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# A f t e r m a t h

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## Degrees Awarded



This year, approximately 50 undergraduate math majors will receive a baccalaureate degree. A total of 14 Masters degrees will be awarded. Students receiving the Ph.D. in 2002-2003 are Emina Alibegovic, Nick Cogan, Robert Guy, Anca Mustata, Andrei

Mustata, Brad Peercy, Tom Robbins, and Matthew Rudd.

## Changes to the Faculty

There will be six new assistant professors joining the department next year. Emmanuel Allaud, Ph.D. Paul Sabatier University, 2002, will be a Wylie Assistant Professor (Lecturer). He specializes in Hodge Structures. Daniele Arcara, Ph.D. University of Georgia, 2003, will also be a Wylie Assistant Professor (Lecturer), with interests in Algebraic Geometry. The new Scott Assistant Professor (Lecturer) will be Sandra Spiroff, Ph.D. University of Illinois – Urbana, 2003, and she focuses in Commutative Algebra. Robert Bell, Ph.D. Ohio State University, 2003, specializes in Topology and will be a VIGRE Assistant Professor (Lecturer). Dan Margalit, Ph.D. University of Chicago, 2003, will also be a VIGRE Assistant Professor (Lecturer). His area of interest is Topology. Our third VIGRE Assistant Professor (Lecturer) will be Grady Wright, Ph.D. University of Colorado – Boulder, 2003, who specializes in Numerical Analysis.

There are also several people who will not be with us next year. Les Glaser retired at the end of December after many years of service to the department. Herb Clemens has assumed his position at Ohio State University, and Ben McKay and Liya Zhornitskaya have accepted positions at the University of South Florida. Jim Carlson and Wiesa Niziol will be on sabbatical, while Grisha Mikhalkin will be on faculty development leave. Misha Kapovich and Hugo Rossi will be on leave without pay.

## Personality!

Paula Tooman comes from a small family. After serving 21 years in the United States Air Force, and traveling all over the world, her father decided to retire his family here in Salt Lake City. She is now happily married to her husband, Paul, with two children: Emily, 12, and Anthony, 8. They just bought a new home and Paula enjoys gardening in her yard.

Paula enjoys all kinds of puzzles, cross stitching, spending time at her parents cabin up in the mountains, traveling, and riding her husband's motorcycle with him.



Something that might surprise you about Paula is that she can drive a semi-truck and back it into a very small area – no problem. Another surprise . . . she would LOVE to go skydiving someday!

Paula's supervisor says (and I'm sure that we'd all agree) that "her warm and welcoming personality is a major talent which the department greatly benefits from. She always makes you feel important and good about yourself. She is fantastic as our 'first contact' for the department! She is a kind and caring person."

## Problem Solving Contest

This was the second year that the Math Department at the University of Utah has participated in the national Problem Solving Competition. Problems appear roughly monthly, and monthly winners have been selected. The overall winner, Batdorj Lhaajav, and the student representative who helped run the program on our campus, Brian Knaeble, will be attending the national finals of the Problem Solving Competition. This year's finals will be held in Boulder, CO in conjunction with Mathfest, which runs July 30 through August 1.

## Calculus Challenge

The fourth annual Calculus Challenge for undergraduates was held Saturday, April 12. Twenty students participated in this three hour exam which consisted of six challenging calculus problems. Zsuzsanna Horvath took first place, Tim Simmons took second place, and Nam Nguyen took third place.

## Summer VIGRE Offerings

With support from a National Science Foundation VIGRE grant, this summer the math department will host two mini-courses and an REU (Research Experience for Undergraduates).

The first mini-course, held June 2 - 13, is organized by Fred Adler and will cover the mathematics behind biological invasions. Speakers will include Fred Adler, Mark Lewis (University of Alberta), and Mike Neubert (Wood Hole Oceanographic Institution), and Nancy Sundell-Turner will lead problem sessions. Biological invasions are one of the greatest threats to biodiversity and ecosystem function, and are also one of the largest perturbation experiments our species has tried. This mini-course will examine the many ways that mathematical models have been used to make sense of this important and interesting problem. This program is designed for students who have studied differential equations at the graduate school level.

The second mini-course, held July 29 - August 8, is organized by David Dobson and will focus on waves in inhomogeneous media. The principal speaker will be George Papanicolaou from Stanford University, while other speakers include Andrej Cherkaev, Elena Cherkaev, David Dobson, Ken Golden, and Graeme Milton. Waves frequently propagate through inhomogeneous media. This manifests itself in phenomena as diverse as the twinkling of stars, the appearance of rainbows, the blueness of distant mountain ranges, the colors of opal and Venetian glasses, and the milkyiness of colloidal suspensions. Technologically, an understanding of wave propagation in inhomogeneous media is important to tomographical applications where one seeks to say something about underlying inhomogeneities from seismic or electromagnetic measurements. It is also important to the design of photonic and phononic band gap materials (which prevent the propagation of waves over a band of frequencies), of diffraction gratings, and of selec-

tive absorbers of solar energy. The mini-course will focus on both electromagnetic and elastic wave propagation in linear and non-linear media.

This summer's REU on "Rational and Integer Points on Elliptic Curves" is organized by Aaron Bertram and will run May 12 - June 20. Consider the set of solutions  $(x,y)$  to the equation  $y^2 - x^3 = -2$ . If we allow  $(x,y)$  to be real numbers, then such solutions are easy to find. They are:  $((y^2 + 2)^{1/3}, y)$  and  $y$  can be any real number. But what if we want solutions that are rational numbers, or even integers? A little trial and error will show you that  $(3,5)$  and  $(3,-5)$  are two such solutions. Are there any other integer solutions? (Hint: No.) Are there any other rational solutions? (Hint: Yes, lots.) We'll explore such questions in this REU and look at how the rational points on elliptic curves can be used to produce fast algorithms for factoring large numbers, among other applications.

## NCUR Report

The University of Utah hosted this year's National Conference on Undergraduate Research, held March 13-15, 2003. Several members of the math department participated, including both faculty and students. Students affiliated with the math department who presented research projects included Gary Crum, Troy Finlayson, Amy Heaton, Nancy Newren, Robin Plachy, and Mike Woodbury. Mohamed Camar-Eddine, Stewart Ethier, Jesse Ratzkin, Gordan Savin, Andrejs Treibergs, and Jingyi Zhu each moderated a presentation session. Other faculty members and students participated in the reception held at Rice-Eccles Stadium Thursday evening. Following are two reports on the NCUR experience.



## NCUR – A Faculty View by Andrejs Treibergs

Mathematics students from across the country presented their work at the 17th National Conference on Undergraduate Research, held on campus March 13-15. Students gave 15 minute

talks to visiting students and faculty in sessions moderated by local faculty.

Topics ranged from statistics to number theory in the session I chaired. Kelly Torres, from Texas A&M, Corpus Christi, described a regression model to predict tides in the Gulf of Mexico. Tram Hoang, from Cal State Fullerton used an ODE model to compute the effects of various drug intervention strategies on newborn jaundice. Edgar Lobaton of Seattle University compared numerical methods to compute a 2d convection-diffusion equation, which models how a hot spot moves by fluid flow. Lisa Zimmermann, of Capital University, discussed how a tiny satellite, placed near a Lagrange point near two massive planets orbiting each other is forced to meander. Kumar Jeev of Coastal Carolina University presented his method to predict prime numbers using a linear recursion obtained by fitting a best line through previous primes.

Although at first nervous, students relaxed when describing their work. Their enthusiasm was evident. Every one said they will pursue graduate school in statistics or mathematics. All talks were very polished and on PowerPoint. Each speaker attracted a different audience, as groups of students wandered from talk to talk in support of their friends.

## **The Best of the NCUR**

**by Nancy Newren**

Other than a better chance to get into a graduate school of your choice and the money that it brings in, the best part about doing research is getting to present your work to others. For the past (almost) year, I've been working with Victor Bazterra and Julio Facelli here at the University of Utah on a research project in bioinformatics. With their help I have had the opportunity to begin research as an undergraduate, and recently I got to present my research at the 2003 National Conference on Undergraduate Research. My poster, "Implementation of a Parallel Genetic Algorithm (PGA) for Multi-sequence Alignment of DNA and Protein Sequences," showed how we used a "Parallel GA"\* to align multiple sequences of protein.

At the NCUR I talked with many professors and undergraduates and got to give them a thorough explanation of my work. While the plenary speakers, meals (the desserts were wonderful), and free t-shirts were great, getting to share my

research with other undergraduates was the best part of the NCUR, after, of course, the free bag I received for participating in the conference. I can't wait to do it again next year.

\*Even a simple explanation of my project takes quite a while because of the complexity and integration of the many things that went into it. So here I will just leave a brief explanation of what a GA is: GAs are optimization programs based on Darwin's theory of survival of the fittest. An initial population of individuals, in my case they were protein sequences, are created and then evolved. Each generation all individuals are scored and ranked by comparing them against each other; the "best" individuals will move on to the next generation, the rest undergo crossovers, mutations, and other operations before moving on. Eventually the best individual's score converges - its value doesn't change significantly from one generation to the next - which means that the best individual has been found, and the algorithm ends.

## **New Book Collection**

A few books have been purchased using funds from the James H. Case Mathematics Library Memorial Fund. Each book purchased with these funds will be labeled with a gold bookplate that reads, "This book was donated in memory of James H. Case, Professor of Mathematics from 1954 to 1990." The books that have been purchased are: The Hilbert Challenge, The Book of Numbers, Mathematical Reflections, Fantasia Mathematica, The Historical Development of the Calculus, Zero to Lazy Eight, The Nothing that Is: A Natural History of Zero, An Imaginary Tale, and Chaos: Making a New Science. These books will soon be available for check-out in the Mathematics Library.

## **MSRI Associate Director**

**by Graeme Milton**

I am pleased to announce that Hugo Rossi will be Associate Director of MSRI during the coming year. Hugo's energy and enthusiasm is bound to benefit the larger mathematical community through his presence at MSRI. He previously held this position from 1997 to 1999 and did such a great job that they want him back again. Hugo will be on leave of absence from the department for next year but will continue to manage his online Calculus courses. Congratulations, Hugo!

## Milton Honored

Graeme Milton has been selected as the recipient of the 2003 Ralph E. Kleinman Prize. This prize is awarded to an individual for outstanding research or other contributions that bridge the gap between mathematics and applications. Prof. Milton will be presented with the award at the Award Luncheon of the SIAM Annual Meeting on June 17, 2003.

Dr. Milton is also being honored by the University of Sydney with the award of the degree of Doctor of Science in the Faculty of Science, School of Physics. This rare honor is given to an individual who has published work which has been generally recognized by scholars in the field concerned as a distinguished contribution to knowledge or creative achievement. Dr. Milton has been selected for his work which has been judged to represent a significant advance in knowledge in the field of mathematics and physics and has directly given rise to significant changes in the direction of research or practice of a newer generation of recognized scholars.

## Students Honor Faculty

Henryk Hecht and Anne Roberts have received the ASUU Student's Choice Award. Only eight of these awards were given university-wide, and recipients of these awards must be nominated by their students.

Erik Larson, who nominated Henryk Hecht, wrote, "Professor Hecht was outstanding, he made class a pleasure. His abilities lie in many areas: a great sense of humor, an ability to convey difficult ideas in a clear and concise manner, and a true care for his students. It is this last quality that has struck me the most. He left me with an open invitation to come to him, any time, if I needed help along the way. I took him up on this offer and that is what makes professor Hecht outstanding. His goals lie in educating the student whether the student is his own or one of another professor."

Kristina LeeFlang, who nominated Anne Roberts, wrote, "Anne Roberts doesn't just give us answers and information, but she guides our minds to understanding the concepts rather than just telling us. This is so important, especially in Math, when you find out something yourself it means so much more to you. When I leave her class, I can't stop thinking about the previous topic under discussion. Ideas are constantly entering

my mind even when not in class. Anne Roberts is probably one of the best, if not the best, teacher I have ever had, and I believe she deserves an honor for excellent teaching." Anne was also nominated by Vicky Hansen, who wrote, "Anne Roberts takes the time to help you in and out of class. She is willing to work with you and help you to become a better teacher. I feel that Anne's teaching methods are an excellent example of the way I want to be able to teach math to students."

## REU Report

by Amy Heaton

Over the past sixteen months, I have been working for the math department with my advisor Dr. Kenneth Golden. Dr. Golden specializes in mathematical modeling of the effective properties of composite systems, and I am specifically modeling the fluid permeability of sea ice. Sea ice is important because it covers 10% of the ocean surface and acts as an insulating layer between the ocean and the atmosphere, mediating the exchange of heat and moisture between them. A parameter which plays a key, controlling role in these exchanges and in other geophysical and biological processes is the fluid permeability of the sea ice. Using percolation and the theory of bounds on effective parameters, I have made publishable advances in mathematically characterizing the fluid permeability as a function of temperature, and this research has even taken me to the Arctic to do field work.



Amy, far right, out on the ice with other researchers.

During my week-long retreat from school to Barrow, Alaska in February, I spent time both out on the frozen ocean and in the laboratory to obtain data for my research. On the ice, we drilled core samples, and then we took temperature and salinity readings from them at different depths. We also used centrifuge and x-ray meth-

ods to obtain brine and microstructural data from the samples. This experience was not only constructive for my research, but fun and exciting as well. From the classroom to the Arctic, these types of experiences go to show that the



possibilities of math are endless.

Amy working in the lab in Barrow.

## Faculty Awards

Pedro Mendez is receiving the Outstanding Instructor Award, given for distinction in both teaching and research.

Henryk Hecht has been chosen for the Faculty Undergraduate Teaching Award.

Henryk Hecht and Anne Roberts were honored with the ASUU Student's Choice Award.

## Graduate Student Awards

Fumi Sato has been awarded a University Research Fellowship.

Denis Lukic is the recipient of the T. Benny and Gail T. Rushing Graduate Fellowship.

Renzo Cavalieri is receiving the Superior Teaching Award.

Matthew Clay joined Phi Kappa Phi this year.

## Undergraduate Awards

The recipients of Continuing Departmental Scholarships are Christopher Calaway, Joel Kramer, and Collin Perschon.

Adam Gully and Ashley Sadler are receiving

Entering Departmental Scholarships.

The Susan C. Christiansen Memorial Scholarship has been awarded to Kevin Sullenberger.

Eunjung Um is the recipient of the Thomas Andrew Hurd Mathematics Scholarship.

Leslee Morrill is receiving the Ferdinand Biesele Scholarship.

The J.L. Gibson Senior Award goes to Les Kartchner.

Ryan Pratt has been awarded the D. Keith Reed Memorial Scholarship.

The recipient of the C. Bryant and Clara C. Copley Scholarship is Nancy Newren.

Jason Henline is the recipient of the Calvin H. Wilcox Memorial Scholarship.

The Stephen E. Newman, Jr. Mathematics Alumni Scholarship has been awarded to Michael Hofmann.

Ryan Rettberg earned this year's Putnam Contest Award.

The winners of the 2003 Calculus Challenge are Zsuzsanna Horvath, Timothy Simmons, and Nam Nguyen.

The Top Problem Solver in the Undergraduate Problem Solving Competition is Batdorj Lhaajav. The student representative was Brian Knaeble.

The members of the Co-Map Mathematical Modeling Contest team that received an Honorable Mention are Matthew Taylor, Michael Hofmann, and Elena Sager.

Garret Fox and Victor Wang placed 1st and 2nd respectively in the State Math Contest among high school seniors. Morgan Dennis and Tyson Willis tied for 3rd. If they attend the University of Utah next fall they will receive a scholarship.

Michael Woodbury is graduating Summa Cum Laude.

David Ayala, Robin Plachy, and Ryan Rettberg are graduating Cum Laude.

# Upcoming Events

**Friday, April 25** - Math Department Barbecue at Canyon Rim Park 4:00 p.m.

**Friday, May 2** - University Commencement. The Math Department will be having a post-convocation reception on the plaza.

**Monday, May 12** - Summer courses begin.

**Monday, May 26** - Memorial Day holiday.

**Friday, July 4** - Independence Day holiday.

**Thursday, July 24** - Pioneer Day holiday.



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*[www.math.utah.edu/newsletter](http://www.math.utah.edu/newsletter)*

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