

# CHRISTOPHER J. HILLAR

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## EDUCATION

**University of California, Berkeley**, Berkeley, CA, 2001 – 2005

- Ph.D. Mathematics (advisor: Bernd Sturmfels)
- Thesis Topic: Solving Polynomial Systems with Special Structure

**Yale University**, New Haven, CT, 1996 – 2000

- Graduated Cum Laude.
- B.S. Intensive Mathematics (with distinction in the major), B.S. Computer Science (with distinction in the major)

Honors/Awards:

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|---|-------------|
| • <b>NSA Young Investigators Grant</b> (Mathematics)                        | 2008 – 2010 |
| • <b>NSF Postdoctoral Fellowship</b> (Mathematics)                          | 2005 – 2008 |
| • <b>NSF Graduate Research Fellowship</b> (Mathematics)                     | 2001 – 2004 |
| • <b>John DeForest Prize</b> for excellence in pure and applied mathematics | 2000        |
| • <b>Anthony Stanley Memorial Prize</b> for excellence in mathematics       | 1998, 1999  |

## EXPERIENCE

**Redwood Center for Theoretical Neuroscience**, Berkeley, CA, August 2011 – August 2012

**Assistant Project Scientist**

**Mathematical Sciences Research Institute**, Berkeley, CA, June 2009 – June 2011

**MSRI NSF Institutes Postdoctoral Fellow and NSA Young Investigator**

**Mathematical Sciences Research Institute**, Berkeley, CA, January 2009 – May 2009

**Research Member and NSA Young Investigator**

**Texas A&M University**, College Station, TX, Fall 2005 – Summer 2008

**Visiting Assistant Professor and NSF Postdoctoral Fellow**

- Organized the Texas A&M Algebra and Combinatorics Seminar.

**Art Institute at San Francisco**, San Francisco, CA, Fall 2004 – Spring 2005

**Instructor**

- Taught a class titled *Data Structures*, covering basic computer algorithms with programming component in C++. Topics included *Discrete Mathematics*, *Trees*, *Sorting*, *Hashing*, *Graph Theoretical Algorithms*.

**College of William and Mary**, Williamsburg, VA, Summer 1999, 2002

**Matrix Analysis and its Applications**

- (1999) One of eight U.S. undergraduates selected to participate in intensive research experience. NSF-funded, eight week program involved one-on-one interaction with research faculty to solve open problems.
- (2002) Served as graduate mentor to the students selected to participate in above program. Lectured, supervised research, and collaborated on several projects.

## RESEARCH INTERESTS

Computational mathematics, combinatorics, matrix analysis, mathematical neuroscience, structured systems of equations

## SELECTED PUBLICATIONS

14. (with O. Bastani, D. Popov, and J.M. Rojas) *Randomization, sums of squares, near-circuits, and faster real root counting*, Contemporary Mathematics Proceedings, AMS Press, to appear.

13. (with F. Sommer) *Ramsey theory reveals the conditions when sparse coding on subsampled data is unique*, submitted, 2011.

12. (with G. Isely and F. Sommer) *Deciphering subsampled data: adaptive compressive sampling as a principle of brain communication*, Neural Information Processing Systems, 2010.

11. (with S. Sullivant) *Finiteness Grobner bases in infinite dimensional polynomial rings and applications*, Advances in Mathematics, to appear.

10. (with Lek-Heng Lim) *Most tensor problems are NP-hard*, preprint.

9. (with J. Nie) *An elementary and constructive solution to Hilbert's 17th Problem for matrices*, Proceedings of the American Mathematical Society, 136 (2008), 73-76.
8. (with T. Windfeldt) *An algebraic characterization of uniquely vertex colorable graphs*, Journal of Combinatorial Theory Series B., 98 (2008), 400-414.
7. (with S. Armstrong) *Solving symmetric word equations in positive definite letters*, Journal of the London Mathematical Society, 76 (2007), 777-796.
6. *Advances on the the Bessis-Moussa-Villani trace conjecture*, Linear Algebra and Applications, 426 (2007), 130-142.
5. (with D. Rhea). Automorphisms of finite abelian groups, American Mathematical Monthly, 114 (2007), no. 10, 917-923.
4. (with M. Aschenbrenner) *Finite generation of symmetric ideals*, Transactions of the American Mathematical Society, 359 (2007), 5171-5192.
3. *Cyclic resultants*, Journal of Symbolic Computation, 39 (2005), 653-669; erratum, *ibid.* 40 (2005).
2. (with C. R. Johnson). *Symmetric word equations in two positive definite letters*, Proceedings of the American Mathematical Society **132** (2004), 945-953.
1. (with C. R. Johnson). *Eigenvalues of words in two positive definite letters*, SIAM Journal of Matrix Analysis and Applications, 23 (2002), 916-928.

## HOBBIES

- Life-long soccer player
- Texas hold 'em aficionado
- Rock Climbing
- Creating problems:  
(*American Mathematical Monthly*: 11422, 11321, 11288, 11231, 11204, 11123, 11098, 10928, 10723  
*Mathematics Magazine*: 1775, 1750, 1684)

## BIOGRAPHICAL SKETCH

In the summer of my junior year in high school, I was invited to attend two math programs for talented students – one at the Rose Hulman Institute for Technology and the other at Southwest Texas State University (SWT). The two environments provided a rigorous introduction to the world of mathematics outside of my high school curriculum. The next two summers, I returned to SWT and served as a counselor and teacher to a new group of SWT Honors students. A rewarding aspect of this program is that it is very successful at gathering a diverse student population with mathematics as a common bond.

As an undergraduate at Yale, I had the opportunity to serve as editor-in-chief of the Yale Scientific magazine. With my leadership, the nearly defunct publication underwent a revitalization that has been maintained to this day. In the summer of 1999, I was selected to attend the College of William and Mary REU (research experiences for undergraduates). This productive encounter with research mathematicians resulted in four journal publications in matrix analysis (my REU advisor was Charles R. Johnson).

In the spring of 2001, I accepted an NSF graduate research fellowship to attend the University of California, Berkeley. Within the first year, I had found a Ph.D. advisor, many good friends, and experienced first-hand the breadth and excitement of the Berkeley mathematical community. The numerous Berkeley colloquia and seminars and the proximity of MSRI (Mathematical Sciences Research Institute) have given me the opportunity to form many friendships with colleagues in my field. In the summer of 2002, I returned to the College of William and Mary as a mentor and advisor to a group of undergraduate researchers.

I completed my Mathematics Ph.D. in 2005, my advisor being Bernd Sturmfels. For the past two years, I was funded by an NSA Young Investigators Grant and an NSF Joint Institutes Postdoctoral Fellowship through MSRI that involves both mathematics and theoretical neuroscience (my research mentor was Friedrich Sommer at the Redwood Center for Theoretical Neuroscience). Currently, I am funded through a grant with PI Kilian Koepsell (also from the Redwood Center).

My long-term vision is to nurture a cross-disciplinary research interaction between institutions such as MSRI and Theoretical Neuroscience (such as the Redwood Center) and Mathematics departments (such as the one at UC Berkeley).