

## CURRICULUM VITAE

### EDUCATION: *University of California at Los Angeles (UCLA)*

Ph.D.	Computer Science	Major Field: Theory	1987
M.A.	Mathematics	Emphasis in Logic	1982
B.A.	Mathematics	Highest Honors	1980

### EMPLOYMENT

2007-	<i>Professor of Computer Science, Haverford College</i>
1993-2007	<i>Associate Professor of Computer Science, Haverford College</i>
1987-1993	<i>Assistant Professor of Computer Science, Haverford College</i>
1986-1987	<i>Teaching Fellow, Computer Science Department, UCLA</i>
Summer '86	<i>Research Associate, Instructional Development, UCLA</i>
1983-1986	<i>Teaching Associate, Computer Science Department, UCLA</i>
1982-1983	<i>Research Assistant, Computer Science Department, UCLA</i>
1981-1982	<i>Teaching Assistant, Mathematics Department, UCLA</i>
Summer '81	<i>Tutor, Mathematics Department, UCLA</i>
1978-1980	<i>Reader, Mathematics Department, UCLA</i>
Summer '80	<i>Computer Programmer, Office of Academic Computing, UCLA</i>
Summer '79	<i>Computer Programmer, Douglas Aircraft Corporation</i>
Sum. '77,'78	<i>Student Aide, Long Beach Unified School District</i>
1975-1982	<i>Private Tutor, science and mathematics</i>

### HONORS AND AWARDS

Departmental Nominee for UCLA Distinguished Teaching Award  
American Electronics Association Doctoral Fellowship (3 years)  
School of Engineering Fellowship in Computer Science  
University Fellowship in Mathematics  
Daus Prize for outstanding graduating senior in Mathematics  
Departmental Scholar in Mathematics  
Member of UCLA Math Team for nationwide Putnam examination  
Regents' Scholar; Alumni Scholar; Continuing Alumni Scholar Award

### GRADUATE STUDY

*Computer Science Theory*: Computability theory; Complexity theory; Algorithms.  
*Mathematics*: Logic & Set Theory; Abstract Algebra; Complex Analysis.  
*Programming Languages*: Denotational Semantics; Correctness Proofs.

### DISSERTATION

The Logical Complexity of Queries on Unordered Graphs *UCLA, 1987*  
Professor Sheila A. Greibach, Computer Science Department (thesis advisor).  
Professor Yiannis N. Moschovakis, Mathematics Department (thesis advisor).

### AREAS OF INTEREST

*Finite Model Theory*: first-order, fixed-point, and second-order logics on finite structures  
*Inductive Definability*: bounded variable logics, threshold quantifier logics  
*Theoretical Foundations of Computational Complexity*: logical characterization of the fundamental physical limitations of mechanical computing devices.

## NATIONAL SCIENCE FOUNDATION GRANTS

- 2002-5 Principal investigator for SGER grant "*A mathematical logic for physically feasible computation*" CCR-0225063.
- '98-'02 ROA participant in "*Logical Studies in the Complexity of Computation*" together with principal investigator Scott Weinstein in the Department of Philosophy at the University of Pennsylvania, CCR-9820899.
- 1994-8 ROA participant in "*Logical Methods applied to Complexity Theory*": principal investigators Scott Weinstein and Maria Bonet from the University of Pennsylvania, CCR-9403447.
- 1990-3 Principal investigator for RUI grant "*Fixed-Point Logic on Finite Structures*", CCR-9003356.

## PAPERS

- *To appear (2024)* "*Traversal-invariant characterizations of logarithmic space*," in eds. A. Deutsch et. al., *The Provenance of Elegance in Computing - Essays Dedicated to Val Tannen, Dagstuhl Open Access Series in Informatics (with Siddharth Bhaskar and Scott Weinstein)*.
- *Submitted (2021)*: (to the Archive for Mathematical Logic) "Order types of traversals of infinite graphs" (with Siddharth Bhaskar and Scott Weinstein).
- *Revised (2021)*: "A Logical Characterization of Input Strictly Local Functions" (with Jane Chandlee in Linguistics) to appear in *Model Theoretic Phonology* edited by Jeffrey Heinz, Oxford University Press.
- *Submitted (2020)*: (to Logical Methods in Computer Science) "Traversal-invariant characterizations of logarithmic space".
- *Submitted*: (to the Bulletin of Symbolic Logic) "Hanf Locality and Invariant Elementary Definability" with Henry Towsner and Scott Weinstein (at the University of Pennsylvania)
- "Infinitary methods in finite model theory" (coauthored with Scott Weinstein) in *Logic without Borders – Essays on Set Theory, Model Theory, Philosophical Logic and Philosophy of Mathematics*, ed. Roman Kossak, De Gruyter 2015.
- "Real-Time Collaboration Tools for Digital Ink", *Journal of Computing Sciences in Colleges*, Volume 25, Number 3, January 2010, pp. 24-31.
- "A normal form for first-order logic over doubly-linked data structures", *International Journal of Foundations of Computer Science*, vol. 19 no. 1, Feb. 2008, pp. 205-217.
- "An Elementary Term Logic for Physically Realizable Models of Information" in *The Old New Logic: Essays on the Philosophy of Fred Sommers* edited by David Oderberg, MIT Press 2005.

- "The Role of Decidability in First Order Separations over Classes of Finite Structures" (co-written with Scott Weinstein), in the Proceedings of the 15th Annual IEEE Symposium on Logic in Computer Science (2000), pp. 45-50.
- "Elementary Properties of the Finite Ranks" (co-written with Anuj Dawar, Kees Doets, & Scott Weinstein), *Mathematical Logic Quarterly*, Vol. 44, pp. 349-353 (1998).
- "A Constant-Space Sequential Model of Computation for First-Order Logic", *Information and Computation* Vol. 143, pp. 231-250 (1998).
- "First Order Logic, Fixed Point Logic and Linear Order" (co-written with Anuj Dawar & Scott Weinstein), in Kleine-Büning, H. (ed.), *Computer Science Logic '95*, Springer-Verlag, *Lecture Notes in Computer Science* Vol. 1092, 1996, pp. 161-177.
- "Generalized Implicit Definitions on Finite Structures" (co-written with Stéphane Grumbach & Zoé Lacroix), in Kleine-Büning, H. (ed.), *Computer Science Logic '95*, Springer-Verlag, *Lecture Notes in Computer Science* Vol. 1092, 1996, pp. 252-265.
- "A Constant-Space Sequential Model of Computation for First-Order Logic" *Logic and Computational Complexity*, *Lecture notes in Computer Science* no. 960, Daniel Leivant (ed.), Springer-Verlag 1995 pp. 447-462.
- "Infinitary Logic and Inductive Definability over Finite Structures" (co-written with Anuj Dawar & Scott Weinstein), *Information and Computation*, Vol. 119, No. 2, June 1995 pp. 160-175.
- "A Purely Logical Characterization of Circuit Uniformity" in *Proceedings of the 7th Annual IEEE Conference on Structure in Complexity Theory* (1992), pp. 185-192.
- "A Logspace Algorithm for Tree Canonization" in *Proceedings of the 24th Annual ACM Symposium on the Theory of Computing* (1992), pp. 400-404.
- "The Invariant Problem for Binary String Structures and the Parallel Complexity Theory of Queries" *Journal of Computer and System Sciences*, Vol. 44 no. 3, June 1992, pp. 385-410.
- "An Analysis of Fixed-Point Queries on Binary Trees" *Theoretical Computer Science*, Vol. 85 (1991) pp. 75-95.

## LECTURES

- "*A logarithmic space algorithm for the generic graph traversal*" invited talk at James Madison University, Department of Computer Science, May 1, 2024.
- "Invariant definability, graph traversals, and logarithmic space computation" October 25, 2021, invited presentation for the *Logic and Computation* seminar at the University of Pennsylvania.
- "Traversal-invariant definability & logarithmic-space computation" on July 27, 2021, at the *Structure meets Power workshop*, part of a virtual Logic in Computer Science conference (invited to submit).

- “Traversal-invariant elementary definability and logarithmic-space computation” on July 13, 2018, at the *Nineteenth International Workshop on Logic and Computational Complexity*, part of the Federated Logic Conference held in the University of Oxford.
- “Traversal-invariant elementary definability for logarithmic-space computation” (an invited presentation given on April 1, 2017, at the *AMS Special Session on Computability and Inductive Definability over Structures*, as part of the Spring Central Sectional Meeting at Indiana University in Bloomington).
- “A logical characterization of strictly local functions” (presented on July 10, 2016, at the *Fourth Workshop on Natural Language and Computer Science* at Columbia University).
- “Presentation-invariant definability” (presented on September 20, 2013, at the *HIGHLIGHTS of Logic, Games and Automata* conference in Paris, France).
- “Infinitary methods in finite model theory” (presented on May 14, 2012, at the Finite and Algorithmic Model Theory 2012 workshop hosted at the *École de Physique des Houches*).
- “Infinitary methods in finite model theory” (presented on March 30, 2012, at the Logical Approaches to Barriers in Complexity II workshop hosted by the *Isaac Newton Institute for Mathematical Sciences* in Cambridge, England).
- “Logic and Models of Computation” a series of invited lectures for the Third Indian School on Logic and its Applications at the *University of Hyderabad*, in Gachibowli, India from January 18-24, 2010.
- “Real-Time Collaboration Tools for Digital Ink” (presented on October 30, 2009, at *Villanova University* in the 25th Annual Consortium for Computing Sciences in Colleges Eastern Conference).
- “Computation: A Mathematical or Physical Notion?” (Presented on November 5, 2007 at *Villanova University*).
- “A physical analysis of mechanical computability” (presented May 25, 2006, at the *Isaac Newton Institute for Mathematical Sciences* in Cambridge).
- “A normal form for singular logic over physically realizable data models” (presented February 28, 2006, at the *Isaac Newton Institute for Mathematical Sciences* in Cambridge).
- “Computing monadic fixed-points in linear-time on doubly-linked data structures” (given June 24, 2005, at Seventh International workshop on *Logic and Computational Complexity*).
- “Revisiting finite-visit computations” (short presentation at IEEE Conference on *Computational Complexity* June 2004).
- “Linear-time algorithms for Monadic Logic” (short presentation at IEEE Conference on *Logic in Computer Science* June 2003).
- “Linear-time algorithms for Monadic Logic” (given at the University of Pennsylvania's *Logic and Computation Seminar*, February 2003).

- "An Axiomatic approach to Physically Scalable Computation" (short presentation at IEEE Conference on *Computational Complexity* June 2001).
- "Computer Science as a Liberal Art: The Convergence of Technology and Reason", (a *Faculty Research talk* given at Haverford College on January 24, 2001).
- "The Role of Decidability in First Order Separations over Classes of Finite Structures", (presented at the IEEE Conference on *Logic in Computer Science* June 2000).
- "Nonstandard methods for Analyzing First-order Definability over Finite Structures" (invited presentation at the NSF/DIMACS *Workshop on Logic and Cognitive Science*, IRCS, University of Pennsylvania, Apr. 18, 1999).
- "Fixed-point vs. First-order definability on structures with arithmetic" (invited presentation at the *DIMACS Workshop on Descriptive Complexity and Finite Models*, Princeton University, Jan. 17, 1996).
- "A Constant-Space Model of Computation for First-Order Queries" (given at the *DIMACS Special Year on Logic and Algorithms Seminar*, November 1995).
- "A Constant-Space Model of Computation for First-Order Queries" (given at the University of Pennsylvania's *Logic and Computation Seminar*, April 1995).
- "Computing Without Machines - a logical approach to the mathematics of computation" (given at Bryn Mawr college, departmental mathematics colloquium, Friday, March 18, 1994).
- "A Purely Logical Characterization of Circuit Uniformity" (presented at the 1992 IEEE Conference on Structure in Complexity Theory, June 1992).
- "A Logspace Algorithm for Tree Canonization" (presented at the 1992 ACM *Symposium on the Theory of Computing*).
- "Fixed-point Logic and Cyclic Formulas" (invited talk at Villanova University's *Computer Science Colloquium*, October 10, 1991).
- "A Purely Logical Notion of Circuit Uniformity" (given at the 21st Annual Symposium on the Theory of Computing, in an informal rump session, July 2, 1991).
- "Logical Relations and Circuit Uniformity" (informal talk given at the University of Massachusetts at Amherst on March 27, 1991).
- "Elementary Arithmetic on Finite Structures" (invited talk for the *Discrete Mathematics Seminar* at the University of South Florida on Tuesday, February 5, 1991).
- "When are Two Binary Strings Isomorphic?" (Invited talk for the *Departmental Mathematics Colloquium* at the University of South Florida on Monday, February 4, 1991).
- "When are Two Binary Strings Isomorphic? or The Logical Foundations of Parallel Complexity Theory" (given at the University of Pennsylvania in their *Logic and Computation Seminar*, March 1990).

- "The Invariant Problem for Binary String Structures and its connection with the Parallel Complexity of Queries" (a contributed talk at the *Association for Symbolic Logic's annual meeting* in Berkeley CA, January 1990).
- "Inductive Definability on Binary Trees" (given at the University of Pennsylvania's *Logic and Computation Seminar*, October 1987).

**MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS**

IEEE	Institute of Electrical and Electronics Engineers (full member)
ASL	The Association for Symbolic Logic (lapsed)
ACM	Association for Computing Machinery
SIGLOG	Special interest group in Logic and Computation
SIGACT	Special interest group in Algorithms and Computation Theory
EATCS	European Association for Theoretical Computer Science (lapsed)