

PRIME BITS

Department of Mathematics Newsletter
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Fall 2013

Volume 15

Professor David Grant named new Math Department Chair

Professor David Grant was selected to serve as the new Math Department Chair beginning in July 2013.

Raised in Queens, N.Y., Grant had two early passions, math and the Mets. He recovered from the latter of these, becoming a Rockies fan when they formed as an expansion team in 1993. Since the Rockies are as bad as the Mets, this was a simple conversion. However, he still seems to like math, having been exposed to the fun of it in high school (he went to Stuyvesant High School in New York at the same time as the former CU Boulder Math Department chair, Eric Stade, and he attended a summer math program at Hampshire College). Professor Grant tries to pass that passion and sense of fun on to his CU students. In recent summers he has done the same while teaching at MathPath, a summer



program for advanced middle school math students.

As an undergraduate, Grant majored in math at Princeton, where he spent most of his time working on the school newspaper as a writer, pollster, and eventually, sports editor. He toyed with the idea of doing polling as a career

(he started a political surveying firm with classmate Eliot Spitzer), and thought seriously about becoming a journalist (he worked for Newsweek during graduate school) and tried out actuarial work during the summers.

Although he kept coming back to math, these experiences helped shape his later career. Along with former colleague Kent Goodrich, Professor Grant co-founded CU's Actuarial Studies Program in 1997 and co-directs it still with Anne

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Chair's annual Communiqué

*Dear Alumnae/Alumni and other
Friends of CU's Math Department,*

It is a great honor and privilege to address you. I took over as Chair of the Mathematics Department in July, and was immediately impressed by the tremendous role your concern and generosity, and those of your forbears, play in the everyday running and success of the Department. We view the Department as a living organism, that extends roots back into the past to gain the vision and sustenance that propels us into the future. I'm lucky enough to participate in that small snapshot

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Dr. Alejandro Sarria joins faculty as 2013 Bernie Meyers Instructor



Dr. Alejandro Sarria joined the department as the Burnett Meyer Instructor in Fall 2013.

He obtained a Ph.D. in Mathematics from the University of New Orleans in December 2012 under Professor Ralph Saxton. Dr. Sarria was born in Colombia where

he completed two years of Electronics and Electrical Engineering at UTP. He moved to the United States with his family in November 2000.

Dr. Sarria's research interests include the qualitative analysis of

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David Grant selected as new Math Department Chair, (continued from p. 1)

Dougherty of Applied Math. He recently published a sports article on baseball and statistics.

This was followed by two postdocs before coming to CU Boulder in 1989. He was a T.H. Hildebrandt Research Assistant Professor at the University of Michigan and then took a NATO Postdoctoral Fellowship at Cambridge, UK. At CU, Professor Grant has been the advisor for 11 Ph.D. students and served the department in numerous functions before he was elected chair. Most of his research has been in number theory, but in recent years, after winning an NSF Interdisciplinary Grant in the Mathematical Sciences, he has been collaborating with Mahesh Varanasi of CU's Department of Electrical, Computer, and Energy Engineering on problems in coding theory. It was this work which

inspired him to start the math department's course in Coding and Cryptography, areas of importance for national security.

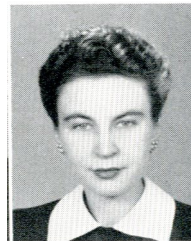
Professor Grant has spent sabbatical semesters at Columbia University, at the Mathematical Sciences Research Institute in Berkeley, in Montreal, and at the University of Texas in Austin. He has been named Professeur Invite' three times by the French government for collaborative research with a colleague in Normandy, France.

A big fan of the movies, Professor Grant is trying to get a film series called "Math Goes to the Movies" running on campus, to raise awareness of mathematics. He also enjoys card playing and crosswords. Every Sunday night he can be found with a steady group of friends at the Trident Cafe in Boulder, doing the Times crossword puzzle. Grant invites all to come by and kibbitz.

Dr. Sarria, (continued from p. 1)

Partial Differential Equations, especially models from the field of fluid dynamics such as n-dimensional incompressible Euler flow, shallow water waves, gas dynamics, and nematic liquid crystals. More particularly, he is interested in the criteria for and detailed properties of finite-time singularity formation in solutions (or solution-related quantities) and their global existence in time; as well as methods for continuing solutions beyond blow-up.

**Sieglinde Haller
endows scholarship**



Sieglinde "Linda" Talbott Haller, with a gift of \$735,000, has established an endowment to provide scholarships for students in the Department of Mathematics at CU Boulder. The estimated annual earnings for the Haller Endowment Fund will be between \$30,00 and \$32,000; 4 percent earnings on the account.

A 1941 graduate of the University of Colorado, Ms. Haller was herself a scholarship recipient. She was a competitor on the CU Swimming and Diving Team and was also involved in yearbook publications. After graduating from CU, she moved to Denver and did graduate work in statistics at the University of Denver, but did not complete her master's degree, which she said was a "shame."

In 1946, she moved to Chicago where she lived until 1972 and worked for the *Chicago Tribune* in their marketing department. During her tenure at the *Tribune*, she was named to Who's Who in the Midwest. When she retired early from the *Tribune*, she moved to the Canary Islands where she lived for several years. Eventually, she moved to Florida where she lived the remainder of her life.

She is described as a curious and vigorous woman, an avid dancer, and a cancer survivor. She enjoyed travel and visited over 80 countries in Europe, Africa, Asia and Central and South America. Ms. Haller spoke several languages. Please see Student News (p. 10) for the names of the 2013-2014 Sieglinde Haller Scholarship recipients.

PRIME BITS

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Faculty Profiles and Highlights



Sebastian Casalaina-Martin, Assistant Professor, Ph.D. Columbia, 2004.

Research: Algebraic geometry with a broad range of interests such as curves, abelian varieties, cubic threefolds, vector bundles and moduli spaces.



Jeanne Nielsen Clelland, Associate Professor, Ph.D. Duke, 1996.

Research interests: Geometry of Partial Differential Equations. Clelland works in differential geometry and the application of geometry to the study of partial differential equations.

Specifically, her work has focused on conservation laws, Backlund transformations, intermediate equations, and sub-Finsler geometry with applications to control theory.



Peter D.T.A. Elliott, Professor, Ph.D. Cambridge U., UK, 1969.

Research interests: Number Theory



Homer Ellis, Associate Professor, Ph.D. U. Texas, 1961.

Research interests: Relativity Theory, Differential Geometry, Mathematical Physics. The long-standing primary goal of Ellis' research

is to explain as many as possible of the phenomena of physics as hidden properties of space brought to light by careful examination of its geometry. By 'space' he means three-dimensional space described by differential geometry, the geometry of Riemann in particular. All dimensions beyond the three dimensions of space (the time dimension in space-time, for one) are to be found inherent in the geometry of space.



Janos Englander, Associate Professor, D.Sc. Technion-IIT, 1997.

Research interests: Spatial stochastic models, in particular in diffusions, branching diffusions, superprocesses, and processes in random media. Certain linear and nonlinear partial differential equations are closely

connected to these research areas. Broader interest lies in probability theory in general.



Carla Farsi, Professor, Ph.D. Maryland, 1989.

Research interests: C^* Algebras, Non-Commutative Differential Geometry. Research is in operator algebras and applications to geometry, with particular emphasis on commutative and non-commutative

orbifolds and their C^* -algebras. In particular, she established index theorems for orbifolds and orbifolds with boundary, investigated properties of orbifold elliptic operators, and characterized invariants of orbifold C^* -algebras. Recently, her research has mainly focused on analysis on open orbifolds and orbifolds with boundary. Orbifolds, which are generalized manifold groupoids, play an important role in many branches of mathematics and mathematical physics. Many symplectic quotients are for instance orbifolds, while in string theory, orbifolds describe regions "at infinity."



Jeffrey S. Fox, Professor, Ph.D. Berkeley, 1983.

Research interests: Group Representations and Differential Geometry.



Alexander Gorokhovskiy, Assistant Professor, Ph.D. Ohio State University, 1999.

Research interests: Noncommutative Geometry. Research belongs to the area of noncommutative geometry, in particular, the cyclic cohomology and index theory and the deformation quantization and its application to the index problems.



David Grant, Professor, Ph.D. MIT, 1985.

Research interests: Number theory, arithmetic geometry, and space-time coding. (Please see article on Page 1 for more information)

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Faculty Profiles and Highlights, (continued from p. 3)



Richard Green, Professor, Ph.D., University of Warwick, 1995.

Research interests: Mainly in the areas of algebraic Lie theory, combinatorics and representation theory. Particular interest in Coxeter groups and their Hecke algebras, diagram algebras and related algebras.

Professor Green's research monograph, "Combinatorics of Minuscule Representations", was published by Cambridge University Press in spring 2013. Two of his students were awarded Ph.D. degrees in 2013: Tyson Gern and Strider McGregor-Dorsey.



Karl Gustafson, Professor, Ph.D. Maryland, 1965.

Research: Partial Differential Equations, Mathematical Physics, Functional Analysis, Financial Engineering, Linear Algebra. Wide interests in both Pure and Applied Mathematics.

Professor Gustafson presented a special seminar entitled "Parallel Computing Fifty Years ago and the World's First Spy Satellite" at Ball Aerospace & Technologies Corp., Oct. 19, 2012, on the 50th anniversary of the Cuban Missile Crisis. Gustafson reported that his computer program "played a critical role in tracking soviet submarines during that crisis." In August 2013 he gave an invited lecture on "A New Financial Risk Ratio" at the 22nd International Workshop on Matrices and Statistics at the Fields Institute in Toronto, Canada. In another lecture Gustafson spoke on "Climbs of my Youth: Colorado First Ascents of the 1950s" in the Estes Valley Library Summer Adventure Program, July 22, 2013. The Estes Valley Library announcement stated that "Karl Gustafson, a longtime University of Colorado mathematician, is one of our region's legendary mountaineers. In his presentation, he offers a fascinating retrospective of his Colorado first ascents of sixty years ago, including the Matron North Face (1951), Window South Corner on Longs Peak (1953), Mount Meeker North Face (1955), and the Snowmass-Capitol Ridge (1951)."



Su-ion Ih, Associate Professor, Ph.D. Brown University, 2000.

Research interests: Number Theory, Arithmetic Geometry and Algebraic Geometry including the distribution of algebraic, rational, and integral points on algebraic varieties from various perspectives.



Keith Kearnes, Professor, Ph.D. U.C. Berkeley, 1988.

Research interests: Algebra and Logic.



Sergei Kuznetsov, Associate Professor, Ph.D. Kiev (USSR), 1976.

Research interests: Probability, Statistics, PDE.



Monk, Don, Professor, Ph.D. Berkeley, 1961.

Research interests: Logic, Boolean Algebra.



Judith Packer, Professor, Ph.D. Harvard, 1982.

Research interests: Operator Algebras, Wavelets.



Markus Pflaum, Professor, Ph.D. Universität München, 1995.

Research interests include: Topology, Geometric Analysis, Noncommutative Geometry.

Continued on p. 5

Faculty Profiles and Highlights, (continued from p. 4)



Stephen Preston, Associate Professor, Ph.D. Stony Brook University, 2002.

Research interests include: Partial Differential Equations, Riemannian Geometry. Favorite courses: Math 3001 (UG real analysis) and Math 6230 (Grad differential geometry) Preston is currently the Graduate Program Chair.

He is married to Anca Radulescu, an instructor in the Mathematics Department, and the couple has a son, Alex, who was born Jan. 16, 2011



Katherine Stange, Assistant Professor, Ph.D. Brown University, 2008.

Research areas: arithmetic geometry, elliptic curves, algebraic divisibility sequences, recurrence sequences, Diophantine geometry, cryptography, Apollonian circle packings, arithmetic dynamics, game

theory. Favorite courses: All types of algebra, from linear algebra to algebraic number theory. Katherine Stange received the American Mathematical Association's Paul R. Halmos-Lester R. Ford Award at the MathFest 2013 Prize Session on August 2 in Hartford, CT. for her paper "How to make the most of a shared meal: Plan the last bite first?" published in The American Mathematical Monthly. In 2013 she received an NSA Young Investigator Grants of \$40,000.



Eric Stade, Professor, Ph.D. Columbia, 1988.

Research: Number Theory. Eric Stade was appointed in 2011 as a President's Teaching Scholar, an appointment that will continue throughout his career at CU. "Established in 1989 as a presidential initiative, PTSP endorses excellence in teaching by

honoring faculty throughout the university who excel in teaching, scholarship, and research. The President's Teaching Scholars are chosen from the three CU campuses, not only for their skill in their own classrooms, but also for their potential to improve education and enlarge its possibilities across the university. Serving as ambassadors for the integration of teaching with research, the Teaching Scholars develop individual, departmental, campus and system-wide projects, including mentoring that cultivate exemplary teaching and engaged learning."

Professor Stade has been appointed co-director of iSTEM, a CU-Boulder program aiming to transform STEM (Science, Technology, Engineering and Mathematics) education and boost the number of STEM teachers at all

levels. He has been a driving force in creating or redesigning several courses. He leads his students in undertaking outreach efforts throughout the Boulder Valley School District. "His passion for mathematics and mathematics education is contagious, and over the years, it has infected in a good way all of his students and his colleagues in our department," wrote Judith A. Packer, former mathematics department chair. "He is a force in the classroom, in the lecture halls at conference venues, in meetings of the members of the iSTEM project, and even in the elementary schools of Boulder Valley School District where he performs his outreach, as he communicates both his enthusiasm and love of the subject matter to anyone who meets him."



Agnes Szendrei, Professor, Ph.D. Budapest, Hungary, 1982.

Research: Algebra, Combinatorics and Logic.



Nathaniel Thiem, Associate Professor, Ph.D. University of Wisconsin, 2004.

Research interests: Algebra.



Robert Tubbs, Associate Professor, Ph.D. Penn State, 1981.

Research: Number Theory. Robert Tubbs is currently the Director of the Miramontes Arts & Sciences Program, MASP, in the College of Arts and Sciences. MASP is a mentoring and academic excellence program for students who are either from traditionally underrepresented groups or who are first-generation college students. He is also still teaching half-time in the math department. Rob has two books that will be published this year: (1) Hilbert's Seventh Problem: Solutions and Extensions (intended for advanced undergraduates and graduate students) grew out of a short course he taught at the Institute for Mathematical Research in Chennai, India in December 2010. (2) Mathematics in Twentieth Century Literature and Art: Content, Meaning and Form, is an interdisciplinary look at how twentieth century artists and writers employed mathematical ideas in their work.

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Faculty Profiles and Highlights, (continued from p. 5)



Marty Walter, Professor, Ph.D. California, Irvine, 1971.

Research: W^* and C^* Algebras, Environmental Modeling. Professor Walter introduced and teaches (among other subjects) a popular course on Environmental Mathematics using his excellent text “Mathematics for the Environment” published in 2011 by the CRC Press.



Jonathan Wise, Assistant Professor, Ph.D. Brown University, 2008.

Research: Algebraic Geometry, Moduli of curves, Deformation theory, Sheaves. Jonathan Wise received an NSA Young Investigator Grant of \$40,000, to begin in January 2014. The grant will support his research on curve

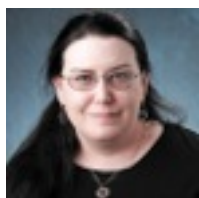
counting theories and deformation theory. Deformation theory is the study of how algebraic or geometric objects can change infinitesimally. Wise does some foundational work in that subject, but mainly he applies it to count curves satisfying various restrictions (such as passing through points or having tangency to other curves). The main project for which the grant was awarded has to do with counting curves with specified kinds of singularities.



Faan Tone Liu, Instructor, Ph.D. University of Colorado, Boulder, 1994.

Dr. Liu serves as course coordinator (a.k.a. “Calc Czar”) for all the department’s Calculus 1 and Calculus 2 courses. Her responsibilities include developing the course syllabi, coordinating and mentoring all the

graduate student instructors and teaching assistants and undergraduate learning assistants, and overseeing the administration and grading of exams. Dr. Liu comes to us with a wealth of teaching experience from institutions all over the country, and we are very happy to have her here.



Carrie Muir, Instructor and Lead Advisor, Ph.D. University of Nebraska, 2012.

Carrie has been an instructor and advisor for the department since 1999. She was promoted to Lead Advisor in 2013 and she recently received the

Excellence in Advising Award. She is currently serving as a Regional Mathematics Lead for the Colorado Department of Higher Education’s Core-to-College program. Research

interests include: Scholarship of Teaching and Learning, Undergraduate Mathematics, Education, Postsecondary Gifted Education. Her favorite courses are Discrete Math, Linear Algebra, and History of Math.

Patrick Newberry, Instructor, PhD, University of Colorado-Boulder, 2012. Research: Noncommutative Geometry. Primarily teach lower-division courses, with an emphasis on Precalculus.



Anca Radulescu, Instructor, SUNY, Stony Brook,

Research interest: Dynamical systems and their applications to neuroscience. Her work spans from theoretical models of learning and memory to data-driven approaches to psychiatric illness, from studying complexity in polynomial families to

understanding complex computational networks in the brain.

She is the faculty advisor of the Campus Initiative at CU, with some off-duty activities fueled by UNICEF goals. Dr. Radulescu joined the CU Boulder Mathematics Department in 2010, following a three-year Instructorship in the Applied Math Department. She was born in Romania, where graduated from college in 1998, with a degree in Mathematics from the University of Bucharest.

Delphy (Dee Dee) Shaulis, Instructor, Ph.D. University of Colorado, Boulder, 1998.

Alejandro Spina, Senior Instructor, Ph.D., La Plata National University (Argentina), 1984. Ph.D., University of Colorado Boulder, 1996.



Research interests: Phase instabilities, pattern formation and confined domains in traveling wave states of double diffusive convection.

Formerly, he developed analytical tools for the study of statistical properties of noise-driven oscillators, and studied transport properties of classically chaotic systems in quantum phase-space. He also improved the numerical performance of existing semiempirical codes for the calculation of electronic structure of molecules, and studied the electronic structure and interactions of base-pair molecules in DNA, particularly in relation to tunneling effects in double hydrogen bonds of DNA chains.

Staff News



Tiffany Dowd



Donna Maes



Lakshmi Muralidharan



Barbara Wojcik

Staff members assist in hosting Western Sectional Meeting of the American Mathematical Society on CU Boulder campus

Staff members of the Mathematics Department contributed greatly this spring to the Western Sectional Meeting of the American Mathematical Society meeting on the CU Boulder campus. **Lakshmi Muralidharan** (Accountant Technician) helped with reimbursements between AMS and our department for costs incurred; **Tiffany Dowd** (Undergraduate Studies Assistant) scheduled all the meeting rooms; **Barbara Wojcik** (Graduate Program Assistant) recruited our student ambassadors; **Jeff Taylor** (IT Assistant) and **Barbara Wojcik** drove over to Humanities to make sure tables and the AMS delivery items were safely delivered; **Donna Maes** (Office Manager) oversaw all of this

and, in addition, planned all the many details of the great Saturday reception and ensured all ran smoothly.

Barbara Wojcik, the Math Department's Graduate Program Assistant, reports that she celebrated her 60th birthday in October 2013 and her 25th wedding anniversary in July. Barbara joined the Math Department Staff in February 2008 in the position that she now holds. *Prime Bits* is grateful to Barbara for much of the student news in the current issue.

DeLong Lecture Series features Microsoft researcher Yuval Peres

Professor Yuval Peres, a principal researcher in the Theory group at Microsoft Research, presented two lectures on the University of Colorado – Boulder campus in April as the featured speaker for the 49th annual DeLong Lecture Series, honoring the late Ira M. DeLong.

The title of the two-day lecture series was "Scaling Limits of Some Combinatorial Models and Classical Analysis." On April 22, Peres gave a talk on "Laplacian Growth and the Mystery of the Abelian Sandpile: a Visual Tour," and on April 23, he gave a lecture entitled "Hunter, Cauchy Rabbit, and Optimal Kakeya Sets."

According to the lecture series program, "Peres has published more than 200 papers with 100 co-authors and has



mentored 19 PhD theses. His research encompasses many areas of probability theory, including random walks, Brownian motion, percolation, point processes and random graphs as well as connections with Ergodic Theory, PDEs, Combinatorics, Fractals, and Theoretical Computer Science. He has recently co-authored books on Markov chains and mixing times, on zeros of Gaussian analytic functions, and on Brownian motion."

A fellow of the AMS, Peres is a recipient of the Rollo Davidson Prize. In 2001, he received the Loeve Prize, awarded once every two years to a leading probabilist. He was an invited speaker at the International Congress of Mathematics (2002) and in the European Congress of Mathematics (2008).

Student News

Ph.D. Degrees

(Listed by student name, faculty advisor, field of specialization, title)

Cui Cong; Karl Gustafson; Differential, Integral, Difference Equations; “Implicit space-time domain decomposition methods for stochastic parabolic partial differential equations.”

Jonathan Kish; Peter Elliott; Algebra/Number Theory; “Harmonic analysis on the positive rationals: multiplicative functions and exceptional Dirichlet characters.”

Zachary McGregor-Dorsey; Richard Green; Discrete Math/Combinatorics/Logic/Computer Science; “Some properties of full heaps.”

Tyson Gern; Richard Green; Discrete Math/Combinatorics/Logic/Computer Science; “Leading coefficients of Kazhdan-Lusztig polynomials in type D.”

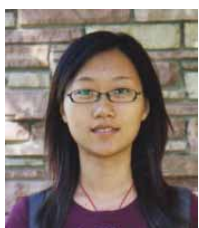
Nathan Wakefield; Su-lon Ih; Algebra/Number Theory; “Primitive divisors in generalized iterations of Chebyshev polynomials.”

Bryce Christenson; Markus Pflaum; Geometry/Topology; “The real homotopy type of singular spaces via the Whitney-de Rham complex.”

Chao Ma; Stephen Preston; Differential, Integral, Difference Equations; “Qualitative and quantitative analysis of nonlinear integral and differential equations.”

Michael Martinez; Markus Pflaum; Geometry/Topology; “The relative K-theory of an Algebraic pair.”

Matthew Moore; Keith Kearnes; Discrete Math/Combinatorics/Logic/Computer Science; “The undecidability of the definability of principal subcongruences.”



Cui Cong



Jonathan Kish



Zachary
McGregor-Dorsey



Tyson Gern



Nathan Wakefield



Bryce Christenson



Chao Ma



Michael Martinez



Matthew Moore

MA degrees

(Listed by student; faculty advisor)

Erica Shannon; Richard Green

Liang Zhang; Janos Englander

Tyler Janes; Karl Gustafson

Trubee Davison; Judith Packer

Krisztian Havasi; Sebastian Casalaina-Martin

Student News, (continued from p. 8)



Above: May 2013 graduates. Pictured below, a number of students and faculty from the Math Department participated in team building exercises at the CU Challenge ropes course.



Student News, (continued from p. 9)

Students and faculty members enjoyed the annual Math Department fall picnic at Eben G. Fine Park



Pictured above, from left: Mark Pullins, Noah Williams, Taylor Klotz, Shawn Burkett and Justin Keller.



From left: Trevor Jack, Caroline Matson, Steven Weinell, Jae Min Lee and Robert Hines

2013 recipients of scholarships and summer fellowships

2012 W.E. Briggs Teaching Excellence Award

Boramey Chhay
Kathleen Smith

2013 Burton W. Jones Teaching Excellence Award

Amy Feaver
William Stanton
Nathan Wakefield

Adele V. Leonhardy Scholarship

Harold Hausman
Philippe Guegan Leonhardy

William Lowell Putnam Competition

The Cu Putnam team placed 35th among 402 college teams. Christopher Aicher and Daniel Bragg tied for 1st place. David Lieberman, Varodom Theplertboon and Weiming Zhang were in a three-way tie for third place. Faculty advisors were: Alexander Gorohovsky, Keith Kearnes and Sergei Kuznetsov (chair).

W.J. Thron

Joseph Migler
Ryan Rosenbaum

Francis P. Stribic

Amy Feaver
Matthew Grimes
Krisztian Havasi
Julie Linman
Erica Shannon

Sieglinde Haller Scholarship

Scott Andrews
Clifford Blakestad
Clifford Bridges
Trubee Davison

University Summer Fellowships

John Hower
Justin Keller
Andrew Moorhead
Jared Nishikawa
Alex Nita
Ben Purkis
Charlie Scherer
Kevin Selker
David Wayne
Lian Zhang

Math Corner

(Written by Keith Kearnes, research by Jeffrey Fox)

Math Corner: Understanding what makes a neuron fire

A neuron is a specialized type of cell that processes information through electrochemical signals. These cells occur in nearly every member of the animal kingdom. A typical neuron consists of a cell body, dendrites (branching tree-like structures growing out of the body), and an axon (often a tube-like structure). Neurons typically accept information along its dendrites and pass it to the cell body. If the cell fires, then a signal is transmitted through the axon to the dendrites of neighboring neurons. The interconnected neurons of an animal comprise its biological neural network.

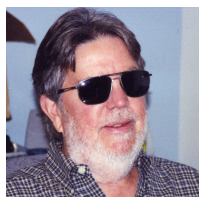
We know very little about what kind of data transmitted through the dendrites will cause the cell to fire. Throughout the animal kingdom, one type of cell stands out as being easy to analyze: the Mauthner cell of fishes. Most fish have these two large nerve cells, one on each side, with axons that run down the length of the spine. When a predator is sensed on one side of the fish the Mauthner cell on that side fires to initiate a very fast escape response involving a contraction on the opposite side of the body. This cell is one of the few identifiable neurons in the animal kingdom, and we know exactly what kind of input causes it to fire.

Neural networks have been modeled in simple ways by treating them as electrical networks consisting of nodes and wires, with nodes representing connections between neurons and wires representing segments of dendrites or axons along which signals are passed. This model of nodes and wires oversimplifies the situation: closer to the cell body, the dendritic pieces are larger; this affects the transmission of signals. Conductance varies along dendritic cells inducing a varying frequency rather than a constant average current. The ions that conduct the charge can “pool up” in places in the cell. When a signal enters the cell body from a dendrite, the broadening corridor of the dendrite could cause a reflected signal to move back upstream in a neighboring dendrite thereby inhibiting signals being carried by the neighbor.

About 15 years ago CU Professor Jeffrey Fox began working with students to build models of the Mauthner cell that take into account the geometry of the cell. He introduced students to the *finite element method*, which is a method for modelling systems with complex geometry. This work, which involves computer coding and mathematical analysis, has taken place over several summers and involved many students. The ultimate goal of this research is to be able to predict what each neuron calculates.

When asked about the results of the research, Fox said “We have learned that what’s happening between the connections between two neurons is much more complicated than is predicted by the standard model. There are wave phenomena and interference effects happening near the membrane that, I think, effects how the cell processes information. I like this project because the mathematics goes from the introductory level to the front-line. The tremendous breadth of the mathematics involved allows undergraduates, graduates and professors each to do meaningful research on it.”

Retired Faculty News



Lawrence Baggett was the honored guest speaker at his alma mater, Davidson College, where he presented the Barnard Lecture in the fall of 2013. The lectureship is sponsored by The Barnard society of Mathematics and the Department of Mathematics at Davidson College. The title of Baggett's talk was "What We Don't Know We Don't Know."



Jan Mycielski and **Wolfgang M. Schmidt** were elected to the inaugural class of Fellows of the American Mathematical Society in November 2012. The Fellows of the American Mathematical Society program recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics.

John H. (Jack) Hodges and his wife, Jean Hodges, had a triple celebrations, Birth-A-versary: 80-85-58, with friends and family on August 10, 2013. The first two numbers represented birthdays and the last an anniversary. A photo of Jack and Jean is among the Mathematics Endowment citations.



David Rearick. In June 2013 Neptune Mountaineering in Boulder celebrated the pioneers of Colorado climbing to share and detail the earliest technical ascents of Rocky Mountain National Park's Longs Peak. The event organizer told the gathering: "This is America's premier rock wall. This one is really the crown of the Rockies." In 1960, at age 27, David Rearick joined Bob Kamps in the historic first ascent of the Diamond on Longs Peak. Among remarks given by David Rearick were the following: "I feel very humbled up here today, because everything we did was so old-fashioned and so easy compared to what they are doing today. It was the first time ... and we broke the ice. We showed that the Diamond was feasible. All in all, it was memorable for the fact that we made a good impression on the Park Service, and the Diamond was officially opened after that."



The Fifth Annual Retired Math Faculty Picnic was held at the home of Bill and Martha Jones on August 14, 2013. Shown in the above photo are those who attended. From left to right: Bill Jones, Doris Goodrich, Dick Holley, Kent Goodrich, Frieda Holley, Jack Hodges, Jerry and Susan Malitz, Arlan and Judy Ramsay, Hank Hermes, Virginia and Al Lundell, Wolfgang Schmidt, Walter Taylor, Bob and Sara MacRae, Pat Schmidt (next to Wolfgang), Chris Taylor, Richard Roth, Ruth Rebekka Struik, Laura Fischer, David Grant (Math Department Chair), Jean Hodges, Muriel Briggs and Martha Jones. We were grateful that Professor Grant joined us for the picnic dinner and gave the group a brief update on the current state of the Math Department.

Alumnae/Alumni News

Fred T. Burton (MA Math, 1975) wrote that Dr. David Rearick and Dr. Richard Roth were his favorite faculty members during his years at CU – Boulder. He also has fond memories of conversations in the TA offices and the beauty of the Flatirons and the mountains near Boulder. From 1976 to 2011, he worked as a teacher of math and physics at Nampa Senior High School in Nampa, Idaho, retiring in May 2011. Along with traveling in the mountains in his travel trailer, Burton enjoys fishing and volunteer work through his church and he serves as an adjunct teacher at Northwest Nazarene University.

Nick De Toustain (BA Math, 1993) writes: “Some of my beloved professors I remember: Ellingwood, Tubbs, Walter, Ellis, Schmidt, Reinhardt, Elliott and Goodrich. I also had Statistics briefly with Professor Struik but, full disclosure, I had to drop that class. And although I never had one of his classes, I got to know Jack Hodges pretty well and he’s terrific (Jean too!). I had a wonderful experience with the Math department and consider myself very lucky for it!

“Which is why I enjoy reading Prime Bits so much. Thank you very much for compiling and publishing it (I know it’s a team effort) – I look forward to each new edition. Now that I’m in software sales I don’t get to use my pure math training too often but I like to think it shaped my thinking and got me comfortable with numerical analysis. I live in northern NJ but work in NYC. If any CU math professors are ever traveling through the Big Apple, I’d love to meet up with them.

“Thank you again for putting together Prime Bits. All good things to CU’s superb Math Dept!”

Garney Hardy (MA Math, 1968) recalled working on her thesis with Professor Bill Jones, who served as her thesis advisor. “After finishing my thesis I don’t think I ever did any math again,” she wrote. “I went from Fortran programming to systems, ending up as a systems programmer on the big mainframes. Left Boulder in 1968, returned briefly and went to Idaho Falls, Idaho, in 1973 at the Idaho National Lab, where I retired in January 1995.” gah@cda.net

Jim Harvey (BA Math, 1970) was the co-founder and first president of the Math Club during his years at CU and now serves as the director of Stanton Chase International, an executive search firm. Harvey writes: “I don’t really use the advanced mathematics I studied at CU much, but you never know when you will be in a crowded room and someone runs up to you and says, ‘Quick – solve this differential equation!’” He named Jean Ferris and John Hodges as faculty members who were particularly helpful to him as an undergraduate. He offered a favorite quote: “I’ve lived in the Atlanta area for over 30 years and enjoy it here, but deep down I sense that there is nothing wrong with Atlanta that couldn’t be cured by moving it to Colorado.” Harvey, who enjoys fly fishing and

racquetball and does volunteer work with Trout Unlimited, also cited a favorite saying: “Life is not measured by the number of breaths we take, but by the moments that take our breath away.” harveyjl@bellsouth.net

James Marshall (BA Math, 1968) writes: “I am sending along a picture of my recent contacts with what one of my professors, Claude McMillan, used to call ‘math types’.”

What do old math guys do?

Last year I worked extensively on the Atkinson Bridge at Mt. Pisgah Arboretum, Eugene, Oregon. Much to my surprise I ended up working with three retired Ph.D. mathematicians from the University of Oregon, including Theodore Palmer (ex dean, UO Mathematics), Charlie Right, and Paul Patterson. The bridge we were building was 86 feet long, a trestle bridge over a viewing pond.



Here Charlie (bearded) and I are working on a join out in the brush. We constructed the bridge, labeled all the pieces, had it pressure treated and reassembled it as the Oregon winter was closing in. I enjoyed working with them all and talking about various branches of mathematics. I always appreciated what the mathematics background has done for me throughout life and have used it throughout including my teaching at Oregon State University and the University of Oregon before ultimately going into business.

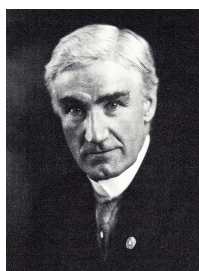


L. J. (Jerry) Lange (Ph.D. Math, 1960) writes: “Thanks so much for Prime Bits. What touched me a lot by it were the many pictures in it of persons who played a positive role in my life.”

Continued on p. 16

Mathematics Department Endowment Funds

Endowed funds for the Mathematics Department provide vital support for teaching, research and scholarship. It would be difficult to overstate the great benefit of these endowments for higher education. Their contributions continue in perpetuity in accordance with the will of each donor. If you are interested in contributing to an endowment (new or existing), please contact the department chair, Professor David Grant, Department of Mathematics, University of Colorado, Boulder, CO 80309-0395, grant@colorado.edu or Margot Jenson Neufeld, University of Colorado Foundation, Senior Director of Development, University of Colorado at Boulder, Boulder, Colorado 80309. Direct: (303) 492-2990 or margot.neufeld@cufund.org. Following is a brief description of existing Mathematics Department endowments.



Ira DeLong Lectures

Professor Ira M. DeLong was essentially the Mathematics Department at CU Boulder from 1888 until his retirement in 1925. After DeLong's death in 1942 his bequest to the university of \$25,000 accumulated interest until 1963 when the faculty began using income from the endowment

to fund an annual series of DeLong Lectures and undergraduate prizes for the Putnam competition. DeLong lecturers are among the leading mathematicians of our time. Each one delivers three lectures and holds informal discussions with our faculty, students and visitors during his/her weeklong visit to the Boulder campus.

Frank F. Islam Scholarships



With a gift of \$52,000 to the CU Foundation, University of Colorado alumnus **Frank F. Islam** endowed two annual scholarships for CU Boulder mathematics students with a gift of \$52,000 to the CU Foundation: The Frank F. Islam Mathematics Scholarship in Honor of **William B. Jones** (Emeritus Professor, Mathematics) and the Frank F.

Islam Mathematics Scholarship in Memory of **Wolfgang J. Thron** (Emeritus Professor, Mathematics).

In making this gift Islam said "These two individuals were the instruments of my successful life journey and the core belief that we must continue the giving in any way we can. I hope these scholarships will allow students in the Mathematics Department to pursue their dreams, choose a career and make their marks on the world. When I give money for a scholarship program, I strongly believe I am investing in the future. I had a great experience at CU, and I hope these scholarships will help the next generations of students to have the same great experience. I want to inspire others to have passion for philanthropy."

Born in India, Islam immigrated to the United States at 15. He earned bachelor's and master's degrees in computer science from the University of Colorado. After working extensively in the federal government, he founded QSS

group, an information-technology company, one of his many successful ventures. Islam now serves as CEO of FI Investment Group LLC, which focuses on providing growth capital to emerging companies and manages specialized and branded funds.

Frank Islam is co-author of "Renewing the American Dream," a book concerned with giving citizens the opportunity to realize their potential by getting educated, working hard and getting a job that pays a living wage. See: www.renewingtheamericandream.net or www.ffislam.com.

John H. "Jack" Hodges Scholarship



John and Jean Hodges

In 2010 with a gift of \$25,000, Emeritus Professor John H. Hodges endowed a scholarship for undergraduate mathematics students, providing for an annual award of \$1000 to a CU undergraduate with financial need who is a good

student. He had considered bequeathing the scholarship funds but decided: "Who knows how long anybody is going to last? I'd like to do it while I'm still around."

Hodges was a member of the CU Boulder Mathematics faculty for 33 years (1960-1993) and continued teaching part-time for two more years. He served as department chair, directed dissertations for a large number of students and was the recipient of many teaching and service awards, including: The CU-student-initiated Teaching Recognition Award (1968), the Boulder Faculty Assembly Teaching Excellence Award (1990), the Outstanding Service to the University Award (1993) and the annual 1992 Burton W. Jones Teaching Excellence Award given by the Mathematical Association of America (Rocky Mountain Section). In reflection Hodges said: "I had the GI bill. It was a blessing for our whole country. The GI bill changed the character of education of the United States. I feel some desire to help carry that on for other people."

Continued on p. 15

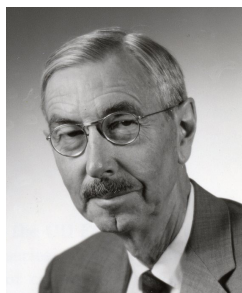
Endowment Funds, (continued from p. 14)



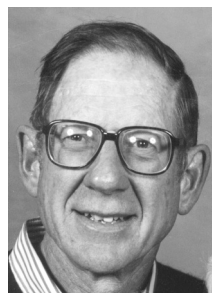
Aubrey Kempner (left) with Burton Jones at Kempner home in 1952

Kempner Mathematics Colloquium

The Kempner Colloquium began in 1963 in honor of Professor Aubrey J. Kempner who served as head of the Mathematics Department from 1925 until he retired in 1949. Kempner gave the inaugural lecture on Reminiscences of the University of Goettingen where he received his Ph.D. degree under Edmund Landau in 1911. Kempner continued to take an active interest in the department until his death in 1973. The Kempner Colloquium Endowment was established in 1995 by gifts from faculty (\$15,000), the College of Arts and Sciences (\$10,000) and CU Math alums, including a major gift of \$25,000 from Dr. William J. LeVeque (B.A. 1944). LeVeque wanted to perpetuate the memory of the CU professor Aubrey Kempner who had greatly influenced his life. The weekly colloquium on topics of broad mathematical interest is essential for maintaining a vibrant learning environment.



Burton W. Jones



William E. Briggs

B. W. Jones and W. E. Briggs Teaching Excellence Awards

The Burton W. Jones Teaching Excellence Award was created in 1984 by gifts from the Mathematics Department faculty to honor their colleague for his long and distinguished service as a member of the faculty (1949 to 1971) and department chair (1949 to 1963). When Professor William E. Briggs retired in 1988, gifts were made by faculty of

mathematics and other Arts and Sciences departments for a memorial in recognition of his distinguished service as a faculty member (1955-1988) and Dean of the College of Arts and Sciences (1963-1980). Since Briggs and Jones had been close friends who greatly valued good teaching, it was decided in 2007 to fund a separate William E. Briggs Teaching Excellence Award with both awards funded by a combined endowment. Each year the Burton W. Jones award is given to a veteran Math graduate student teaching assistant (TA) for outstanding teaching accomplishments. The William E. Briggs award is given each year to a first-year TA in the Mathematics Department for outstanding teaching accomplishments.

Adele Leonhardy Memorial Scholarship

The Adele Leonhardy (B.A. 1924) Memorial Scholarship was established by a gift from her estate. Awards are made to graduate students or upper division A&S undergraduates majoring in mathematics. Recipients must demonstrate excellence in their studies and must be preparing to teach mathematics. Adele Leonhardy was born in Carbondale, Colorado and grew up in Fruita near Grand Junction. While attending the University of Colorado from 1917 to 1924 she taught elementary school in Boulder to pay for her college education. After graduate work at the Universities of Chicago and Missouri she taught mathematics at Stephens College until her retirement in 1967. Professor Leonhardy understood the difficulty of working one's way through college and she dedicated her life to teaching. Her gift to the University of Colorado will enable students from future generations to become teachers of mathematics.

Burnett Chandler Meyer Endowment



The Mathematics Department has established a two-year postdoctoral position called the Burnett Meyer Instructorship, with the first appointment in August 2009. Candidates are considered who have a Ph.D. degree in any area of mathematics including mathematics education. Selection is based on strong evidence of teaching and research. The position has a teaching load of three courses per year. The Burnett Meyer Instructorship is funded by a bequest of more than \$2,000,000 from the estate of the late Professor Emeritus Burnett Chandler Meyer who was a member of the CU Boulder faculty from 1957 to 1990. The bequest is to be used for the benefit of students and faculty. A portrait and plaque in honor of Professor Meyer has been placed in the Mathematics Building.

Continued on p. 16

Endowment Funds, (continued from p. 15)

William Reinhardt Memorial Lectures

The William Reinhardt Memorial Lecture Endowment Fund was established in 2001 by family, colleagues and friends of Professor Reinhardt who was a Mathematics Department faculty member from 1967 until his untimely death on June 22, 1998 at the age of 59. Reinhardt was deeply interested in the foundations and philosophy of mathematics, occasionally teaching courses in the Department of Philosophy.

Frances C. Stribic Scholarships



Frances Stribic and Dorothy Martin

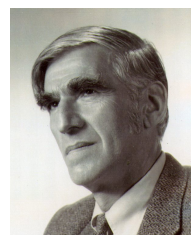
Frances Stribic was a member of the Mathematics faculty from 1926 until she retired in 1965. Finding a need for someone to teach statistics, she prepared herself in that subject and not only taught it for a number of years

but also did research applications jointly with psychology Professor Dorothy (Happy) Martin. Professor Stribic was an outstanding teacher, well respected by her students and

colleagues. In 1990 her friend Happy Martin established the Stribic Scholarship awarded each year to a female graduate student chosen by the faculty for excellence in mathematics scholarship.

Wolfgang J. Thron Mathematics Fellowship

In 1999 Professor Emeritus Wolfgang Joseph Thron expressed his faith in and devotion to the University of Colorado with a gift of \$216,000 to endow the W. J. THRON Mathematics Fellowship awarded each year to an outstanding graduate student in the Mathematics Department. Thron was a member of the Mathematics Department from 1954 until he retired in 1985. He served as department chair from 1972 to 1974 and he was thesis advisor for 21 Ph.D. students. In 1980 Thron was elected to the Royal Norwegian Society for



Sciences and Letters (Det Kongelige Norske Videnskapers Selskap) for outstanding creative research in mathematics and for his great inspiration to others to do creative work. He was awarded the University of Colorado Medal for outstanding contributions to the university and for his distinguished career as a scholar,

teacher and research mathematician.

Alumnae/Alumni News, (continued from p. 13)

Emeritus Professor L. J. Lange had a long and distinguished career in the Mathematics Department of the University of Missouri at Columbia. He was the first of twenty-one doctoral students of the late CU Emeritus Professor Wolfgang J. Thron.



John McArthur (MA Appl. Math 1993, Ph.D. Math, 1994) was named president of Cameron University in Lawton, Okla., effective July 1, 2013. “John McArthur has a track record as a strong, confident academic officer for Cameron, and this search elicited a variety of solid, capable candidates,” said Richard R. Dunning, Chairman of the University of Oklahoma, Cameron

University and Rogers State University Board of Regents. “We are fortunate that a person of John’s caliber and accomplishments has agreed to serve as President of Cameron, and we look forward to working with him to further the University’s mission in the years to come.”

McArthur was a National Merit Scholar and received his Bachelor of Arts in Mathematical Sciences from Rice University in 1987, his Master of Arts in Applied

Mathematics from the University of Colorado in 1993 and his Ph.D. in Mathematics from Colorado in 1994. Both John McArthur and his wife **Karla Oty** (Ph.D. Math, 1993) are products of the University of Colorado – Boulder’s Department of Mathematics, as John did his Ph.D. research under the supervision of Professor Karl Gustafson and Karla worked with Professor Arlan Ramsay.

Marlene Rose Pratto (BA Math 1960) recalled fond memories of CU Boulder, especially of Professors William E. (Bill) Briggs and Arne Magnus. Among other things she remembers Professor Magnus using his necktie as a “pointer” in lectures. She also remembers sitting side-by-side with teachers who were studying higher (abstract) algebra in the wake of Sputnik. In response to her deep concern for education she has written many letters to politicians asking for improvements in education. During her sophomore year Ms. Pratto worked as a student intern at the National Bureau of Standards (NBS) Boulder Laboratories where she learned to program on early computers. When Fortran came in they thought it was too easy. She remarked that, unlike the CU engineers, the scientists at NBS accepted her supportively even though she was the only female intern. Ms. Pratto met her husband at CU and after he received his Ph.D. in sociology they left Boulder for North Carolina in 1969.

Continued on p. 17

Alumnae/Alumni News, (continued from p. 16)

Richard H. Warren (Ph.D. Math, 1971) writes: My first year in Boulder I studied general topology under Professor Wolfgang J. Thron using his book 'Topological Structures.' I enjoyed the class. Our relationship developed into a Ph.D. topic in general topology. While Thron was on sabbatical in Germany, Professor Bill Jones was my mentor. After graduating, Warren's career included working from January 1972 to June 1977 at Aerospace Research Laboratories, Wright-Patterson AFB, Ohio; July 1977 – June

1980 as an Associate Professor of Mathematics, University of Nebraska at Omaha; July 1980 – February 2012 at Lockheed Martin Corp., King of Prussia, PA. After retiring in February 2012, Lockheed Martin brought him back as a part-time, technical consultant. Warren is the author or co-author of more than 25 papers in refereed journals. His volunteer activities include distributing Bibles and New Testaments with the Gideons and serving as an usher at church.

Richard.warren@villanova.edu

Chair's Annual Communiqué, (continued from p. 1)

that comprises the present, and I plan on using periodic communiqués to bring all of you, the Math Department family, up-to-date on the exciting events of the current incarnation of the Department.

One of the main innovations in the Department is on the educational front. The subject of calculus hasn't changed much since you took it, but the way we teach it surely has. Twenty years ago the Department focused much of its resources on converting its large-lecture calculus classes into small sections, so students would get the individual attention they need and deserve. Immediately, the percentage of students who didn't succeed in the course (those earning grades of "D," "F," or "W") dropped by a third.

A half-dozen years ago, two of our faculty, Professors Eric Stade and Robert Tubbs, began a multi-year effort to reform our first-year calculus courses, making use of best practices culled from educational research. They converted the classroom into an arena for "active-learning" (sometimes called the "modified Moore method"), where students work at their desks, singly or in groups, actively solving problems during much of class time, so that ideas can form in their mind by doing mathematics and communicating their mathematical ideas. Key to this effort is a weekly lab, where students work in groups on more involved problems, further cementing ideas and encouraging independent and group exploration. These group discussions are facilitated by graduate teaching assistants and what are called undergraduate "learning assistants."

The concept of Learning Assistants was developed at CU (and has now spread to many other institutions), and is similar to the use of medical students at teaching hospitals. Our Learning Assistants are talented undergraduates who are

considering becoming math teachers after graduation. They help our educational mission by bringing their skills and passions to their facilitating group work in the classroom, while at the same time getting a real taste of what it's like to be a teacher, hopefully whetting their appetite for a future career in the field.

I am pleased to report that our approach to calculus has just been recognized as a national model for how the subject should be taught! Indeed CU Boulder has just been chosen as one of only four schools nationwide to be funded by the Helmsley Foundation, through the Mathematics Teacher Education Partnership, to help redesign secondary mathematics teacher preparation programs. This is due to the efforts of Stade and Tubbs who, along with colleagues David Webb and Kimberly Bunning at the CU School of Education, won the grant which will fund the design of materials based upon our calculus courses to disseminate to other schools for professional development of the next generation of teachers, and to serve as a model for adoption by other colleges and universities.

We hope one day to have the resources to employ this same approach to mathematics education in some of our other courses such as multivariable calculus and pre-calculus taken by a wide variety of students on campus.

If you have a moment, send me an email with your memories of Calculus at CU (or your thoughts on Math education), your time in the Math Department, and what you're doing today. Or please stop by if you're in town and visit your Department.

Best wishes,
David R. Grant
(grant@colorado.edu)

STAYING IN TOUCH

It is with great pleasure that we receive news from former CU Alums. Please share with us some news about you and reminiscences of CU Boulder. Mail responses to William.Jones@colorado.edu and/or primebitseditor@gmail.com or by USPS to

Prime Bits Editors
(W. B. Jones and K. H. Jones)
Mathematics Department
University of Colorado
Boulder, CO 80309-0395

Name_____

Post Office
address_____

e-mail address_____

CU Boulder degrees and dates_____

Favorite faculty, mentors, thesis advisor_____

Honors and awards_____

Employment_____

Professional activities_____

Family news / Travel / Hobbies_____

Volunteer work_____

Other_____

Reminiscences of CU Boulder_____

Please enclose additional pages if needed. We hope to hear from you.

Mathematics Department Donors 2011-2013

The Mathematics Department is grateful for the generous contributions by donors listed below. Gifts to endowments and funds make it possible to bring colloquium speakers (DeLong, Kempner and Reinhardt) to the CU Boulder campus, to offer scholarships (Hodges, Islam, Leonhardy, Stribic and Thron) and to reward outstanding teaching assistants (B.W. Jones & W.E. Briggs awards) and Putnam Contest winners. Gifts (cash or securities) can be sent by returning the enclosed form MATHEMATICS DEPARTMENT 2012 ANNUAL FUND to the CU Foundation. Contributions to the Mathematics Department through the CU Foundation are tax deductible.

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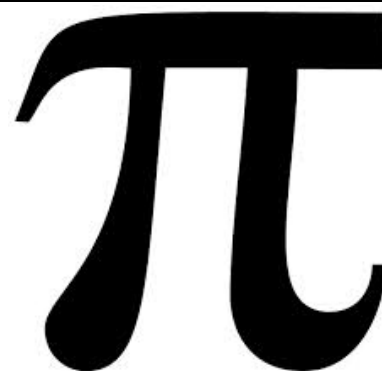
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Judith Sharon Zinn



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Math Awareness Month Lecture

The Math Awareness Month lecture for Spring 2012 was presented by Colin Adams of Williams College. The title of the lecture was “Blown Away: What Knot to Do When Sailing.” Being a tale of adventure on the high seas involving great risk to the tale teller, and how an understanding of the mathematical theory of knots saved his bacon. No nautical or mathematical background assumed. Collin Adams is the Thomas T. Read Professor of Mathematics at Williams College. The event was organized by Professor Jeanne Clelland,



National Pi Day Celebrated

Professor Judith Packer, former Math Department Chair, reported that she went to King Soopers on March 14, (Pi Day) to buy some pie, but they were almost all gone. Everybody seems to be getting into Pi Day, a special day recognized by Congress in 2009. About 30 people gathered at CU’s Mathematics Building in honor of the beloved mathematical constant.