
JOSEPH EDWARD FIELDS

Department of Mathematics (EN D122) Phone: (203) 392-6519
Southern Connecticut State University Fax: (203) 392-6808
501 Crescent Street E-mail: fieldsj1@southernct.edu
New Haven CT 06515 Web: <http://giam.southernct.edu/>

RESEARCH INTERESTS

Information theory, algorithms, discrete mathematics, error-correcting codes, graph theory, design theory, Ramsey theory and combinatorics.

EDUCATION

PhD in Mathematics

University of Illinois at Chicago - 1999.
Advisor: Dr. Vera Pless.

MS in Applied Mathematics

University of Maryland, Baltimore County - 1991.

BS in Applied Mathematics

University of Maryland, Baltimore County - 1990.

EXPERIENCE

Professor, Southern Connecticut State University,
August 1999 — present. (Tenured and promoted to Associate Professor in August 2004.
Promoted to Professor in August 2011.)

My duties include full responsibility for teaching approximately 4 courses per semester, maintenance of an active academic research agenda, departmental and university service, and community outreach. The following sections of this C.V. give details on these activities.

Teaching Assistant, University of Illinois at Chicago,
January 1998 — June 1999 and September 1994 — May 1997.

Conducted discussion sections for various mathematics courses, including graduate abstract algebra. Had full responsibility for teaching sections of multivariable calculus on two occasions. I also acted as a “peer mentor” in a training program for incoming graduate teaching assistants.

Computer System Administrator, University of Illinois at Chicago,
May 1997 — January 1998.

Administered a heterogeneous network of computers including Sun, NeXT, Linux and FreeBSD machines. Provided support for faculty and graduate assistants within the the Department of Mathematics and Computer Science at UIC.

Senior Scientific Programmer, Applied Research Corporation,
September 1991 — August 1994.

While contracted to the Naval Research Laboratories, I worked in support of government oversight of the of the Strategic Scene Generation Model (SSGM). I administered the independent verification and validation (IV&V) and project documentation sub-contractors.

I also worked on a development team for the graphical user interface to the SSGM system. The SSGM was a program of the Strategic Defense Initiative Office that leveraged existing phenomenological modeling software to create composite images and image sequences for virtual testing of SDI concepts.

Teaching Assistant, University of Maryland, Baltimore County,
September 1990 — May 1991.

While an undergraduate and beginning graduate student, I served as a teaching assistant, conducting discussion sections for several mathematics courses. I also was given full responsibility for teaching a section of intermediate algebra in my final year of the Masters program.

Mechanical Design Engineer, Catalyst Research Corporation,
May 1982 — June 1987.

Catalyst Research was a company founded by research chemists. The company developed and manufactured batteries and electrolytic gas sensor cells. The battery division where I was employed had two main commercial lines: lithium iodine batteries used in cardiac pace-makers and as backup power for CMOS memory chips and so-called “thermal” batteries which exploited a lithium-iron chemistry in an electrolyte of molten salts. My contribution to the company was in developing equipment for automating battery production, including an early robotic installation. Because of the exotic nature of Catalyst Research’s products, primary emphasis was on automating procedures that exposed workers to hazardous environments and materials for example iodine, thionyl chloride, molten lithium and various pyrotechnics. These processes often posed unique design challenges. During this period I was also taking night courses at Johns Hopkins University’s Whiting School of Engineering.

Machine Designer, M. S. Willet Inc.,
June 1980 — May 1982.

M. S. Willet Inc. is a company located in Cockeysville, MD, specializing in sheet metal stamping and forming equipment for customers ranging from the beverage industry to Detroit. The company was best known in engineering circles (at that time) for two innovations: the “ecology” can lid which has now completely replaced the older “pop top” lids, and three axis transfer systems that used cam generated motions to transfer parts from one station to the next as they were progressively formed. I was hired as a designer trainee, and participated in a program something like an apprenticeship for engineers – in addition to design work, I did stints in the company’s quality assurance laboratory, general machine shop and tool & die shop.

Draftsman, E.P.M. Inc.,
September 1979 June 1980.

Translated engineering drawings from E.P.M.’s parent company which were in Italian with S.I. units into English and imperial units.

PUBLICATIONS

“Methods used in the classification of \mathbb{Z}_4 codes” (with V. Pless) Proceedings of the 34th Annual Allerton Conference on Communication, Control and Computing (1996) pages 312-321.

“All \mathbb{Z}_4 Type II codes of length 16 are known” (with V. Pless and J. S. Leon) Journal of Combinatorial Theory, Series A, vol. 78, no. 1, April 1997, pages 32-50.

“Split weight enumerators of self-dual codes” (with V. Pless) Proceedings of the 35th Annual Allerton Conference on Communication, Control and Computing (1997) pages 422-431.

“All self-dual \mathbb{Z}_4 codes of length 15 or less are known” (with P. Gaborit, J. S. Leon and V. Pless) IEEE Transactions on Information Theory, vol. 44 no. 1, January 1998, pages 311-322.

“On the non- \mathbb{Z}_4 linearity of certain good binary codes” (with P. Gaborit) IEEE Transactions on Information Theory, vol. 45 no. 5, July 1999, pages 1674-1677.

“On the classification of extremal even formally self-dual codes” (with P. Gaborit, W. C. Huffman and V. Pless) Designs, Codes and Cryptography, Vol. 18, No. 1/2/3, (1999), pages 125-148.

“On the classification of formally self-dual codes” (with P. Gaborit, W. C. Huffman and V. Pless) Proceedings of the 36th Annual Allerton Conference on Communication, Control and Computing.

“On the classification of extremal even formally self-dual codes of lengths 20 and 22” (with P. Gaborit, W. C. Huffman and V. Pless) Discrete and Applied Mathematics, Vol. 111 (2001), 75-86.

“On the optimal design of transfer and dwell cams” (with Leon Brin) in preparation.

“A Gentle Introduction to the Art of Mathematics”
(e-text — May 2007)

“A Gentle Introduction to the Art of Mathematics, version 2.0”
(e-text — September 2010)

“A Gentle Introduction to the Art of Mathematics, version 3.0”
(e-text — available on GitHub at <https://osj1961.github.io/giam/> and at <http://giam.southernct.edu/>
— September 2013)
(subversion 3.2 to be released Summer 2017.)

SOFTWARE PROJECTS

SAGE – Sage is a computer algebra system which includes and extends Python. The framework within Sage for computations relevant to coding theory is in part based on Guava. Since June of 2016

GUAVA – Guava is a long-standing package of the GAP (Groups, Algorithms and Programming) project. Guava enables researchers in Coding Theory to construct codes, manipulate them in various ways and calculate their properties. Since March of 2009 I am lead developer and maintainer.

Fig4LaTeX – Fig4LaTeX is designed to simplify management of the figures in a large LaTeX document. Fig4LaTeX is included in most major TeX/LaTeX distributions and is hosted at CTAN. I wrote Fig4LaTeX in PERL in 2008 and released it to CTAN in June 2009.

HTMX – HTMX is an authoring tool for mathematicians and others who wish to include mathematical formulae in their HTML documents. I wrote HTMX in 1996 and have maintained it through to the current version (4.2).

COURSES TAUGHT

MAT 095 – Elementary Algebra (Su00, Su02)
MAT 101 – Intermediate Algebra A (Fa01 x 3, Fa05)
MAT 103 – Math for Liberal Arts (Sp01 x 2, Sp02 x 2, Fa02 x 2, Sp05 x 2, Fa07, Sp08, Fa08, Fa09 x 2, Fa11, Fa15, Sp17)
MAT 119 – Intermediate Algebra B (Fa00, Su01)
MAT 120 – College Algebra (Fa99, Sp03 x 2, Sp04, Fa 09, Fa12 x 2, Sp15)
MAT 122 – PreCalculus (Sp01, Fa05, Sp10, Sp11, Sp12, Sp13 x 2, Fa13, Sp14, Fa14, Sp15, Sp16)
MAT 139 – Calculus for the Social Sciences (Fa99, Fa03 x 2, Fa07 x 2, Sp08 x 2, Fa 08 x 2, Fa11 x 2, Fa13)
MAT 150 – Calculus I (Fa00, Fa14, Sp17)
MAT 151 – Calculus II (Su02, Fa03, Fa06, Sp15)
MAT 178 – Discrete Math
(Fa99 x 2, Sp00, Fa00 x 2, Sp01, Fa01, Sp02, Fa02 x 2, Sp03, Sp06, Fa06, Sp12, Sp16)
MAT 250 – Foundations of Mathematics (Su01, Sp02, Su03, Su04, Su05, Su06, Fa07, Su08, Fa08, Su10, Sp13, SP14)
MAT 252 – Calculus III (Fa09, Sp10, Fa10, Sp11, Fa11, Fa12, Fa13) MAT 370 – Number Theory (Sp00, Sp04)
MAT 372 – Linear Algebra (Fa01, Fa02, Fa03, Fa04, Sp06, Su10, Fa10, Fa14, Fa15)
MAT 375 – Abstract Algebra (Fa05, Fa12)
MAT 378 – Discrete Mathematics (Sp00, Sp03, Sp05, Sp07, Sp08, Sp10, Sp12, Sp14)

MAT 495 – Honors Thesis: David Fried “Polyominoe connectivity” (Fa 04)
MAT 495 – Honors Thesis: Jon Knickerbocker, “On the existence of projective planes of finite order” (Fa07)
MAT 495 – Honors Thesis: Daniel Radil, “On Multinomials” (Fa10)
MAT 495 – Honors Thesis: Michelle Desmarais, “The Action of the Modular Group on the Primitive Pythagorean Triples” (Sp13) MAT 499 – Independent Study, “The Mathematics of General Relativity” (Sp00)
MAT 499 – Independent Study, “Discrete Dynamical Systems” (Sp11)
MAT 499 – Independent Study, “Hamiltonian decompositions of hypercubes” (Sp13)
MAT 499 – Independent Study, “Squigonometry” (Fa14)
MAT 573 – Algebraic Structures I (Fa04)

SEMINARS, COLLOQUIA AND PRESENTATIONS

AMS Summer Meeting, Boulder Colorado, July 1990, “Applications of Finite Differences in Number Theory”.

Mathematics Department Colloquium, University of Maryland, Baltimore County, February 1994, “Projective Geometry in Computer Graphics.”

Coding Theory Seminar, University of Illinois at Chicago, April 1995, “Multi-color Graph Ramsey Numbers.”

Math and Computers Seminar, University of Illinois at Chicago, February 1996, “The First Ramsey Number for Hypergraphs.”

Algebraic Geometry Seminar, University of Illinois at Chicago, November 1996, “Mordell-Weil Lattices.”

IEEE International Symposium on Information Theory, Ulm Germany, June 1997, “All Self-Dual $Z/(4)$ Codes of Length 15 or Less Are Known.”

AMS Central Section Meeting, Chicago Illinois, September 1998, “Decoding the Golay Code by Hand.”

Associated Teachers of Mathematics in Connecticut (ATOMIC) conference, March 2000, “Workshop in Combinatorial Math”

Mathematics Department Seminar, Southern Connecticut State University, November 2001, “Progress in the proof that $R(4, 4; 3) = 13$ ”

SCSU Math Club, February 2001, “The Möbius Band and friends ... Is it better to be one-sided or two-faced?”

Hudson River Undergraduate Mathematics Conference, Hamilton College, April 2002, “Elimination of the Jerk, Part I.”

SCSU Math Club, October 2002, “What is the biggest set of divisors of a number that do not divide one another?”

“In Medias Res” an Interdisciplinary, University-wide Research Conference for Faculty at SCSU, November 2003, “Ways of being in the middle”

SCSU Mathematics Seminar, November 8, 2007, “Brun’s Sieve”

CCSU Mathematics Colloquium, February 27, 2009, “Can You Understand the Title of this Talk? (the basics of error-correcting codes)”

New England Educational Assessment Network (NEEAN) Fall Forum 2009, College of the Holy Cross, November 6, 2009, “Getting to Standards” (with B. Vaden-Goad).

NES-MAA Fall Meeting, Western New England College, November 21, 2009, “Differential Equations with a Fractal Character” (reporting on joint work with Len Brin.)

SCSU Math Club, December 7, 2009, “Fractal Differential Equations” (reporting on joint work with Len Brin.)

Learning from Form and Space at the Yale Center for British Art, Saturday April 17 2010, “The Divine Proportion” (workshop, with Therese Bennett)

CSUS Conference on Assessment of Learning for Educational Improvement, Central Connecticut State University, April 30 2010, “Getting to Standards” (poster, joint with Robert Vaden-Goad)

Graph Theory Day 59, May 8, 2010, “Factoring even-dimensional hypercubes into disjoint Hamiltonian circuits”

Connecticut Association of Mathematically Precocious Youths (CAMPY), May 26, 2010, “Can you hear me now? Can you hear me now? (the basics of error-correcting codes)” (workshop)

Connecticut Association of Mathematically Precocious Youths (CAMPY), May 2009??, “An Introduction to Cryptography” (workshop)

SCSU Teaching Academy, June 3 2010, “Electronic Publishing with Open Source Tools”

NES-MAA Spring Meeting, Salve Regina University, June 12 2010, “Hamiltonian Decomposition of Hypercubes”

Math Honors Seminar, Sacred Heart University, Wednesday, September 22 2010, “An Introduction to Coding Theory”

Spuyten Duyvil Undergraduate Mathematics Conference, Manhattan College, April 2, 2011, “Forbidden Positions” (with R. Mugno)

First Annual Southern Connecticut GeoGebra Conference November 5, 2013, “Squigonometry (doing trig on a squirele)”

Joint Math Meetings, Baltimore, January 17, 2014, “You say tomatoe . . . and I say tomatoe”

Second Annual Southern Connecticut GeoGebra Conference, August 20, 2014, “Designing a solar pizza cooker with GeoGebra”

Choate Rosemary Hall, invited address, January 8, 2015, “Pizza, Pizza!!! . . . the Math and Mechanics of building a solar oven”

Joint Math Meetings, San Antonio TX, January 12, 2015, “Figures for open-source textbooks” (poster)

Connecticut Library Association, November 18, 2015, “OER . . . a view from the trenches” (invited presentation)

Sage Days 75 at INRIA Saclay, August 22-26/2016 (workshop participant)
(SD75 was an intensive coding/debugging effort to improve the treatment of Algebraic Coding Theory in Sage. My main effort involved bug fixes related to Sage’s interaction with the GAP package Guava.)

The Integration of Online Materials and Online Textbooks, University of Puget Sound, Tacoma WA, May 22-26, “Updates on the conversion of GIAM to MathBookXML”

MathFest 2017, Chicago IL, July 26-29, (Attended many events for section officers.)

DEPARTMENTAL AND UNIVERSITY SERVICE

Math Department Webmaster (2001 – 2008)

Math Department Seminar Coordinator (1999 – 2006)

Puzzle Editor for the Math Department’s Alumni Newsletter (2002 – present)

Problem Coordinator for the annual New Haven High School Math Competition (2003 – present)

Putnam Exam Preparation Co-Coordinator (2006 – present)

Member, Math Department Curriculum Committee, (1999 – 2006, 2008–2012)

Member, Math Department Student Recruitment Committee, (2000 – present)

Math Department Assessment Coordinator (2007 – 2010)

Co-coordinator (with R. Gingrich), Spring Problem Solving Seminar (2010 – present)

Member, Mathematics Algebra Search Committee (2006-07)

I regularly attend the various “extra curricular” activities hosted by the Math department. Major’s fairs, Admissions Open Houses, Graduate Open Houses, Alumni Reunions, etc.

Member, Arts and Sciences School Curriculum Committee (2001 – 2003)

Chairperson, Notifications Management Committee, (a standing subcommittee of the Undergraduate Curriculum Forum) (May 2003 – May 2004)

Chairperson, Undergraduate Curriculum Forum (May 2004 – May 2007)

Member, NEASC Review Steering Committee (Fall 2005 – Summer 2006)

Co-adviser of the SCSU student chapter of Habitat for Humanity (2005 – 2012)

Member, Liberal Education Program Committee – formerly the General Education Task Force – (2009-2015)

Member, University Promotion and Tenure Committee (2009–2010, 2012–2013)

Math dept. Alternate, Undergraduate Curriculum Forum (2010–2013)

Member, University-Wide Impact Committee, a standing subcommittee of the Undergraduate Curriculum Forum, (9/2010 – 2013)

Baritone saxophonist, SCSU University Band, (2003 – 2015)

Member, Organizing Committee for “Reuniting the Higher Educational Family” a joint conference between SCSU and Gateway Community College, (Spring 2009)

Member, Common Read Book Selection Committee, (Spring 2010)

I regularly attend New Student Convocations in the autumn, and Commencement ceremonies in the spring.

COMPUTER SKILLS

Operating Systems: I have system administration experience in several Unix environments (Linux, Solaris and Irix). I am considered a power user of Microsoft Windows. My primary O.S. is Ubuntu Linux, however I maintain development environments (for Guava and Sage development/testing) on Windows and MacOS machines as well.

Programming and Scripting: C, C++, Java, Perl, Bash Shell and Python/Cython.

Scientific Computing Applications: Maple, Matlab, GAP, Magma, Sage.

Publishing: HTML, TeX, LaTeX, MathbookXML.

Project Management and Revision Control: Git and GitHub.

Other Applications: Open Office and Microsoft Office (Spreadsheets, Word Processing, Presentation software, WYSIWYG web authoring). VRML and X3D (3-D modeling and simulation). XFig (vector graphics). GIMP (raster graphics). OpenSCAD (modeling for 3-d printing)

AWARDS, ACTIVITIES AND AFFILIATIONS

University Fellowship, University of Illinois at Chicago, 1998-9.

Mathematics Departmental Graduate Fellowship, University of Illinois at Chicago 1997-8.

President of the Mathematics Graduate Student Association at the University of Illinois at Chicago, 1997-8.

President and Vice-President of the Maryland Gamma Chapter of Pi Mu Epsilon.

Member of the American Mathematical Society.

Member of the Mathematics Association of America.

Member of the Institute of Electrical and Electronics Engineers.

Member of the IEEE, Information Theory Society.

Vice Chair of the NorthEastern Section of the Mathematics Association of America (2016-17)

(The vice chair becomes chairperson of the section after one year.)

ONGOING PROJECTS

The “Online Dictionary of Combinatorics” is a reference for terminology in mathematics and combinatorics that I created and have maintained since 1993.

“Calendar on a Polytope” series. Annually since 2005 I have created webpages giving instructions and templates for constructing calendars on an appropriate polyhedron.

I regularly contribute 3-d models of a pedagogical/mathematical nature to the online repository of 3-d printable objects known as “the Thingiverse.”