Howard Straubing

CURRICULUM VITAE

Computer Science Department
Boston College
Chestnut Hill, Massachusetts
02467

Education

- Ph.D. (Mathematics), University of California at Berkeley, 1978. (Dissertation: 'Varieties of recognizable sets whose syntactic monoids contain solvable groups'.)

- A.B., University of Michigan, 1974. Major in mathematics.

Professional Appointments

- Professor, Computer Science Department, Boston College, since September, 1991.

- Visiting Researcher, CRIStAL (Centre de recherche en informatique, signal et automatique de Lille), Univeristy of Lille, Lille, France, October-November, 2022.

- Department Chairperson, Computer Science Department, Boston College, June, 2019-June, 2022.

- Interim Department Chairperson, Computer Science Department, Boston College, January, 2018-June, 2018.

- Visiting Researcher, IRIF (Institut pour recherche en informatique fondamentale), Paris, France, May-June, 2017.

- Visiting Researcher, IRIF (Institut pour recherche en informatique fondamentale), Paris, France, May-June, 2016.

- Professeur Invité, Université de Paris Diderot, Paris, France, March-May, 2013.

- Professeur Invité, LSV, Ecole Normale Supérieure de Cachan, Cachan, France, May-June, 2011.

- Chairperson, Computer Science Department, Boston College, June, 2007-December, 2010.

- Professeur Invité, LABRI, Université de Bordeaux I, Talence, France, May-June, 2007.

- Professeur Invité, LIAFA, Université de Paris VII, Paris, France, March-April, 2006.

- Professeur Invité, LIAFA, Université de Paris VII, Paris, France, June, 2002.

- Visiting Research Professor, Computer Science Department, Boston University, September, 1998-December, 1998.

- Visiting Researcher, Dipartimento di Matematica, Università di Roma "La Sapienza", Rome, Italy, March, 1992.

- Professeur Invité, Département d'Informatique et Rechereche Opérationelle, Université de Montréal, Montreal, Quebec, Canada, September-December, 1992.

- Chairperson, Computer Science Department, Boston College, January, 1990–June, 1992.

- Maître de Conférences, Université de Paris VII, Paris, France September-December, 1989.

- Associate Professor, Computer Science Department, Boston College, September, 1987–August, 1991.

- Assistant Professor, Computer Science Department, Boston College, September, 1984–August, 1987. Granted tenure in March, 1987.

- Professeur Associé, Institut de Programmation, Université de Paris VI, Paris, France, January–August, 1981.

- Assistant Professor, Mathematics Department, Reed College, Portland, Oregon, September, 1978–August, 1984.

Editorial Appointments

- Program Committee Member, 2018 STACS (Symposium on Theoretical Aspects of Computer Science)

- Program Committee Member, 2012 LATA (International Conference on Language and Automata Theory and Applications)

- Former Editor, *International Journal of Algebra and Computation.*

- Former Editor, *Electronic Journal of Discrete Mathematics and Theoretical Computer Science.*

- Former Editor, *Semigroup Forum.*

- Program Committee Member, 2010 SOFSEM (International Conference on Current Trends in the Theory and Practice of Computer Science).

- Program Committee Member, 2009 ICALP (International Conference on Automata, Languages and Programming).

- Program Committee Member, 2008 STACS (Symposium on Theoretical Aspects of Computer Science).

- Program Committee Member, 2007 FCT (International Symposium on Fundamentals of Computation Theory).

- Program Committee Member, 2006 LATIN (Latin American Theoretical Informatics).

- Program Committe Member, 1992 IEEE Conference on Structure in Complexity Theory.

Publications

Research and Expository Articles

1. H. Straubing and P. Weil, 'Varieties', in J. E. Pin, ed., *Handbook of Automata Theory,* EMS Press (2021), 569-615.

2. A. Krebs, K. Lodaya, P. Pandya and H. Straubing, 'Two-variable logic with betweenness relations: Membership, satisfiability and expressibility', to appear in *Logical Methods in Computer Science*, **16:3** (2020). (https://doi.org/10.23638/LMCS-16(3:16)2020)

3. C. Borlido, M. Gehrke, A. Krebs and H. Straubing, 'Difference hierarchies and duality with an application to formal languages', *Topology and its Applications* **273** (2020). (https://doi.org/10.1016/j.topol.2019.106975)

4. A. Krebs, K. Lodaya, P. Pandya and H. Straubing, 'An algebraic decision procedure for two-variable logic with a between relation', *27th EACSL Annual Conference on Computer Science Logic (CSL 2018)*, 28:1-28:17, (2018).

5. M. Hahn, A. Krebs and H. Straubing, 'Wreath products of distributed forest algebras', *33rd Annual IEEE Symposium on Logic in Computer Science (LICS 2018)*, 512-520 (2018).

6. H. Straubing, 'First-order logic and aperiodic languages: a revisionist history' *ACM SIGLOG News* **5:3** 4-20 (2018).

7. A. Krebs and H. Straubing, 'An effective characterization of the alternation hierarchy in two-variable logic', *ACM Transactions on Computational Logic,* **18** (4:30), (2017).

8. A. Chattopadhyay, F. Green, and H. Straubing, 'Circuit complexity of powering in fields of odd characteristic', *Chicago J. Theor. Comput. Sci.* **2016:10**.

9. A. Krebs, K. Lodaya, P. Pandya and H. Straubing, 'Two-variable logic with a between relation', *Proc. 27th IEE Symposium on Logic in Computer Science (LICS)*, 106-115 (2016).

10. A. Krebs and H. Straubing, 'EF+EX Forest Algebras', in A. Maletti, ed., Proceedings 6th International Conference on Algebraic Informatics, *Lecture Notes in Computer Science* **9270** Springer International Publishing, 128-139 (2015).

11. H. Straubing, 'A new proof of the locality of **R**,' *International Journal of Algebra and Computation* **25**, 293-300 (2015).

12. H. Straubing, 'New applications of the wreath product of forest algebras', *RAIRO-Theoretical Informatics and Applications* **47**(3), 261-291 (2013).

13. A. Krebs and H.Straubing, 'An effective characterization of the alternation hierarchy in two-variable logic', in D. D'Souza, T. Kavitha, and J. Radhakrishnan, eds., *FSTTCS 2012*, LIPIcs **18** (2012) 86-98.

14. M. Bojanczyk, H. Straubing and I. Walukiewicz, 'Wreath Products of Forest Algebras, with Applications to Logics for Unranked Trees', *Logical Methods in Computer Science* **8** (3:19) (2012) (Extended abstract presented at LICS 2009.)

15. M. Bojanczyk, L. Segoufin and H. Straubing ' Piecewise testable forest languages', *Logical Methods in Computer Science* **8** (3:26) (2012) (Extended abstract presented at LICS 2008.)

16. H. Straubing and P. Weil, 'An introduction to finite automata and their connection to logic', in D. D'Souza and P. Shankar, eds., *Modern Applications of Automata Theory* IISc Research Monographs 2, World Scientific (2012), pp. 3-43.

17. H. Straubing, 'Algebraic Characterization of the Alternation Hierarchy in $FO^2[<]$ on Finite Words', in *Computer Science Logic 2011,* LIPIcs **12** (2011) 525-537.

18. H. Straubing, P. Tesson and D. Thérien, 'Weakly Iterated Block Products and Applications to Logic, Circuits and Communication Complexity', *International Journal of Algebra and Computation* **20**(2) (2010), 219-341.

19. M. Bojanczyk, H. Straubing and I. Walukiewicz, 'Wreath Products of Forest Algebras, with Applications to Logics for Unranked Trees' (extended abstract), *Proc. 24th IEEE Symposium on Logic in Computer Science (LICS)*, (2009), 255-263.

20. H. Straubing and D. Thérien, 'Modular Quantifiers', in E. Grädel, J. Flum and T. Wilke (eds.), *Logic and Automata: History and Perspectives*, vol. 2 of the series *Texts in Logic and Games,* Amsterdam University Press, 2008, pp. 627-643.

21. Mikolaj Bojanczyk, Luc Segoufin and H. Straubing ' Piecewise testable forest languages' (extended abstract), in *Proc. 23rd IEEE Symposium on Logic in Computer Science (LICS)*, (2008), 442-451.

22. A. Roy and H. Straubing, 'Definability of Languages by Generalized First-order Formulas over $(\mathbf{N}, +)$', *SIAM Journal on Computing,* **37** (2007) 502-521. Preliminary version appeared in Proceedings 23rd STACS, *Lecture Notes in Computer Science* **3884** (2006) 35-50.

23. H. Straubing and D. Thérien, 'A Note on Mod p-Mod m Circuits', *Theory of Computing Systems* **39** (2006) 699-706.

24. E. Dueñez, S. Miller, A. Roy and H. Straubing 'Incomplete Quadratic Exponential Sums in Several Variables', *J. Number Theory,* **116** (2006) 168-199.

25. L. Chaubard, J. E. Pin and H. Straubing 'First-order Formulas with Modular Predicates', Proceedings of 2006 21st IEEE Symposium on Logic in Computer Science, (2006), 211-220.

26. L. Chaubard, J.E. Pin and H. Straubing, 'Actions, Wreath Products of C-varieties, and Concatenation Product', *Theoretical Computer Science* **356** (2006), 73-89.

27. J. E. Pin and H. Straubing 'Some Results on $\mathcal{C}$-varieties', *RAIRO: Theoretical Informatics,* **39** (2005) 239-262.

28. F. Green, A. Roy and H. Straubing, 'Bounds on an Exponential Sum Arising in Boolean Circuit Complexity', *C.R. Acad. Sci. Paris,Ser. I* **341** (2005) 279-282.

29. H. Straubing, 'Inexpressibility Results for Regular Languages in Nonregular Settings', in C. de Felice, A. Restivo (eds.), *Developments in Language Theory, LNCS 3572,* (2005) 69-77.

30. H. Straubing and D. Thérien, 'Regular Languages Defined by Generalized First-order Formulas with a Bounded Number of Bound Variables', *Theory of Computing Systems* **36** (2003) 29-69.

31. H. Straubing and D. Thérien, 'Weakly Iterated Block Products of Finite Monoids', in Proceedings of LATIN 2002, *Lecture Notes in Computer Science* **2286** (2002).

32. 'On the Logical Description of Regular Languages', Proceedings of LATIN 2002, *Lecture Notes in Computer Science* **2286** (2002).

33. 'Finite Semigroups and the Logical Description of Regular Languages', in G. M. S. Gomes, J.-E. Pin and P.V. Silva, eds., *Semigroups, Algorithms, Automata and Languages,* (World Scientific, Singapore, 2001) 463-474.

34. 'Languages Defined by Modular Quantifiers', *Information and Computation* **166** (2001) 112-132.

35. 'When Can One Finite Monoid Simulate Another?', in J.C. Birget, S. Margolis, J. Meakin and M. Sapir (eds.) *Algorithmic Problems in Groups and Semigroups,* Birkhäuser (2000) 267-288.

36. D. Barrington and H. Straubing, 'Lower Bounds for Modular Counting by Circuits with Modular Gates', *Computational Complexity* **8** (1999) 258-272.

37. 'Languages Defined with Modular Counting Quantifiers', Proceedings of 15th Annual Symposium on Theoretical Aspects of Computer Science, *Lecture Notes in Computer Science* **1373**, Springer, Berlin (1998) 332-343.

38. 'Finite Models, Automata, and Circuit Complexity' in N. Immerman and P. Kolaitis (eds.) *Descriptive Complexity and Finite Models,* DIMACS Series in Discrete Mathematics and Theoretical Computer Science, American Mathematical Society (1997) 63-96.

39. P. Péladeau, H. Straubing and D. Thérien, 'Finite Semigroup Varieties Defined by Programs', *Theoretical Computer Science,* **180** (1997) 325-339

40. D. A. Mix Barrington and H. Straubing 'Lower Bounds for Modular Counting by Circuits with Modular Gates', in Proceedings of the 2nd Latin American Symposium on Theoretical Computer Science, *Lecture Notes in Computer Science* **911** Springer, Berlin (1995), 60-71.

41. H. Straubing, D. Thérien and W. Thomas, 'Regular languages defined with generalized quantifiers', *Information and Computation* **118** (1995) 289-301.

42. R. Beigel and H. Straubing, 'The Power of Local Self-Reductions', in Proceedings of the Tenth IEEE Conference on Structure in Complexity Theory, 1995.

43. H. Straubing, D. Thérien and W. Thomas, 'Logics for Regular Languages, Finite Monoids, and Circuit Complexity', in J. Fountain (ed.), *Semigroups, Formal Languages and Groups,* Kluwer Academic Publishers (1995), 119-146.

44. K. J. Compton and H. Straubing, 'Characterizations of the regular languages in low-level complexity classes', *Bulletin of the European Association for Theoretical Computer Science* **48** (1992) 134-142.

45. 'Circuit complexity and the expressive power of generalized first-order formulas', in Proceedings of ICALP 92, *Lecture Notes in Computer Science* **623** Springer, Berlin (1992) 16-27.

46. D. A. Mix Barrington, K. Compton, H.Straubing and D. Thérien, 'Regular Languages in NC^1, *J. Comp. Syst. Sci.* **44** (1992) 478-499.

47. H. Straubing and P. Weil, 'On a conjecture concerning dot-depth two languages', *Theoretical Computer Science* **104** (1992) 161-183.

48. J.E. Pin, H. Straubing and D. Thérien 'Some Results on the Generalized Star-Height Problem', *Information and Computation* **101** 219-250 (1992).

49. D. A. Mix Barrington and H. Straubing, 'Complex polynomials and circuit lower bounds for modular counting', in Proceedings of LATIN '92 conference, *Lecture Notes in Computer Science* **583**, Springer, Berlin (1992) 24-31; journal version in *Computational Complexity* **4** (1994) 325-338.

50. D. A. Mix Barrington and H. Straubing, 'Superlinear lower bounds for bounded-width branching programs', in *Proc. 6th IEEE Structure in Complexity Theory Conference* (1991) 305-314; journal version in in *J. Comp. Syst. Sci.* **50** (1995) 374 - 381

51. 'Automata, logic and computational complexity', in *Monoids and Semigroups with Applications,* (J. Rhodes, ed.), World Scientific, (1991) 467-492

52. 'Constant-depth periodic circuits', *International J. Algebra and Computation,* **1** (1991), 49-87.

53. 'The wreath product and its applications' in *Formal Properties of Finite Automata and Applications,* (J.E. Pin, ed.) *Lecture Notes in Computer Science* **386**, Springer, Berlin (1990) 15-24.

54. H. Straubing and D. Thérien, 'Finite automata and computational complexity' in *Formal Properties of Finite Automata and Applications,* (J.E. Pin, ed.) *Lecture Notes in Computer Science* **386**, Springer, Berlin (1990) 199-223.

55. D. A. Mix Barrington, H. Straubing and D. Thérien, 'Non-Uniform automata over groups', *Information and Computation.* **89** (1990) 109-132

56. D.A. Mix Barrington, N. Immerman and D. Thérien, 'On uniformity in NC^1', *J. Comp. Syst. Sci.* **41** (1990), 274-306.

57. J.E. Pin, H. Straubing and D. Thérien 'New Results on the Generalized Star-Height Problem', *6th Annual Symposium on Theoretical Aspects of Computer Science (STACS 1989)* 458-467 (1989).

58. H. Straubing and D. Thérien, 'Partially ordered finite monoids and a theorem of I. Simon', *Journal of Algebra* **119** (1988), 393-399.

59. 'Semigroups and Languages of dot-depth two', *Theoretical Computer Science* **58** (1988), 361-378.

60. H. Straubing, D. Thérien and W. Thomas,'Regular languages defined with generalized quantifiers', *Proc. 15th ICALP,Lecture Notes in Computer Science* **317**, Springer, Berlin (1988) 561-575

61. J. E. Pin, H. Straubing, and D. Thérien) 'Locally trivial categories and unambiguous concatenation', *Journal of Pure and Applied Algebra* **52** (1988) 297-311.

62. 'Applications of the theory of automata in enumeration', *Discrete Mathematics* **64** (1987), 269-279.

63. H. Straubing and D. Thérien, 'Finite J-trivial monoids and partially ordered monoids', in S. Goberstein and P. M. Higgins, eds., *Semigroups and their Applications,* (D. Reidel, Dordrecht, 1987), 183-191.

64. 'Semigroups and languages of dot-depth two' (extended abstract), *Proc. 13th ICALP*, Lecture Notes in Computer Science **218**, Springer, 1986, 416-423.

65. 'Finite semigroup varieties of the form $\mathbf{V} * \mathbf{D}$, *Journal of Pure and Applied Algebra* **36** (1985), 53-94.

66. J.E. Pin and H. Straubing, 'Monoids of upper triangular matrices', *Colloquia Math. Soc. J. Bolyai* **39** (dated 1981; appeared 1985), 259-272.

67. J. E. Pin, H. Straubing, and D. Thérien) 'Small varieties of finite semigroups', *Journal of the Australian Mathematical Society A* **37** (1984), 269-281.

68. 'The Burnside problem for semigroups of matrices', in L. Cummings, ed., *Combinatorics on Words* (Academic Press, New York, 1983), 279-296.

69. C. Reutenauer and H. Straubing. 'Inversion of matrices over a commutative semiring', *Journal of Algebra* **88** (1984), 350-360.

70. 'A combinatorial proof of the Cayley-Hamilton theorem', *Discrete Mathematics* **43** (1983), 273-279.

71. 'The variety generated by finite nilpotent monoids', *Semigroup Forum* **24** (1982), 25-38.

72. 'Relational morphisms and operations on recognizable sets', *RAIRO (Informatique théorique)* **15** (1981), 149-159.

73. J. E. Pin and H. Straubing, 'Remarques sur le dénombrement des variétés de monoïdes finis', *C. R. Acad. Sci. Paris* t. 292 (January, 1981).

74. 'A generalization of the Schützenberger product of finite monoids', *Theoretical Computer Science* **13** (1981), 137-150

75. 'Recognizable sets and power sets of finite semigroups', *Semigroup Forum* **19** (1980), 331-340.

76. 'On finite J-trivial monoids', *Semigroup Forum* **19** (1980), 107-110.

77. 'Aperiodic morphisms and the concatenation product of recognizable sets', *Journal of Pure and Applied Algebra* **15** (1979), 319-327.

78. 'Families of recognizable sets corresponding to certain varieties of finite monoids', *Journal of Pure and Applied Algebra* **15** (1979), 305-318.

Book Review

- Review of *Finite Automata, their Algebras and Grammars,* by J. Richard Büchi, *Bull. Amer. Math. Soc.* **26** (1992) 340-343.

Book

- *Finite Automata, Formal Logic, and Circuit Complexity,* Birkhaüser, Boston, 1994.

Grants and Awards

- Grant from Boston College Affordable Course Materials program, for the development of a free electronic textbook for the courses Logic and Computation and Randomness and Computation (collaboration with Sergio Alvarez), 2015.

- National Science Foundation Grant CCF-0915065, October, 2009-September, 2012, 'Algebraic Methods for the Study of Logics on Trees', $244,537.

- Teaching, Advising and Mentoring Grant from Boston College for development of core introductory course in Computer Science, 2006.

- Research Incentive Grant, Boston College, 2000.

- National Science Foundation Grant CCR-9203208, September, 1992-February, 1995, 'Complexity of Small-depth Circuits', $120,740.

- National Science Foundation Grant CCR-8902369, July, 1989-December, 1992, 'Algebraic and Logical Approaches to Circuit Complexity', $94,114.

- National Science Foundation Grant CCR-8700700, July, 1987-December, 1989, 'Development of Algebraic Theories of Formal Languages and Circuit Complexity', $51,686 .

Recent invited presentations

'Expressing properties of finite automata in variants of first-order logic', May, 2025, Northeastern University, Boston.

'Expressing properties of finite automata in variants of first-order logic', April, 2025, LIPN, Villetanneuse, France. (Announcement posted at https://lipn.univ-paris13.fr/ banderier/Seminaires/.)

'An old problem on automata and logic', theory seminar, Computer Science Department, December, 2023, Boston University.

(Announcement posted at https://www.bu.edu/cs/algorithms-and-theory-seminar/).

'The algebra of finite categories', invited talk at the LICS affiliated workshop 'Structure Meets Power', June, 2023, Boston University.

(Announcement and abstract posted at https://www.cst.cam.ac.uk/conference/structure-meets-power-2023/programme)

'An old problem on automata and logic', K Lakshmanan Memorial Distinguished Lecture, March, 2023, Chennai Mathematical Institute, Chennai, India.

(Announcement and abstract posted at https://www.cmi.ac.in/activities)

'A problem in logic and automata', seminar of the group 'Automates' at IRIF, October, 2022, Paris, France.

(Announcement and abstract posted at https://www.irif.fr/seminaires/automates/index.)

'What can you say (about strings and trees) in first-order logic?', Theory group seminar, April, 2022, University of Massachusetts, Amherst, Computer Science departement.

'Two-variable logic with a between relation', Seminar of LaBRI (Laboratoire bordelais pour recherche en informatique), February, 2020, University of Bordeaux, France.

'Block products', Tüftler Seminar, June, 2017, University of Tübingen, Germany.

'The power of two variables', Workshop on Symmetry, Logic, Computation, November, 2016, Simons Institute for the Theory of Computing, University of California, Berkeley, California.

(Abstract and talk posted at

https://simons.berkeley.edu/talks/howard-straubing-11-07-2016.)