

CURRICULUM VITAE

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Present Position

Full Professor
Department of Mathematics
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Degrees

Ph.D. University of California, Berkeley, 1979.
A.B Rutgers University, 1974.

Positions

1996-Present- Full Professor of Mathematics, Bar Ilan University
January-May 2005 Visiting Professor of Mathematics, Hunter College, CUNY
August-December 2004- Gorenstein Visiting Professor of Mathematics, Queens College, CUNY
January-May 2003- Visiting Professor, University of Virginia
1991- Present Managing Editor, International Journal of Algebra and Computation.
1992-1995 Director, Center for Communication and Information Science, University of Nebraska.
1988-1995 Full Professor of Computer Science, University of Nebraska.
1984-1988 Associate Professor of Computer Science, University of Nebraska.
1982-1984 Assistant Professor of Computer Science, University of Vermont.
1979-1982 Assistant Professor of Mathematics, University of Vermont.
September-December 1990 Maitre de recherche, University of Paris VI.
July-August 1990 Visiting Professor MSRI, Berkeley.
June-July 1990 Visiting Professor, Monash University, Clayton, Australia.
June-July 1988, Maitre de recherche, University of Paris VI.
January-August 1983 Visiting Professor, Institut de Programmation, University of Paris VI.

Grants

Akademia Research Focus Center, 1999-2006, 3000000 Shekels
INTAS, 99-1224, 2000-2002, 60000 Euro
Binational Science Foundation, 2001, \$22000
Israel-France Exchange of Researchers, 1996, \$20000
NSF Grant DMS 9813432, 1998-2001, \$160,134
NSF Grant DMS 9623284, 1996-1998, \$116619
University of Minnesota Geometry Center(NSF funded Science and Technology Center),
"GASP: Groups, Automata and Semigroups Project \$28443
NSF Grant DMS 9203981, 1992-1995, \$216000
NSF Grant M8703010, 1987-1990, \$140000
NSF Grant MCS8503010, 1985-1987 \$87000
NSF/CNRS U.S.-France exchange of scientists program, 1983 \$15000

Research Interests

Automata theory, formal language theory, theory of semigroups, combinatorial group theory, computational abstract algebra.

Refereed Journal Publications

1. *K-transformation semigroups and a conjecture of Tilson*, J. Pure and Appl. Alg. 17(1980), 313-322.
2. *An upper bound for the complexity of transformation semigroups*, with B. Tilson, J. Algebra, 73(1981), 518-537.
3. *On M-varieties generated by power monoids*, Semigroup Forum, 22(1981), 339-353.
4. *On the syntactic transformation semigroup generated by a finite biprefix code*, Theoretical Computer Science, 21(1982), 225-230.
5. *Continuous maps on block designs*, with J. Dinitz, Ars Combinatoria, 14(1982), 21-47.
6. *Continuous maps in finite projective spaces*, with J. Dinitz, Congressus Numerantium, 35(1982), 239-247.
7. *Translational hulls and block designs*, with J. Dinitz, Semigroup Forum 27(1983), 243-261.
8. *Minimal noncommutative varieties and power varieties*, Pac. J. Math., 111(1984), 125-135.
9. *Power monoids and finite \mathcal{J} -trivial monoids*, with J.E. Pin, Semigroup Forum, 26(1984), 132-141.

10. *On varieties of rational languages and variable length codes II*, with J.E. Pin, Journal of Pure and App. Alg., 41(1986), 233-253.
11. *Inverse semigroups and extensions of groups*, with J.E. Pin, J. of Alg. 110 no. 2, (1987), 277-297.
12. *Expansions, free inverse semigroups and Schutzenberger products*, with J.E. Pin, J. of Alg., 110 no. 2(1987), 306-323.
13. *E-unitary inverse semigroups and the Cayley graph of a group presentation*, with J. Meakin, J. Pure and App. Alg. 58(1989), 45-76.
14. *Semigroups whose idempotents form a subsemigroup*, with J.C. Birget and J. Rhodes, Bull. Aust. Math. Soc., 41(1990), 161-184.
15. *Free objects in certain varieties of inverse semigroups*, with J. Meakin and J. Stephen, Canadian J. of Math., XLII, No. 6 (1990), 1084-1097.
16. *Free products of inverse semigroups II*, with P. Jones, J. Meakin and J. Stephen, Glasgow Math J., 33(1991), 373-387.
17. *Profinite topologies, Malcev products and Ash's Theorem, Part I*, with K. Henckell, J.E. Pin, and J. Rhodes, Int. J. of Alg. and Comp., 1(1991), 314-341.
18. *New results on the conjecture of Rhodes and the topological conjecture*, with J.E. Pin, J. Pure and App. Alg., 80(1992), 137-148.
19. *Inverse monoids and rational Schreier subsets of free groups*, with J. Meakin, Semigroup Forum, 44 No. 2 (1992), 137-148.
20. *Trees and inverse semigroups*, with J. Meakin, Contemporary Mathematics, 131(1992), Part 3, 147-158.
21. *Inverse monoids, trees and context free languages*, with J. Meakin, Trans. Am. Math. Soc., 335 No. 1, (1993), 259-276.
22. *Free inverse monoids and graph immersions*, with J. Meakin, Int. J. Alg. and Comp. Vol. 3 No. 1 (1993), 79-100.
23. *Inverse monoids presented by one idempotent relator*, with J.C. Birget and J. Meakin, Theoretical Computer Science, (1994), 274-285.
24. *Quasi-identities of finite semigroups and symbolic dynamics*, with M. Sapir, Israel J. Mathematics, Israel J. Math. 92(1995), 317-331.
25. *On the maximal varieties of finite monoids*, Izv. Vuzov, 39 no. 1 (1995), 65-70.
26. *Bass-Serre theory for groupoids and the structure of full regular semigroup amalgams*, with S. Haataja and J. Meakin, J. of Alg., 183(1996), 38-54.

27. *Algorithmic problems for finite groups and finite 0-simple semigroups*, with T.E. Hall, S. Kublanovsky, M. Sapir, P. Trotter J. Pure and Appl. Alg, 119(1997), 75-96.
28. *Irreducibility of certain pseudovarieties*, with M. Sapir, P. Weil, Comm. in Alg, 26(1998), no. 3, 779-792.
29. *On the word problem for tensor products and semigroups*, with J.C. Birget and J. Meakin, J. Algebra, 195(1999), 147-164.
30. *Algorithmic problems for subgroups of free groups and finite inverse automata*, with J.C. Birget, J. Meakin, P. Weil, Theoretical Computer Science, 131(2000), 247-281.
31. *Finite aperiodic semigroups with commuting idempotents and generalizations*, with P. Higgins, Israel J. of Math, 86(2000), 38-54.
32. *Closed subgroups in pro-V topologies and the extension problem for inverse automata*, with M. Sapir, P. Weil, Int. J. Alg. and Comp., Vol. 11 no. 4 (2001) 405-445.
33. *On one-relator groups and one-relator inverse monoids*, with S. Ivanov and J.C. Meakin, J. Pure and App. Alg. 159(2001) 83-111.
34. *Combinatorial group theory, inverse monoids, automata, and global semigroup theory*, with Manuel Delgado and Benjamin Steinberg, Internat. J. Algebra and Comput. 12 (2002) 179-211.
35. *A complete rewrite system and normal forms for $(S)_{reg}$* , with J.C. Birget, Semigroup Forum 65 (2002) 348-373.
36. *On the Kurosh theorem and separability properties* with Rita Gitik and Benjamin Steinberg, J. Pure Appl. Algebra 179(2003) 87-97.
37. *Words guaranteeing minimum image*, with J.E. Pin and M.V. Volkov, Int. J. Foundations of Computer Science, Vol. 15 No. 2, 259-275, 2003
38. *Power semigroups and polynomial closure*, with Benjamin Steinberg, in the Proceedings of the Third International Colloquium on Words, Languages and Combinatorics, Kyoto, 2003.
39. *On semigroups whose idempotents generate an aperiodic semigroup* with M. Delgado, V.H. Fernandez and B. Steinberg, Int. J. Alg. and Comp., 14 (2004),655-665.
40. *On the variety of triangular matrices over a finite field*, with J. Almeida, M. Volkov, RAIRO-Theoret. Informatics Appl. 39, 31-48 (2005) .
41. *Distortion functions and the membership problem for submonoids of groups and monoids*, with J. Meakin, Z. Sunik, Contemporary Mathematics 372 (2005), 109–129.
42. *Expansions of inverse semigroups* with M. V. Lawson and B. Steinberg, J. Aust. Math. Soc. 80(2006),205-228.

Refereed Conference Proceedings

1. *A generalization of the ideal theorem*, special session on semigroups and their applications, Conference on Semigroups and their Applications, UC Davis.
2. *An Invitation to finite semigroups*, Conference on Semigroups, University of Nebraska, Proceedings.
3. *Languages and inverse semigroups*, with J.E. Pin, Lecture Notes in Computer Science, Vol. 172, 337-346, Springer Verlag, 1984.
4. *Topologies on the free monoid and group languages*, with J.E. Pin, Proceedings of the Marquette semigroups conference, 113-131, 1984.
5. *Graphs, inverse semigroups and languages*, with J.E. Pin, Proceedings of the Marquette semigroup conference, 85-113, 1984.
6. *An extension of the structure theory of inverse semigroups to the non-regular case*, with J.E. Pin, Proceedings of the Conference on theory and applications of inverse semigroups, Greifswald(GDR), 1984, 82-92.
7. *Products of group languages*, with J.E. Pin, Lecture Notes of Computer Science, Vol. 199, 1985, 285-299.
8. *On a class of one relator inverse monoid presentations*, with J Meakin, Proceedings of the LSU semigroups Conference, 1986, 37-41.
9. *Some decision problems for inverse monoid presentations*, with J. Mjeakin and J. Stephen, in Semigroups and their applications, D. Reidel, New York , 1986, 99-110.
10. *Semigroups whose idempotents commute or form a subsemigroup* , with J.C. Birget and J. Rhodes, in Semigroups and Their Applications, D. Reidel, New York, 1986, 25-36.
11. *Kernels and expansions: A historical and technical]erspective*, Proceedings of the Berkeley Conference on Semigroup Monoids, World Scientific, Singapore, 1991, 3-30.
12. *Immersion of graphs and inverse monoids*, Proceedings of the Berkeley Conference on Monoids, World Scientific, Singapore, 1991, 144-158.
13. *Consequences of Ash's proof of the Rhodes Type II conjecture*, Proceedings of the Monash Semigroups Conference, World Scientific, Singapore, 180-205.
14. *A PSPACE-complete problem for subgroups of free groups*, with J.C. Birget, J. Meakin, P. Weil, Lecture Notes on Computer Science, 820, 274-285.
15. *Algorithmic problems for groups, semigroups and inverse semigroups*, with J. Meakin, M. Sapir, in Semigroups, Formal Languages and Groups, J. Fountain Ed., Kluwer, 1995, 147-214.

16. *Varieties of semigroups and languages: past, present and future*, Proceedings of the Tel Aviv Conference on Semigroups, 1994, 6-12.
17. *On the indecomposibility of certain language classes*, with M. Sapir and P. Weil, Proc. of the 4th Israel Symposium on Theory of Computing and Systems, IEEE Computing Society, 1996, 129-135.

Invited Lectures

1. A new proof of the synthesis theorem, Colloquium, Tulane University, November 1977.
2. K-transformation semigroups and a conjecture of Tilson, Conference on the Algebraic Theory of Semigroups, September 1978.
3. An upper bound for the complexity of transformation semigroups, meeting of the AMS, Special Session on Semigroups, April, 1979.
4. A generalization of the ideal theorem, meeting of the AMS, Special Session on Semigroups, April, 1980.
5. An invitation to finite semigroups, Conference on Semigroups, University of Nebraska, September 1980.
6. On operations preserving decidable varieties, McGill University Colloquium, August 1980.
7. Wreath products and kernels of semigroup morphisms, Penn State University Colloquium, March 1981.
8. Minimal noncommutative varieties and power varieties, Conference on Varieties and Disjunctive Languages, University of Western Ontario, June, 1981.
9. Power varieties and literal morphisms, University of Waterloo, Colloquium, April 1982.
10. On the complexity of a finite language, Conference on Combinatorics on Words, University of Waterloo, August 1982.
11. On the membership problem for varieties of finite monoids, Special Session on Semigroups, meeting of the AMS.
12. Codes, decomposition theorems and varieties, Universite de Rouen, Colloquium, March 1983.
13. Methods of decomposition theory, Universite de Paris VI, Colloquium, May 1983.
14. Decidability problems in the theory of varieties, Colloquium, University of Paris VII, May 1983.

15. Varieties of rational languages, University of California, Berkeley, Colloquium, November 1983.
16. Graphs, inverse semigroups and languages, Conference on Semigroups, Marquette University, September 1984.
17. Recent results in the theory of rational languages and paths, Conference on the Semantics of Programming Languages, Kansas State University, April 1985.
18. Relatively free E-unitary inverse semigroups, Conference on Automata, Languages and Semigroups, University of California-Berkeley, August 1985.
19. Word problems for inverse monoid presentations, Conference on Semigroups, Oberwolfach, Germany, February, 1986.
20. Some decision problems for inverse monoid presentations, Conference on Semigroups and their Applications, Chico, California, April 1986.
21. Varieties of rational languages and finite monoids, Conference on Semigroups, University of Kerala, Trivandrum, India, August 1986.
22. Graphs, immersions and inverse categories, Group Theory Seminar, University of California-Berkeley, December 1986.
23. On the variety generated by finite orthodox semigroups, University of California-Berkeley, July 1987.
24. Inverse monoids presented by idempotents, International Conference on Semigroup Theory, Szeged, Hungary, August, 1987.
25. Decision problems for inverse monoids, 16th Ecole de Printemps d'Informatique Theoretique, Ramatuelle, France, May 1988.
26. Immersions and inverse categories, International Conference on Universal Algebra, Lattices and Semigroups, Lisbon Portugal, June 1988.
27. Finitely generated closed inverse submonoids of the free inverse monoid, meeting of the Canadian Math Society, Special Session on Semigroups, December 1988.
28. Kernels and expansions: a historical and technical perspective, 2 lectures, Berkeley Conference on Monoids, August, 1989.
29. A Schreier theorem for closed inverse submonoids of the free inverse monoid, Berkeley Conference on Monoids, Berkeley Conference on Monoids, August, 1989.
30. Consequences of Ash's proof of the Rhodes type II conjecture, Conference on Semigroups, Monash University, July 1990.
31. On Ash's proof of the Rhodes type II conjecture, Conference on Semigroups, University of Sydney, July 1990.

32. On Malcev products with groups, Charles University, Prague Czechoslovakia, September 1990.
33. Recent results in the theory of varieties, Colloquium, Brno, Czechoslovakia, September 1990.
34. An invitation to inverse semigroup theory, Colloquium, University of York, November 1990.
35. Geometric methods in inverse semigroup theory, Colloquium, University of Glasgow, November 1990.
36. Topological methods in inverse semigroup theory, Colloquium, St. Andrews University, November 1990.
37. Decomposition methods in the theory of varieties, Franco-Allemand Joint Computer Science Conference, December 1990, Paris France.
38. A new proof of Ash's Theorem, University of Paris VII, December 1990.
39. The freeness problem for affine semigroups: some work of David A. Klarner, University of Paris VI, December 1990.
40. An Eilenberg type theorem for finitely generated subgroups of free groups and closed inverse submonoids of free inverse monoids, Conference on Semigroups, Marquette University, March 1991.
41. The closed rational sets of the profinite group topology for free monoids and free groups, Conference on Semigroups, Oberwolfach, Germany, July, 1991.
42. Algorithmic problems in Algebra- Seven lecture mini-course, University of Lisbon, June 1992.
43. Inverse semigroups and subgroups of free groups, Colloquium, University of Porto, June 1992.
44. The extension problem for inverse automata, Conference on Semigroups and their Applications, Milan, Italy, June 1992.
45. Symbolic dynamics and identities of inverse semigroups, Colloquium, University of California, Berkeley, July 1992.
46. The closed rational sets in the profinite topology of free monoids and groups, Ben Gurion University, December, 1992.
47. An introduction to the theory of varieties of languages and finite semigroups, Conference on Semigroups and Their Applications, Open University, Tel Aviv, Israel, December 1992.

48. Recent results in the theory of varieties, Conference on Semigroups and Their Applications, Open University, Tel Aviv, Israel, December 1992.
49. Symbolic dynamics and identities and quasi-identities of semigroups, Conference on Semigroups, Qingdao, China, May 1993.
50. Finite basis theorems for semigroups and inverse semigroups, Berkeley Semigroup Conference, July 1993.
51. Algorithmic problems for semigroups, groups and inverse semigroups, 6 lecture series with J. Meakin and M. Sapir, NATO Conference on Groups, Languages and Semigroups, York England, August, 1993.
52. Complexity theory: past. present and future, Tasmania Conference on Semigroups, University of Tasmania, January 1994.
53. Quasi-identities of semigroups and finite basis problems, Universal Algebra Seminar, University of California-Berkeley, May 1994.
54. On the closed finitely generated pro-C groups and their relation to finite semigroup and automata theory, Algebra Seminar, Hebrew University, Jerusalem, Israel, July 1994.
55. PSPACE-completeness of certain algorithmic problems on the subgroups of free groups, ICALP-94, Hebrew University, Jerusalem, Israel.
56. On the word problem for tensor products and amalgams of semigroups, Colloquium, University of California, Berkeley, December 1994.
57. Irreducibility of certain pseudovarieties, Colloquium, University of California, Berkeley, July, 1995.
58. Subgroups of free groups and finite inverse automata, Workshop on Algorithms and Software for Groups and Semigroups, Geometry Center, University of Minnesota, August, 1995.
59. Introduction to AUTOMATE, Workshop on Algorithms and Software for Groups, Automata and Semigroups, Geometry Center, University of Minnesota, August 1995.
60. AUTOMATE: A computational system for semigroups and automata, 2nd MAGMA Conference, Marquette University, May, 1996.
61. Indecomposibility of certain language classes, 4th Israeli Symposium on Theoretical Computer Science and Systems, Hebrew University, June 1996.
62. Closure of subgroups of free groups, automata and finite semigroups, 2nd Amitsur Memorial Conference in Algebra, Hebrew University, June 1996.

63. The AUTOMATE system for automata and semigroups, WIA96, University of Western Ontario, August, 1996
64. Profinite topologies and completions of automata, Semigroup Seminar, University of Nebraska, February, 1997.
65. On embedding semigroups in inverse and regular semigroups, International conference on Algorithms, Groups and Semigroups, University of Nebraska, June 1998
66. On the word problem for one relator inverse semigroups, International Conference on Semigroup Theory, University of Minho, Braga, Portugal, July, 1999
67. Inverse semigroup theoretic algorithms for subgroups of free groups, International Conference on Geometric Group Theory, Technion, Haifa, Israel, June 2000
68. Computing profinite closures of finitely generated subgroups of free groups, International Conference on Group Theory, University of Trento, June 2001.
69. Finite inverse semigroups and subgroups of free groups, Colloquium, University of Virginia, February, 2003.
70. On embedding monoids in groups, Conference on Semigroups and Automata Theory, McGill University, March 2003.
71. Inverse semigroup theoretic methods for embedding monoids in groups, Colloquium, University of York, May 2003.
72. Inverse semigroup theoretic algorithms for subgroups of free and related groups, Colloquium, University of Newcastle, May 2003.
73. Undecidable problems for finite groups and finite semigroups, Colloquium, University of Northern Wales, May 2003
74. Undecidable problems in finite group theory, International Conference on Group Theory, Gaeta, Italy, June 2003.
75. Inverse semigroups and embedding monoids in groups, International Conference on Semigroup Theory, University of Minho, Braga, Portugal, June 2003.
76. Inverse automata and semigroups in the theory of free groups, Colloquium, University of Firenze, October, 2003.
77. Inverse automata and semigroups in the theory of free groups, Colloquium, Queens College, CUNY, November, 2003.
78. Irreducible Representations of Finite Monoids, the Rhodes Radical and Formal Language Theory, Colloquium, University of Paris VI, May, 2004
79. Representation theory and the theory of automata, AMS Meeting October, 2004, Vanderbilt University.

80. Subgroups of free groups and inverse automata, series of 10 lectures, Gorenstein Lecture Series, Queens College, CUNY October-December 2004.
81. Subgroups of free groups and the theory of automata, Hunter College, CUNY, November, 2004.
82. Representation theory and formal language theory, Can. Math. Soc. Meeting, December, 2004.
83. Logic, automata and semigroups, Hunter College, February, 2005.
84. Inverse monoids, logic, and the computational complexity of computing root groups in free groups, New York Group Theory Seminar, April 2005.
85. Subgroups of free groups, automata and inverse semigroups, Hunter College, May, 2005.
86. Subgroups of free groups, automata and inverse semigroups, Florida Atlantic University, May, 2005.

Courses Taught

Theory of automata
Theory of formal languages
Theory of computability
Complexity theory
Compiler construction
Operating systems
Advanced operating systems
Data structures
Discrete structures
Discrete mathematics
Program correctness
Algebraic automata theory
Logic
Logic programming
Analysis of algorithms
Assembly programming
Calculus I,II,III
Linear algebra
Differential equations
Differential geometry
Group theory
Groups, algebras and representations