

Aaron Williams
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Research

Positions

- Postdoctoral fellow at Carleton University, May 2010 – August 2011. This position is currently being hosted by Brett Stevens
- Postdoctoral fellow at the University of Guelph, March 2010 – April 2010. This position was hosted by Joe Sawada.

Degrees

- PhD in Computer Science, University of Victoria, 2004-2009. Thesis entitled *Shift Gray Codes* in the field of combinatorial generation.
- Masters of Mathematics in Combinatorics & Optimization, University of Waterloo, 2002-2003. Thesis entitled *Packing Directed Joins* in the field of combinatorial optimization.
- Bachelor of Mathematics in Combinatorics & Optimization, University of Waterloo, 1996-2001. Graduated with distinction in Honors co-op program.
- Bachelor of Mathematics in Computer Science, University of Waterloo, 1996-2001. Graduated with distinction in Honors co-op program.

Distinctions and Awards

- Finalist for the Distinguished Dissertation Award from the Canadian Association of Graduate Studies in 2009. This award is for “unusually significant and original contributions to their academic field” during the calendar year. Each Canadian university nominates one finalist per year for the combined area of engineering, medical sciences and natural sciences.
- Finalist for the University of Victoria’s Governor General’s Gold Medal in 2009. Each faculty nominates one finalist per year.
- Finalist for Bell Canada 125th Anniversary Scholarship in 2005. This scholarship was open to all Canadian graduate students.
- Best paper by a PhD student, CATS 2008: The Australasian Theory Symposium, 2008 (\$500) for the paper *Generating Balanced Parentheses and Binary Trees by Prefix Shifts*.
- NSERC Post-Graduate Doctoral Scholarship, 2005-2008 (\$63,000). This award funded my PhD at the University of Victoria.
- Ontario Graduate Scholarship, 2002-2004 (\$30,000). This award funded my Masters degree at the University of Waterloo.

Publications and Submissions

Published Journal Articles

- [1] F. Ruskey, J. Sawada, and A. Williams, *Binary Bubble Languages and Cool-lex Order*. Journal of Combinatorial Theory Series A [JCTA] (accepted) 2011, 13 pages.
- [2] A. Holroyd, F. Ruskey, and A. Williams, *Shorthand Universal Cycles for Permutations*. Algorithmica (accepted) 2011, 30 pages.
- [3] F. Ruskey, and A. Williams, *The Feline Josephus Problem*. Theory of Computing Systems (accepted) 2011, 13 pages.
- [4] F. Ruskey and A. Williams, *An Explicit Universal Cycle for the $(n-1)$ -Permutations of an n -Set*. ACM Transactions on Algorithms, Volume 6, Issue 3, Article 45 (2010).
- [5] F. Ruskey and A. Williams, *The Coolest Way to Generate Combinations*, Discrete Mathematics, Volume 309, Issue 17 (2009), 5305-5320.

Submitted to Journal

- [6] J. Sawada and A. Williams, *A Gray Code for Fixed-Density Necklaces and Lyndon Words in Constant Amortized Time*. Submitted to Theoretical Computer Science (Special Issue for GASCOM 2010) in March 2011.
- [7] F. Ruskey, J. Sawada, and A. Williams, *Fixed-Density de Bruijn Sequences*. Submitted to SIAM Journal of Discrete Mathematics in September 2010.
- [8] J. Sawada, and A. Williams, *Efficient Oracles for Generating Binary Bubble Languages*. Submitted to Electronic Journal of Combinatorics in September 2010.

Published Refereed Conference Proceedings

- [9] B. Stevens and A. Williams, *Hamilton Cycles in Restricted Rotator Graphs*. Submitted to the 22nd International Workshop on Combinatorial Algorithms (IWOCA 2011).
- [10] S. Durocher, P. C. Li, D. Mondal, and A. Williams, *Ranking and Loopless Generation of k -ary Dyck Words in Cool-lex Order*. Submitted to the 22nd International Workshop on Combinatorial Algorithms (IWOCA 2011).
- [11] J. Sawada, B. Stevens, and A. Williams, *De Bruijn Sequences for Binary Strings with Maximum Density*, the 5th Workshop on Algorithms and Computation (WALCOM 2011), New Delhi, India, 6552 Lecture Notes in Computer Science (2011).
- [12] A. Holroyd, F. Ruskey, and A. Williams, *Faster Generation of Shorthand Universal Cycles for Permutations*, The Sixteenth International Computing and Combinatorics Conference (COCOON 2010), Nha Trang, Vietnam, 2010, Lecture Notes in Computer Science, 6196 (2010) 298-307.
- [13] A. Williams, *$O(1)$ -Time Unsorting by Prefix-Reversals in a Boustrophedon Linked List*, Fifth International Conference on FUN with Algorithms (FUN 2010), Ischia Island, Italy, 2010, Lecture Notes in Computer Science, 6099 (2010) 368-379.

- [14] F. Ruskey and A. Williams, *The Feline Josephus Problem*, Fifth International Conference on FUN with Algorithms (FUN 2010), Ischia Island, Italy, 2010, Lecture Notes in Computer Science, 6099 (2010) 343-354.
- [15] A. Williams, *Loopless Generation of Multiset Permutations using a Constant Number of Variables by Prefix Shifts*. SODA 2009, ACM-SIAM Symposium on Discrete Algorithms, New York, United States (2009).
- [16] F. Ruskey and A. Williams, *Generating Balanced Parentheses and Binary Trees by Prefix Shifts*, Proc. Fourteenth Computing: The Australasian Theory Symposium (CATS 2008), Wollongong, Australia, 2008. Theory of Computing, 77 (2008). 107-115.
- [17] G. Lee, F. Ruskey, and A. Williams, *Hamming Distance from Irreducible Polynomials over \mathbb{F}_2* , International Conference on Analysis of Algorithms (AofA 2007), Juan-les-pins, France, 2007. DMTCS (2007). 169-180.
- [18] O. Lee and A. Williams, *Packing Dicycle Covers in Planar Graphs with no $K_5 - e$ Minor*, Theoretical Informatics 7th Latin American Symposium (LATIN 2006), Valdivia, Chile, 2006. Lecture Notes in Computer Science, 3887 (2006) 677-688.
- [19] F. Ruskey and A. Williams, *Generating Combinations by Prefix Shifts*, The Eleventh International Computing and Combinatorics Conference (COCOON 2005), Kunming, China, 2005. Lecture Notes in Computer Science, 3595 (2005) 570-576.
- [20] B. Guenin and A. Williams, *Advances in Packing Directed Joins*, GRACO 2005, 2nd Brazilian Symposium on Graphs, Algorithms, and Combinatorics, Angra dos Reis, Brazil, 2005. Electronic Notes in Discrete Mathematics, 19 (2005) 249-255.

Teaching

- Instructor for Math 4805 / Math 5605 / Comp 4805 (Finite Automata), Carleton University, Fall 2010. Three lectures per week with 7 students.
- Instructor for CSC 322 (Logic and Computer Science), University of Victoria, Fall 2007. Three lectures per week with 25 students.
- Instructor for Math 135 (Classical Algebra), University of Waterloo, Fall 2003. Three lectures per week with 60 students.
- Outstanding Teaching Assistant Award, Department of Combinatorics & Optimization, University of Waterloo, Fall 2002.

Community Outreach

- National media coverage including the *National Post* newspaper, *CFOX 1070* radio, and *A-Channel* television for my discovery of a flaw in the 2010 FIFA World-Cup tiebreaker rules. The error allows for situations in which three teams can logically argue for placement in the top two positions of their Group, thereby causing ambiguity on who advances to the Round of 16. The problem arises from FIFA's mishandling of *partially unbroken three-way ties* and

journalist Sarah Petrescu named this story the most memorable of 2009 in Victoria's *Times Colonist* newspaper (December 18, 2009).

Sarah Petrescu - Memorable Stories: Victoria Mathematician Finds Flaw in FIFA World Cup Rules

BY SARAH PETRESCU, TIMES COLONIST FEBRUARY 11, 2010



[More Images »](#)

On Sunday, Victoria mathematician Aaron Williams reveals what he says is a flaw in FIFA's World Cup tie-breaking rules.

Photograph by: Bruce Stotesbury, Times Colonist

- Art shows including *The Make* and *Look 2007* where I exhibited visual representations of my research in combinatorial generation, together with explanations for the general public. These works have also been published in books such as *The Feast* (ISBN 0-978066-30-98).
- Volunteering at the University of Victoria including training senior citizens to use the internet, and teaching young girls to program Lego robots.

Work Experience

Discreet Logic

- Programmer and Designer, including development of internal programming language using Lex and Yacc, Summer 1999 and Summer 2000.

Corel Corporation

- Programmer and Designer, including nib rotation feature and bug fixing, Fall 1997 and Summer 1998.
- Quality Assurance Specialist, Winter 1997.