

# T. S. MICHAEL

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 Mathematics Department 410.293.6759  
 United States Naval Academy www.usna.edu/Users/math/tsm/  
 Annapolis, MD 21402
- Education** 1988: Ph.D. University of Wisconsin — Mathematics  
 Advisor: Richard A. Brualdi  
 1983: B.S. California Institute of Technology — Mathematics
- Employment** 1995–present: Associate Professor, U.S. Naval Academy — Mathematics  
 1990–1995: Assistant Professor, U.S. Naval Academy — Mathematics  
 1988–1990: Assistant Professor, Louisiana State University — Mathematics
- Research** Combinatorics, Matrix Theory, Graph Theory
- Research Grants** Naval Academy Research Council (NARC) — 8 summers, \$5000–7500  
 Louisiana State University Council on Research — 1 summer
- Awards** 2012: George Pólya Award for mathematical exposition (Mathematical Association of America)
- Professional Societies** MAA: Mathematical Association of America  
 with Special Interest Group: Mathematics and the Arts  
 SIAM: Society for Industrial and Applied Mathematics  
 with Activity Group: Discrete Mathematics  
 ICA: Institute of Combinatorics and Its Applications, Fellow  
 Tau Beta Pi: National Engineering Honor Society — lifetime member
- Publications** Book  
  
*How to Guard an Art Gallery and Other Discrete Mathematical Adventures.*  
 Johns Hopkins University Press, Baltimore, 2009.
- Publications** Book Chapter  
  
 Tournaments — in *Handbook of Linear Algebra* 2nd ed. CRC Press, Boca Raton, 2013.

Publications Refereed Articles

1. Cycles of length 5 in triangle-free graphs: a sporadic counterexample to a characterization of equality, *Bulletin of the Institute of Combinatorics and Its Applications*, to appear
2. Guarding orthogonal prison yards: an upper bound, *Congressus Numerantium*, to appear (with Val Pinciu)
3. The  $p$ -ranks of residual and derived skew Hadamard designs, *Discrete Mathematics*, **311** (2011) 2216–2219.  
(with Ilhan Hacıoglu)
4. Even and odd tournament matrices with minimum rank over finite fields, *Electronic Journal of Linear Algebra*, **22** (2011) 363–377.  
(with Elizabeth Doering and Bryan L. Shader)
5. Guards, galleries, fortresses, and the octoplex, *College Math Journal*, **42** (2011) 191–200. (won Math Assoc. of America’s Pólya Award, 2012)
6. Intrinsically knotted graphs have at least 21 edges, *Journal of Knot Theory and Its Ramifications*, **19** (2010) 1423–1429.  
(with Brenda Johnson and Mark E. Kidwell)
7. Sphericity, cubicity, and edge clique covers of graphs, *Discrete Applied Mathematics*, **154** (2006) 1309–1313.  
(with Thomas Quint)
8. Guarding the guards in art galleries, *Math Horizons*, **14** (2006) 22–23, 25.  
(with Val Pinciu)
9. Packing boxes with bricks, *Mathematics Magazine*, **79** (2006) 14–30.  
(with Richard J. Bower)
10. Optimal strategies for node selection games: skew matrices and symmetric games, *Linear Algebra and Its Applications* **412** (2006) 77–92.  
(with Thomas Quint)
11. Ryser’s embedding problem for Hadamard matrices, *Journal of Combinatorial Designs*, **14** (2006) 41–51.
12. When can you tile a box with translates of two given rectangular bricks?, *Electronic Journal of Combinatorics*, **11** (2004) Note 7, 9 pages (electronic).  
(with Richard J. Bower)
13. Art gallery theorems for guarded guards, *Computational Geometry*, **26** (2003) 247–258.  
(with Val Pinciu)
14. Impossible decompositions of complete graphs into three Petersen subgraphs, *Bulletin of the Institute of Combinatorics and Its Applications*, **39** (2003) 64–66.
15. Independence sequences of well-covered graphs: non-unimodality and the roller-coaster conjecture, *Graphs and Combinatorics*, **19** (2003) 403–411.  
(with William N. Traves)

16. Sphere of influence graphs and the  $L_\infty$ -metric, *Discrete Applied Mathematics*, **127** (2003) 447–460.  
(with Thomas Quint)
17. Signed degree sequences and multigraphs, *Journal of Graph Theory*, **41** (2002) 101–105.
18. Multiply guarded guards in orthogonal art galleries, *Lecture Notes in Computer Science*, **2073** pp 753–762, in: Proceedings of the International Conference on Computer Science, San Francisco, Springer, 2001.  
(with Val Pinciu)
19. The rigidity theorems of Hamada and Ohmori, revisited, in *Coding Theory and Cryptography: From the Geheimschreiber and Enigma to Quantum Theory. (Annapolis, MD, 1998)* pp 175–179, Springer, Berlin, 2000.
20. Sphere of influence graphs in general metric spaces, *Mathematical and Computer Modelling*, **29** (1999) 45–53.  
(with Thomas Quint)
21. An upper bound for the permanent of a nonnegative matrix, *Linear Algebra and Its Applications*, **281** (1998), 259–263.  
Correction: *Linear Algebra and Its Applications*, **300** (1999), no. 1–3, 1–2.  
(with Suk-Geun Hwang and Arnold R. Kräuter)
22. Skew-Hadamard matrices and the Smith normal form, *Designs, Codes, and Cryptography*, **13** (1998) 173–176.  
(with W. D. Wallis)
23. The  $p$ -ranks of skew Hadamard designs, *Journal of Combinatorial Theory, Series A*, **73** (1996) 170–171.
24. The ranks of tournament matrices, *American Mathematical Monthly*, **102** (1995) 637–639.
25. Lower bounds for graph domination by degrees, pp 789–800 in *Graph Theory, Combinatorics, and Algorithms: Proceedings of the Seventh Quadrennial International Conference on the Theory and Applications of Graphs*, Y. Alavi and A. Schwenk (eds.), Wiley, New York, 1995.
26. Sphere of influence graphs: a survey, *Congressus Numerantium*, **105** (1994) 153–160.  
(with Thomas Quint)
27. Sphere of influence graphs: edge density and clique size, *Mathematical and Computer Modelling*, **20** (1994) 19–24.  
(with Thomas Quint)
28. The structure matrix of the class of  $r$ -multigraphs with a prescribed degree sequence, *Linear Algebra and Its Applications*, **183** (1993) 155–177.
29. The decomposition of the complete graph into three isomorphic strongly regular graphs, *Congressus Numerantium*, **85** (1991) 177–183.
30. The structure matrix and a generalization of Ryser’s maximum term rank formula, *Linear Algebra and Its Applications*, **145** (1991) 21–31.

31. The class of matrices of zeros, ones and twos with prescribed row and column sums, *Linear Algebra and Its Applications*, **114(115)** (1989) 181–198.  
(with Richard A. Brualdi)
32. The class of 2-multigraphs with a prescribed degree sequence, *Linear and Multilinear Algebra*, **24** (1989) 81–102.  
(with Richard A. Brualdi)
33. Maximum permanents of matrices of zeros and ones, *Journal of Combinatorial Theory, Series A*, **47** (1988) 207–245.  
(with Richard A. Brualdi and John L. Goldwasser)

Publications Pedagogy

1. Art gallery theorems and triangulations, DIMACS Educational Module Series, 2007, 18 pp (electronic 07–1).  
(with Val Pinciu)
2. Alumni Profiles: United States Naval Academy, *Math Horizons*, **12** February 2004.
3. Mathematical pitfalls with equivalence classes, *PRIMUS*, **3** (1993) 331–335.  
(with Aaron Stucker)

Talks National Meetings

MathFest, Madison, Wisconsin, August 2012  
“Tournaments and Their Matrices” (invited)

National Mathematics Joint Meetings, Boston, January 2012  
“Paradoxes in Colley Matrix Sports Rankings”

MathFest, Madison, Wisconsin, August 2008  
“Art Gallery Theorems: Examples and Counterexamples”

National Mathematics Joint Meetings, Atlanta, January 2005  
“When Can You Pack a Box with Translates of Two Bricks?”

SIAM Conference on Discrete Mathematics, Nashville, June 2004  
“When Can You Pack a Box with Translates of Two Bricks?”

Talks Conferences

- “Art Galleries and Roller-Coasters,” Workshop on Combinatorics, Enumeration, and Invariants, George Mason University, March 2010, Fairfax, Virginia
- “Two New Art Gallery Theorems: Guarding the Guards,” Ninth Quadrennial International Conference on Graph Theory, Combinatorics, Algorithms, and Applications. June 2000, Kalamazoo, Michigan

- “Ryser’s Embedding Problem for Hadamard Matrices,” Thirtieth Southeastern International Conference on Combinatorics, Graph Theory, and Computing. March 1999, Boca Raton, Florida
- “Pranks by Design,” Coding Theory, Cryptography, and Number Theory Conference. October 1998, U.S. Naval Academy, Annapolis
- “Rigidity and Rank: Report from Annapolis,” University of Wisconsin Centennial Conference. May 1997, Madison, Wisconsin
- “Ranks of Hadamard Matrices,” The George Washington University, Combinatorics Mini-Conference. April 1996, Washington, DC
- “Combinatorial Conferences with Maximum Excess: Best Results and Beyond,” Eighth Quadrennial International Conference on Graph Theory, Combinatorics, Algorithms, and Applications. June 1996, Kalamazoo, Michigan
- “Abstract Sphere of Influence Graphs,” (invited principal speaker) Third Workshop on Proximity Graphs, Mississippi State University. December 1994, Starkville, Mississippi
- “Sphere of Influence Graphs: A Survey,” Twenty-Fifth Southeastern International Conference on Combinatorics, Graph Theory, and Computing. March 1994, Boca Raton, Florida
- “Lower Bounds for Graph Domination by Degrees,” Seventh Quadrennial International Conference on Graph Theory, Combinatorics, Algorithms, and Applications. June 1992, Kalamazoo, Michigan
- “The Decomposition of the Complete Graph into Three Isomorphic Strongly Regular Graphs,” Twenty-Second Southeastern International Conference on Combinatorics, Graph Theory, and Computing. February 1991, Baton Rouge, Louisiana
- “Multigraphs and Structure Matrices,” Third SIAM Conference on Applied Linear Algebra. May 1988, Madison, Wisconsin

#### Invited Mathematics Department Colloquia

- “Tiles, Guards, and Galleries,” University of Nevada-Reno, November 2000, Reno, Nevada
- “Hadamard Matrices,” George Washington University, October 1999, Washington, DC
- “Problems in Combinatorial Matrix Theory,” University of Western Florida, April 1999, Pensacola, Florida
- “Sphere of Influence Graphs,” University of Louisville, October 1993, Louisville, Kentucky
- “An Application of Linear Algebra to Graph Theory,” George Washington University, March 1992, Washington, DC



Combinatorics 2: senior-level course  
 Problem-Solving: preparation for Putnam and Virginia Tech mathematics contests  
 Reading and Research: combinatorics; graph theory; discrete mathematics

Courses  
 Taught at LSU  
 1988–90

Mathematics for Liberal Arts Majors  
 Calculus 1: for scientists and engineers  
 Calculus 2: for scientists and engineers  
 Business Calculus 1: one-semester course on differential and integral calculus  
 Graph Theory: senior/masters-level course  
 Combinatorics senior/masters-level course  
 Combinatorics: graduate reading course  
 Matrix Theory: Graduate reading course

Naval Academy  
 Curriculum

Naval Academy Curriculum Development Grants

- Defense-Wide Information Assurance Program (DIAP), 2012. \$5000  
 developed material to introduce error-correcting codes in mathematics courses
- Maple projects in Multivariable Calculus — 1 summer
- Student projects in Discrete Mathematics — 1 summer

Service to  
 Profession

Referee for Grants

- National Security Agency — mathematics grant
- Banff International Research Station — mathematics conference grant

External Evaluator for Tenure and Promotion

- Occidental College (Los Angeles)
- St. Joseph's University (Philadelphia)

Organized or Chaired Sessions at Conferences

- Wisconsin Centennial Conference, Mini-Symposium on Combinatorics and Linear Algebra, May 1997 — co-organized and chaired
- National Joint National Mathematics Meetings, Atlanta, January 2005 — chaired special session on combinatorics

Referee for Journals

- American Mathematical Monthly*
- College Math Journal*
- Congressus Numerantium*
- Discrete Applied Mathematics*
- Discrete Mathematics*
- Discrete and Computational Geometry*
- Electronic Journal of Combinatorics*

- *Electronic Journal of Linear Algebra*
- *Graphs and Combinatorics*
- *Journal of Combinatorial Theory, Series B*
- *Journal of Graph Theory*
- *Journal of Mathematical Analysis and Applications*
- *Linear Algebra and Its Applications*
- *Linear and Multilinear Algebra*
- *Mathematics Magazine*
- *Rocky Mountain Journal of Mathematics*
- *SIAM Journal on Discrete Mathematics*

### Judge

Association of Women in Mathematics, essay contest, 2011

Other Outside  
Service

### Wrestling Tournaments

Used mathematical techniques to devise a new, fairer method to distribute first-round byes in wrestling tournaments. The method has been adopted by several collegiate and scholastic wrestling leagues for their championship tournaments.

Service to U.S.  
Naval Academy

Faculty Senate, committee on copyright  
 Faculty Senate, Nimitz Library committee  
 Naval Academy Summer Seminar — mathematics talks for high school students  
 Webmaster of the Division of Mathematics and Science  
 Trident Scholar selection committee  
 Faculty mentor, Tau Beta Pi — Engineering Honor Society  
 Nimitz Library 25th anniversary celebration, panelist

### Aquatics

Advanced swimming instruction for Navy SEAL candidates  
 Naval Academy triathlon team — founding coach  
 Naval Academy water polo team — faculty representative (academic advisor)

Service to  
USNA Math  
Department

Hiring Committee  
 Colloquium Committee  
 Webmaster  
 Mathematics Honors Committee — co-chair  
 Displays Committee — chair  
 led the design, creation, acquisition, and display of over 100 posters and objects  
 Editor, *Math News* — newsletter to recruit mathematics majors  
 Head Coach, Naval Academy math team — Putnam and Virginia Tech contests  
 Mathematics Contest Coordinator — chair  
 Mathematics Department representative to Nimitz Library  
 Mathematics Major Recruitment Committee

Academic advisor to mathematics and applied mathematics majors  
Mentor for mathematics major capstone projects  
Evaluation of military officers' teaching  
Proctor and grader for mathematics placement exams