PRIME BITS

Department of Mathematics Newsletter
University of Colorado, Boulder, CO 80309-0395

Emeritus professor endows math scholarship

Emeritus Professor John H. Hodges has 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 he notes: "Who knows how long anybody is going to last? I'd like to do it while I'm still around."

Growing up in the Great Depression and learning to be frugal, Professor Hodges packed a sack lunch for 35 years even as many of his colleagues lunched at the University Club. Money saved by this discipline went into an Individual Retirement Account, part of which Hodges has dedicated to establish the scholarship endowment enabling students to have more access to higher education.

Hodges was a member of the CU-Boulder Mathematics Department faculty for 33 years (1960-1993) and continued teaching part-time for two more years. He served as

Jean and Jack Hodges

department chair for three years, directed dissertations for a large number of doctoral and master's degree students and was the recipient of many teaching and service awards.

During his career at the University of Colorado, Professor Hodges placed major emphasis on undergraduate teaching, a vocation in which he excelled among his peers. In 1968 he received the CU-student-initiated Teaching Recognition Award given only to the most outstanding classroom instructors. The Boulder Faculty Assembly awarded Hodges the Teaching Excellence Award in 1990 and the Outstanding Service to the University award in 1993. The Mathematical Association of America (Rocky Mountain Section) honored John H. Hodges in 1992 with the annual Burton W. Jones Teaching Excellence Award.

Judith Packer named new math department chair

Judith Packer was born in San Diego, Calif. Since her father was in the US Navy and later a marine engineer for Exxon International, she spent her childhood moving from seaport to seaport within the U.S. with her family. Before the age of ten, Judith had lived in San Diego, Jacksonville, Fla, Washington, D.C., Norfolk, Va, and Annapolis, Md. She also lived in Italy and Japan while growing up. Such an upbringing made her enjoy traveling (although not moving!).

She always enjoyed mathematics, and already in high school had decided to major in math. At Wesleyan University in Middletown, Conn. she was fortunate to have her freshman

advisor, Ethan Covan, become her undergraduate thesis advisor; he convinced her she could be a mathematician.

By 1978 Judith had completed both a B.A. and an M.A. degree at Wesleyan. After visiting several universities in search of a graduate school, Judith chose Harvard because she said "It felt like the right place for me." She earned her Ph.D. degree at Harvard, doing thesis research under Professor George Mackey. Her brother was an undergraduate there at the time, and he introduced her to his TA, Loring Tu

Packer (continued from p. 1)

(now at Tufts), with whom she continues to be in touch.

Dr. Packer spent a postdoctoral year in Berkeley, Calif., at MSRI (Mathematical Sciences Research Institute) in its very first year of existence. Following the MSRI post-doctoral, she accepted a position at the National University of Singapore where she worked from 1983 to 1989.

In 1989 Judith joined the Department of Mathematics at the University of Colorado at Boulder. She very kindly recalls that: "I was fortunate enough to have as my first chair of the Department none other than Professor Bill Jones, editor of these very *Prime Bits*! I remember that on one of my first visits to the Department (then located in the Engineering Center), Bill showed me the plan for the new Mathematics Building."

In 1992 Judith returned to the National University of Singapore, but after a sabbatical year in Boulder, Colo., in 1999 she and her family began to miss Boulder, and with some good timing and good fortune, she rejoined the CU Boulder Mathematics Department in 2002.

Judith's areas of mathematical expertise are functional and harmonic analysis and operator algebras. Her mathematical travels have brought her to such places as the Institute for Advanced Study at Princeton, University of New South Wales in Australia, Kyushu University in Japan, the Mathematical Research Institute at Oberwolfach in Germany's Black Forest, the Banff International Research Station, the Institute of Mathematical Sciences in Chennai, India, the Schrodinger Institute in Vienna, and the University of Oslo, to name just a few.

Dr. Judith Packer

As Department Chair, Professor Packer said she will continue to promote an atmosphere that allows members of the Department to feel positive about one another's research and educational efforts. She will work together with our faculty to persuade the administration to enact recommendations of the recent external reviewers of the CU Boulder Mathematics Department, Roger Howe of Yale and Sylvia Wiegand of Nebraska, who argued that the CU Mathematics Department would benefit from filling our vacant faculty lines and instituting a larger postdoctoral program.

Judith said she chose to work at the University of Colorado at Boulder because there were faculty members here with similar interests (Professors Larry Baggett and Arlan Ramsay), because her husband also obtained a position in the general vicinity and because the Front Range of Colorado is a beautiful place.

Judith is married to James Jesudason, who teaches in the Liberal Arts and International Studies Division of the Colorado School of Mines at nearby Golden, Colorado. She and James have two sons, Adam, 19, a sophomore at the University of Vermont, and Aaron, 17, a senior at Fairview High School. Judith said that: "Veterans in the Mathematics Department will recall that before Adam was born in 1991, Judy Ramsay and Martha Jones kindly threw a baby shower for me."

This past summer, she and her family traveled to Singapore, Malaysia, and India. Some of her hobbies are reading, kickboxing and watching movies.

DeLong Lectures to feature Professor Endre Szemeredi

The Forty-Seventh Annual DeLong Lectures (Oct. 4, 6, 8, 2010) will be given by Professor Endre Szemeredi of Rutgers University, speaking on the theme "In every disorder there is an order." In the first talk the "order" is an arithmetic progression of moderate size. In the second talk the "order" is a large generalized arithmetic progression. In the third talk the "order" is a graph with nice properties.

DeLong Lectures Schedule

Monday, Oct. 4, 2010, 4-5 p.m., "Arithmetic progressions," in the Benson Earth Science Center (BESC) Room 180.
Wednesday, Oct. 6, 4-5 p.m., "Long Arithmetic progressions in sunsets." Room to be announced.
Friday, Oct. 8, 4-5 p.m., "Embedding sparse graphs into large graphs." Room to be announced.

Further details of the talks and the speaker may be found at http://math.colorado.edu/~rmg/delong/

International mathematics conference honors CU Professor Richard Laver

A set theory conference to honor the mathematical accomplishments of Emeritus Professor Richard Laver was held at CU during Feb. 5-7, 2010. Invited lectures were delivered by 16 prominent mathematicians. The lectures focused on many current topics in set theory including topics related to Professor Laver's research, e.g. to his solution to Fraïssé's conjecture, his proof of the consistency of the Borel conjecture, his introduction of Laver forcing, and his invention of the Laver Tables.

Several of the speakers had connections to CU: Tim Carlson (Ohio State U) was a Special Assistant Professor in the CU Mathematics Department in the late 1970's and early 80's. Matthew Foreman (B.A. 1975) UC Irvine was a CU undergraduate in mathematics who, in 1975, won the Jacob Van Ek Scholar award for outstanding academic achievement and contributions to the university and Boulder communities. Stevo Todorcevic (U Toronto and Universite Paris VII) was an Ulam Professor in the CU Mathematics Department in the early 1980's.

The conference was funded by the National Science Foundation, the CU Council on Research and Creative Work, and the CU Department of Mathematics. The program was organized by Dr. Sheila Miller (Ph.D. 2007 from CU Boulder) of the U.S. Military Academy and the local organizers were CU professors Bart Kastermans, Keith Kearnes and Agnes Szendrei. Administrative support was supplied by Donna Maes and Denise Rodriguez-Mora.

Scholarship *(continued from p. 1)*

Hodges' path from Pennsylvania youth to university professor was not pre-ordained. He recalls that "As a kid I was pretty good at arithmetic and things of that sort." At age 17 when he finished high school he found himself with three options: (a) get drafted, (b) work in steel mills, or (c) join a special military training program. He remembers the special-training route in the Navy as a "great time and a big adventure." Using the GI bill he earned a bachelor's degree in three years and then entered graduate school at Duke University where he received a Ph.D. degree in mathematics. Jack remembers the day before classes began at Duke when the department chair, a "blunt guy," with an arm load of books, "slapped a book on my armchair and said, 'Hodges, you're an algebra teacher.'" Jack said "He was right. I loved it. I was in heaven, because I loved teaching. And that's been my life."

In awarding the John H. "Jack" Hodges Scholarship, the Mathematics Department chair, Professor Eric Stade, stated that Jack's particular interests and contributions to the department would be taken into account. One of Hodges's passions is helping people conquer their fear of mathematics and even appreciate its beauty and logic. During the latter part of his career, Hodges focused attention on prospective elementary school teachers, many of whom were enrolled in a course he taught called, "The Spirit and Uses of Mathematics." Those enrolled in this course for prospective elementary school teachers were often older women who had a degree in, say, English. It was the least prestigious course in the department, he said, so there was no competition to teach it. Hodges likens it to a course on mathematics-

appreciation. It was a course he loved to teach. Jack believed that it was not adequate to concentrate on mathematics used before 1600. So what he did was to teach very contemporary mathematics at an intuitive level. He said "This is something people don't normally get in a high school mathematics course." Jack Hodges' conception is that "Mathematics is an art, not a science." Professor Stade notes that "Hodges was both passionate and abundantly successful in training our future teachers. The Mathematics Department is very excited about and grateful for this opportunity to recognize our best and brightest undergraduates, especially considering the constraints the present economy puts on our own finances, and those of our students."

Hodges and his wife, Jean, both retired in 1995, Jean from an outstanding 15-year career as the Director of the Boulder High School Theater Program. They have since traveled extensively, visiting Australia, New Zealand, China, Turkey, Africa and Southeast Asia. The couple is active in PFLAG (Parents, Families, & Friends of Lesbians and Gays), a cause about which both of them are passionate. They also enjoy theater, the arts, reading, book clubs, social activism, family, friends and church activities. They celebrated their 55th wedding anniversary on August 13, 2010 with a family barbecue.

In reflection, Jack Hodges had this to say about his motivation to create a scholarship. "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."

Faculty Highlights

Faculty administrative responsibilities**: Judith Packer**, Department Chair; **Carla Farsi**, Graduate Program Chair, **Brian Rider**, Undergraduate Program Chair; **Stephen Preston**, Chair of the Kempner Colloquium and DeLong Lectures; Markus **Pflaum**, Chair of Computer Committee.

Sebastian Casalaina-Martin (Yano) and his wife, Irene, have a son, Vincent Elijah Hasun Casalaina, who arrived on Saturday, Jan. 23, at 4:24 p.m. Rocky Mountain Time. He was born two weeks early weighing in at 5 lbs 14 oz and measuring 20.5 inches tall. Irene did an amazing job with a long delivery that otherwise went very smoothly.

Yano and Irene with son Elijah

R. Kent Goodrich will be retiring officially on Dec. 31, 2010, after 44 and one-half years of service to the CU Boulder Mathematics Department. He joined the faculty in 1966, has directed theses for 10 PhD students in Mathematics, and helped direct a PhD thesis in Electrical Engineering. He has directed 29 Masters Degree students. Goodrich states that "these and the other students I have taught, made my work here at CU a pleasure.

Goodrich and David Grant started the Actuarial Science Certificate Program in 1995, which produces around four certificate students per year. Many of these students have gone on to successful careers in the actuarial field. Goodrich gives thanks to John Williamson (Applied Mathematics) for helping to found this program, Anne Dougherty (Applied

Mathematics) for her work as Co-Chair of the program and advisors in the program: Karl Gustafson (Mathematics), Nicholas Flores (Chair of Economics), and Michael Stutzer (Leeds School of Business). This is an interdisciplinary program involving Mathematics, Applied Mathematics, Economics, and the Leeds School of Business.

Goodrich has been a Visiting Scientist at the National Center for Atmospheric Research (NCAR) since 1985, working in the Research Applications Lab (RAL) on wind shear detection algorithms that are now in most major airports in the US and at many other airports around the world, including the Hong Kong airport. He has worked on turbulence detection algorithms for the Juneau Alaska and the Hong Kong airports. The system in Juneau will go live in 2012. Goodrich has worked on plume detection algorithms using lidar and is presently working with a team at NCAR and CU on turbulence detection from GPS signals. This work is funded by a NASA grant. He gives thanks to Penina Axelrad (CU) for her collaboration on this work, to Wes Wilson for getting him started at NCAR and to Larry Cornman, Andrew Weekley, Cory Morse, and Gerry Wiener for all of the interesting collaborative work we have done over the years at NCAR.

Goodrich generously expresses his gratitude to his colleagues in the Mathematics and Applied Mathematics Departments from whom he learned much about teaching and research. The friendships within these two Departments have added much to my life here at CU. In this regard, he gives special thanks to Karl Gustafson, Arlan Ramsay, Larry Baggett, Bill Jones and Jack Hodges. He would like to thank the Staff in the Mathematics Department, and Eric Stade and Judy Packer for their work on his retirement.

"In retirement, I plan on reading more history, exercising more, and traveling more with my wife Doris. She has been a huge help to me over the years with her patience, support, love and advice.   I still love my work, but it is time to slow down and enjoy retirement."

Richard Green was recently promoted to the rank of full professor of mathematics. During his Spring 2010 sabbatical leave he wrote a research monograph called "Combinatorics of minuscule representations". He is currently working on an NSF-funded topology project entitled "Polytopal subcomplexes and homology representations."

Karl Gustafson gave three invited lectures in Shanghai China in June 2010. These were presented at the IWMS2010 Conference (Plenary Address) at Shanghai Finance University and at Shanghai University and Fudan University. Gustafson gave six lectures throughout China in 1994 and reports that the new China due to its phenomenal growth and high morale is unrecognizable from that of 16 years ago.

Faculty Highlights (continued from p. 4)

Alexander (Sasha) Gorohovsky, Keith Kearnes and **Sergei Kuznetsov** received the 2009 and 2010 Colorado Mathematics Award for outstanding service to students presented to them by Colorado Governor Bill Ritter.

A conference in honor of the 60th birthday of Professor **Sergei Kuznetsov** was held at the University of Colorado at Boulder, June 24-- 26, 2010, sponsored by the NSF and the CU Department of Mathematics, organized by CU faculty members **Janos Englander** and **Brian Rider**. **Sergei Kuznetsov** is one of the top experts on measure valued branching processes (also known as "superprocesses") and their connection to nonlinear partial differential operators. His research interests range from stochastic processes and partial differential equations to mathematical statistics, time series analysis and statistical software. His most well known contribution to probability theory is the "Kuznetsov-measure."

Sergei obtained his Ph.D. in 1976 in the former Soviet Union under the guidance of **Eugene Dynkin**, and ever since that time he has been the main research collaborator of his former advisor. Sergei joined the Department of Mathematics at the University of Colorado at Boulder in 1998. His other love affair besides mathematics is with hiking and landscape photography. Most of his spare time he devotes to hiking with his wife, Olga, and to their four Chihuahuas. Among the invited speakers for the conference were the following outstanding mathematicians: **Donald Dawson** (Carleton, Ottawa), **Eugene B. Dynkin** (Cornell) and **Daniel W. Stroock** (MIT).

Markus Pflaum is the recipient of the 2010 LEAP Award, related to a mathematical website called Liber Mathematicae. See http://www.libermath.org for details.

Stephen Preston is in charge of the Kempner Colloquium and DeLong Lectures for 2010-2011.

Anca Radulescu was appointed an Instructor in the Mathematics Department starting in fall 2010. At the request of Prime Bits, Dr. Radulescu kindly submitted the following biographical story:

"I was born in Romania, where I developed my irremediable math nerd skills and where I also graduated college in 1998, with a degree in Mathematics from the University of Bucharest.

Graduate school took me to Stony Brook, New York. There, amongst the typical Long Island blue waves and blue moods, I learned about how complexity of dynamical systems evolves under perturbations, and about how all this applies to our brains when we learn. Although my dissertation problem steered clear of the brain, safely contained in a space of abstract functions, I started to also find enjoyment in applying methods from dynamics to theoretical, and sometimes even data-driven, systems.

When finishing my first postdoctoral position at CUNY, I came to Boulder in order to be together with my boyfriend (now husband), and instantly my love extended to the whole place. After a three-year instructorship in Applied Math, followed by a short visit to a collaborating research group in New York, I most happily returned to Boulder and joined the Math Department. I greatly appreciate being back, and indulging in the activities that come with it: hiking, running, playing lengthy board games with our nerdy friends, and procrastinating the furnishing of our place." Anca Radulescu and Stephen Preston were married on May 17, 2008.

Dr. **Delphi (Dee Dee) Shaulis**, received the Marinus G. Smith Award from the CU Parents Association in recognition of her significant impact on the lives of CU-Boulder undergraduates. Students and parents were asked to nominate candidates who were deserving of this recognition. The award is named for Marinus G. Smith, a Colorado pioneer who made significant financial and land donations to the university, allowing it to locate in Boulder at the base of the Flatirons.
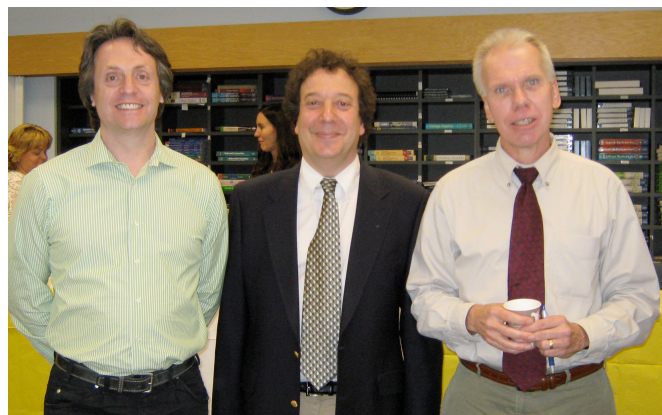
From left: Professors Eric Stade (Department Chair), David Grant (Graduate Program Chair) and Robert Tubbs (filling in as Undergraduate Program Chair while Brian Rider was on leave).

Eric Stade, professor and chair of the Department of Mathematics at the University of Colorado at Boulder, received the 2010 Burton W. Jones Award for Distinguished College or University Teaching of Mathematics. The award

Faculty, (continued from p. 5)

is intended to recognize extraordinarily successful teachers of mathematics. The award committee stated that "Stade's efforts and accomplishments are truly exceptional." The honor includes a certificate, honorarium and automatic nomination for the Deborah and Franklin Haimo Award for Distinguished College or University Teaching of Mathematics by the Mathematical Association of America (MAA). Professor Stade will deliver the opening lecture at the 2011 spring meeting of the Rocky Mountain Section of the MAA and will serve a one-year term on the Rocky Mountain Section Awards Selection Committee. The CU boulder Mathematics Department will host the 2011 Annual Meeting of the MAA Rocky Mountain Section, April 8-9, 2011; co-organizers will be Professors Robert Tubbs and Eric Stade.

Martin E. Walter is the author of a new book, "Math for the Environment: Food, Economics, Climate, Pollution, Media Literacy, and much more," to be published by the CRC Press/Taylor & Francis (600+ pages) to appear in 2010. Other topics include: encryption/surveillance, identity theft, voting, chance and health, recycling, box models, population and epidemics. In 1992 Professor Walter introduced a new course at CU-Boulder called "Mathematics for the Environment" which he and other faculty members have been teaching for the past 18 years. During these years he has gathered material and prepared various versions of his book in paperback for use in the classroom. The course has been well received by students with two sections being offered most semesters. Professor Walter states that: "The level of mathematics is elementary, and I view the course as an alternative to College Algebra or Liberal Arts Math. It can be viewed as an elementary modeling course. I investigate the logic of current human systems, such as agriculture and finance. The first chapter is on climate change, the second on the financial collapse (and why the necessary conditions for preventing the next one have not been put in place). One of my favorite chapters is on the Warlpiri aborigines of Australia and their kinship relations, which form a group isomorphic to the Dihedral group of order 8. Fuzzy logic and feedback loops come up at crucial moments.

Siye Wu has resigned his position as a member of the Mathematics Department faculty as of Sept. 1, 2010, so that he can pursue his career in Hong Kong.

2010 Ulam Visitors

2010 Ulam Visitors are: Professors Youri Davidov and Daniel Stroock.

Retired Faculty

Hank and Carol Hermes celebrated Hank's 77th birthday with a Mt. Rainier climb. Hank's description follows: "Day one was a 5,000 ft climb, with a 45 lb pack, on the Muir Glacier to camp one at 10,000 ft. Eight climbers, with four guides, started in our group. Seven made it through the first day. Day two was rope, ice ax, practice and a 1,100 ft. climb with full packs to our high camp at 11,100. Two more of our party dropped out."

"Day three, summit day, began at 12 a.m. in a freezing drizzle and high wind. We had lighter packs but now crampons on our heavy plastic boots and a 3,300 ft climb ahead. Two more of our group dropped out after about 1,000 ft leaving now only Carol, her son Grant and me with two guides. We struggled to the Crater rim in well below freezing temperatures with wind gusts over 60 mph. Visibility at the Crater was essentially zero, not many photos. Hank, Carol and Grant were the only ones making it to the top. Then down 3,300 ft to high camp; pack sleeping bags, etc, and continue down another 6,000 ft (with full packs) to the van at Paradise Valley. Hardest thing I've ever done! Carol and I are back, healthy but so, so tired!"

Hank and Carol Hermes on the ascent of Mount Rainier in Washington state.

William B. Jones has recently assumed the job of Membership Secretary for the CU Retired Faculty Association (CURFA), consisting of more than 800 members. CURFA serves as an advocacy organization for retirees. It also provides educational and social events with its spring and fall luncheon meetings and other gatherings. In spring 2010 Bill and Martha participated in a three-week tour of Turkey by bus, covering 3500 miles, visiting historical sites of civilizations from 9,500 BC, to the Greek, Roman, Ottoman empires and modern Turkey. Bill continues to publish *Prime Bits* each year.

First Annual Retired Faculty Picnic. CU retired mathematics faculty and families gathered for a summertime potluck picnic at the home of Bill and Martha Jones on a beautiful afternoon in July. Front row, l. to r.: Bill Jones, Jean Hodges, Martha Jones, Susan and Jerry Malitz. Back row l. to r.: Virginia and Albert Lundell, Anna Clements, Bob and Sara MacRae, George Clements (far back), Jack Hodges, Wolfgang and Pat Schmidt, Walter Taylor, Richard Roth, Arlan Ramsay, Muriel Briggs, Judy Ramsay, Dick and Frieda Holley.

Retired Faculty, (continued from p. 6)

David Rearick celebrated the 50th anniversary of his ascent of the Longs Peak Diamond. David and his climbing partner, Robert Kamps, made the first ascent of The Diamond on the east face of Longs Peak in Rocky Mountain Park 50 years ago, August 1-3, 1960. Following are excerpts from a description of the climb written by Chris Weidner for the Boulder Daily Camera, August 4, 2010.

"By 1960, the Diamond glinted as the most famous unclimbed wall in America. Two California climbers -- Robert Kamps, an elementary school teacher, and David Rearick, a mathematics Ph.D. -- were fit from a month in Yosemite, and on July 27, 1960, they were granted permission for an August attempt on the Diamond.

Three days later, Kamps, his wife, Bonnie, Rearick and friend Jack Laughlin trekked to the Chasm Lake Shelter. The following day, Kamps' and Rearick's own four-member support/rescue team arrived. They schlepped loads of gear up to Broadway, a ledge at the base of the Diamond, where they intended to sleep, but heavy rain drove them back to the shelter. In the 1961 'American Alpine Journal,' Rearick wrote, 'The grim aspect of the Diamond looming over us, veiled in clouds and weeping streams of water, did little for our morale.' Monday, Aug. 1, dawned cold and windy, but clear. The pair boldly chose a crack system (later dubbed D1) splitting the center of the Diamond at its tallest point and began climbing at 9:30 a.m. A mix of free and aid climbing brought them one-third of the way up, but by 4 p.m. the weather threatened. They rappelled to their bivouac on Broadway. The next morning, they ascended fixed ropes

Staff News

Donna Maes received the CU-Boulder Service Excellence Award. Four University of Colorado staff members were honored for outstanding volunteer service to CU and their communities during the All Staff Council Conference. Recognized as Service Excellence Award winners were Alexis Kelly, system administration; Donna Maes, CU-Boulder; Stephanie Hanenberg, CU-Colorado Springs; and Lisa Province, CU-Denver. Each received a plaque and $1,000. Maes, the office manager for the department of mathematics, was given her award by CU-Boulder Chancellor Philip Distefano, who called her "tireless and dedicated." He said Maes "uses the right mix of humor and professionalism" in her job and always "steps up to the plate." Maes oversees the day-to-day responsibilities of the department; coordinates department recruiting, graduation functions and re-accreditation; and has advocated for colleagues in her position of co-chair on the Boulder Campus Staff Council. With three sons, Maes is active in scouting and numerous school activities. She also helps rescue and rehabilitate birds of prey, and volunteers with the Buffalo Bicycle Classic, which raises money for scholarships for students in the College of Arts and Sciences.

Barbara Wojcik, Graduate Program Assistant, reports that, with the official start of the Fall 2010 semester, "we have a few changes in the department. Dr. Judith Packer was elected the new department chair, succeeding Dr. Eric Stade. She has been with the department for about 12 years in total, and served as the Graduate Program chair in 2007-2008 and 2008-2009. Dr. Carla Farsi takes over from Dr. David Grant as the new Graduate Program chair, and she has been with the department almost 20 years. This academic year we have a good-sized incoming class of graduate students. We have 18 new graduate students – nine women and nine men. We also have a new instructor, Dr. Anca Radulescu. Our new students and colleagues in the department are a very energetic group, so please join me in welcoming them to beautiful Boulder, Colorado and the University of Colorado at Boulder. Thanks and have a wonderful year."

Tiffany Dowd and her husband have a new member of their family. "Parker Grace was born Tuesday, January 19, 2010 at 5:13pm. She weighed 8lbs, 8oz, and measured 21 1/2 in. She has brown hair and dark eyes. We are so proud and so amazed at how this has changed us! We love her like nothing else and couldn't be happier!" Tiffany Dowd joined the Mathematics Department staff on St. Patrick's Day 2008. Tiffany works with Professor Brian Rider, chair of the Undergraduate Program. Tiffany's job requires her to give information and assistance (with a friendly smile and lots of patience) to undergraduate students entering the mathematics office, including 300 mathematics majors and thousands of students enrolled in mathematics courses.

Retired Faculty, (continued from p. 7)

back to their highpoint. One pitch higher, the rock quality deteriorated and the wall tipped backward. Rearick wrote, 'For the next several hundred feet the climbing would be largely direct-aid, overhanging, and quite strenuous. The rope moved very slowly now through my hands as Bob labored upward.' The wall was so steep that Kamps and Rearick climbed behind a narrow waterfall that gushed from the summit slopes. The team scaled four pitches that day but was caught by darkness well below the top. They spent the night of Aug. 2 two-thirds up the wall, without sleeping bags, sharing a ledge 2 feet wide and 7 feet long. Early the next morning, they cut all ties to the ground and prusiked back to their highpoint. Later that year, in 'Trail and Timberline,'

Kamps wrote: ' ... when we stepped into our prusik loops, and swung into space, retreat would be impossible.' Higher up, as they neared the source of the cascade, they encountered 'water, moss, and overhanging chockstones.' Two pitches from the top, Kamps hung in slings to belay; ledges were non-existent. Rearick recalled, 'A more exposed position is hard to imagine.' On the 11th and last pitch, they squirmed up a cold, wet chimney. 'At one point," wrote Rearick, 'I remember doing a layback against a block of ice.' Kamps and Rearick surmounted the Diamond at 1:15 p.m. on Aug. 3, 1960." David Rearick began his long career with the faculty of the University of Colorado Mathematics Department in 1961.

Laver Conference, (continued from p. 3)

Names of participants in the Laver Conference who are affiliated with CU Boulder mathematics. Jan Mycielski (CU faculty, leftmost); Tim Carlson (CU Visiting Prof long ago, 3rd from left); Stevo Todorcevic (CU Ulam Prof long ago, 4th from left); Everett Piper (CU student, 6th from left, in back); Matthew Foreman (Once a CU undergrad, now prof at UC Irvine, 8th from left); Spencer Unger (Past CU grad student, MS under Monk, 9th from left, in back); Robin Chestnut (Current CU grad student, 10th from left); Charles Holland (CU adjunct professor, 16th from left); Bart Kastermans (CU faculty, 18th from left); Rich Laver (CU faculty, 20th from left); Kevin Selker (Current CU grad student, 24th from left, in back); Jason Hill (Current CU grad student, 27th from left); Dima Sinapova (Past CU undergraduate, 2008 PhD from UCLA, 28th from left); Sheila Miller (CU PhD under Laver, now at West Point, 30th from left); Don Monk (CU faculty, 32nd from left) Joshua Sanders (Current CU grad student, 34th from left); Keith Kearnes (CU faculty, 37th from left); Photo by Agnes Szendrei (CU faculty)

Laver Tables

The nth Laver table is the multiplication table on $\{1, 2, 3, ..., 2^n\}$ defined by the rules:

(1) $x*1 = x+1$ cyclically. (That is, $x*1=x+1$ if $x < 2^n$, while $2^n*1 = 1$.)
(2) $x*(y*z) = (x*y)*(x*z)$.

The first three Laver tables are:

Rule (1) says that the first column is a cyclic permutation of $\{1, 2, 3, ..., 2^n\}$. Once the first column is determined, Rule (2) determines the rest of the table uniquely

The first row of a Laver table is a periodic sequence. In the first three tables these sequences are: [1], period 1; [2,2], period 1; and [2,4,2,4], period 2. Extending this list, the periods of the first ten Laver tables are 1, 1, 2, 4, 4, 8, 8, 8, 8, 16. It is known that the sequence of periods is nondecreasing and consists of powers of 2. R. Laver used a large cardinal axiom to prove that the periods of these tables tend to infinity. But, as he showed, period 16 is repeated very many times before period 32 appears. Later calculations of R. Dougherty show that in order to find a Laver table whose period is bigger than 16 one must take n much bigger than, e.g., the number

$n = 0$

*	1
1	1

$n = 1$

*	1	2
1	2	2
2	1	2

$n = 2$

*	1	2	3	4
1	2	4	2	4
2	3	4	3	4
3	4	4	4	4
4	1	2	3	4

$k=10^{10^{10^{\dots}}}$, where the number of 10's in this tower of exponentials equals the number of atoms in the universe.

This is more than just an unexpected appearance of astronomically large numbers. Mathematics is founded on a set of axioms called ZFC (short for Zermelo-Fraenkel set theory with Choice). ZFC by itself is not strong enough to solve all interesting mathematical questions, but in the 1940's K. Goedel conjectured that every mathematical problem can be solved by adding a suitable large cardinal axiom to ZFC. The large cardinal axiom Laver needed to prove his result about the periods is essentially the strongest one believed to be consistent with ZFC. At present the statement about periods of Laver tables is the simplest result whose only known proof uses methods beyond ZFC.
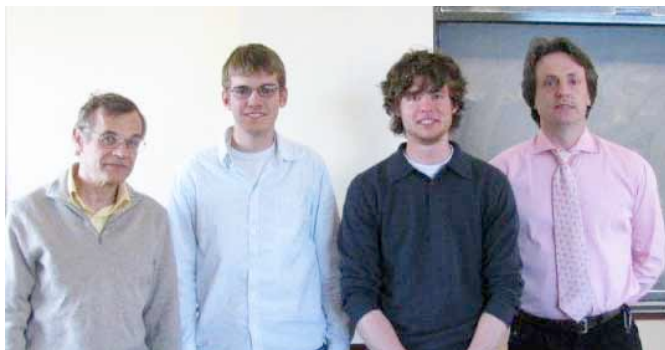
Student News

William Lowell Putnam Competition

The William Lowell Putnam Competition is a national undergraduate contest. Professor Sergei Kuznetsov served as chair of the Putnam Committee.
1st place -- Paul Fornia
2nd place – Newton Banks
3rd place – Marshall Carpenter

Putnam Team; l. to r.: Professor Sergei Kuznetsov, Paul Fornia, Newton Banks and Professor Eric Stade, Department Chair

Undergraduate Scholarships

Adele Leonhardy Memorial Scholarships
Stephanie Horn and Brian Carlsen.

John H. "Jack" Hodges Scholarship
Keegan Boyle

Outstanding Teaching Awards for Graduate Teaching Assistants
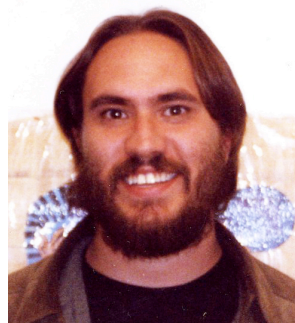
Burton W. Jones Teaching Excellence Award
Patrick Newberry and Michael Noyes

William E. Briggs Teaching Excellence Award
Daniel Proulx

Graduate Fellowships

Wolfgang J. Thron Fellowship

Zachary Strider McGregor-Dorsey

Frances C. Stribic Fellowships
Camilo Mesa
David Keyes
Eun Kim
Jason Hill
John Hower
Matthew Moore
Matthew Stackpole
Michael Martinez
Michael Roy
Patrick Newberry

University Fellowships
Michael Noyes
Joshua Sanders
Joshua Wiscons
Jonathan Kish
Steven Limburgh
Robin Chestnut
Jacob Harper
Benjamin Katz-Moses
David Keyes

Students explore job prospects at Mathematics Career Night

Mathematics Career Night, co-sponsored by the Undergraduate Math Club and by the Mathematics Graduate Program, is intended to help both undergraduates and graduate students learn about jobs in mathematics, and what skills are helpful in obtaining them.

The 2010 speakers were: Laura Waterbury, Analytic Science Scientist 1, FICO, Tressa Fowler, Associate Scientist NCAR, our own Professor Kent Goodrich, (also an NCAR visiting scientist and Director of the Actuarial Studies and Quantitative Finance Program), Dr. Emily Silverman, Fairview High School Math Teacher, Dr. Richard Clelland, Principal Geodetic Engineer for GeoEye, Inc. This year's event was organized by Professor David Grant, chair of the Graduate Program.

Ph.D. graduates. Front, from left: Eitan Angel and Erika Frugoni Wittenborn. Back: Kevin Manley (Dec. 2011), Joseph Newhall, Tiffiny Tasset.

Graduate Degrees -- May 2010 (Graduates are listed by name, degree (faculty advisor); thesis title for Ph.D.)

Eitan Angel, Ph.D. (Alexander (Sasha) Gorokhovsky); A geometric construction of cyclic cocycles on twisted convolution algebras

Yiung Jo Kwak, Ph.D. (Keith Kearnes); Automorphisms of some combinatorially defined Lie algebras over GF(2)

Kevin Manley, Ph.D (Eric Stade); The Discrete Fourier-Riccati-Bessel Transform for Robin Boundary Conditions

Joseph Newhall, Ph.D. (R. Kent Goodrich); On the density of the Henig efficient points of asymptotically compact sets in locally convex vector spaces

Tiffany Tasset, Ph.D. (R. Kent Goodrich); Lagrange multipliers for set-valued functions when ordering cones have empty interior

Erika Wittenborn, Ph.D. (David Grant); On special values of hyperelliptic division polynomials and a formula of Eisenstein

Paige Cudworth, M.A. (Agnes Szendrei)
Richard Dodson, M.A. (Agnes Szendrei)
Daniel Akech, M.A. (Karl Gustafson)
Nathaniel Bushek, M.A. (Jeanne Clelland)
Jason Hill, M.A. (Keith Kearnes)
John Hower, M.A. (Markus Pflaum)
Matthew Jones, M.A. (Richard Green)
Yingwei Li, M.A. (Keith Kearnes)
Michael Martinez, M.A. (Markus Pflaum)
Chelsea McCarty, M.A. (Judith Packer)
Matthew Moore, M.A. (Keith Kearnes)
Nicholas Pratarelli, M.A. (Judith Packer)
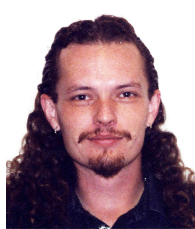David Wayne, M.A. (Su-Ion Ih)

Karen Farrell, M.S. (Karl Gustafson)
Steven Brier, M.S. (R. Kent Goodrich)
Kyle Hanifen, M.S. (Karl Gustafson)
Emily Pavey, M.S. (R. Kent Goodrich)

| Eitan Angel | Yiung Jo Kwak | Kevin Manley | Joseph Newhall | Tiffany Tassert |

Alumnae/Alumni News

Lee Badger (Ph.D. 1975) writes: "I haven't flunked out of retirement – yet!" On reminiscences of CU Boulder he adds: " One year the annual (department) picnic was to be on the summit of Green Mountain. As a fundraiser, the grad students took orders to buy and carry the beer and other drinks to the summit. Most faculty and their families went up the West Ridge. I was the leader of the grad student packers and chose the more demanding route past the Scout Cabin and up the Ranger Trail – and of course beer and other attention altering substances were perfectly in order before the trip and along the way. About midway up I realized, after backtracking and multiple wrong turns, that we were hopelessly lost and that the advertised arrival time was fast approaching. Ed Garrity pointed to the summit and said, well obviously that was the way we should go, trail be damned. Bushwhacking straight up the slope worked well, albeit with much huffing and puffing. With sweaty bodies and packs we made the summit only slightly behind schedule and no one complained about the odor and temperature of the beer."

William L. (Bill) Briggs (B.A. Math 1971) has recently written a calculus textbook co-authored with Lyle Chochran of Whitworth University. Bernard Gillett (M.A. Math 1992), who teaches mathematics in the CU-Boulder residential programs, is cited on the title page for his assistance. Bill writes: "I regard Bernard as a coauthor for the many vital contributions that he made." The book supports a standard three-semester calculus sequence for mathematics, science, and engineering students. The book also appears in a fully electronic form with 750 interactive figures, all created by Eric Schulz of Walla Walla Community College. The book is published by Addison-Wesley, which is a part of Pearson Education.

Marilyn Love Davis (B.A. 1948) was a member of Phi Beta Kappa and the mathematics honorary society, Phi Kappa Tau at CU Boulder. She writes: "Hello to the Mathematics Department at CU. I don't know how you tracked me down but I've been interested in your newsletter and developments in the department. I am quite likely the oldest woman math major from CU. I graduated in 1948. The Math department was in a half dozen little rooms in the basement of the A&S building. In 1945 I had my Calculus course with Aubrey Kempner. There were 5 of us in the class – 4 sailors and myself. Today of course Calculus is a high school course. Probability study and Non-Euclidean Geometry were just appearing at that time. The department offered me a job teaching algebra to veterans returning from World War II. I said no, which was lucky for those young men. I have been especially interested in the number of women now studying math. Quite amazing. I heard just today that girls are now equal to boys in math proficiency on standardized tests. Great! At the age of 83 I am now tutoring a girl for her GED in Math. I can still understand their questions, but nothing more complicated, thank you. I loved my time there (CU)!! Boulder was a great small town – with CU enrollment at 5,000." Her favorite faculty mentor was Miss Kendall (Professor Dr. Claribel Kendall, 1889 – 1965). Marilyn Davis had a career as a teacher and now does volunteer work for AAUW and GED tutoring. She has two sons and four grandchildren. Her gift to the Frances C. Stribic Scholarship Endowment is greatly appreciated. P.O. Box 458 Lakebay, WA 98349. MAR25DAVIS@CENTURYTEL.NET.

Jennifer Patricia Hyndman (Ph.D. 1991, M.A. 1989) has received a high honor from the Canadian Mathematical Society (CMS). The following announcement was released by the CMS in March 2010. UNBC Professor Garners Prestigious CMS National Education Award. The Award will be presented to Professor Jennifer Hyndman, Mathematics Program, University of Northern British Columbia (UNBC) at the Society's 2010 Summer Meeting in Fredericton, New Brunswick. The award recognizes sustained and distinguished contributions in teaching at the undergraduate level at a Canadian post-secondary education institution. Nelson Education, a major Canadian publisher for students and educators, is a proud sponsor of this unique national Award. In announcing the award, Tony Lau, President of the CMS, noted that "Professor Hyndman is an outstanding educator and this award recognizes her proven excellence as a teacher, her unusual effectiveness in the classroom, and her commitment and dedication to teaching and to students. For Professor Hyndman, teaching is not a job but a passion." "She deeply cares that students really understand, and she believes that the best way to achieve this understanding is by having the students play the part of teacher themselves. Her role then becomes that of mentor, critic, and teacher of constructive criticism techniques" said Lee Keener, a close colleague at UNBC. Professor Hyndman's success as a teacher and her educational accomplishments were also recognized in 2003 when she received the UNBC Teaching Excellence Award. Jennifer Hyndman earned her Bachelors of Mathematics with a Minor in Dance from University of Waterloo in 1986. She is a Full Professor and currently Chair of Mathematics at UNBC. Professor Hyndman's research interests are in natural duality theory, quasi-equations and finite basis theory, lattice theory, and mathematics education." Professor Walter Taylor was her Ph.D. thesis director at CU Boulder.

Dale Lear (B.A. 1983) received a Ph.D. in mathematics from the University of Washington in 1991. Since then he has worked as a mathematician doing research and development in computer aided geometric design. Currently Dale is at Robert McNeal & Associates where he works on "Rhinoceros," a geometric welding tool. He lists his favorite CU mathematics faculty as Professors Walter Taylor, David Rearick and Albert Lundell. Address: 6303 26th Ave. NW, Seattle, WA 98107. dalelear@mcneal.com

Mathematics Endowments

Endowments give vital support for teaching, research and scholarly work by the Mathematics Department. If you are interested in contributing to an endowment (new or existing), please contact the department chair, Professor Judith Packer, Department of Mathematics, University of Colorado, Boulder, CO 80309-0395, Judith.Jesudason@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.
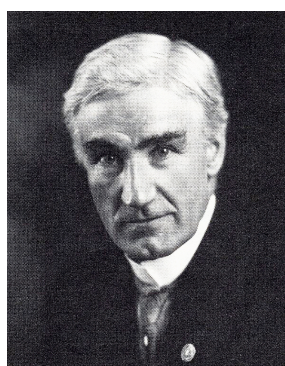
Ira DeLong Lectures

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.

Kempner Mathematics Colloquium

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

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 and 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 who had greatly influenced his life and distinguished career in mathematics. The weekly colloquium on topics of broad mathematical interest is essential for maintaining a vibrant learning environment.

### B. W. Jones & W. E. Briggs Teaching Excellence Awards
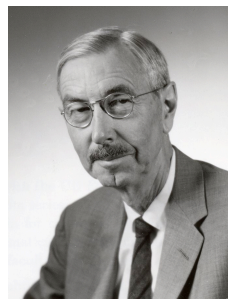
Burton W. Jones   William E. Briggs

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 from 1949 to 1971 and department chair from 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 as 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 graduate student teaching assistant (TA) in the Mathematics Department 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.

W. J. Thron Mathematics Fellowship
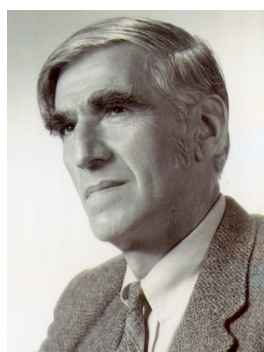
In 1999 Professor Emeritus Wolfgang Joseph Thron expressed his faith in and devotion to the University of Colorado with a gift of $216,000 to endow the W. J. THRON MATHEMATICS FELLOWSHIP awarded each year to an outstanding graduate student in the Mathematics Department. Thron was a member of the Mathematics Department from 1954 until he retired in 1985. He

Endowments, (continued from p. 13)

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.

William Reinhardt Memorial Lectures

The William Reinhardt Memorial Lecture Endowment was established in the University of Colorado Foundation in 2001 by family, colleagues and friends. Professor Reinhardt 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 (left) and Happy 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.

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 Room 350 in the Mathematics Building, which has been named **Meyer Lounge.**

John H. "Jack" Hodges Scholarship
Please see related article on page 1 of the issue.

Alumnae/Alumni News, (continued from p. 12)

Paul Mattingly (B.A. Math 1980) writes that he has been enjoying the news from the Alums.

Pamela Schwerer-Rizzuto (B.A. 1992) has been a mathematics teacher at Broomfield High School in the Boulder Valley School District for the past 18 years. She has been honored with a National Board Teacher Certification, volunteers at a Boulder Valley sister school, has traveled to Nepal and is the proud "mother" of an 18-month golden retriever, Matira. Her favorite CU faculty mentor was Professor John H. Hodges. Pamela was married in 2007. She writes: "I'll never forget my time spent in the Engineering Building with my best friend, Jill, eating Reeses peanut butter cups and drinking coke before heading to Prof. Roth's math class. We always had a good time and continue to do so as co-workers at the same school." 5120 Crane Drive, Brighton, CO 80601; pkschwerer@msn.com

Richard H. Warren (Ph.D. 1971) has worked as a research mathematician at Lockheed Martin for more than 25 years on systems engineering for software to command and control satellites. Occasionally he publishes a mathematics paper. At CU his Ph.D. thesis advisor was Professor Wolfgang J. Thron. Dick writes: "Thanks Bill (Jones) for mentoring me while Wolf (Thron) was on sabbatical for nearly a year." His new mailing address is 74 Pasture Lane, Apt. 304, Bryn Mawr, PA 19010-1775.

Dorothy Matilda Rosenberger (B.A. Math 1939) graduated Cum Laude from CU Boulder and was a member of Phi Beta Kappa. For many years she taught mathematics at the University of Colorado Extension Program and at CU Denver. Her favorite mentor in the CU Mathematics Department was Professor Claribel Kendall. Dorothy and her husband of 70 years, Glenn Rosenberger, moved from Boulder to Oak Harbor, Wash., in 1999 to be with their daughter, Kathy. She died at the age of 91 on July 14, 2010, in Oak Harbor, Wash.

Google Street View films walkways on CU Campus

Professor Kent Goodrich and Donna Maes (Math Department Office Manager) made arrangements for the Google trike team to come to campus and film our paths and sidewalks for Google Street View.

Donna was able to get approval from the Pedestrian Safety committee, CUPD, Vice Chancellor Frank Bruno and the University Counsel office all within a week! These things usually take a year or more.

Mark Limber, a PhD student (1991) of Professor Goodrich, now works for Google here in Boulder. Donna noticed that Google was in town doing the bike paths and asked Goodrich to arrange for Google to do the campus. Goodrich contacted Mark who made the arrangement with Google. The campus was beautiful.

BLAST 2010 conference held June 2-6 at CU

The third in the BLAST series of mathematics conferences was held at CU during June 2-6, 2010. BLAST is an acronym for: Boolean algebra, Lattice theory, general Algebra, Set theory, and set-theoretical Topology. These topics are part of the foundations of mathematics.

The scientific part of the conference included invited lectures by eight prominent mathematicians, series of tutorial lectures by four well known experts, and 26 contributed talks. The lecturers affiliated with CU were Walter Taylor and Joshua Wiscons. The nonscientific part of the conference consisted of a conference dinner at The Med and a hike in Chautauqua Park.

The conference was funded by the National Science Foundation, the CU Council on Research and Creative Work, and the CU Department of Mathematics. The conference was organized by CU professors Bart Kastermans, Keith Kearnes, J. Donald Monk, and Agnes Szendrei. Graduate student assistance was provided by Topaz Dent, Joshua Sanders,

Kevin Selker, and Joshua Wiscons. Administrative support was supplied by Donna Maes and Denise Rodriguez-Mora.

Hike by participants in the 2010 BLAST Conference at CU near the Boulder Flatirons. Participants affiliated with the CU Boulder Mathematics Department are : Agnes Szendrei (CU faculty, 1st from left); Don Monk (CU faculty, 5th from left),; Walter Taylor (CU faculty, 6th from left). Photo by Keith Kearnes (CU faculty)

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The Mathematics Department is grateful for the generous contributions by donors listed below. Gifts to Mathematics Department endowments and funds make it possible to bring colloquium speakers (DeLong, Kempner and Reinhardt) to the CU Boulder campus, to offer scholarships to our students (Hodges, Leonhardy, Stribic and Thron) and to award outstanding teaching assistants (B.W. Jones & W.E. Briggs awards) and Putnam Contest winners. They also support the publication of the newsletter, Prime Bits. Gifts (cash or securities) can be sent by returning the enclosed MATHEMATICS DEPARTMENT 2010 ANNUAL FUND form to the given address. Contributions to the Mathematics Department through the CU Foundation are tax deductible. Please see description of Charitable Gift Annuities on the back of that sheet.

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