October 31, 2007

CURRICULUM VITAE
ALAN L. SELMAN

Department of Computer Science and Engineering
University at Buffalo
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EDUCATION

1970 Ph.D.	Pennsylvania State University, Mathematics
1964 M.A.	University of California, Berkeley, Mathematics
1962 B.S.	City College of CUNY, Mathematics, *cum laude*

EXPERIENCE

2006	Gastprofessor, Theoretische Informatik, Universität Würzburg
1998–	Professor, Department of Computer Science and Engineering, University at Buffalo
1998–	Adjunct Professor, Department of Mathematics, University at Buffalo
1998	Visiting Professor, Department of Computer Science, University of Chicago,
1996–1998	Professor, Department of Computer Science, University at Buffalo
1990–1996	Professor and Chairman, Department of Computer Science, University at Buffalo
1986–1990	Professor, College of Computer Science, Northeastern University
1988–1989	Acting Dean, College of Computer Science, Northeastern University
1982–1986	Professor, Department of Computer Science, Iowa State University
1982	Gastprofessor, Fachbereich Mathematik und Informatik, FernUniversitat, Hagen, West Germany
1981–1982	Fulbright Lectureship Award, Visiting Scientist, Department of Computer Science, Technion, Haifa, Israel
1977–1982	Associate Professor, Department of Computer Science, Iowa State University
1972–1977	Assistant Professor, Mathematics Department, Florida State University
1971–1972	Research Mathematician (Postdoctoral Research Fellow), Lecturer of Computer Science and Mathematics, Carnegie-Mellon University
1968–1970	Instructor of Mathematics, Pennsylvania State University

AREA OF SPECIALIZATION

Computational Complexity Theory

PROFESSIONAL AND HONORARY SOCIETIES

Phi Beta Kappa
Sigma Xi
Phi Kappa Phi
Association for Computing Machinery
ACM Special Interest Group for Automata and Computability Theory
European Association for Theoretical Computer Science

AWARDS AND HONORS

Humboldt Research Award, 2005

Chancellor's Award for Excellence in Scholarship and Creative Activities, State University of New York, 2004

ACM-SIGACT Distinguished Service Award, 2001

Exceptional Scholar Award, University at Buffalo, 2002

Honored at the Sixteenth Annual IEEE Conference on Computational Complexity, June 2001, with a Special Session preceding the conference of three retrospective talks on my work and a Dedication in the Conference Proceedings

Fellow of the ACM, 1997

Invitation Fellowship from the Japan Society for the Promotion of Science, 1996

IEEE Computer Society Meritorious Service Award for founding the Symposium on Structure in Complexity Theory, and serving as its Conference Chairman, 1986–1988

Fulbright Award, 1981–1982

Faculty Improvement Leave from Iowa State University, 1981–1982

Citations in Who's Who in America, Who's Who in the Media and Communications, and American Men and Women in Science

RESEARCH GRANTS

1. Complexity of Feasible Computations, NSF, 2003–2006, $150,000
2. Workshop on Research in Theoretical Computer Science, NSF, 1999, $25,942
3. U.S.-Japan Cooperative Research, with J-Y. Cai, K. Regan, and M. Ogihara, NSF, 1998–2001, $30,950
4. Complexity of Feasible Computations, with S. Homer, NSF, 1994–1997, $360,794
5. Wide Area Technical Report Server, with K. Maly, E. Fox, and J. French, NSF, 1993, $22,736

6. Cooperative Research in Complexity Theory, with S. Homer and L. Longpré, International Programs, Netherlands, NSF, 1992–1994, $12,475
7. Complexity of Feasible Computations, NSF, 1990–1993, $199,782
8. Structure in Complexity Theory Conference, with S. Mahaney, NSF, 1986, $15,000
9. Complexity of Feasible Computations, NSA, 1987–1990, $215,000
10. Multiple Awards with the title "Complexity of Feasible Computations," NSF, 1982–1987
11. Multiple Awards with the title "Studies in Nondeterminism and Relative Computation," NSF, 1975–1982

EDITORSHIPS

1. Editor-In-Chief, *Theory of Computing Systems* (formerly *Mathematical Systems Theory*), 2001–
2. Member of the Editorial Board, *Journal of Computer and System Sciences*
3. Member of the Editorial Board, *Chicago Journal of Theoretical Computer Science*
4. Journal Special Issues
   (a) Special Issue Editor for an issue of *Journal of Computer and System Sciences* based on papers presented at the Second Annual Structure in Complexity Theory Conference
   (b) Special Issue Editor for a special issue of *Theoretical Computer Science* based on papers presented at the Fifth Annual Structure in Complexity Theory Conference
   (c) Special Issue Editor for a special issue of *Journal of Computer and System Sciences* based on papers presented at the 21st IEEE Symposium on Foundations of Computer Science

PROFESSIONAL ACTIVITIES

Program Committees:

1. Member, Computability in Europe, 2008
2. Member, Computability in Europe, 2010
3. Member, Theory and Applications of Models of Computation, Beijing, May, 2006
4. Member, Thirteenth Annual IEEE Conference on Computational Complexity, Buffalo, June, 1998
5. Member, Second Annual International Computing and Combinatorics Conference, Hong Kong, June, 1996
6. Chair, Fifth Annual IEEE Structure in Complexity Theory Conference, Barcelona, 1990

7. Co-Chair, Structure in Complexity Theory Conference, first meeting, Berkeley, CA, June, 1986
8. Member of the Program Committee of the 22nd IEEE Symposium on Foundations of Computer Science, Nashville, 1981
9. Member of the Program Committee of the 21st IEEE Symposium on Foundations of Computer Science, Syracuse, 1980

Co-organizer of the special session on computational complexity at Theory and Applications of Models of Computation, Beijing, May, 2006

Chairman of the ACM SIGACT Service Award Committee, 2005–2006

Member of the ACM SIGACT Service Award Committee, 2003–

Member of the Computer Science and Engineering division of the Industrial and Professional Advisory Council for the College of Engineering at The Pennsylvania State University, 2003–2005

External Evaluator for Florida State University of their Computer Science Department, 2002

Organizer and Chair of an NSF-Sponsored Workshop on Research in Theoretical Computer Science, 1999

External Advisor for the Department of Computer Science, University of Tennessee, Knoxville, 1998

Panel Member at the Snowbird-Conference Workshop on using the Web in research and education, 1996

Member of the Strategic Directions in Computing Research, Theory of Computing Working Group, 1996

Site visitor for the NSF/DARPA/NASA Digital Libraries Initiative projects, 1996

Member of the Networked Computer Science Technical Report Library (NCSTRL) Working Group, 1995–2001

Member of National Science Foundation panels, 1990, 1992, 1994, 1995, 1998, and 2003

Co-organizer of the Symposium to honor the 1993 Turing Award Recipients, Juris Hartmanis and Richard Stearns, held March 1994 at Albany and Schenectady

Co-organizer of a Workshop on Managing Departmental Publications at the Snowbird Conference, 1992

Conference Chair, Structure in Complexity Theory Conference, 1986–1988

Steering Committee, Structure in Complexity Theory Conference, 1985–1995

Member of the Executive Board, IEEE Computer Society Technical Committee on Mathematical Foundations of Computing, 1985–1988

Member of the Council for International Exchange of Scholars Discipline Screening Committee for Fulbright Scholar Awards in Computer Science 1985–1988

Chair, CIES Discipline Screening Committee for Fulbright Scholar Awards in Computer Science, 1986–1988

Examiner for the Ph.D. defense of Harry Buhrman, University of Amsterdam, June, 1993

Examiner for the Ph.D. thesis of Christopher B. Wilson, University of Toronto, October, 1984

Reader of the Ph.D. thesis of Jie Wang, Boston University, May, 1990

Reader of the Ph.D. thesis of Krishnamurthy Ganesan, Boston University, August, 1989

UNIVERSITY SERVICE

University at Buffalo:
Chairman, Department of Computer Science, 1990–1996
Member, Middle States Accreditation Self-Study Task Force on Faculty/Staff, 1992–1993
Member, Computer Technology and Academic Programs Committee, 1996
Member, FNSM Elected Personnel Committee, 1996–1997
Member, SEAS Bylaws Committee, 1998–1999
Member, CAS Elected Personnel Committee, 1999–2000
Member, Middle States Accreditation Self-Study Steering Committee, 2001-2003

Northeastern University:
Chair, College of Computer Science Colloquium Committee, 1989–1990
Acting Dean, College of Computer Science, January, 1988–September, 1989
Chair, College of Computer Science Faculty Hiring Committee, 1986–1987
Member, College of Computer Science Graduate Committee, 1986–1988

Iowa State University:
Chair, Computer Science Department Faculty Search Committee, 1983–1985
Chair, Computer Science Department Colloquium Committee, 1983–1985
Member, NCAA Accreditation Self-Study Subcommittee on Research and Scholarly Activities, 1984–1986
Member, College of Sciences and Humanities Faculty Development Committee, 1982–1983

PH.D. STUDENTS

1. Joachim Grollmann, Complexity Measures for Public-Key Cryptosystems, Ph.D. received from Abteilung Informatik, Universitat Dortmund, Dortmund, West Germany, February, 1985

2. John Geske, On the Structure of Intractable Sets, Ph.D. received from Iowa State University, 1987

3. Roy Rubinstein, Structural Complexity Classes of Sparse Sets: Intractability, Data Compression, and Printability, Ph.D. received from Northeastern University, 1988

4. Ashish Naik, The Structural Complexity of Intractable Search Functions, Ph.D. received from University at Buffalo, 1995

5. A. Pavan, Average-Case Complexity Theory and Polynomial-Time Reductions, Ph.D. received from University at Buffalo, 2001

6. S. Sengupta, Structural Properties of NP and coNP, Ph.D. received from University at Buffalo, 2004
7. Liyu Zhang, Disjoint NP-pairs, Ph.D. received from University at Buffalo, 2007

POSTDOCTORAL ADVISEES

1. Mitsunori Ogihara, 1992
2. Edith Hemaspaandra, 1993
3. Christian Glasser, 2002

TEACHING

Computer Science: Programming, Discrete Structures, Data Structures, Analysis of Algorithms, Compiler Construction, Automata Theory and Formal Languages, Theory of Computability, Complexity Theory, Denotational Semantics, Introduction to Graduate Study in Computer Science, Cryptography

Mathematics: Recursive Function Theory, Mathematical Logic, Real Analysis, Finite Mathematics, Number Systems, Linear Algebra, Calculus, Elementary Mathematical Structures

BOOKS

1. "Structure in Complexity Theory," editor, Proceedings of the Conference held June 1986. Lecture Notes in Computer Science, v. 223, Springer-Verlag
2. "Complexity Theory Retrospective," editor, Springer-Verlag, 1990
3. "Complexity Theory Retrospective II," co-editor with L. Hemaspaandra, Springer-Verlag, 1997
4. "Computability and Complexity Theory," with S. Homer, Springer-Verlag, Texts in Computer Science, 2001
5. "Theoretical Computer Science —Essays in Memory of Shimon Even," co-editor with O. Goldreich and A. Rosenberg, Springer-Verlag, Festschrift series of Lecture Notes in Computer Science, vol. 3895, March 2006

REFEREED PUBLICATIONS

1. Arithmetical reducibilities, I. *Z. Math. Logik Grudl. Math.*, 17:335–350, 1971.
2. Arithmetical reducibilities, II. *Z. Math. Logik Grudl. Math.*, 18:83–92, 1972.
3. Applications of forcing to the degree-theory of the arithmetical hierarchy. *Proc. of the London Mathematical Society* 25:586–602, 1972.

4. Completeness of calculii for axiomatically defined classes of algebras. *Algebra Universalis*, 2(1):20–30, 1972.

5. Sets of formulas valid in finite structures. *Trans. Amer. Math. Soc.*, 177:490–504, 1973.

6. Turing machines and the spectra of first-order formulas (with N. Jones). *J. Symbolic Logic*, 39(1):139–150, 1974.

7. Relativized halting problems. *Z. Math. Logik Grudl. Math.*, 20:193–198, 1974.

8. A comparison of polynomial time reducibilities (with R. Ladner and N. Lynch). *Theor. Comput. Sci.*, 1(2):103–124, 1975.

9. Inclusion complete tally languages and the Hartmanis-Berman conjecture (with R. Book, C. Wrathall, and D. Dobkin). *Math. Systems Theory*, 11:1–8, 1977.

10. Polynomial time enumeration reducibility. *SIAM J. Comput.*, 7(4):440–457, 1978.

11. A second step toward the polynomial hierarchy (with T. Baker). *Theor. Comput. Sci.*, 8:177–187, 1979.

12. P-selective sets, tally languages, and the behavior of polynomial time reducibilities on NP. *Math. Systems Theory*, 13:55–65, 1979.

13. Reductions on NP and p-selective sets. *Theor. Comput. Sci.*, 19:287–304, 1982.

14. Some observations on NP real numbers and p-selective sets. *J. Comput. System Sci.*, 23:326–332, 1981.

15. Analogues of semirecursive sets and effective reducibilities to the study of NP complexity. *Information and Control*, 52:36–51, 1982.

16. Positive relativizations of complexity classes (with R. Book and Xu Mei-rui). *SIAM J. Comput.*, 12:565–579, 1983.

17. Quantitative relativizations of complexity classes (with R. Book and T. Long). *SIAM J. Comput.*, 13:461–487, 1984.

18. Characterizations of reduction classes modulo oracle conditions (with R. Book). *Math. Systems Theory*, 17:263–277, 1984.

19. The complexity of promise problems with applications to public-key cryptography (with S. Even and Y. Yacobi). *Information and Control*, 61(2):159–173, 1984.

20. Hard-core theorems for complexity classes (with S. Even and Y. Yacobi). *J. Assoc. Comput. Mach.*, 32(1):205–217, 1985.

21. Qualitative relativizations of complexity classes (with R. Book and T. Long). *J. Comput. System Sci.*, 30(3):395–413, 1985.

22. Relativizing complexity classes with sparse oracles (with T. Long). *J. Assoc. Comput. Mach.*, 33(3):618–627, 1986.

23. Complexity measures for public-key cryptosystems (with J. Grollmann). *SIAM J. Comput.*, Special Issue on Cryptography, 17(2):309–335, 1988.

24. Promise problems complete for complexity classes. *Information and Computation*, 78, 87–98, 1988.

25. Natural self-reducible sets. *SIAM J. Comput.*, 17(5):989–996, 1988.

26. Oracles for structural properties: The isomorphism problem and public-key cryptography (with S. Homer). *J. Comput. System Sci.*, Special Issue of papers selected from the Fourth Annual IEEE Structure in Complexity Theory Conference, 44: 287–301, 1992.

27. A survey of one-way functions in complexity theory. *Math. Systems Theory*, 25(3):203–222, 1992.

28. Hard promise problems and nonuniform complexity (with L. Longpré). *Theor. Comput. Sci.*, 115(3):277–290, 1993.

29. A taxonomy of complexity classes of functions. *J. Comput. System Sci.*, 48(2):357–381, 1994.

30. Nondeterministically Selective Sets (with A. Hoene, L. Hemaspaandra, A. Naik, M. Ogihara, T. Thierauf, and J. Wang). *Int. J. on Foundations of Comput. Sci.*, 6(4):403–416, 1995.

31. Wide Area Technical Report Service: Technical Reports Online (with J. French, E. Fox, and K. Maly). *C. Assoc. Comput. Mach.*, 38(4): 45, 1995.

32. P-Selective sets and reducing search to decision vs. self-reducibility (with A. Naik, E. Hemaspaandra, and M. Ogihara). *J. Comput. System Sci.*, Special Issue of papers selected from the Eighth Annual IEEE Structure in Complexity Theory, 53:194–209, 1996.

33. Computing solutions uniquely collapses the polynomial hierarchy (with L. Hemaspaandra, A. Naik, and M. Ogihara). *SIAM J. Comput.*, 25(4):697–708, 1996.

34. Oracles that compute values (with S. Fenner, S. Homer, and M. Ogihara). *SIAM J. Comput.*, 26(4):1043–1065, 1997.

35. Adaptive versus nonadaptive queries to NP and p-selective sets (with A. Naik). *Computational Complexity*, 8(2):171–189, 1999.

36. Fine separation of average time complexity classes (with J-Y. Cai), *SIAM J. Comput.*, 28(4):1310–1325, 1999.

37. A hierarchy based on output multiplicity (with A. Naik, J. Rogers, and J. Royer), *Theoretical Computer Science*, 207(1):131–157, 1998.

38. Complements of multivalued functions (with S. Fenner, F. Green, S. Homer, T. Thierauf, and H. Vollmer), *Chicago Journal of Theoretical Computer Science*, March 19, 1999.
`http://cs-www.uchicago.edu/publications/cjtcs/articles/1999/3/contents.html`

39. Complete distributional problems, hard languages, and resource-bounded measure (with A. Pavan), *Theoretical Computer Science*, 234(1–2):273–286, 2000.
`http://www.elsevier.nl/locate/tcs.`

40. Distributionally-hard languages (with L. Fortnow and A. Pavan), *Theory of Computing Systems*, 34(3):245–263, 2001.
http://link.springer-ny.com/link/service/journals/00224/contents/01/0003/

41. Separation of NP-completeness notions (with A. Pavan), *SIAM Journal on Computing*, 31(3):906–918, 2002.

42. Bi-immunity separates strong NP-complete notions (with A. Pavan), *Information and Computation*, 188:116–126, 2004.

43. Disjoint NP-Pairs (with C. Glasser, S. Sengupta, and L. Zhang), *SIAM Journal on Computing*, 33(6):1369–1416, 2004.

44. Reductions between disjoint NP-pairs (with C. Glasser and S. Sengupta), *Information and Computation*, 200(2):247–267, 2005.

45. Properties of NP-Complete Sets (with C. Glasser, A. Pavan, and S. Sengupta). *SIAM Journal on Computing*, 36(2):516–542, 2006.

46. Canonical disjoint NP-pairs of propositional proof systems (with C. Glasser and L. Zhang). *Theoretical Computer Science*, 370:60–73, 2007.

47. Autoreducibility, mitoticity, and immunity (with C. Glasser, M. Ogihara, A. Pavan, and L. Zhang). *Journal of Computer and System Sciences*, 73:735–754, 2007.

48. Polylogarithmic-round interactive proofs for coNP collapse the exponential hierarchy (with A. Pavan, S. Sengupta, and N. V. Vinochandran). *Theoretical Computer Science*, 385:167–178, 2007.

49. Splitting NP-complete sets (with C. Glasser, A. Pavan, and L. Zhang). *SIAM Journal on Computing*, in press.

OTHER PUBLICATIONS

1. Complexity issues in cryptography, in "Computational Complexity Theory," editor, J. Hartmanis, Procs. of Symposia in Applied Mathematics, 38: 92–107, 1989, publ. by Amer. Math. Soc., Providence, RI.

2. Complexity classes for partial functions, in The Structural Complexity Column, J. Hartmanis, Bulletin of the EATCS, no. 45, Oct. 1991.

3. Complexity theory (with S. Homer), in Encyclopedia of Computer Science and Technology, Marcel Dekker, Inc., 26: 77–100, 1992.

4. A. Condon *et al.*, Challenges for Theory of Computing. Report of an NSF-Sponsored Workshop on Research in Theoretical Computer Science, April 1999. (There are nineteen authors. I am the workshop Chair.)
http://www.cse.buffalo.edu/~selman/report

5. A. Condon, F. Fich, G. Fredrickson, A. Goldberg, D. Johnson, M. Loui, S. Mahaney, P. Raghavan, J. Savage, A. Selman, and D. Shmoys. Strategic directions for research in theory of computing, *ACM Computing Surveys*, 28(4)584–599, 1996.

6. L. Hemaspaandra and A. Selman, Writing and editing complexity theory: tales and tools. In SIGACT News Complexity Theory Column 22, *SIGACT News*, 29(4):20–27, 1998.

7. J. Savage, A. Selman, and C. Smith, History and Contributions of Theoretical Computer Science. *Advances in Computers*, ed. M. Zelkowitz, Academic Press, 55: 172–183, 2001.

8. C. Glasser, A. Selman, and L. Zhang, Survey of Disjoint NP-Pairs and Relations to Propositional Proof Systems. *Theoretical Computer Science—Essays in Memory of Shimon Even*, eds. O. Goldreich, A. Rosenberg, and A. Selman, Springer-Verlag, Festschrift series of Lecture Notes in Computer Science, vol. 3895, March 2006.

9. C. Glasser, A. Selman, S. Travers, and K. Wagner. The Complexity of Unions of Disjoint Sets. *Electronic Colloquium on Computational Complexity*, TR06-069, 2006.
`http://eccc.hpi-web.de/eccc-reports/2006/TR06-069/index.html`

10. C. Glasser, A. Selman, S. Travers, and L. Zhang. Non-Mitotic Sets. *Electronic Colloquium on Computational Complexity*, TR06-090, 2006.
`http://eccc.hpi-web.de/eccc-reports/2006/TR06-090/index.html`

REFEREED PAPERS AT SCIENTIFIC MEETINGS

1. Turing machines and the spectra of first-order formulas (with N. Jones). Presented at the Fourth Annual ACM Symposium on Theory of Computing, May 1972, and published in the Conference Proceedings (pages 157–167, 1972).

2. A comparison of polynomial time reducibilities (with R. Ladner and N. Lynch). Presented at the Sixth Annual ACM Symposium on Theory of Computing, May 1974, and published in the Conference Proceedings (pages 110–121, 1974).

3. A second step toward the polynomial hierarchy (with T. Baker). Presented at the 17th Annual IEEE Symposium on Foundations of Computer Science, October 1976, and published in the Conference Proceedings (71–75, 1976).

4. P-selective sets, tally languages, and the behavior of polynomial time reducibilities on NP. Presented at the Sixth International Colloquium on Automata, Languages and Programming, Graz, Austria, July, 1979, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 71, pages 546–555, Springer-Verlag, Berlin, 1979).

5. The complexity of promise problems (with Y. Yacobi). Presented at the Eighth International Colloquium on Automata, Languages and Programming, Aarhus, Denmark, July, 1982, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 140, pages 502–509, Springer-Verlag, Berlin, 1982).

6. Controlled relativizations of P and NP (with R. Book and T. Long). Presented at the Sixth GI-Conference, Dortmund, West Germany, January, 1983, and published in the Conference Proceedings. (*Lecture Notes in Computer Science*, pages 85–90, Springer-Verlag, Berlin, 1983).

7. Complexity Measures for Public-Key Cryptosystems (with J. Grollmann). Presented at the 25th Annual IEEE Symposium on Foundations of Computer Science, October 1984, and published in the Conference Proceedings (pages 495–503, 1984).

8. Sparse oracles and uniform complexity classes (with J. Balcazar, R. Book, T. Long, and U. Schöning). Presented at the 25th Annual IEEE Symposium on Foundations of Computer Science, October 1984, and published in the Conference Proceedings (308–311, 1984).

9. A hierarchy theorem for almost everywhere complex sets with application to polynomial complexity degrees (with J. Geske and D. Huynh). Presented at the Fourth Symposium on Theoretical Aspects of Computer Science, February, 1987, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 247, pages 125–135, Springer-Verlag, Berlin, 1987).

10. Oracles for structural properties: The isomorphism problem and public-key cryptography (with S. Homer). Presented at the Fourth Annual IEEE Structure in Complexity Theory Conference, June, 1989, and published in the Conference Proceedings (pages 3–14, 1989).

11. Hard promise problems and nonuniform complexity (with L. Longpré). Presented at the Seventh Symposium on Theoretical Aspects of Computer Science, February, 1990, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 415, pages 216–226, Springer-Verlag, Berlin, 1990).

12. On using oracles that compute values (with S. Fenner, S. Homer, and M. Ogihara). Presented at the Tenth Symposium on Theoretical Aspects of Computer Science, February, 1992, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 665, pages 398–407, Springer-Verlag, Berlin, 1993).

13. P-selective sets, and reducing search to decision vs. self-reducibility (with A. Naik and M. Ogihara). Presented at the Eighth Annual IEEE Structure in Complexity Theory Conference, May, 1993, and published in the Conference Proceedings (pages 52–64, 1993).

14. Selectivity (with L. Hemachandra, H. Hoene, M. Ogihara, T. Thierauf, and J. Wang). Presented at the Fifth International Conference on Computing and Information, May, 1993, and published in the Conference Proceedings (pages 55–59, 1993, IEEE Computer Society Press).

15. Computing solutions uniquely collapses the polynomial hierarchy (with L. Hemaspaandra, A. Naik, and M. Ogihara). Presented at the Fifth International Symposium on Algorithms and Computation, Beijing, August, 1994, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 834, pages 55–64, Springer-Verlag, Berlin, 1994).

16. The Wide Area Technical Report Service (with E. Fox, J. French, and K. Maly). Presented at the Second International World Wide Web Conference '94: Mosaic and the Web, Illinois, October, 1994, and published in the Conference Proceedings, pages 535–543.
`http://www.ncsa.uiuc.edu/SDG/IT94/IT94Info.html`

17. Fine separation of average time complexity classes (with J-Y. Cai). Thirteenth Symposium on Theoretical Aspects of Computer Science, February 1996, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 1046, pages 331–343, Springer-Verlag, Berlin, 1996).

18. A note on p-selective sets and on adaptive versus nonadaptive queries to NP (with A. Naik). Eleventh Annual IEEE Conference on Computational Complexity, May, 1996, and published in the Conference Proceedings (pages 224–232, 1996).

19. Complements of multivalued functions (with S. Fenner, F. Green, S. Homer, T. Thierauf, and H. Vollmer). Eleventh Annual IEEE Conference on Computational Complexity, May, 1996, and published in the Conference Proceedings (pages 260–261, 1996).

20. Distributionally-hard languages (with L. Fortnow and A. Pavan). Fifth Annual International Conference on Computing and Combinatorics, Tokyo, July, 1999, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 1627, pages 184–193, Springer-Verlag, Berlin, 1999).

21. Separation of NP-completeness notions (with A. Pavan). Sixteenth Annual IEEE Conference on Computational Complexity, Chicago, June, 2001, and published in the Conference Proceedings (pages 78–89, 2001).

22. Bi-Immunity Separates Strong NP-completeness Notions (with A. Pavan). 19th International Symposium on Theoretical Aspects of Computer Science, Antibes Juan-les-Pins, France, March, 2002, and published in the Conference Proceedings. (*Lecture Notes in Computer Science*, vol. 2285, pages 408–418, Springer-Verlag, Berlin, 2002).

23. Disjoint NP-Pairs (with C. Glasser, S. Sengupta, and L. Zhang). 18th IEEE Conference on Computational Complexity, Aarhus, Denmark, July, 2003, and published in the Conference Proceedings (pages 313–332, 2003).

24. Polylogarithmic-round Interactive Proofs for coNP Collapse the Exponential Hierarchy (with S. Sengupta). 19th IEEE Conference on Computational Complexity, Amherst, MA, June 2004, and published in the Conference Proceedings (pages 82–90, 2004).

25. Reductions between Disjoint NP-Pairs (with C. Glasser and S. Sengupta). 19th IEEE Conference on Computational Complexity, Amherst, MA, June 2004, and published in the Conference Proceedings (pages 42–53, 2004).

26. Properties of NP-Complete Sets (with C. Glasser, A. Pavan, and S. Sengupta). 19th IEEE Conference on Computational Complexity, Amherst, MA, June 2004, and published in the Conference Proceedings (pages 184–197, 2004).

27. Canonical Disjoint NP-Pairs of Propositional Proof Systems (with C. Glasser and L. Zhang). 30th International Symposium on Mathematical Foundations of Computer Science, Gdansk, Poland, August 29–September 2, 2005, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 3618, pages 399–409, Springer-Verlag, Berlin, 2005).

28. Autoreducibility, Mitoticity, and Immunity (with C. Glasser, M. Ogihara, A. Pavan, and L. Zhang). 30th International Symposium on Mathematical Foundations of Computer Science, Gdansk, Poland,

August 29–September 2, 2005, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 3618, pages 387–398, Springer-Verlag, Berlin, 2005).

29. Redundancy in Complete Sets (with C. Glasser, A. Pavan, and L. Zhang). 23rd Annual Symposium on Theoretical Aspects of Computer Science, Marseille, France, February 2006, and published in the Conference Proceeedings (*Lecture Notes in Computer Science*, vol. 3894, pages 444–454, Springer-Verlag, Berlin, 2006).

30. The Complexity of Unions of Disjoint Sets (with C. Glasser, S. Travers, and K. Wagner). 24th Annual Symposium on Theoretical Aspects of Computer Science, Aachen, Germany, February 2007, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 4393, pages 248–259, Springer-Verlag, Berlin, 2007).

31. The Informational Content of Canonical Disjoint NP-Pairs (with C. Glasser and L. Zhang). 13th Annual International Computing and Combinatorics Conference, Banff, Canada, July 2007, and published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 4598, pages 307–317, Springer-Verlag, Berlin, 2007).

32. Non-Mitotic Sets (with C. Glasser, S. Travers, and L. Zhang). Foundations of Software Technology and Theoretical Computer Science, New Delhi, India, December 2007, and published in the Conference Proceedings

INVITED ADDRESSES AT SCIENTIFIC MEETINGS (since 1981)

1. One-hour lecture given at NSF Workshop on Recursion Theoretic Aspects of Computer Science, Purdue University, 1981.

2. Half-hour talk given at Special Session on Computing Theory, 86th Summer Meeting of the American Mathematical Society, Toronto, 1982.

3. One-hour lecture given at NSF Conference on Complexity Theory, Santa Barbara, 1982.

4. Series of three one-hour lectures given at Recursive Combinatorics Symposium, Münster, West Germany, 1983.

5. One-hour lecture given at Conference on Logic in Computer Science, Brooklyn College of CUNY, 1983.

6. One-hour keynote address given at the Second Conference on Computer Science and Computerized Domino Competition for Puerto Rican students sponsored by the University of Puerto Rico, Mayaguez, 1984.

7. Two one-hour lectures given at the Special Year in Mathematical Logic and Theoretical Computer Science, session on Recursion Theoretic Aspects of Computer Science, University of Maryland, 1984.

8. One-hour lecture given at the Workshop on the Mathematical Theory of Security, M.I.T., 1985.

9. One-hour lecture given at Logic Colloquium 85, European Summer Meeting of the Association for Symbolic Logic, Orsay, France, July, 1985.

10. One-hour lecture given at Structure in Complexity Conference, Berkeley, CA, 1986.

11. One-hour and fifteen minutes Short Course Lecture given at the American Mathematical Society Short Course on Computational Complexity at the Joint Annual Meeting of the AMS and the MAA, Atlanta, 1988. (Text of the lecture is published in the Proceedings of Symposia in Applied Mathematics series and is listed above.)

12. Half-hour talk given at the Special Session on Structural Complexity Theory at the Joint Annual Meeting of the AMS and the MAA, Atlanta, 1988.

13. One-hour lecture at the 1990 International Symposium on the Mathematical Foundations of Computer Science, Banská Bystrica, Czechoslovakia, August, 1990. (Talk cancelled because of illness.) Text of lecture on one-way functions in complexity theory is published in the conference proceedings (*Lecture Notes in Computer Science*, v. 452, pages 88–104, Springer-Verlag, Berlin, 1990).

14. Forty-five minute talk given at the DIMACS Workshop on Structural Complexity and Cryptography, 1990.

15. Forty-five minute talk given at the Seminar on Structure and Complexity, Schloss Dagstuhl, Germany, 1992.

16. One-hour talk at the workshop on Complexity Theory, University of Amsterdam, 1993.

17. Two hour talk given at the opening session of the Southern Maine Summer Workshop in Structural Complexity, 1993.

18. One-hour talk given at the Seminar on Structure and Complexity, Schloss Dagstuhl, Germany, 1994.

19. One hour talk given at the opening session of the Southern Maine Summer Workshop in Structural Complexity, 1995.

20. Thirty minute talk given at the Special Session on Complexity Theory at the meeting of the American Mathematical Society, Greensboro, NC, 1995.

21. One hour talk, Much ado about functions. Presented at the Eleventh IEEE Conference on Computational Complexity, May, 1996, and published in the Conference Proceedings (pages 198–212, 1996).

22. One hour talk on average-case complexity at a Workshop on Complexity Theory, University of Texas, El Paso, May, 1997.

23. One hour talk, Disjoint NP-Pairs, Mathematical Aspects of Computation, University of Leeds, March, 2006.

24. One hour plenary lecture, Mitosis in Computational Complexity, Theory and Applications of Models of Computation, Beijing, May, 2006. Text of lecture (co-authored with C. Glasser, A. Pavan, and L. Zhang) published in the Conference Proceedings (*Lecture Notes in Computer Science*, vol. 3959, pages 61–67, Springer-Verlag, Berlin, 2006).

25. Forty-five minute talk given at the special session on Computational Complexity, Disjoint NP-Pairs, Theory and Applications of Models of Computation, Beijing, May, 2006.

COLLOQUIUM ADDRESSES (since 1981)

1981 Technion, Israel

1982 Weizmann Institute, Rehovat, Israel
Tel Aviv University, Israel
Hebrew University, Israel
Universita di Torino, Italy
Universita di Pisa, Italy
Technische Universitat, Berlin, W. Germany
Universitat Stuttgart, W. Germany
Technische Hochschule Aachen, W. Germany
FernUniversitat, Hagen, W. Germany
University of Iowa

1983 Universitat Dortmund, W. Germany
Johann Wolfgang Goethe Universitat, Frankfurt, W. Germany
Universitat Karlsruhe, W. Germany
Universitat des Saarlandes, W. Germany
University of California, Berkeley
Stanford University

1984 Arizona State University
University of Texas at Dallas
University of Connecticut
Wesleyan University
University of Toronto
University of Puerto Rico, Mayaguez, 1984, one-week short course on complexity theory

1985 Universitat Dortmund, W. Germany
Universitat Bonn, W. Germany
FernUniversitat, Hagen, W. Germany
University of Maryland
SUNY at Albany
Boston College
University of Oregon
Oregon State University
University of Maryland, Baltimore County
Wesleyan University

1986 Oxford University, England
University of Warwick, England
University of Edinburgh, Scotland
University of Virginia
Smith College
Northeastern University
Brown University

Syracuse University

1987 Supercomputing Research Center
Johns Hopkins University

1988 Rutgers University
City University of New York
Columbia University

1989 University of Maryland
Technische Universitat, Berlin, W. Germany
Michigan State University
University of California, Berkeley
Dartmouth College
SUNY at Buffalo
Boston University

1990 Georgia Institute of Technology
University of Rochester
Syracuse University

1991 University of Arizona

1993 Rensselaer Polytechnic University
University of Southern California

1994 University of Delaware
University of North Carolina at Greensboro

1995 University of Kentucky
University of Chicago

1996 Osaka University
Tokyo University of Agriculture and Technology

1997 Florida State University
Iowa State University
Brown University
University of Alberta

1998 Texas A & M University

1999 University of Rochester

2003 Iowa State University
University of Rochester

2004 Toyota Technological Institute at Chicago

2006 University of Edinburgh

Durham University
University of Stuttgart