*Celebrating*
**25**th
*Math Day*

**Department gears up for event on Nov. 20 | Story, Page 4**

# { Math News }

Fall 2014

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## VIEW FROM THE CHAIR

*Judy Walker*

It is a gorgeous fall day here in Lincoln: the leaves are in brilliant yellows, oranges and reds, and the sun is shining. Shadows are growing long, and mornings are quite brisk, but I am sitting outside in 77 degree weather as I write this. Those of you who haven't been in downtown Lincoln for a while would see some real changes. The Historic Haymarket District has been expanded to the west – the railroad tracks have been moved to allow this – and the new Pinnacle Bank Arena is bringing a steady stream of

# Lewis receives MAA Gung and Hu Award

Jim Lewis, Aaron Douglas Professor of Mathematics and director of the Center for Science, Mathematics and Computer Education, is the 2015 recipient of the Gung and Hu Award by the Mathematical Association of America (MAA), a professional society that focuses on mathematics at the undergraduate level. Lewis will receive the award at the 2015 Joint Math Meetings in San Antonio, Texas, in January.

The Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics is the most prestigious award for service offered by the MAA. First presented in 1990, it consists of a cash prize of $5,000, a citation, and the recognition of the American mathematical community.

"It is a great honor to receive

*Jim Lewis*

the Gung and Hu Award. Having the opportunity to contribute to mathematics both at UNL and nationally has greatly enriched my career," Lewis said.

The citation that accompanies the award recognizes Lewis for his outstanding contributions to the mathematics education of teachers, for his leadership in the mathematics profession and in academia at all levels, for his work increasing the visibility and participation of women in mathematics, for his exemplary work serving the state of Nebraska, and especially for his vision and ability to bring together diverse

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## PARTIAL DIFFERENTIAL EQUATIONS

# PDE group morphs as interests branch out

The nature of Partial Differential Equations (PDEs) makes them not only interesting mathematical objects in their own right, but also causes them to play important roles in many branches of applied mathematics, science and engineering, such as continuum mechanics, electromagnetism, quantum mechanics, relativity theory, mathematical biology, control theory, finance and economics.

When Steve Dunbar, Mohammad Rammaha and Richard Rebarber were hired in the 1980s and joined senior applied mathematics faculty members David Logan and Tom Shores, it could be said the "modern era" of PDEs at UNL had begun. In 1989, the group expanded again with the additions of Steve Cohn and Glenn Ledder. Their interests reflect the eclectic character of the field. Dunbar, Logan and Ledder were primarily applied mathematicians, Shores a numerical analyst, Rammaha and Cohn analysts, and Rebarber a control theorist.

In 1994, Cohn gave the plenary address at the First International Conference on Inverse and Improperly-Posed Problems in Izmit, Turkey. In 1997, Jennifer Mueller, a student of Shores, became the first UNL mathematics student to win an NSF postdoctoral fellowship. Also in 1997, the second edition of David Logan's *Applied Mathematics* was issued; this book, now in its fourth edition, is one of eight that Logan has authored or co-authored during his career. To this

COURTESY PHOTOS

*ABOVE: John Meakin (seated in the second row from the bottom, flanked by K.S.S. Nambooripad and A.R. Rajan) with faculty and graduate students at the University of Kerala, January 2, 2014. (Inset on cover: Meakin presents a gift to His Highness Raman Rajamannan, the Tribal King of Kovilmala, at an International Conference on Algebra and Discrete Mathematics at Kattappana College, Kerala on March 5.)*

# A Fulbright passage to India

Early in his career as a mathematician, John Meakin submitted a paper on the structure of a class of algebraic objects known as inverse semigroups, hoping to have his research published. The journal editor was impressed, but ultimately, Meakin had been "blown out of the water," as he put it, by a brilliant mathematician in the southern state of Kerala in India.

Instead of starting over, Meakin reached out to this mathematician who shared his research interests half a world away, and they embarked on a decades-long, albeit sporadic, collaborative working relationship. In the fall semester of 2014, with support from a Fulbright-Nehru teaching/research fellowship to India, Meakin was able to renew that collaborative working relationship.

"I've had a long-standing connection with people in that region," Meakin said. "I spent one year there early in my career engaged in collaborative research, so professionally, it made a lot of sense to go there. It is a place of particular research interest to me."

His Indian colleague, K.S.S. Nam-

booripad, founded an internationally acclaimed school devoted to the theory of von Neumann regular semigroups and their connections with other areas of mathematics. Von Neumann regular semigroups arise very naturally in mathematics, for example, when studying algebraic properties of matrix multiplication, or more generally in the modern theory of operator algebras.

The Kerala School of semigroup theory that Nambooripad established is one of the acclaimed contemporary research schools in this field, worldwide. It continues a rich tradition of outstanding contributions to mathematics in Kerala, dating back at least to the 14th century with original contributions of Mahavan and his followers, who developed infinite series expansions for trigonometric functions for example, predating some of the work of Gregory, Newton and Leibnitz some three centuries later.

Meakin was based in Trivandrum, the capital of Kerala, during his five-

month visit to India. He conducted joint research with Nambooripad and others in the Kerala School, taught a graduate course in semigroup theory, organized workshops and mini-courses for students in Kochi and Kolkata, co-organized two international research conferences, and gave invited lectures at several other conferences, research centers and universities around India during his visit.

"It was an intense, fascinating and enriching experience," Meakin said. "I had the opportunity to interact with many established mathematicians and a large number of students from all parts of India. India is a riot for the senses in all ways, with a rich and ancient culture, a diverse and dynamic society. It is hard to assess what impact a visit like this can have, but I felt that my interactions with students and faculty members were incredibly positive."

Meakin is preparing an article about the Kerala School of semigroups and is in the early stages of writing a research level book about regular and inverse semigroups, informed in part by his experiences in Kerala.

## Hartke spends three months in Hungary on Fulbright

Stephen Hartke was a Fulbright Scholar at the Alfréd Rényi Institute of Mathematics, in Budapest, Hungary, for three months last year. The Rényi Institute is the mathematics institute of the Hungarian Academy of Sciences, and is one of the pre-eminent places in the world for research in discrete mathematics. While there, Hartke collaborated with several groups of people on ongoing research projects. His graduate student James Carraher also visited the Rényi Institute for about a week.

day, his monograph *Applied Partial Differential Equations* is successfully used as the text for the introductory undergraduate PDE course at UNL.

By the late '90s, the diversity of their interests tended to pull the group apart and the label "PDE group" had become a misnomer. Dunbar, Cohn, Logan, Shores and Ledder pursued their interest in mathematical modeling. Rebarber continued working in control theory for PDEs and subsequently branched out into mathematical biology, though he still occasionally produces papers on control of distributed-parameter systems.

Rammaha kept the PDE seminar going and advised the graduate students who were interested in the analysis and differential equations. Rammaha's work delves into qualitative analysis of solutions of so-called "hyperbolic" PDEs, which describe wave propagation phenomena, in particular acoustic waves, as well as some aspects of elastodynamics and thin plate theory. Rammaha has supervised six Ph.D. students who are now on either tenured or tenure-track positions at various universities, except for the two most recent graduates who presently hold postdoctoral fellowships.

In 2000, most of the applied group migrated to mathematical biology and the department hired George Avalos. Avalos specializes in the mathematical control theory of partial differential equations and some aspects of numerical analysis. He is particularly interested in coupled systems – those comprised of two or more disparate dynamics, such as thermo-elastic phenomena, or interaction of thin chamber walls with acoustic pressure or fluid flow within. Avalos has since supervised three Ph.D. theses, and his work has been supported by seven NSF grants since 1997.

The arrival of Avalos more clearly defined a group who were interested primarily in PDEs and analysis. In 2004, Petronela Radu came to UNL as a postdoc, and then became an assistant professor in fall of 2005. In her work, Radu resolved some open problems concerning solvability of nonlinear wave equations (see more on Radu on page 11). The hiring of Radu brought the additional benefit of her husband, Mikil Foss, to the department. Foss provided the much-needed expertise to the PDE group in the hitherto unrepresented areas of calculus of variations and elliptic PDEs, which address many important questions in continuum mechanics. A few years ago, Foss and Radu became interested in the new and rapidly developing theory of peridynamics, which deals with non-local models that account for "long-distance" interactions between particles within a body. Among its many applications, nonlocal theory has been successfully used to mathematically describe dynamic fractures. Now, several of their graduate students are working on various questions pertaining to nonlocal models in diffusion and wave propagation.

A few years after the arrival of Radu and Foss, Daniel Toundykov repeated Radu's feat: he came as a post-doc and stayed as an assistant professor. Daniel's specialty is in the control of PDEs with emphasis on nonlinear models describing mechanical vibrations and acoustics. His recent work also provides analytic results concerning electromagnetic fields and certain models of hydrodynamics. Daniel's research has been supported by two grants from the NSF (one of them joint with Avalos) and was recognized by the UNL Edgerton Junior Faculty Award.

With Shores' retirement in 2010, the department lost its sole full-time numerical expert. In 2014, after an extensive search directed by Avalos, the department hired Adam Larios (see page 12). As a graduate student, Larios worked as a researcher at Los Alamos National Lab, and collaborated with its Climate Ocean Sea-Ice Modeling group and the Computer, Computational, and Statistical Sciences group. Larios investigates problems in fluid dynamics, turbulence, geophysics, phase-field dynamics, and fluid-structure interaction.

Presently the PDE group exchanges ideas and explores new topics in the PDE & Applied Analysis seminar led by Cohn. Larios kicked off the PDE seminar this fall with a series of lectures on the Navier-Stokes equations, which are the subject of a "Million Dollar Millennium Prize" from the Clay Mathematics Institute.

*– Steve Cohn and Daniel Toundykov*

# Department News

# *Math Day reaches 25th event*

Over the past 24 years, more than 20,000 students have participated in UNL Math Day, and another 1,600 are registered for the 25th Math Day on Nov. 20, 2014.

Hosted by the UNL Department of Mathematics, Math Day is a highly competitive event that recognizes high school students who are interested in mathematics.
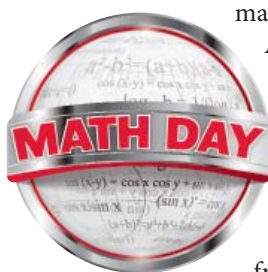


About 100 schools from across Nebraska attend each year, bringing anywhere from three students to the 150 students who will represent Lincoln Southeast in 2014.

"Math Day is a unique experience for both the competitors and the coaches," said Bill Rogge, a UNL lecturer in mathematics who was once the Math Day coach at Lincoln Northeast and brought teams from 1990 to 2007. "As a coach, I relished the hours of practice our students put in to be competitive. Now I have the privilege of being a moderator for the Math Bowl. I love seeing and feeling the tension that each question brings. I look forward to each and every Math Day."

The overall schedule for Math Day has remained the same since it began, with an opening ceremony, then the PROBE I exam, the start of the Math Bowl before lunch, PROBE II and department displays after lunch, and the rest of the bowl team rounds in the afternoon. Now, it also takes more than 250 volunteers to keep the events of Math Day running.

"When I was working for the university, I was just trying to figure out how they could possibly bring in this many kids and have a Math Day run smoothly," said John Cockerill, a former math major and the Math Day coach for Sterling High School. "To my amazement, things pretty much went right on schedule. But, the math department has always been very precise when it comes to schedules and doing things that are beneficial to students."

This foundation for success was set by Emeriti Professors Gordon Woodward and Rao Chivukula. Back in 1989, Jim Lewis, who was then chair of the department, asked Woodward and Chivukula to go to the Math Day hosted at Colorado State University and observe the event. After seeing firsthand the excitement at CSU, they agreed with Lewis that Math Day would be a wonderful event for UNL and agreed to be the co-directors.

In its first year in 1990, there were 562 students and 68 high schools. The winner of the first Math Day was Eric Smith, a senior at Westside High School in Omaha who is now a faculty member in mathematics at Southeast Community College. Jaclyn Kohles from Ralston was the first female student to win Math Day in 1996. As an undergraduate at UNL she won an award as the outstanding female math major in the U.S. She went on to earn a Ph.D. in mathematics at Wisconsin. The 2013 winner was Ingrid Zhang, now a senior at Lincoln East.

With the help of graduate students through 1996, Woodward and Chivukula organized Math Day until the department hired Lori Mueller.

"I started the job a few days before Math Day was held, in 1996," Mueller said. "In 1997, my first year in charge, the Union was being renovated so the students were split between Kimball Hall and Schulte Fieldhouse. The students had to leave the buildings after the opening ceremony, walk around the Union and come back while we laid out the PROBE exams. It was mayhem."

In Mueller's first year, she worked hard to recruit more participants in Math Day, attracting 1,167 students and 94 schools in 1997. Mueller continued to oversee Math Day until 2013, when the staff in the Center for Science, Mathematics and Computer Education took over logistics to allow Mueller more time as an advisor.

Chivukula retired in 1999 and then Woodward retired in 2013, handing the leadership reins to faculty member Jamie Radcliffe.

Over the years, Mueller has enjoyed seeing former UNL math majors become Math Day coaches, such as Cockerill and Shelby Aaberg, who is now at Scottsbluff High School.

"My first experience with Math Day was as a timer in 2000 during my freshman year as an undergrad. I thought it was exciting to see the energy and excitement students brought with them. Just four years later, my Westside students won the 2004 Class A Math Bowl competition," said Aaberg, who since 2011 has brought 45 to 50 students from Scottsbluff. "Driving 400 miles is a chore, but UNL Math Day is worth the trip year after year."

Math Day consists of both individual and team competitions. All students participate in a multiple-choice, preliminary exam called PROBE I (Problems Requiring Original and Brilliant Effort). Now the top 40 students then move on to take the famous essay exam PROBE II. The PROBE top 10 Nebraska high school students (sum of PROBE I and II) are awarded a total of $34,000 in four-year scholarships to UNL. One hundred teams also compete in the Math Bowl, a double-elimination tournament pitting three-member teams against one another.

"I think the problems in PROBE I are great problems that seem very accessible to the students but yet require them to think beyond the obvious," said Lincoln East Math Day coach Leona Penner, who for 15 years has brought around 50 students to compete.

Volunteers are still needed for this year. Alumni interested in coming to help should contact mathday@unl.edu.

LINDSAY AUGUSTYN/UNL CSMCE

*ABOVE: Jared Vitosh (right) helps a student in algebra class at Norris High School. Vitosh earned his MAT degree in August 2012. BELOW: Jared's brother Jason Vitosh (center), a teacher at Falls City High School, teaches Math 806T in the summer of 2013 to a group of teachers on their way to earning their MAT degrees. Jason Vitosh earned his MAT degree in 2006.*

# MAT evolves to meet needs

*Math teacher brothers witness development of graduate program*

UNL graduates Jared and Jason Vitosh both teach high school mathematics in Nebraska. Both hold a Master of Arts for Teachers from the UNL Department of Mathematics. The two brothers from Odell, Nebraska, took Math 809: Mathematical Modeling for teachers together. Both agreed that their favorite course has been Math 806T: Number Theory and Cryptology. However, the comparisons stop there.

Their journeys to earning their graduate degree took diverse paths. Jason earned his MAT degree from the mathematics department, back in 2006, driving "to campus five days a week for 10 weeks each summer for



four summers to take classes during the regular summer sessions," the teacher at Falls City High School explained.

Jared, on the other hand, completed his degree in 2012 and was privy to taking courses that emphasized "mathematical knowledge for teaching" in their current summer format – one course for 40 hours a

week or two half-day courses over two weeks.

"I was much more connected to other students and professors than Jason," said Jared, a teacher at Norris High School. "He kind of helped pioneer the program, but that meant he took a lot of graduate classes when there were not many others taking the same courses."

As part of its commitment to being a leader with respect to the mathematical education of teachers, the department offers courses that lead to

# MAT *From Page 5*

the MAT to any certified mathematics teacher who wants to earn a content-rich master's degree. First developed with the support of an NSF grant in the 1960s, the MAT now offers two tracks, one for secondary mathematics teachers and one for middle level teachers that offers a specialization in the teaching of middle level mathematics.

With the support of several NSF grants over the course of the past decade, faculty in mathematics have developed 17 mathematics courses for K-12 math teachers that stress the development of mathematical knowledge for teaching. The Department also partners with the Teaching, Learning and Teacher Education and Statistics departments to aid them in development and offering of courses for K-12 teachers working on master's degrees.

The NSF Math Science Partnership Institute grant, Math in the Middle, resulted in 115 Nebraska teachers earning the MAT degree between 2006 and 2011. As part of the institutionalization of the Math in the Middle grant, the Center for Science, Mathematics and Computer Education (CSMCE) developed the Nebraska Math and Science Summer Institutes (NMSSI) program to continue to offer the courses from Math in the Middle to more teachers. To further support the program, the university offers Nebraska teachers a 20 percent tuition discount on NMSSI courses taught in-person.

"The way the courses are developed specifically for teachers and with teachers for their own growth and improvement as classroom educators makes the entire experience useful to your career," Jason Vitosh said. "After I finished my degree, I felt like I had the permission and the right to consider myself a knowledgeable and experienced expert in my field. I was confident that I was doing the right things in my classroom, for the right reasons and for my students."

The subsequent NSF grant, NebraskaMATH, aided the NMSSI in al-

*"I loved the intense focus that came from doing nothing but studying one topic 24/7."*

– Jason Vitosh

## MAT Courses

The Department has created 17 graduate courses for math teachers; the following list highlights 10 of them:

**Courses for Middle Level Teachers**
MATH 800T - Mathematics as a Second Language
MATH 802T - Functions, Algebra & Geometry
MATH 804T - Experimentation, Conjecture & Reasoning

**Courses for Middle Level and High School Teachers**
MATH 805T - Discrete Mathematics
MATH 806T - Number Theory & Cryptology for Teachers
MATH 807T - Using Mathematics to Understand our World

**Courses for High School Teachers**
MATH 810T - Algebra for Algebra Teachers
MATH 811T - Functions for High School Teachers
MATH 812T - Geometry for Geometry Teachers
MATH 809 - Mathematical Modeling

lowing teachers to be able to continue to take math and pedagogy courses each summer and to pursue the MAT degree. Over the past two years, 27 teachers have earned the MAT degree.

"I encouraged Jared to begin his MAT as soon as he could make it work," Jason Vitosh said, who is also a Noyce Master Teaching Fellow through the CSMCE. "The session format had changed to short one- or two-week courses with all-day instruction. He also was able to get in on some of the new programs like the New Teacher Network from the NebraskaMATH grant. I missed out on making connections with peers like Jared did, but through the Noyce fellowship now, I have been able to see how powerful and helpful those connections can be."

The Vitosh brothers, whose father also was a math teacher, enjoyed the connections to tangible, real-world applications in Math 806T, their favorite course. It was also the only course Jason got to take in the one-week format.

"I loved the intense focus that came from doing nothing but studying one topic 24/7. I devoured the content and read about a dozen supplemental texts that week," Jason said. "I was extremely honored to be asked to teach the same course two summers ago on campus. I was able to reconnect with the content in a different way as the instructor and share my excitement for the subject with my peers in the class."

Currently, three years after the NSF Math in the Middle grant ended, 68 Nebraska math teachers are actively pursuing their MAT degree and because of recent partnerships with the OPS and LPS school districts, between 27 and 60 additional teachers are expected to apply to the MAT graduate program over the next year.

A more recent initiative is to offer these courses online for teachers both in Nebraska and across the country. In partnership with Nebraska Online, the mathematics department is committed to offering online coursework for mathematics teachers that would enable a teacher to earn the MAT degree completely through online coursework. While the online program is too new to have a graduate yet, it is worth noting that a discrete mathematics class for teachers offered in Spring 2014 attracted 25 teachers, and 29 total teachers are taking two online courses in Fall 2014, so the demand exists.

Since 2005, 17 faculty members in the Department of Mathematics have taught a mathematics course for teachers organized by the CSMCE, and 61 mathematics graduate students have been part of an instructional team for one of these courses (by the end of Summer 2014).

Jim Lewis, as director of the CSMCE and PI of the aforementioned grants, has had a prime role in the department's education efforts. For details on the MAT program contact Dr. Wendy Smith, wsmith5@unl.edu, or to see a list of the teachers who have graduated with a MAT since 2010, visit: http://scimath.unl.edu/csmce/mat_ma_degrees.php.

Jason's advice for teachers who are interested in earning a MAT is simple.

"Do it now," he said. "Don't wait another year; get started. Take one class, then take another. Make it work. It will change you and your teaching forever."

# Renovations aid learning

## *Math Resource Center, Brace Lab bring more student collaboration*

Renovations in two City Campus buildings have improved the delivery method for mathematics instruction.

An $8 million renovation has converted UNL's 107-year-old Brace Laboratory into a facility dedicated to using innovative teaching methods to further undergraduate education and a small renovation to the Math Resource Center in Avery Hall has enlarged the amount of functional space for helping students with their study of mathematics.

Initial users of the renovated space in Brace include mathematics, biological and life sciences, and business administration. Much of the project has been focused on providing collaborative learning spaces to undergraduates. While lecture courses remain useful, research in the last 20 to 30 years has shown that in many cases, students benefit from a more active and collaborative approach, said Lance C. Pérez, associate vice chancellor for academic affairs.

The updated building, originally used for physics instruction, now possesses four life sciences laboratories and support space; a 186-seat auditorium; four classrooms dedicated to active and collaborative instruction; a Technology Transforming Teaching (T3) classroom where instructors can use and evaluate cutting-edge teaching technologies from furniture to advanced computerized devices; and office space that will allow Information Technology Services employees to provide classroom and learning support.

The collaborative classrooms for mathematics each seat 42 students, with the furniture set up to seat seven groups of six. The space also includes multiple white boards to promote interactive learning and group discussions.

"Mathematics has invested in professional development and is



LINDSAY AUGUSTYN/UNL CSMCE

*Students study in the newly renovated Math Resource Center.*



completely updating how they teach many of their 100-level courses," Pérez said. "The focus will be on small groups working together."

The life sciences labs in Brace include three modern "wet" labs and a space designed for virtual instruction. The four lab spaces are designed to be similar to recent updates to chemistry labs in Hamilton Hall, with "islands" that allow students to face one another for group work. The College of Business Administration will be a primary user of the redesigned 186-seat auditorium. A portion of the funding for Brace was provided by the Nebraska Legislature.

In an effort to find more space

for students needing mathematics assistance from the counselors, the Department of Mathematics' Math Resource Center was renovated in May and June of this year. The two small conference rooms inside the MRC were removed to transform the room into one large space.

"I wanted to make it a warm and inviting atmosphere," said Lori Mueller, academic advisor and MRC supervisor, who chose paint colors that included an accent wall with the signature Husker red and the rest of the room as a warm tan shade. "A lot of students that struggle with math first have to battle trying to admit they need more help. Our counselors make them feel comfortable and help calm their anxieties. To me, warm colors also calm the nerves."

Amy Goodburn, associate vice chancellor for academic affairs, appreciates the effort made by mathematics to provide better service to new students.

"Studies show that success in first-year math courses is critical to college students' retention and degree completion rates," Goodburn said. "The Math Resource Center is a vital partner in supporting UNL students' academic success. With this renovation, we hope that even more students will take advantage of this free and important service."

*- Troy Fedderson, University Communications, and Lindsay Augustyn*

# Student success key to task force

Under Judy Walker's leadership as chair, the department is engaged in its most significant initiative to increase student success in pre-calculus courses in more than 40 years. Key strategies included changing to an instructional format that emphasizes active learning and providing our graduate students with the pedagogical preparation and support needed to be successful teachers of mathematics.

Alumni who were graduate teaching assistants at UNL recognize the challenge faced by the department as it works to improve student success in Math 100A, 101, 102, and 103. Most students in these courses have had modest success in previous math classes. Often they are not motivated to do the hard work necessary to be successful in a college math class that moves at a rapid pace. Many dislike math, believe that they cannot learn math, and do not believe that learning math is important to their future.

As a consequence, our student success (i.e. the percent earning a grade of C or better) in these courses is often in the 62 percent to 67 percent range and occasionally lower. The department's goal is to improve student success to at least 75 percent and to improve student success in subsequent courses.

The department's initiative, Transforming Instruction to Increase Student Success, is led by Vice Chair Allan Donsig and advised by a new faculty committee, the First-Year Mathematics Task Force. Wendy Smith, a faculty member in the Center for Science, Mathematics and Computer Education, is leading a research project to study the department's changes in instruction and to provide formative evaluation that can inform and improve the initiative.

For Fall 2012, the department developed common lesson plans for two courses (100A and 101), and appointed experienced GTAs to serve as associate conveners for those two courses. Common exams were given in the evening and the First-Year Task Force provided input as to the quality of the exams and their grading.

For the following fall, a new textbook was chosen that was aligned



LINDSAY AUGUSTYN/UNL CSMCE

*Mathematics graduate student Jessalyn Bolkema (right) teaches a section of Math 101: College Algebra in a renovated classroom in Brace Laboratory in October 2014.*

with the department's instructional approach and a major effort was made to revise the lesson plans in ways that provided GTAs with guidance for active learning and group work in class. A substantial Student Guide and Instructor Guide was created for Math 100A, 101 and 103. In addition, the department decided to use the software WeBWorK to enable a mastery approach to homework that provides students with immediate feedback and to incorporate Team Quizzes, assignments that students complete in groups outside of class. Similar changes were phased in for Math 102 in Spring 2014.

These changes, together with a revised professional development workshop for GTAs the week before class starts in the fall, appear to have led to marked improvement in student success. In Fall 2013, student success in Math 103 was 76 percent and exceeded 80 percent in Math 101.

The Department also has become involved in the Association of Public and Land-grant Universities' Mathematics Teacher Education Partnership. As part of that partnership, faculty from the department are part of a five-campus "networked improvement community" that is studying active learning approaches to improving mathematics teaching and learning at

the calculus and pre-calculus levels. A grant from the Helmsley Trust has enabled the department to increase the initiative's research effort and funded (together with funds from the Mathematical Associative of America) a "learning assistants" initiative.

Not content to declare victory and move on to other issues, Walker's leadership and the support the department has received from UNL's administration has resulted in five major changes that position the department for even greater success and that make it a leader among mathematics departments nationwide with respect to emphasizing active learning in freshmen mathematics classes.

• The department received approval for a new position, the Director of First-Year Mathematics. After a successful search, Nathan Wakefield was hired to fill this position.

• UNL remodeled four classrooms in Brace Lab for active learning and has permitted the department exclusive use of the four classrooms.

• The department received approval to break with the paradigm that "lecture courses" should meet for 50 minutes per credit hour. This fall the 3-credit Math 101 class meets 225 minutes each week and the 5-credit Math 103 class meets 300 minutes per week.

# Pixar animator gives behind scenes talk

Tony DeRose, a Senior Scientist and the lead of the Research Group at Pixar Animation Studios, gave the 18th Annual Rowlee Lecture at UNL on April 1, 2014. Using numerous examples drawn from Pixar's feature films, he offered a behind the scenes look at the process of transforming a director's vision into an animated story. He also discussed the advances in mathematics and computer science that revolutionized the world of computer animation making it possible to create the visuals we see on screen today.

One such formative development was subdivision surfaces, which provide a way of dynamically calculating the shape of a smooth object from a coarser mesh through a recursive process of subdividing each face into smaller components. The subdivision algorithm was pioneered by Edwin Catmull (current president of Pixar Animation Studios) and Jim Clark. It was used in Pixar Animated Short "Geri's Game" that



LINDSAY AUGUSTYN/UNL CSMCE

*Tony DeRose of Pixar Animation Studios gives the Rowlee lecture on April 1, 2014.*

won the Academy Award for Best Animated Short Film in 1998. In 2005, Catmull together with Tony DeRose and Jos Stam received an Academy Award for Technical Achievement for their invention and application of subdivision surfaces in computer animation.

A more recent one among Pixar's contributions is an efficient framework for simulating global illumination. In real life, the light intensity at each point may be significantly affected by indirect sources through the rays reflected, possibly multiple times, off the surrounding surfaces. Traditionally, for this purpose complex animated environments contained hundreds of artificial light sources to mimic the reflected rays. Precise ray-tracing had only limited applications in mainstream computer animation. Pixar researchers developed algorithms to efficiently incorporate dynamic reflected lighting into their movie creation process. Monsters University (2013) became the first animated full-length feature film to employ global illumination throughout.

*– Daniel Toundykov*

## TASK FORCE *From Page 8*

• GTA appointments were modified so that the first year that each GTA teaches their own class they teach only one 3-credit course per semester (a one course reduction) to give them the time to take a 3-credit pedagogy course to learn to teach mathematics without cutting into the time the GTA has for their own coursework.

• Learning assistants – bright undergraduates who work under the direction of the GTA – were hired for almost all sections of Math 101 and 103. The learning assistants attend all class meetings and support active learning in the classroom.

While it is too early to understand the combined impact of these changes, both Walker and Wakefield believe that these changes will lead to a sustainable model for how UNL mathematics graduate students learn to teach and will lead to the level of student success the department seeks.

"I'm very optimistic," said Wakefield, the Director of First-Year Mathematics (see page 12). "It is interesting to see how much the perspective of the graduate teaching assistants has changed in just eight weeks, in the way that they are thinking about how students are learning. They are thinking about how to help students develop knowledge on their own. The conversations are student-centered.

"We also added a pedagogy course for the second-year GTAs called Teaching and Learning at the Post-Secondary Level," Wakefield added. "In my mind, it's a vocabulary course. They are reading some of the relevant education literature, learning what different terms mean and then taking those concepts and trying to apply them to what they are doing in their classrooms through various essays and projects. The first paper was to discuss radical constructivism and how a radical constructivist would describe their class."

Wakefield said while he tries to observe as many courses as he can, he has at least three or four GTAs coming to his office daily to discuss issues in their classes or how to take things that are working well to the next level.

"My perspective is that to make the biggest change in these courses, I have to work with the teachers," he said. "That's my passion. If I can develop the GTAs as good teachers, then the rest is going to fall into place."

Stay tuned. We hope that two years into the future we can report that students in pre-calculus courses are regularly achieving at a higher level and thus the department is making a major contribution to UNL's efforts to improve freshmen-sophomore retention and eventually UNL's six-year graduation rate.

# Faculty News

## Sylvia's Journal

*Editor's note: This journal from Sylvia Wiegand, professor emerita, is adapted slightly from an email message she sent in August 2014 from Seoul, Korea, where she was attending the International Congress of Mathematicians (ICM). The International Mathematics Union (IMU) holds an ICM every four years. This year the 27th Congress was the first time that the meeting was held in conjunction with an International Congress of Women Mathematicians (ICWM).*

Dear Colleagues,

In case you are interested in the goings-on here in Seoul, I'm sending you this short report.

John and Glory Meakin and I have been enjoying Seoul where both the ICM and the ICWM have been taking place. I haven't seen other department members, although I'm sharing lodging with Aihua Li, Montclair State University, and UNL Ph.D. 1994, my first Ph.D. student.

In particular, the opening ceremony on the morning of August 13 with the announcements of the Fields medalists and the Nevanlinna prize winner was part of an exciting upbeat day at the ICM. Ingrid Daubechies of Duke University presided over the prize ceremony, and the president of Korea spoke to the whole ICM gathering and emphasized the value of mathematics and mathematicians in the world. There was a LOT of applause about the selection of Maryam Mirzakhani, a professor of mathematics at Stanford University. Also Manjul Bhargava of Princeton University, whom I had met in Luminy many years ago, was chosen for a Fields medal. He was the first Fields winner of Indian descent. The other Fields winners were Artur Avila (first winner from Brazil) and Martin Hairer of the University of Warwick in England.

Apparently, the Korean press article on the opening ceremony emphasized the domination of the ceremony


COURTESY PHOTO

*(From left) Sylvia Wiegand with Maryam Mirzakhani, the first female Fields medalist, Maryam's daughter, and Aihua Li at the ICM Prize reception on August 13, 2014, in Seoul, Korea.*

by "Three women": Ingrid Daubechies, the first female president of the IMU (shown in cover photo); Park Geun-Hye, the first female president of Korea; and Maryam Mirzakhani, the first female Fields winner.

In the context of ICM2014, Ingrid was promoting an auction of beautiful mathematical art objects at http://www.donauction.org. The IMU is focusing its charitable efforts on providing assistance and encouragement to mathematicians in developing countries. The money collected through this auction will go to the first year of the program called "Adopt a Mathematics Graduate Student," which will help young, talented students from developing countries to get access to an assistantship in another developing country. This auction is an initiative of the International Mathematical Union. (The online auction ended August 20.)

There were talks about the Fields medalists that afternoon, and, in the evening, the Meakins, Aihua and I went to a fancy celebration for the prize winners. We got to talk to Manjul and Maryam and Ingrid, and Aihua and I were in pictures with them.

Manjul is not only a great mathematician but he has been working on encouraging students to be math majors at Princeton. When our daughter, Andrea, graduated in 2003, there were only four or five math majors and only one of them was a woman, but Manjul said that now there are 60 female math majors.

Later that evening, there was an inspiring lecture by James Simons on his life, including how he solved famous problems in differential geometry, how he made all his money and why he is giving money to support mathematics and mathematicians.

Among many other wonderful ICM talks I heard were those by Janos Kollar ("The structure of algebraic varieties"), Manjul Bhargava on "Answers on a donut" [There is a very clear discussion of this talk at http://plus. maths.org/content/very-old-question-very-latest-maths-fields-medal-lecture-manjul-bhargava], and John Milnor – he won the Abel prize in 2011 and so he gave the Abel lecture on "Topology through Four Centuries."

The ICWM has attendees from 52 countries. A panel discussion featured special issues for women in mathematics in different countries. One of the points made by the African women was that they have the additional burdens of poverty and the mistreatment of women in many African countries – women are discouraged from even attending school, even physically prevented from doing so and kidnapped if they try.

There were terrific lectures by well-known women mathematicians who generally took care to make clear and appealing talks; in particular Hee Oh, who is originally from Korea and is the first tenured woman at Yale University, gave a fantastic talk on "Circle packing." She has helped to establish famous conjectures related to this subject, including one posed by Peter Sarnak.

Aihua's poster on a math biology project done with undergraduates at Montclair State University was among the 20 "best posters" (out of 97) selected by the ICWM committee to receive a special certificate and prize.

In all, there were 5,193 participants from 122 countries at the ICM. I would guess there were at least 250 participants at the ICWM, and at least 50 countries represented.

Best wishes to all,
*Sylvia*

# *Walker receives university-wide honor*

Sometimes it's hard to find beauty in everyday life. Not for Judy Walker.

"Mathematics really is beautiful," she said. "Helping students look at mathematics beyond just a set of rules and procedures and see it instead as truth and as beauty is what I enjoy doing."

Walker, chair and Aaron Douglas Professor of Mathematics, demonstrates this enjoyment with her students every day. It's earned her the University of Nebraska systemwide Outstanding Teaching and Instructional Creativity Award.

The award recognizes individual faculty members who have demonstrated meritorious and sustained records of excellence and creativity in teaching.

Fellow Aaron Douglas Professor Jim Lewis nominated Walker. Lewis hired Walker in 1996 and said in his nomination letter that "hiring Judy is easily one of the five most important

things" he accomplished during his tenure as chair of the department of mathematics.

Walker has written courses, mentored graduate students and, by developing the Nebraska Conference for Undergraduate Women, has helped thousands of undergraduate women succeed in mathematical careers.

"We believe that over time, the conference will merit part of the credit for helping change the gender distribution in our profession," Lewis wrote.

The conference already has earned national acclaim, consistently earning funding from the National Science Foundation and earning the Programs That Make a Difference award in 2013 from the American Mathematical Society.

On campus, Walker has made significant strides in improving general education mathematics courses. Walker took the lead in reviewing the courses and worked to develop teach-

ing methods that helped both students and the faculty be more successful in the classroom.

Walker said the reason she has accomplished so much at UNL is that she loves math and she loves sharing that with her students.

"The best thing about teaching math is watching students learn to recognize beauty in math and get excited by it," Walker said. "It's really fun when you see them have that 'Aha' moment. There's nothing that compares to it."

As department chair, she's continued developing new curriculum, mentored graduate students and elevated the stature of the department.

"She is a visionary leader and contributes enormously to our reputation among math departments across America," Lewis said. "She's remarkably creative and a superb research scholar."

*– Deann Gayman, University Communications*

## AWARDS AND PROMOTIONS



*Mark Brittenham*

Associate professors **Mark Brittenham and Petronela Radu** were awarded the College of Arts and Sciences Outstanding Teaching Award. College Distinguished Teaching Awards are $1,000 awards in recognition of consistent excellence in teaching.



*Glenn Ledder*

**Glenn Ledder** has been promoted to full professor in the department of mathematics.

**Petronela Radu**, associate professor of mathematics, also was awarded the Hazel R. McClymont Distinguished Teaching Fellow Award in April 2014. The McClymont Award, which is chosen by the faculty



*Petronela Radu*

instructional development committee, honors exemplary teaching and carries a $6,000 stipend. Radu joined the UNL faculty in 2004 as a research assistant professor. She received tenure in 2012. Her research interests focus on partial differential equations, continuum mechanics, peridynamics and calculus of variations. She was a Fulbright winner in 2013 and is the principal investigator on a National Science Foundation research grant that is allowing her to lead the "Math in the City" course. Radu designed "Math in the City" as an interdisciplinary course that promotes hands-on learning experiences through the use of mathematical modeling to understand current societal issues. The course is run through collaborations with local businesses, research center and government organizations. "Dr. Radu's record of teaching and dedication to educating our students is impressive and she

is truly deserving of this award," said Steve Goddard, former interim dean of the college and now associate vice chancellor of research.

**Mark Walker**, professor of mathematics, was named to a



*Mark Walker*

Willa Cather Professorship. The Willa Cather/Charles Bessey professorship honors a full professor with an exceptional record of distinguished scholarship or creative activity. Walker joined UNL in 1996. He is an internationally recognized leader in research in algebraic K-theory and is making significant contributions to the fields of algebraic geometry and commutative algebra. In addition to his research, he is a winner of a College of Arts and Sciences Distinguished Teaching Award and has had a major impact on the graduate program through his service as graduate recruiting chair.

# NEW FACULTY

### Adam Larios

Assistant Professor Adam Larios, originally from Seattle, Washington, earned his bachelor's and master's degrees from Western Washington University and his Ph.D. in Mathematics at the University of California, Irvine. Previously, Larios was a visiting assistant professor (postdoc) in the math department at Texas A&M University. He is interested in partial differential equations, mathematical analysis, and numerical analysis. His work focuses on mathematical fluid dynamics. At Texas A&M, he worked with the numerical analysis group. He also collaborates with a team at the Los Alamos National Lab (see page 3).

### Nathan Wakefield

Assistant Professor of Practice Nathan Wakefield was born and raised in Colorado. He earned a bachelor's degree in aviation from the State College of Denver, his master's degree from the University of Northern Colorado in mathematics education and his Ph.D. from the University of Colorado in mathematics. His research area is arithmetic dynamics and post-secondary teaching and learning (see page 9).

# NEW POSTDOCTORAL FACULTY

### Timothy Susse

Timothy Susse joins the department from The Graduate Center, CUNY. He grew up in Oceanside, N.Y. Susse earned his bachelor's degree from Vassar College in 2008, majoring in mathematics and minoring in physics and music composition. He earned his Ph.D. in 2014 from City University of New York in Mathematics. His research interests are geometric group theory and low-dimensional topology.

### Andrew Uzzell

Prior to his postdoctoral appointment at UNL, Andrew Uzzell had been a postdoctoral researcher at Uppsala University in Sweden since 2012. Born and raised in Evanston, Illinois, Uzzell earned his bachelor's degree in mathematics from Yale University and his Ph.D. in mathematics from the University of Memphis in 2012. His research interests lie in probabilistic and extremal questions in graph theory and combinatorics.

### Thanh Vu

Postdoctoral Thanh Vu was born and raised in Hanam, Vietnam. He earned a bachelor's degree in mathematics with highest honors from the Hanoi University of Sciences, Vietnam, in 2008, and his Ph.D. in mathematics in 2014 from the University of California at Berkeley under advisor David Eisenbud. He is working in commutative algebra and algebraic geometry.

# RETIREMENT

### David Logan

retired as Willa Cather Professor of Mathematics at the end of the 2013-14 academic year. David earned his Ph.D. at The Ohio State University in 1970 and came to UNL in 1981 after a postdoctoral appointment at the University of Arizona and a faculty position at Kansas State University. He also served as a collaborator for short periods with Los Alamos National Laboratory and Lawrence Livermore National Laboratory and held a visiting position at Rensselaer Polytechnic Institute. He is the author of seven mathematics books, including the highly influential *Applied Mathematics: A Contemporary Approach*, originally published in 1987 and currently in its fourth edition. His 86 research papers are divided among his early work in the calculus of variations and subsequent work in several areas of mathematical modeling, including detonation theory, groundwater flow, and mathematical biology. The mathematical modeling research group of our department consists largely of faculty who were recruited by David or came because of the opportunity to work with him. He has had joint publications with four faculty in our department and also one faculty member in geology and two in biological sciences. He has mentored six Ph.D. students in our department (Edwin Woerner, Michelle Homp, Rikki Wagstrom, William Wolesensky, Amy Parrott and Ben Nolting), and directed two senior thesis projects (Paul Macklin and Brittany Bunker). He has been influential at the national level through editorial, refereeing and reviewing work, invited colloquia at 32 institutions, and the organization of four conferences and conference sessions hosted by our department.

## IN MEMORIAM

**Walter E. Mientka**, 88, of Lincoln, passed away on June 1, 2014; born October 1, 1925, in Amherst Massachusetts. His most cherished early memories were as a nature counselor at Camp Menatoma, Kents Hill, Maine. Walter built a motorbike using parts scavenged from the local dump on which he rode 250 miles to and from camp for nine summers. Walter's love of camping and nature inspired him to earn an Eagle Scout. He was also a dropforge worker and milling machine operator at the Armory in Springfield, Massachusetts, during WWII.

Walter obtained a BS from the University of Massachusetts, MA from Columbia University, and Analytic Number Theory Ph.D. from the University of Colorado where he met his wife, Gretel Muenzinger. Following teaching positions at the University of Massachusetts and Nevada he had a distinguished 45-year tenure as Professor of Mathematics at the University of Nebraska-Lincoln from 1957-2002. During his career, Walter continued his research, taught thousands of students, and participated in a multitude of mathematical education and service activities. His Ph.D. students included the first woman to receive a Ph.D. from the UNL Department of Mathematics.

He served as Executive Director and President of the Nebraska Academy of Sciences, President of Sigma Xi, Faculty Senate Secretary, Department Liaison for Women in Science, Director of the Junior Mathematics Prognosis program and Executive Director of the American Mathematics Competitions for 22 years and four years as Executive Director of the USA International Mathematical Olympiad.

Numerous honors included the UNL Distinguished Teaching Award and Nebraska Association of Teachers of Mathematics Milton Beckmann Lifetime Achievement Award, "In special recognition for a career of outstanding contributions of mathematics education in the State of Nebraska."

Walter greatly appreciated the developmental opportunities he had during his tenure at the University of Nebraska-Lincoln and support he received from the Mathematics Department faculty, American Mathematics Competitions support staff, College of Arts & Sciences, University administration, and the Mathematical Association of America. He especially wanted to recognize the excellent work of his former students and all students at large he had the privilege and honor to teach.

Walter is survived by his wife of 59 years Gretel; his sons, Andre' and Bennet; daughter, Rebecca Whitaker; daughters-in-law, Margaret, Kathryn, and Sandra; son-in-law, Brent; and ten beloved grandchildren; Gabriel, Stephanie, Christopher, Marinda, Rosemarie, Brianna, Sarah, Duncan, Chloe, and Ethan. He was preceded in death by his second son, Timothy.

## LEWIS *From Page 1*

stakeholders in support of positive change in mathematics.

"Jim Lewis has made tremendous contributions to the mathematics profession, not only at UNL and in the state of Nebraska, but across the country," said Judy Walker, chair of the mathematics department. "To have his contributions recognized with the MAA's Gung and Hu Award is a testament to his commitment to mathematics."

Lewis' work at the national level includes chairing or co-chairing the committees that produced the publications *The Mathematical Education of Teachers*, *Educating Teachers of Science, Mathematics and Technology: New Practices for the New Millennium*, and *The Mathematical Education of Teachers II*. He has also served as Chair of the Conference Board of the Mathematical Sciences.

Lewis also has had a significant impact on K-16 education in Nebraska, much of it done in partnership with his colleague, Professor Ruth Heaton in the Department of Teaching, Learning and Teacher Education. From the creation of The Mathematics Semester for pre-service teachers at UNL to a remarkable collection of professional development opportunities for in-service teachers, he has been masterful at building communities and programs whose goals are to improve education.

Over the past 10 years, Lewis has been the Principal Investigator for two NSF Math Science Partnerships (Math in the Middle and NebraskaMATH) and an NSF Robert Noyce Scholarship grant, NebraskaNOYCE. More recently, he led the team that received major funding from The Sherwood Foundation® and the Lozier Foundation to support the Omaha Public Schools Teacher Leader Academy.

His encouragement of women in mathematics has led to the department being nationally recognized for its successful mentoring of women. Presently, the department is one of the most successful in the country with respect to educating women in mathematics. The department has awarded 42 percent of its Ph.Ds to women since 1995, compared with only 27 percent nationally for all new female Ph.Ds. This data also stands in stark contrast to the fact that the UNL mathematics department did not award the Ph.D. to a single woman during the decade of the '80s.

The 2014 recipient of the Gung and Hu Award was Joan Leitzel, a former interim chancellor, senior vice chancellor for academic affairs and professor of mathematics at UNL between 1992 and 1996, who is president emerita of the University of New Hampshire. Leitzel's husband, Jim, also was a professor of mathematics at UNL from 1993 to 1996. For a list of the past recipients, see the MAA website.

The initial endowment for the award was contributed by husband and wife Dr. Charles Y. Hu and Yueh-Gin Gung. They were not mathematicians, but said they consider mathematics to be the most vital field of study in the technological age we are living in.

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## CHAIR *From Page 1*

shows to our city. Two blocks south of campus, P Street has been redesigned with wider sidewalks, more landscaping, and a new park at the corner of 13th. It's a beautiful city, and exciting things are happening here.

Exciting things are happening in our department, too. Our current group of assistant professors is exceptionally strong, and each of them is on track to a stellar career at UNL. We currently host five postdoctoral fellows, each of whom is contributing to multiple aspects of the department's work. Jim Lewis will be recognized with one of the highest awards given by the Mathematical Association of America – the Gung and Hu Award for Distinguished Service – at the Joint Mathematics Meetings in January. Mark Walker was named a Willa Cather Professor, joining a group of five other named professors in the department. John Meakin just finished his term as a Fulbright-Nehru Teaching and Research Scholar. Mark Brittenham and Petronela Radu both won College of Arts and Sciences distinguished teaching awards, and Petronela was also the recipient of

the McClymont Award – she is the second of our faculty in two years to be recognized with this honor. Aubrey Thompson, who completed her undergraduate mathematics major from our department in May, was awarded an NSF graduate fellowship. And Math Day will celebrate its 25th year later this fall.

Chancellor Harvey Perlman has declared goals for our campus of increasing enrollment, from 25,000 to 30,000, and of increasing the six-year graduation rate for our undergraduate students. Of course our department is central to the campus's abilities to meet these goals: this semester, the department is teaching 13.3 percent of all classes taught at UNL, and 67.4 percent of all freshmen are currently taking a mathematics course. We are responding to this challenge with a renewed focus on our 100-level mathematics courses that includes substantial professional development opportunities for the graduate students teaching these courses. In this issue of Math News are two stories related to these efforts: one on the renovated classrooms we are using to facilitate the active, collaborative learning we want to see in these classrooms, and

one on the changes to the classes themselves and the opportunities for graduate students that go along with these changes.

Our faculty and students are traveling the world. New to this issue of Math News is "Sylvia's Journal," which gives an accounting of Sylvia Wiegand's trip to the International Congress of Mathematicians held in Seoul, Korea in August. Stephen Hartke and John Meakin just completed Fulbright Fellowships in Hungary and India, respectively, and two undergraduate students found opportunities to study mathematics in Russia. These trips are just a sampling of the international travel UNL mathematicians do each year to participate in conferences and workshops and collaborate with colleagues around the globe. We would love to be able to document the travel of department faculty, students, alumni, and friends through photos of these travelers wearing Math Department T-shirts in faraway places. If you don't yet have a Math Department T-shirt, please contact Liz Youroukos at eyouroukos1@unl.edu to order one. And then wear it whenever – and wherever – you can, taking pictures along the way.

# *Mayo physician welcomes a challenge*

When Dr. Jim Steckelberg started medical school at the Mayo Clinic College of Medicine in 1979, he had no set plans to stay. Thirty-five years later, the 1975 University of Nebraska-Lincoln graduate is Mayo's emeritus chair of infectious diseases.

While it's unusual for a doctor to remain at the same institution for medical school, residency and fellowship, it is not uncommon for doctors at the Mayo Clinic in Rochester, Minnesota.

"There is little turnover here," Steckelberg said. "At each step, I would look around and think, 'where should I go for the next part?', and each time it seemed the best thing to stay. The programs are all so good."

A native of Fremont, Nebraska, Steckelberg did not always intend to become a doctor, either. He followed his brother, Allen, who is now an associate professor in UNL's Department of Teaching, Learning and Teacher Education, to UNL and double-majored in mathematics and computer science. His intellectual love for the topics and the challenges they presented were right up his alley, he said.

"College at UNL was the best time of my life," Steckelberg said. "I couldn't have been happier with the education I got there. In my current role, I see people from all over with different educational backgrounds, and UNL is a terrific place."

When Steckelberg arrived on campus, his mathematics professors Jim Lewis and Gordon Woodward were only in their second year at UNL – but to Steckelberg, they were already inspiring teachers.

"Jim was always able to bring out the best in folks," Steckelberg said. "Some students are easier than others,



COURTESY PHOTO

*Dr. Jim Steckelberg graduated from UNL in 1975 with a bachelor's degree in mathematics and computer science. He is emeritus chair of infectious diseases at Mayo Clinic in Rochester, Minnesota.*

but he had a hallmark for being exceptionable with everybody, even the, shall we say, less motivated. He has been an inspiration for generations of students."

After being selected for a prestigious Rhodes Scholarship to attend Oxford, he left UNL planning to pursue a Ph.D. in mathematics. But, his plans all changed after an illness caused him to end up in the hospital and spend three months on a ventilator.

"When I came out of the hospital, I made a career shift," Steckelberg said. "When I went to Oxford, I changed to human physiology from mathematics in preparation for medical school."

Steckelberg had Mayo in mind after meeting the dean of its medical school during the Rhodes Scholar interview process. He started out in internal medicine and then developed an interest in infectious diseases during residency.

Now he is professor and past chair of a unit of 25 clinical infectious disease specialists. While he focuses on cardiovascular and bone and joint infections, his department also handles cases involving HIV, AIDS, tropical diseases, and transplant infections to name a few. Mayo sees patients from around the world and 10 percent to 15 percent are international, Steckelberg said. While no one with Ebola has come to Mayo yet, Steckelberg said the threat of this infectious disease has caused every referral center in the U.S. to be geared up to see it and have a plan for how to handle it.

A fan of pure mathematics because it's a "thought experiment," Steckelberg said he uses statistics the most in his current position, taking observational data and then making reasonable inferences.

He advises any current students considering medical school to "make sure it's what you want to do. Don't do it for glamour; it's hard work. There are a lot of challenges, but I love it."

He also met the love of his life, his wife, Christie, during medical school. She is now a nurse anesthetist at Mayo. They have three daughters, Chelsea, Rachel and Katie. Rachel and Katie are in anesthetist residency programs at UCLA and Mayo, respectively, and Chelsea is a medical social worker in Minneapolis.

For Steckelberg, all of these years at the bedsides of dying patients has made him appreciate his family even more.

"Remember what is really important in life, the relationships you have with the people you love," he advised. "I've never had a patient say at the end of their life, 'I wish I had spent more time at the office.' "

*– Lindsay Augustyn*

> *"Make sure [becoming a doctor] is what you want to do. Don't do it for glamour; it's hard work. There are a lot of challenges, but I love it."*
>
> – Dr. Jim Steckelberg

# Class Notes

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**Nick Homan (BS '92)** went on to earn a Master of Science in Astronautical Engineering from the Naval Postgraduate School in Monterey, California. He is now a captain in the U.S. Navy, in which he has served for 30 years.

**Corey Maley (BS '05)** earned his master's degree in philosophy in 2010 from Princeton University and will earn his Ph.D. from Princeton in 2014. He is an assistant professor in philosophy at the University of Kansas.

**Mark Mills (BS '91)** has taught mathematics at Central College in Pella, Iowa, since 1999. He earned his master's degree and Ph.D. at Iowa State University. He was promoted to Professor of Mathematics at Central College in Fall 2013. In 2009, Mark started an actuarial science major, and in Summer 2012 he took (and passed!) actuarial Exam P. He will use his sabbatical in Spring 2014 to study for actuarial Exam FM. Mark took up running three years ago, running a lot of 5K races over the past three years. He ran his first 10K and half-marathon this past fall. Mark and his wife, Ann, have two children, and they love living in the small Dutch community that is Pella, Iowa.

**Katy Nelson (BS '05)** is now a Wilderness Ranger and Idaho Wolverine Field Technician in the United States Forest Service and Round River Conservation. Katy spends more time outside than inside, both working and playing. She said she is lucky that both of her jobs (backcountry ranger and wolverine study tech) take her to remote places and allow her to study perhaps one of the most amazing animals on the planet, the wolverine. She may not walk a traditional or 'normal' life path since she graduated from UNL, but her background in mathematics gives her the problem solving skills she needs to navigate the out-of-the-ordinary path she follows.

**Ed Wiley (BA '94)** completed a Master of Arts from UNL in educational psychology in 1996, the Stanford Statistics program in 2000, and the Stanford Psychological Studies in Education program in 2001. Ed now works for Seagate Technology as the Director of Big Data Analytics, doing research in statistics and predictive analytics. Ed was formerly on the faculty at the University of Colorado, Boulder, where he chaired the Research and Evaluation Methodology program.

# { Where has your Mathematics T-shirt been? }



*John Meakin at the Shore Temple in Mahabalipuram, Tamil Nadu, India*



*Gordon and Margaret Woodward at Stonehenge in England*



**Send your photos to:**
nebraskamath@unl.edu

*Mike McQuistan (BS '99) in the Everglades, Florida*

*Aubrey Thompson, a senior mathematics major who graduated May 2014, has received a National Science Foundation Graduate Research Fellowship. She will use the award to pursue a doctorate at Carnegie Mellon University.*

# Thompson earns NSF graduate fellowship

A UNL graduate who applied her math skills to understand how the brain thinks and perceives is pursuing a doctorate at Carnegie Mellon University with the help of the National Science Foundation.

Aubrey Thompson earned an NSF Graduate Research Fellowship, which provides international research and professional development opportunities. Thompson received her bachelor's degree in mathematics in May 2014.

Thompson, a Lincoln native, has studied machine learning algorithms, which attempt to extract patterns out of large amounts of data. She expanded her research into the field of mathematical neuroscience through a UCARE undergraduate research project in mathematics.

"I've worked on various neural coding projects, where typically the question is, given neural firing patterns, how does the brain decipher what stimulus is being presented?" Thompson

*"If you can bring your own funding to a graduate school, you're a much better candidate for schools because they don't have to find the funding for you."*

*– Aubrey Thompson, on the honor of receiving the fellowship*

said. "Or, how does the brain represent the world around it?

"The theoretical or mathematical neuroscience field is mainly concerned with asking how the brain thinks and perceives, and specifically whether we can use mathematics to further understand these phenomena."

Thompson, who was also enrolled in the Raikes School, said her computer science education was especially valuable because technology is so intertwined with research.

Thompson assisted a project in summer 2013 that explored how populations of neurons within the brain behave. Thompson said she will continue the research in graduate school.

Receiving the NSF fellowship was a surprise for Thompson, who said the funding would allow her to be more particular in the type of research she pursues in graduate school.

"It's an honor to receive the fellowship and if you can bring your own funding to a graduate school, you're a much better candidate for schools because they don't have to find the funding for you," Thompson said. "This will allow me to do the research I want to do because I won't be relying on my adviser for grant funding."

More than 14,000 applications were received for the 2014 competition, and 2,000 fellowships were awarded.

*– Deann Gayman, University Communications*

# Mayfield one of first from U.S. to visit Russian city

Through a new Education Abroad program at the University of Nebraska-Lincoln, senior mathematics major Caleb Mayfield became one of the first Americans to travel to the city of Perm, Russia.

Headed by Associate Professor Radha Balasubramanian, advisor of Russian Language in the Modern Languages department, Mayfield and two others studied at Perm National Research Polytechnic University from May 16-June 11, 2014.

"It had been a closed city, as it had military installations," Mayfield said, "so it just opened to foreigners because they still have a lot of regulations from socialist times. Our professor had been to Perm multiple times, and she set up the program for students in her Russian class to go, so I and two others decided we'd like to head the program and be the first students to go to that university."

While the program is centered on Russian language learning, students choose a side research track. Mayfield, who is also pursuing a minor in Russian, chose mathematics.

"Since we were there for a short time, we met once a week with our specific professors of interest, so I met once a week with one of their math professors, and then we went over number theory in Russian," he said. "It was in the traditional Russian style of teaching, so it was a lot of translating. Unfortunately my translator only knew about a hundred words of English, and I was at like a second grade Russian level, but it was really unique because since it was math, we could still communicate through math."

Perm National Research Polytechnic University was founded in 1953 and is one of the leading technical higher schools in Russia. About 30,000 students currently study at PNRPU. Perm is the most Eastern city of Europe and is the sixth largest
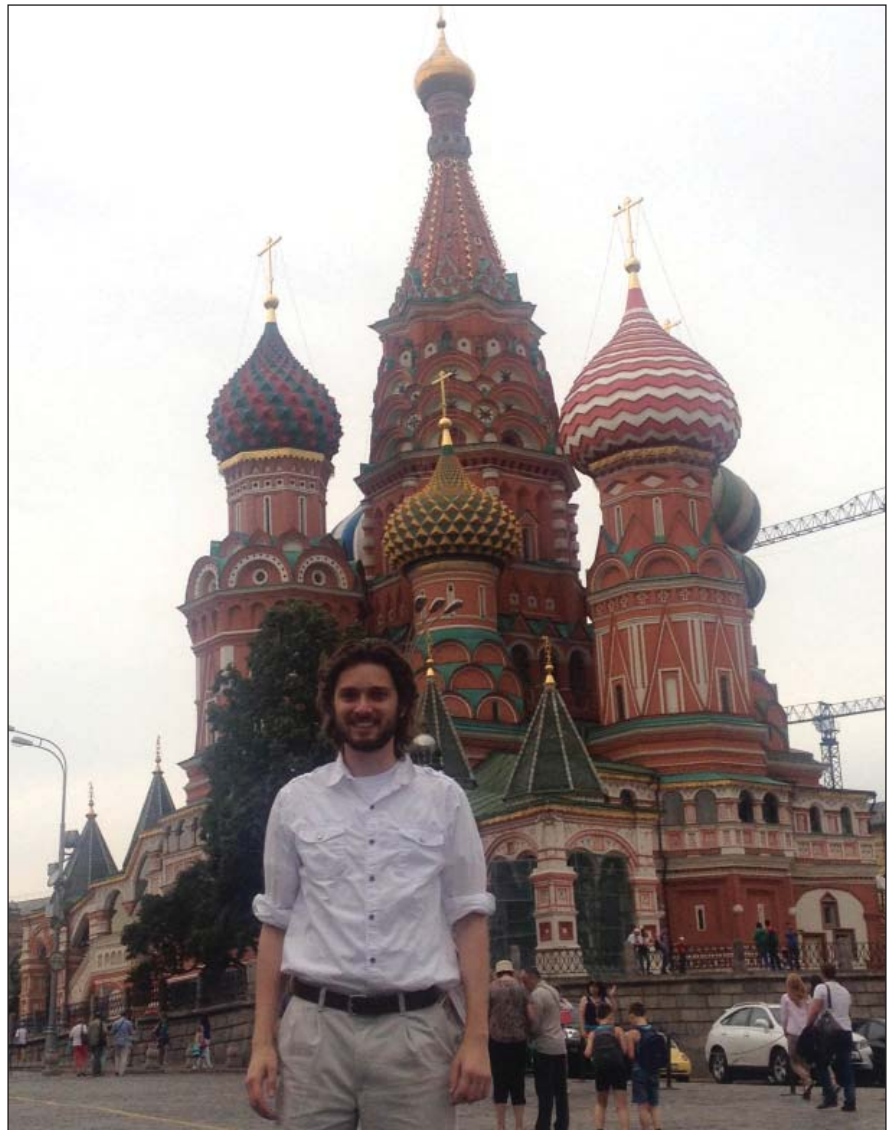


COURTESY PHOTO

*Senior mathematics major Caleb Mayfield, shown outside St. Basil's Cathedral, traveled to Perm, Russia, through a UNL Education Abroad program in 2014.*

city in Russia. After St. Petersburg and Moscow, Perm is Russia's leading city for opera, ballet and drama theatre. At the end of the program, students take a three-day excursion to Moscow. For more information about the program, visit: https://myworld.unl.edu.

Mayfield most enjoyed visiting St. Basil's Cathedral in Moscow and the changing of the guard at the Kremlin.

"The cathedral was a marvel," he said. "It was a life-changing moment."

## Math in Moscow program

Junior mathematics and philosophy major Aaron Calderon of Omaha has been selected for the Math in Moscow program at the Independent University of Moscow in Russia and will study there from January to May.

"I had participated in the MASS program at Penn State, and one of the people there was going to Moscow right after that. I thought it sounded really interesting and so I kept in contact with him. He seemed to enjoy it a lot, so I thought I'd apply," he said.

Calderon will take three mathematics courses and one Russian class. While the program is taught in English, Calderon is currently enrolled in Russian 101 in preparation.

"I've never been out of the country before, so I think that experiencing a completely different culture should be really fun," he said. "There's a really high level of academic rigor there and a different pedagogical approach, so it would be fun to take that all in."

For more information, visit: http://www.mccme.ru/mathinmoscow.

## 2013-2014
# Undergraduate Awards

**Chair's Prize** *Awarded to the graduating senior with strongest mathematics record*
Aubrey Thompson

**Special Scholarships Awards (over $1,000 per year)**
*Note: 64 scholarships of $1,000 or more were awarded for 2013-14 academic year.*

**Dean H and Floreen G Eastman Memorial new freshmen scholars**
*(for Nebraska high school graduates)*

Alexandra Janvrin, Michael Pieper, Ethan Romery, Lawrence Seminario-Romero, Olivia Thiel, Elizabeth Vandergriend, Collin Victor

**Irwin Dubinsky Memorial Scholar**
Erin Fick, Matthew Smith

**Joel Stebbins Fund** *(available to all)*
Claire Schirle

**Graduated with Honors from Honors Program**
Nikolas Bravo, Daniel Geschwender, Keaton Greve, Travis Ray

**Senior Honors Thesis and Graduated with Distinction**
*(directed by)***:**
Spencer Farley (Raikes Program), Kelsey Karnik (Statistics), Matthew Olson (Math, Allan Peterson), Helen Pitts (Math, Jamie Radcliffe), Aubrey Thompson (Raikes Program)

**Putnam Participants**
Jackson Bauer, Nikolas Bravo (UNL 1st), Jordan O'Neal (UNL 2nd), Samuel Tritsch

**NSF Graduate Fellowship**
Aubrey Thompson

**Renneman/Luebber Scholarship**
Cassandra McKay

**Drusilla Winchester Scholarship**
Michaela Cunningham

**Ruby Matzke Wittemore Scholarship**
Matthew Smith

**Dr. Hubert Schneider Scholarship**
Claire Tunakan

# Graduate Awards

**Chancellors Fellowship**
Stephanie Prahl, Laura White

**Don Miller Award for Outstanding Teaching by a Graduate Student**
Jason Hardin

**Grace Chisholm Young and William Henry Young Award**
Christopher Schafhauser

**Outstanding Qualifying Exam**
Neil Steinburg

**Walter Mientka Teaching Award**
Simone Westermayer

**Outstanding First-Year Student Award**
Andrew Windle

**Bill Leavitt Award**
Haydee Lindo

**Lloyd Jackson Award**
Jeremy Trageser

**Emeritus Faculty Fellowship**
Solomon Akesseh, Anne Kerian

**Othmer Graduate Fellowship**
Christopher Evans, Mitch Hamidi

**GAANN Fellowships**
Maranda Franke, Erica Gilliland, William Jamieson, Caitlyn Parmelee, Sara Reynolds, Travis Russell, Chris Schafhauser, Ariel Setniker, Peder Thompson

**MCTP Trainees**
*Advanced (Fall)* - James Carraher, Nora Youngs; *Advanced (Spring)* - Michael Brown, Sarah Behrens; First-Year: Carolyn Mayer, Cory Wright

**Steven Haataja Award for Outstanding Exposition**
Lauren Keough

# Bachelor's degrees

**May 2014:** Kofi Amevor, Nikolas Bravo, Alexander Burch, Jana Carmichael, Daniel Geschwender, Keaton Greve, Cale Hadan, Simin Hong, Libin Jia, Kelsey Karnik, Grant Langdon, Na Li, Yuan Liu, Henry Mattern, Rollin Metzger, Ryan Miller, Brittany Murphy, Sebastian Nabb, Michael Niemeier, Matthew Olson, Michaela Onkka, Katie Pawlowski, Clinton Pettit, Anthony Presnell, Travis Ray, Thomas Seewald, David Stephens, Molly Stukenholtz, Aubrey Thompson, Lydia Wingfield

**August 2013:** Kenneth Cutler, Han Gao, Matthew Harmon, Alexander Houston, Hao Wu

**December 2013:** Anthony Duren, Corrine Hodges, Seth Jameson, Kevin Jerger, Sing Lee, Xiaoluan Li, Yu Li, Chaoyu Liu, Matthew McKitrick, Benjamin Reed, Michael Rogers, Amanda Sedor, Bradley Sedor, Minh Tran, Samuel Tritsch, Francis Wiles, Morgan Wilken, Karly Williams, Jian Yeo, Shalima Zalsha, Yang Zheng

# Master's degrees

**2014 (MA/MS):** Kevin Ahrendt, Solomon Akesseh, Andrew Becklin, Jessalyn Bolkema, Eric Canton, Bin Chen, Derek DeSantis, Areeba Ikram, Jill Jessee, Nicholas Kass, Alexander Kunin, Shaylyn Pike, Neil Steinburg, Camila Tulyaganova, Simone Westermayer, Andrew Windle

**2014 (MAT):** Courtney Beach, Karen Clinch, Mitchell Fricke, Mandy Kehm, Jennifer Kreifels, Dan Martin, Laura Novak, Tiffany Ogden, Tiffany Powers, Kelli Roeber-Schoening, Kyle Schwaninger, Leah Terry, Shannon Wiig

**December 2013 (MAT):** Alicia Davis, Matthew James, Kimberly Ocampo

# 2014 Doctorates

**Brackins, Abby** (University of Nebraska-Lincoln lecturer) *Nabla Fractional Calculus,* Allan Peterson

**Carraher, James** (University of Nebraska at Kearney) *Results on edge-colored graphs and pancyclicity,* Stephen Hartke

**Clark, Tom** (Dordt College) *An Applied Functional and Numerical Analysis of a 3-D Fluid-Structure Interactive PDE,* George Avalos

**Hardin, Jason** (Worcester State University) *Algebraic Properties of Ext-Modules Over Complete Intersections,* Mark Walker

**Haymaker, Katie** (Villanova University) *Algebraic and combinatorial coding techniques for flash memory storage,* Christine Kelley

**Pei, Pei** (Earlham College) *Well-posedness and long-term behavior of semilinear Reissner-Mindlin-Timoshenko plate equations,* Mohammad Rammaha and Daniel Toundykov

**Youngs, Nora** (Harvey Mudd College) *The neural ring: Using algebraic geometry to analyze neural codes,* Carina Curto

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