., Maurer, H., Paun, G., and Rozenberg, G., eds. Springer-Verlag, pp. 353-363.
- Kari, L., Siromoney, R., Daley, M., Gloor, G., and **L. F. Landweber** (1999). How to compute with DNA. *Proceedings of Foundations of Software Technology and Theoretical Computer Science*, C. Pandu Rangan, R. Ramanujam, Eds., *Lecture Notes in Computer Science*, 1738, Springer Verlag, Berlin, 269-282.
- Kari, L. and L. F. Landweber (2000) Computational Power of Gene Rearrangement, In *DNA Based Computers V*, E. Winfree, D. Gifford eds. DIMACS Series in Discrete Mathematics and Theoretical Computer Science, American Mathematical Society, vol 54: 201-216.
- Landweber, L. F.** (2000) Beyond Silicon Computing: DNA Computers. Testimony to the U.S. House of Representatives Committee on Science, Subcommittee on Basic Research, September 12.
- Ruben, A. J. and **L. F. Landweber** (2001) The Past, Present, and Future of DNA Computing. In *Biotechnology 2000*. B. Alizadeh, ed. Universal Medical Press, San Francisco.
- Landweber, L. F.** and L. Kari (2002) Universal Molecular Computation in Ciliates. In **Landweber, L. F.** and Winfree, E., eds. *Evolution as Computation*. Springer-Verlag, Berlin.
- Kari, L. and **L. F. Landweber**. (2004) Biocomputation in ciliates. In *Cellular Computing*, M. Amos, Ed., Oxford University Press, 202-216.
- Vlassov, A. V., Johnston, B. H., **Landweber, L. F.** , and S. A. Kazakov. (2005) RNA catalysis in frozen solutions. *Dokl Biochem Biophys.* May-Jun;402:207-9.
- Cavalcanti, A. R. O., and **L. F. Landweber**. (2006) Insights into a Biological Computer: Detangling Scrambled Genes in Ciliates. In J. Chen, N. Jonaska, G. Rozenberg, eds. *Nanotechnology: Science and Computation*. Springer-Verlag, Berlin, 349-360.
- Liang, H. and **Landweber, L. F.** (2008) Dual-coding Regions in Alternatively Spliced Human Genes. In: *Encyclopedia of Life Sciences*. John Wiley & Sons, Ltd: Chichester <http://www.els.net/> [DOI: 10.1002/9780470015902.a0020780]
- Angeleska, A., Jonoska, N., M. Saito, and **L.F. Landweber**, Strategies for RNA-guided DNA

recombination, In: Algorithmic Bioprocesses (J. Kok et al. eds.), in press.

#### PATENTS

“Microfluidic and Nanofluidic Electronic Devices for Detecting Changes in Capacitance of Fluids and Methods of Using,” L. L. Sohn, O. A. Saleh, D. A. Notterman, J. B. Knight, and **L. F. Landweber** — filed for a US Letters Patent, Sept. 2000. International Patent Publication WO01/18286.

#### GRANTS RECEIVED FOR CURRENT RESEARCH

NSF Emerging Models and Technology (EMT) “Molecular Computation in Ciliates,” September 2006 – August 2009.

NIH RO1 (and subsequent renewal) “Understanding Complex Gene Scrambling and Editing Systems in Protists,” August, 1999 – July, 2009.

NSF Information Technology and Research (ITR) “Molecular Computation in Ciliates,” October 2001 – September 2006.

NSF ITR “Molecular Computation with Automated Microfluidic Sensors”, October 2001 – September 2005.

DARPA “Molecular Computation with Automated Microfluidic Sensors,” September 2001 – September 2003.

NASA “Origins of RNA catalysis in extreme environments” August, 2001- July, 2003 (with Brian Johnston and Sergei Kazakov, Somagenics, Inc.).

NSF: FASEB Conference on Ciliate Molecular Biology, July 28 – August 2, 2001.

NSF “Origins of RNA catalysis in extreme environments” October, 2000- September, 2003 (with Brian Johnston and Sergei Kazakov, Somagenics, Inc.).

Templeton Foundation “The Origins and Implications of Order in the Genetic Code” May, 2000 – April, 2002 (with Stephen Freeland).

NSF CAREER Award in Computational Biology, “Pioneering Nucleic Acid Based Computing: New Approaches and Experiments, October, 1999 – September, 2003.

Somagenics, Inc. Palo Alto, CA, NIH subcontract for joint RNA research, 1999 – 2000.

Alfred P. Sloan Foundation grant for two Symposia on “Nucleic Acid Selection” and “Evolution as Computation” March, 1998 – June, 1999.

NSF/DARPA “Prototyping Biomolecular Computations,” July, 1997 – December, 2000 (with Richard Lipton, Computer Science).

NSF “*In vitro* evolution of RNA modifying ribozymes from random sequences,” April, 1997 – March, 2001.

DIMACS “Special Focus on DNA Computing,” February, 1997 – January, 1999, conference, research and visitor funds (with Richard Lipton, Computer Science)

NSF Small Grant For Exploratory Research (SGER), April, 1995 – March, 1997.

Burroughs Wellcome Fund New Investigator Award in Molecular Parasitology, 1994–1998.

Alfred P. Sloan Foundation grant to Dalhousie University for a Symposium on Evolution of Unusual Molecular Processes in Protists, August 1994 (with Mark Ragan).

#### EXTERNAL SERVICE AND ORGANIZATIONS

Co-Organizer (with Erik Winfree, Ron Weiss, and Mona Singh), NSF EMT Workshop on Bio-Inspired Computing and the Biology and Computer Science Interface, Princeton, July 2008.

Councilor of the Society for Molecular Biology and Evolution (SMBE), 2007–2009.

NIH National Center for Research Resources, Special Emphasis Panel, 2007.

NIH study section on Genetic Variation and Evolution (GVE), 2006-2007.

Co-Editor-in-Chief, Biology Direct, 2005-present (journal launched in 2006). <http://biology-direct.com>

Co-Chair, NHGRI Working Group on Comparative Genome Evolution, to select new organisms for genome sequencing at NHGRI Genome Centers, 2003–2007.

Steering Committee and Scientific Advisory Board, *Tetrahymena* Genome Project, 2003-present.  
Program committee, Ninth International Meeting on DNA Based Computers, 2003.  
Faculty of 1000, 2002–present.  
NHGRI, Genome Resources and Sequencing Priorities Panel, to select new organisms for genome sequencing and BAC library construction at NHGRI Genome Centers, 2001–2003.  
Organizer, “Prospects for Protist Genomics”, The Institute for Genomic Research (TIGR), Dec. 2001.  
Elected Co-Chair, 2001 FASEB conference on Ciliate Molecular Biology.  
Advisory Committee, NSF Directorate for Computer & Information Science & Engineering (CISE) 2001–2003.  
Santa Fe Institute Science Board and nominating committee, 2000–present.  
NIH Panel on Integrated Genomic Technologies, 1999.  
NASA Working Group on Exobiology, 1998–2001.  
NSF Panel for Postdoctoral Research Fellowships in Molecular Evolution, 1996–1998.  
Advisory Board, *Genome Biology*, 1999–present.  
Advisory Board, Springer-Verlag Series on Natural Computing, 1999–present.  
Associate Editor, *Journal of Molecular Evolution*, 2001-present.  
Acting Associate Editor, *Journal of Molecular Evolution*, 1999–2000.  
Invited to be an Associate Editor for *Molecular Biology and Evolution*, 2001, 2002.  
Invited to be an Associate Editor for *Journal of Eukaryotic Microbiology*, 2001.  
Editor, *H.M.S. Beagle* and BioMedNet, 1996–1998 (online publication).  
Associate Editor, *Genes to Cells*, 1995–1999.  
International Symposium Organizer, “Evolution of Dynamic Gene Rearrangements” Society for Molecular Biology and Evolution (SMBE). Brisbane, Australia, July 11-14, 1999.  
Chair, DIMACS Workshop on “Evolution as Computation”, Princeton, January 11-12, 1999.  
Chair, DIMACS Workshop on “Nucleic Acid Selection”, Princeton University, March 15-17, 1998.  
International Symposium Organizer, “The Evolution of Unusual Molecular Processes in Protists,” in joint association with the 1994 meetings of the International Society for Evolutionary Protistology and the Canadian Institute for Advanced Research, Halifax, Canada.  
Short Course Faculty, Workshop on Molecular Evolution, Marine Biological Laboratory, Woods Hole, MA summers 1991–1995, 1998.  
Elected Membership Director, Intl. Society for Evolutionary Protistology (ISEP), 1998-2000.  
Panelist, NPR Radio Times, WHYY Philadelphia. Topic: “Possible Life on Mars.” August 12, 1996  
Ad hoc reviewer for *Science*, *Nature*, *Cell*, *PNAS*, *RNA*, *Genetics*, *Bioinformatics*, *Eukaryotic Cell*, *Journal of Molecular Evolution*, *Molecular Biology and Evolution*, *Nucleic Acids Research*, Princeton University Press, NIH and NSF.  
Member, AAAS (Fellow), Society for Molecular Biology and Evolution (SMBE, Councilor), International Society of Molecular Evolution (ISME, charter member), International Society for the Study of the Origin of Life (ISSOL, regional delegate), International Society for Evolutionary Protistology (ISEP, former membership director), The RNA Society, and The New York Academy of Sciences.

#### DEPARTMENTAL AND UNIVERSITY COMMITTEES/RESPONSIBILITIES

Associate Faculty, Princeton University Department of Molecular Biology, 1994–present.  
Faculty Trustee of the Princeton University Store, 2005–2006.  
Organizer, joint EEB-Molecular Biology seminar series, 2004–present.  
EEB Undergraduate Committee, 2007-2008.  
EEB Graduate Committee, 1994–1996, 2006-2008.  
Institutional Biosafety Committee (URB), 2004–2007.  
Organizer, EEB faculty research seminar series, 2004–2005.  
Organizer and chair, Evolution at Princeton, University Symposium, December 13, 2004.  
EEB Curriculum Committee, 2004–2005.

EEB Associated Faculty Committee, 2004–2006.  
 Member, Search Committee for Genomics Faculty, Dept. Molecular Biology, 2002-2003.  
 Member, Search Committee for Director, Lewis-Sigler Institute for Integrative Genomics, 2001-2002.  
 Elected Member, Princeton University Committee on the Course of Study, 1998–2001.  
 Member, President’s Awards Committee for Distinguished Teaching, 1998-1999.  
 President-Elect/Vice-President, Princeton Chapter of Sigma Xi, 1997–1999.  
 Co-Chair, DIMACS Special Focus on DNA Computing (with Richard Lipton), 1997-1999.  
 Elected Member, Executive Committee of the Princeton Chapter of Sigma Xi, 1996–1999.  
 Organizer, Sigma Xi Lecture Series on “DNA-Based Materials,” 1996–1997.  
 Elected Member, Executive Committee of the Council for Princeton University Community, 1996–1997.  
 Elected Member, Faculty Advisory Committee on Policy, 1996–1997.  
 Organizer, Department of EEB International Symposium in honor of Princeton University’s 250<sup>th</sup>  
 Anniversary (with Andy Dobson): “Genes, Species and the Threat of Extinction: DNA and Genetics  
 in the Conservation of Endangered Species”, Oct 3-4, 1996  
 Faculty Advisor, “RNA Today”, Department of Molecular Biology Graduate Student Sponsored  
 International Symposium in honor of Princeton’s 250<sup>th</sup> Anniversary, May 9-10, 1996.  
 Department Colloquium Organizer, EEB, with Simon Levin, 1995–1996.  
 Elected Member, Council for Princeton University Community, 1995–1998.  
 Faculty Fellow, Forbes College, 1994–present.

TEACHING EXPERIENCE: UNDERGRADUATE AND GRADUATE COURSES CREATED AND TAUGHT AT PRINCETON

FRS 134, *Jurassic Park: Myth or Reality?* Freshman Seminar, Spring 1995.  
 EEB 320/Mol 330, *Molecular Evolutionary Genetics*, Spring 1995, 1997, 1998, 2000, 2002, 2005-2008.  
 EEB 524, *Topics in Evolution: Molecular Evolution*, Spring 1995, 1997, 1998.  
 EEB 524, *Topics in Evolution: Molecular Biology and Evolution of RNA*, Fall 1995.  
 EEB 522, *Colloquium on the Biology of Populations* (with Simon Levin), 1995–1996.  
 EEB 211, *Biology of Organisms* (with James Gould), Fall 1997.  
 FRS 120, *DNA Computing: The Origin of Biological Information Processing*, Freshman Seminar, 1999.  
*EEB Junior Tutorial: Introduction to Genomics*, Fall 2002.  
 EEB 524b, *Topics in Evolution: Molecular Evolution and Genomics*, Spring 2003.  
 EEB/GEO/AST 255, *Life in the Universe* (with Onstott, Turner, Dismukes), Fall 2004-2007.  
*EEB Junior Tutorial: Epigenetics*, Fall 2006.

REPRESENTATIVE PLENARY, PUBLIC, AND INTERNATIONAL LECTURES, OF OVER 160 INVITED TALKS SINCE 1991

**Johns Hopkins School of Medicine**, September 2008.  
**Society for Industrial and Applied Mathematics**, San Diego, symposium speaker, July 2008.  
**Plenary speaker, 14<sup>th</sup> International Conference on DNA Computers**, Prague, June 2008.  
**Society for Molecular Biology and Evolution**, Barcelona, June 2008.  
**American Society for Microbiology (ASM)**, Boston, June 2008.  
**Annual Distinguished Women in Science Lecture, Barnard College**, April 2008.  
**National Evolutionary Synthesis Center, Darwin Day symposium**, Duke University, February 2008.  
**The Salk Institute**, San Diego, November 2007.  
**FASEB Conference on Ciliate Molecular Biology**, Tucson, July 2007.  
**Gaia Workshop on Genomics, Evolution and Biodiversity**. Goulandris Museum of Natural History,  
 Athens, Greece, April 2007.  
**Institute for Advanced Study**, Princeton, February 2007.  
**Planets and Life Symposium**, Dept. of Astrophysics, Princeton, December 2006.  
**NSF Workshop on Theoretical Biology**, Arlington, VA, September 2006.  
**Keynote talk, Society for Protozoology**, Albany, June 2006.  
**International Paramecium Genomics Meeting**, Paris, France, May 2006.

**Plenary talk, 5<sup>th</sup> International Conference on Bioinformatics**, Georgia Tech, November 2005.  
**Plenary talk, NHGRI Large-Scale Sequencing Workshop**, Bethesda, June 2005.  
**The future of Computational Molecular Biology**, Houston, April 2005.  
**University of Chicago**, March, 2005.  
**Harvard University**, March, 2005.  
**Columbia University**, December, 2004.  
**NYU Graduate Student Invited Colloquium**, November 2004  
**Duke University**, March, 2004  
**Plenary talk, University of Maryland Bioscience Day**, From Bioinformatics to Molecular Evolution, November 2003.  
**AMS Joint Mathematics Meeting**, Baltimore, January 2003.  
**ISSOL (Intl. Soc. Study of Origin of Life) Oaxaca, Mexico**, July 2002.  
**Plenary talk, GECCO (Genetic and Evolutionary Computing)** July 2002.  
**Bioinformatics 2002**, Bergen, Norway, April, 2002.  
**Duke University**, April, 2002.  
**Caltech**, January 2002.  
**NSF EC-US Task Force on Biotechnology Research**, September, 2001.  
**Santa Fe Institute, faculty for Complex Systems Summer School** – series of 2 talks, June 2001.  
**DuPont Central Research and Development**, Delaware, May 2001.  
**Institute for Theoretical Physics, Santa Barbara** – series of 3 talks on Biological Information, April 2001.  
**UC Berkeley**, Departments of Bioengineering/Plant and Microbial Biology, March 2001.  
**UC Berkeley**, Department of Chemistry, October 2000.  
**Caltech**, Departments of Applied Physics and Chemical Engineering (2 talks), February 2001  
**Harvard University**, Department of Organismal and Evolutionary Biology, February 2001.  
**University of Texas – Southwestern, Dallas, *Postdoc invited talk***, January 2001.  
**U.S. House of Representatives Committee on Science, Subcommittee on Basic Research**, Congressional Hearing, Beyond Silicon Computing: DNA Computers. September, 2000.  
**New England Molecular Evolutionary Biologists, Harvard University**, Genomics session plenary talk, November 2000.  
**International Society of Evolutionary Protistology**, Czech Republic, August 2000.  
**Microsoft Research**, Seattle, July 2000.  
**Gordon Research Conference on the Origin of Life**, Opening Session Chair, July 2000.  
**DNA Based Computers 6**, Leiden, The Netherlands, plenary invited talk, June 2000.  
**Cold Spring Harbor Laboratory Public Lecture**: “DNA games: From espionage to computing,” June 2000.  
**The Tech Museum of Innovation, San Francisco**, Public Lecture, May, 2000.  
**German Society of Protozoology, Göttingen**, main lecture (only foreign speaker) March 2000.  
**Sigma Xi Annual Meeting**, Young Investigator Award Lecture, Minneapolis, November 1999.  
**The John Templeton Foundation Symposium on “Complexity, Information Theory, and Design: A Critical Appraisal,”** “Nature’s oddities and the genetic code: Can design govern in a thing so small?” Santa Fe, October 1999.  
**Cold Spring Harbor Laboratory**, Workshop on Computational Molecular Biology, session chair. September 1999.  
**European Evolution Meetings, Barcelona**, August 1999.  
**Society for Molecular Biology and Evolution, Brisbane, Australia**, keynote speaker and symposium chair, “Evolution of Gene Scrambling in Ciliate Micronuclear Genes” and “Knights of the Square Table: RNA Solutions to Chess Problems” July 1999.

- 11<sup>th</sup> Conversation in Biomolecular Stereodynamics**, “Computing with RNA” Albany, June 1999.
- Brazilian Society of Biochemistry and Molecular Biology**, Coxambu, Brazil, May 1999.
- Princeton Chapter of Sigma Xi**, “The origin of life, in a test-tube” April, 1999.
- Rockefeller University**, “Computing with RNA: From Ribozyme and Genetic Code Origins to Chess” March, 1999.
- Universiti de Montreal**, “Computing with RNA” March, 1999.
- Harvard University**, Molecular, Cell, and Developmental Biology Colloquium, March, 1999.
- Stanford University**, “Experimental RNA Evolution: From the origins of RNA catalysts to the genetic code and chess” March, 1999
- Stanford University**, “Gene Scrambling and DNA Computing: The Origin of Biological Information Processing” Oct. 1998.
- Princeton University Alumni Day**, “Computing with DNA:” February, 1999.
- The Institute for Advanced Study**, Princeton, NJ, “Computing with DNA and RNA: The Origin of Biological Information Processing” Feb., 1999.
- Princeton Plasma Physics Laboratory**, Science on Saturday, “DNA Computers” Feb. 1999.
- Princeton Adult School**, Origins in Biology, “The Origins of Life: From Molecules and Meteorites to Modern Microbial Organisms” February, 1999.
- NASA Goddard Space Flight Center**, Jan. 1999.
- Bellcore General Colloquium**, Dec. 1998.
- NIH National Institute of Allergy and Infectious Disease (NIAID)**, Dec, 1998.
- Natural History Lecture, Princeton University**, “The Explosion of Life” Oct. 1998.
- NYU Graduate Student Invited Colloquium**, Sept. 1998.
- National Academy of Sciences, Session Chair**, Chinese-American Frontiers of Science, Irvine, CA, 1998.
- Woods Hole, Molecular Evolution Short Course Faculty**, Marine Biological Laboratory, Summers 1991 – 1995, 1998 inclusive.
- Society for Industrial and Applied Mathematics and Society for Mathematical Biology (SMB, SIAM)** Toronto, Ontario. July 1998.
- Witten/Herdecke University, Germany**. July 1998.
- University of Leiden**, Netherlands, “The Biology of DNA Computing” and “Chess Games: A Model of RNA Based Computing” July 1998.
- Society for the Study of Evolution (SSE) Symposium on Simulated Evolution**, “Knight Moves: Molecular Evolution and a DNA Computer” Vancouver, June 1998.
- NASA Ames**, “Molecular Evolution of DNA Computing” and “Rhyme or Reason in RNA Evolution” Moffet Field, CA, March 1998.
- NASA Workshop on Evolution: A Molecular Point of View**, Woods Hole, MA, Oct., 1997.  
(news coverage in *The Washington Post* Dec. 15, 1997).
- Symposium on The Phylogeny of Life and the Accomplishments of Phylogenetic Biology**, Univ. of Arizona, Tucson, Oct. 1996.
- Yale University**, October, 1995.

#### GRADUATE STUDENTS ADVISED AND POSTDOCTORAL RESEARCH FELLOWS SPONSORED

2 Current graduate students: **Estienne Swart** (EEB), **Wenwen Fang** (Molbio).

4 Former graduate students: **Han Liang** (*Chemistry*, Ph.D. 2006, postdoc University of Chicago), **Robin Knight** (EEB, Ph.D. 2001, recipient of the *Council of Graduate Schools/University Microfilms International Distinguished Dissertation Award in the biological and life sciences*; Assistant Professor, University of Colorado, Boulder), **T. Andrew Ronneberg** (*Chemistry*, Ph.D. 2001, contractor for the DOE), **Tamara Horton** (*Molecular Biology*, Ph.D. 2000, NDSEG fellow; postdoc Rockefeller University, now adjunct faculty at Prince George's Community College while on maternity).

3 Current postdoctoral research fellows: **Yi Zhou** (Ph.D. NYU), **Mariusz Nowacki** (Ph.D. Ecole Normale Supérieure), **Brian Higgins** (Ph.D. Georgia).

14 Former postdoctoral research fellows: **Thomas Doak** (Ph.D. Utah; currently Research Staff at Indiana University), **Wei-Jen Chang** (Ph.D. SUNY Buffalo; currently Assistant Professor at Hamilton College), **Andre Cavalcanti** (Ph.D. Universidade Federal de Pernambuco, Brazil; currently Assistant Professor at Pomona College), **Michael Livstone** (Ph.D. Columbia, currently Scientific Curator for the Yeast Genome Database), **Shiuhyang Kuo** (Ph.D. Florida, currently research staff at University of Michigan), **Zhongliang Tang** (Ph.D. Columbia chemical engineering, currently staff scientist at Biocept), **Danny van Noort** (Ph.D. applied physics, Linköpings University, Sweden, currently Assistant Professor at Seoul National University), **Nicholas Stover** (Ph.D. U.C. Irvine, currently Assistant Professor at Bradley University), **Stephen Freeland** (HFSP Fellowship, Ph.D. Cambridge University, currently Associate Professor at University of MD, Baltimore County), **Christina Burch** (Ph.D. U.C. San Diego, currently Associate Professor at University of North Carolina), **David Ardell** (NSF Fellowship in Computational Biology, Ph.D. Stanford; currently Assistant Professor at University of California, Merced) **Dirk Faulhammer** (DFG fellowship, Ph.D. Munich, currently at GE Healthcare, Berlin), **Tai-Chi Kuo** (Ph.D. University of Texas, Austin; currently Assistant Professor at Industrial Technique Research Institute, Taiwan), and **Laura Katz** (Ph.D. Cornell, NSF/Sloan Fellowship, currently Associate Professor at Smith College).

Advised over 20 other rotation graduate students in Molecular Biology.

Advised over 40 Senior Theses and Spring Junior Papers in the Depts. of EEB, Molecular Biology, Computer Science, Chemistry, Electrical Engineering and Geology. Six of my students have been recipients of Senior Thesis Prizes in EEB, Molecular Biology, or Engineering: Andy Goodman '99 (EEB) won the Cannon Prize at the EEB senior symposium; Anthony Cukras '98 (Chemistry and Computer Science) received the *Harold Willis Dodds Award* for Achievement (the highest honor given to an undergraduate from the University) for his senior thesis on an RNA solution to the Knight Problem from Chess; and Vikram Vijayan '07 won best student presentation at the 13th International Conference on DNA Based Computers and the *Charles Ira Young Class of 1883 Memorial Tablet* and Medal (awarded annually to the senior with the highest distinction in research in the department of electrical engineering).