Department of Mathematics Newsletter

Washington University in St.Louis

MATHEMATICS

FALL 2007

Congratulations to our Largest Graduating Class in Recent History!

WE ARE PLEASED TO CONGRATULATE THE graduate degree recipients from our largest graduating class in recent history. The following students received Ph.D. degrees in May 2007.

Amei, who was advised by Stanely Sawyer and has accepted a tenure track job at the University of Nevada, Las Vegas.

Benjamin Braun, who was advised by John Shareshian and has accepted a tenure track job at the University of Kentucky.

Greg Knese, who was advised by John McCarthy and has accepted a postdoctoral position at the University of California, Irvine.

Paul Koester, who was advised by Richard Rochberg and has accepted a postdoctoral position at Indiana University.

Sooraj Kuttykrishnan, who was advised by David Wright and has accepted a postdoctoral position at Washington University's Medical School.

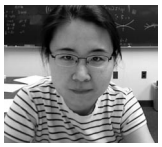
Kimberly Randle, who was advised by John Shareshian and has accepted a position with Citigroup in St. Louis.

Prasada Vegulla, who was advised by John McCarthy and has accepted a postdoctoral position at Ben Gurion University of the Negev in Israel.

Aaron Wiechmann, who was advised by Rachel Roberts and has turned down several academic positions and expects to work for the U.S. government.

The following students received Ph.D. degrees in August 2007.

Jeff Blanchard, who was advised by Guido Weiss and Ed Wilson and has accepted a postdoctoral position at the University of Utah.



Lina Lee, who was advised by Steve Krantz and has accepted a postdoctoral position at the University of Michigan.

Bo Zhao, who was advised by Nik Weaver and expects to work in the financial industry.

We congratulate all of these fine students and wish them the best of luck in their future endeavors.

By Sara

OUR MATHEMATICS PROFESSORS, GRADUATE students, staff and friends had a taste of Iranian new year festivities, Norouz, this spring which was hosted by the Iranian Student Association. There was poetry reading, dancing, food, and more. Iranians celebrate their new year on spring equinox (the first day of spring - 20 or 21 of March) allowing spring to color the celebration. We observe the new year by visiting family and friends and exchanging gifts.

(Please see "Sara" continued on page 12)

IN THIS ISSUE

Our Fondest Memories of Retired Math Librarian Barbara Luszczynska

It is a pity that I've been here for only one year, so I didn't know too much about her. But even in my limited encounters, I could see that she was very conscientious about her work. *Baili Min*

What's not to like about someone with seven consecutive consonants in their last name? I seriously loved the weekly death threats to anyone who gave out the code to the library door or took a book from the library without checking it out." *Joe Bohanon*

She has always been very much admired by me -- an ideal librarian for our department and a friend to all of us. She was always very helpful on any question I might have in finding books and articles, dealing with the library and its computer programs, both the Math Library and Olin, very good at getting things we needed. It is going to be hard to get used to anyone else after all these years of her devoted service to all of us. I wish her a very happy retirement! *Bill Boothby*

I am very fond of Barbara. Here are some memories: Barbara always wanted to help. She gave special tutorials to my writing class. She created "complete works" binders for the faculty. She was terrific at finding obscure references. When I had trouble about an overdue book she would fix it. I couldn't imagine a more proactive or accommodating librarian.
Steven Krantz

I agree entirely with Steve's comments. *Guido Weiss*

Steve said it well. I'm in total accord. The only thing to add is that when we decided during my time as chair to move the library from the old location (now 115) to the present one, Barbara was fantastic in designing how best to use the new space and overseeing every aspect of the move. *Ed Wilson*

I will miss hearing that beautiful accent! *Corine Kidicho-Jones*

I had some hanging plants, and when I moved apartments I brought a couple of the plants to the department. As time went on, I didn't take care of them very well, and so Barbara started taking care of them, and she did until she left. Every time I would see them in the lounge, it would remind me of how nice she was. *Brian Maurizi*

I would say those beautiful plants in our lounge. She was taking care of those so well! *Thanks, Qing Li*

Barbara was always a very pleasant person to have around the department. She made up two ``Collected Papers of'' books/binders/collections for me that I have found very useful. She was also very helpful to me about providing librarians' prospective when I was on an Advisory panel for a Biology journal. Her leaving has created a void in the department that will be difficult to fill. *Stan Sawyer*

(More on Barbara Luszczynska, please continue to "Farewell" on page 19)

LETTER FROM THE CHAIR

WELCOME TO THE 2007-2008 academic year. This fall we welcome to our faculty Roya Beheshti Zavareh, who was hired last year but delayed her arrival one year in order to take a postdoctorate position at MSRI. Roya received her PhD from MIT in 2003, then fulfilled a two-year post doctorate at Queens University. Her field of research is algebraic and arithmetic geometry and she will be teaching a two-semester graduate level sequence in Algebraic Geometry.

Also joining us is our new Chauvenet Lecturer, Rajan Mehta. Professor Mehta received his Ph.D from UC Berkeley in 2006 as a student of Alan Weinstein. His specialties are supermanifolds, Lie groupoids and Lie algebroids, symplectic and Poisson geometry, equivariant cohomology, and homotopy theory. He comes to us off a one-year position at Instituto de Matimática Pura e Aplicado, Brazil. We bid farewell to Chauvenet Jae-Hyouk Lee, who completed the third year of his appointment, and we wish him the very best in his career.

Still another new face is Professor Stefan Richter, who is visiting from the University of Tennessee. Professor Richter specializes in operator theory and complex analysis. He will be collaborating with John McCarthy and Richard Rochberg. Other guests are expected to be with us for various intervals during the academic year.

We welcome the nine incoming graduate students (8 PhD, 1 MA) who will be joining us this fall. Rachel Roberts has now stepped down as chair of the Graduate Committee and Mohan Kumar has kindly agreed to take over this very important and time-consuming position.

We are stretched tight on teaching but continue to offer a first-rate curriculum. This year's menu includes includes eight 500-level topics courses and new upper level courses in Bayesian Statistics (Lin), and Mathematical Biology (McCarthy).

A notable upcoming event is the Roever Lecture, which will be given by John Morgan of Columbia and Gang Tian of MIT on October 19-20 on the topic of Perelman's recent solution to the Poincaré Conjecture.

Continued thanks to our office staff: Shar Weber, Mary Ann Stenner, Sara Quigley, Corine Kidicho-Jones, and Marie Taris, as well as our computing manager Steven Xiao, and our undergraduate coordinator Blake Thornton, for continuing to go beyond the call of duty in many, many ways to make our department run smoothly.

This spring our longtime librarian Barbara Luszczynska retired as our department librarian. Barbara has been a part of our department for many years and many of us came to depend on her for all the personal favors she did for us as well as serving us so ably. We will certainly miss her and we wish her well on her retirement.

We will press forward with our plans to make our department even stronger in the next few years. We have an upcoming external review and this will hopefully help to illuminate our path. There is reason to believe we have the support of our administration in this endeavor.

And, of course, you are all invited to the welcoming party at my house on Saturday evening, September 8th. I look forward to seeing you all there.

David L. Wright

Chair, Mathematics Department

IN MEMORIAM

People Share Memories of an Intellectual on WU fringe

by Bill McClellan

A STANDING-ROOM ONLY CROWD OF about 120 gathered in a second-story lounge at Washington University on Thursday afternoon to remember **BETTY WYNN**. The crowd was mostly professors and staff. There were few, if any, students. I noticed that some of the men had that vaguely nonconformist look that never goes out of fashion on college campuses - hair a bit shaggy, clothes slightly mismatched and so on; a look that says, "A little weird but not dangerous."

In the corner of the lounge sat Sam Lachterman, Betty's brother. He had that look to the 10th power. "Very weird, but not dangerous. Entirely too weird to make it in normal society."

Sam's presence put an interesting spin on the whole thing. It was as if all these people who had opted for a respectable nonconformity were paying tribute to a couple who had taken nonconformity to the edge and then beyond.

Sam and Betty.

For years, they have been part of the fabric of the university. A Canadian author, Robertson Davies, mentioned them in his book, "Happy Alchemy." He wrote that Betty was "the campus bag lady - a learned lady who lives with her brother, a former member of the faculty, in a derelict car; they haunt the campus, are at all refreshments, go to all the free lectures and concerts and wash in the public loos. In fact, real medieval university

(Please see "Betty" continued on page 8)

Henry Schaerf, ca. 1946

PROFESSOR HENRY SCHAERF passed away in Seattle on March 5th, 2006, two weeks before his 99th birthday. He was one of the many scientists who left Europe for the United States because of the crises of the 1930's and 40's. He was on the faculty of the Mathematics Department of Washington University from 1947 to 1975.

Professor Schaerf was born in Rohatyn, a small town near Lwów, Poland (now Lviv, Ukraine). Before the Second World War the University in Lwów was an important mathematical center led by Stefan Banach and Hugo Steinhaus. Professor Schaerf studied mathematics there, earning his degree in 1929. To support his family he put aside his mathematical studies and earned his Actuarial Certificate in 1931 from the University of Göttingen. In the 1930's he was Chief Actuary for several life insurance companies in Poland. After the German invasion of Poland in 1939 Prof. Schaerf settled in Zurich and returned to the study of mathematics. He was a Lecturer and then Assistant Professor at the Swiss Federal Institute of Technology (ETH) and received a PhD in Mathematics there in 1943.

In 1946 Professor Zygmunt Birnbaum, a mathematician at the University of Washington who had been a colleague of Schaerf's in Lwów, helped him obtain a faculty position at Montana State College. The following year he joined the faculty of Washington University and remained on the faculty until he retired. He also held visiting positions at the Institute for Advanced Study in Princeton, the Mathematical Research Center in Madison, and McGill University in Montreal.

During his career Professor Schaerf made important contributions to Actuarial Science and to Mathematics. After his retirement from academic life he remained active in civic life. In 2003 he assisted the International Commission on Holocaust Era Insurance Claims in locating Polish insurance and actuarial records from the 1930's.

CHAIR AND PROFESSOR

David Wright

ELINOR ANHEUSER PROFESSOR OF MATHEMATICS

Guido Weiss

PROFESSORS

Albert Baernstein, II
Quo-Shin Chi
Renato Feres
Ron Freiwald
Gary R. Jensen
Steven G. Krantz
N. Mohan Kumar
John McCarthy
Rachel Roberts
Richard Rochberg
Stanley Sawyer
Edward Spitznagel
Nik Weaver
M. Vladen Wickerhauser
Edward N. Wilson

ASSOCIATE PROFESSORS

Brian Blank
Jack Shapiro
John Shareshian
Cleon R. Yohe

ASSISTANT PROFESSORS

Roya Behesti-Zavareh*
Jimin Ding
Nan Lin
Xiang Tang

CHAUVENET LECTURERS

Joost Berson
Geir Arne Hjelle
Rajan Mehta*

VISITING PROFESSORS

Stefan Richter*
Rodrigo Montes

COORDINATOR OF LOWER DIVISION TEACHING

Blake Thornton

PROFESSORS EMERITI

William M. Boothby
Lawrence Conlon
James A. Jenkins
Robert H. McDowell
A. Edward Nussbaum

*New in Fall 2007

FACULTY SPOT

RAJAN MEHTA received his Ph.D. from U.C. Berkeley, working under Alan Weinstein, and spent the last year at IMPA in Rio de Janeiro. His research interests include supergeometry, Poisson geometry, and mathematical physics. He enjoys playing guitar and banjo, experimental cooking, and freestyle walking.

STEFAN RICHTER is a professor of Mathematics at the University of Tennessee. During the academic year '07-'08 he will be on sabbatical leave and will be a visitor in our department. Stefan was born, raised, and did his undergraduate work in Germany. He got his Ph.D. from U. Michigan in 1986 under the supervision of Allen Shields. His research interests are operator theory, complex analysis, and the interaction between the two areas. He has been particularly active in studying the Dirichlet and Bergman spaces on the unit disk. Stefan will be accompanied by his wife Stephanie and their three young children-current ages 3, 7, and 9.

Two of our faculty, **PROFESSORS STEVEN KRANTZ** and **NAN LIN,** were nominated by the Graduate Student Senate for the Outstanding Mentoring Award. From a very strong group of nominees, five faculty were named for Outstanding Faculty Mentor Awards. Professor Krantz and Lin, along with thirty one other faculty members, were recognized as "special recognition nominees" for excellence in mentoring. On Wednesday, April 18, 2007, the Eighth Annual Outstanding Faculty Mentor Awards ceremony recognized these professors whose dedication to graduate students and commitment to excellence in graduate training have made a significant contribution to the quality of life and professional development of graduate students in Arts and Sciences at Washington University.

Steven Krantz

Nan Lin

CHAUVENET LECTURER JAE-HYOUK LEE SAYS:

It is hard to believe a period of three years has passed since I came to St. Louis; a place with very unique flavor. It's been a great time for my family to explore and stamp our footprints in every corner of the city. Even though we are not big fans of the red birds, we can't help loving this stubborn but charming city.

At the end of my three years working at Wash U, I feel guilty that I got a ton of benefits but returned small contributions. First of all, I was very lucky to teach many interesting courses and to have brilliant students. I appreciate all my students for their passion shown in the classes. My wish was that they would enjoy classes as much as I did. I am indebted to Prof. Chi and Prof. Jensen for their showing new paths to geometry. They let me open another eye on mathematics. I also thank the Algebraic geometry group. It was a great pleasure for me to join the friendly people. Of course, I will reserve one seat during my new work at UMSL. At last, I have a chance to express my gratitude to Prof. Wright and the staff in Math department. It was my honor to work with these attractive people.

Wash U after the sunset is my favorite picture in my heart. It would be even better with the aroma of coffee and the company of mathematics. Sometimes a big bunny could be my company. He looks like a hungry bunny thinking of what to eat. But alas, he is just listening to the sounds the of day. My heart is engraved with all these sounds from each corner of campus.

It was very nice to meet you, Wash U !

Visit to Israel

by Professor Jack Shapiro

PHYLLIS AND I HAVE JUST returned from our three-month stay in Israel. I was a visiting Professor at the Technion in Haifa, and Phyllis worked 25% of her job over the Internet. We found an apartment in Netanya which was about halfway between the Technion and the place that our daughter and three grandchildren live. It is also along the Mediterranean coast. It was about a 50 minute drive for me to get to the Technion, which I did approximately three times a week. I had no official teaching duties but that might not have made a difference since the National University Student Union called a strike covering most of the time I was there. No undergraduate courses were held during the strike, but the graduate program still went on and I gave two talks at the algebra seminar on the connection between cyclic homology and differential forms for an associative algebra A over a unitary commutative ring k. One part was related to derivations, which are k-linear maps, D, from A to M, where M is a unitary A-module, satisfying the relation

$D(ab) = (Da)b + a(Db))$ (like derivatives).

After the first of these talks, Aryeh Juhasz, a faculty member, raised the question as to whether this could be generalized to twisted derivations. That is, suppose we have an endomorphism, h, with the relation becoming

The building of Faculty of Mathematics in the Technion, Haifa, Israel

$D(ab) = (Da)b + h(a)(Db)$.

I couldn't find this discussed in the basic cyclic homology literature. After some searching, I found that the people studying quantum groups had defined in 2003 a twisted cyclic(co) homology which gave them some calculations on the Quantum groups that they were studying. That started me on the

(Continued on next page)

One of the most influencial mathematicians of the 20th century visits campus

ON FRIDAY, MAY 11, 2007 Sir Michael Atiyah presented two very well received and well attended colloquium talks on campus. The first talk, titled "The Role of Quaternions in Algebra, Geometry and Physics" which targeted the mathematics community also generated great interest within the physics community. Free and open to the general public, Atiyah's second talk on "Beauty and Truth in Mathematics" included not only mathematicians, but engineers, scientists and people in many other academic fields.

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Atiyah's career spans many decades and covers a broad range within the field of Mathematics. He taught at Oxford and Cambridge, and now is associated with the University of Edinburgh. His contributions are reflected in the numerous major awards he has been given, including the mathematics equivalent of the Nobel Prize, called the Abel Prize, awarded in 2004 with his colleague Isaac Singer at the Massachusetts Institute of Technology. Their discovery and proof of the index theorem made a significant impact throughout the many branches of mathematics--including topology, geometry and analysis--and provided new links between mathematics and theoretical physics. He has also developed a branch of algebraic geometry called K theory. Atiyah was also awarded the Fields Medal in 1966, as knighted in 1983, and received the Order of Merit in 1992.

"The British scholar's two talks and his brief visit were wonderful events and provided a rare treat for our department and, more generally, for Washington University" said Guido L. Weiss, Ph.D., the Elinor Anheuser Professor of Mathematics in Arts & Sciences. We were fortunate to be included in his Midwest visit.

Prof. Weiss (left) and Prof. David Wright (right) host Sir Michael Atiyah (center) before the colloquiums listed below.

The role of Quaternions in Algebra, Geometry and Physics

2006 was the bicentenary of the birth of William Rown Hamilton. He made contributions to optics and dynamics which proved fundamental for quantum theory but he himself believed that his greatest achievement was the discovery of quaternions. This is not widely accepted, but I want to argue Hamilton's case by showing how quaternions have influenced large and important parts of mathematics and physics.

Beauty and Truth in Mathematics

Truth in mathematics is closely related to the familiar notion of proof, which distinguishes mathematics from science. Beauty however is more subtle and not usually associated with an outwardly austere subject like mathematics. I want to explain what mathematicians mean by beauty and why it is so important to them. I will examine its relation to truth.

Israel (continued from page 6)

path of seeing if all the basic results of the relation between cyclic homology and differential forms went through in the twisted case. I've been working on that since then with positive results so far, hence my trip was really worthwhile. Another nice part of the trip was seeing old friends, especially Jack Sonn, who visited our department and gave talks here in the past.

Another is David Chillag, who also gave a talk here in the past. Then there is Michael Cwikel, well known to many people in our department. The four of us and our wives got together several times. Michael even made it over to the Sonns' for a traditional Friday night dinner one weekend when we were there. By the way, "weekend" in Israel means Saturday with Sunday being a regular workday. We sometimes had trouble knowing which day of the week it was. After working for two days our bodies felt it must be Wednesday when it was really Tuesday. If you want any more information, please feel free to come and chat.

Betty (Continued from page 4)

hangers-on. University opinion about them is understandably divided." That quote is courtesy of Elizabeth Macdonald, the director of strings at the university. As a musician, she knew Betty well. "Betty never missed my concerts at WU and could always be counted on to tell me what she liked, and didn't like, about them. Highly articulate, artistic, knowledgeable and opinionated, she also had an unerring ability to tell when there would be food offered at a reception. ..."

Betty died the day after Christmas. She was 91 years old. She was not a religious person-though she knew a lot about religion and there was no service. Instead there was Thursday's gathering, which was unscripted and had the charm and problems inherent in an open-mike service. Mary Rasp, the coordinator of the office of academic affairs for the George Warren Brown School of Social Work, did her best to keep things moving. By the way, Betty graduated from the School of Social Work in 1936, and she was a regular visitor to the school. Mary liked and respected her. "She had a dry wit and great intellectual curiosity," Mary said.

A number of the speakers made note of Betty's intellect and her willingness to share her thoughts. One fellow read a poem in which he dealt with the time years ago when Sam and Betty were banned from the campus. He described Sam and Betty as squirrels eating food that was meant for the finest and rarest of birds, and therefore were banned until the birds said, "We want the squirrels back." Which is pretty much how it happened. The faculty aked that the ban be lifted, and it was.

For the past several years, Sam and Betty had lived in a home in Olivette. Unlikely suburbanites. One of the speakers at Thursday's memorial was Jill Farmer, a former television newswoman who lives down the the street from their home. She said that Betty had known that Farmer had been in the media, was married to a lawyer and was a churchgoer - three strikes in Betty's mind. Still, they were friends, Farmer said.

She said that when Betty would stop by, there would always be a moment when she, Jill, would think, "Oh gosh, not right now, I'm so busy," but then the visit would invariably turn out to be worthwhile, and Jill would wonder why she ever had that moment of hesitation.

And now, she said, one of her young daughters asked whether Betty, this raggedy-looking woman, might have been some kind of angel. Jill told her daughter: Maybe. Well, who knows about any of this stuff? Sam, who is 85, has a Ph.D. in math from Washington University and was an instructor at the university and then a professor at St. Louis University from 1964 to 1974. Back then, he probably looked a little weird, but not dangerous. Then, for reasons unknown, he took that nonconformity to the edge and beyond. It was a journey he made with his sister. On Thursday, a number of sympathetic souls paid homage to his sister, and in so doing, to the strange journey she made with her brother.

Illinois-Missouri Applied Harmonic Analysis Seminar

ON APRIL 28, 2007, THE WUSTL Mathematics Department hosted the second meeting of the newly organized Illinois-Missouri Applied Harmonic Analysis Seminar. The first meeting of the seminar was held on the University of Illinois Urbana/Champaign campus in December 2006. Approximately 30 people from 12 different institutions attended the Saint Louis meeting which was organized by Professors Guido Weiss and Ed Wilson.

Highly successful, the Illinois and Missouri organizers have applied for a grant to cover the costs of future meetings. It is anticipated that sites for future seminars will vary throughout the Midwest region.

This year's seminar program:

Richard Laugesen, UIUC:
"Affine synthesis onto Lp for 0 < p <1"

Yue Lu, UIUC,
"Surfacelets: Constructions and Applications"

Eric Weber, Iowa State Univ.,
"The Kadison-Singer Problem and the Uncertainty Principle"

Demetrio Labate, North Carolina State Univ.,
"Optimally Sparse Representations using Shearlets"

Brody Johnson, Saint Louis Univ.,
"Stable filtering schemes for rational dilations"

Open Forum Moderated by Guido Weiss, WUSTL

Happy Pi Day!

by Tina Hesman Saey

IT'S IRRATIONAL. IT'S TRANSCENDENTAL. IT'S normal. It's infinite. It never, ever repeats itself. We're talking about the mathematical marvel that starts with those well-known three digits: 3.14.

Just don't call pi a plain number. The pi you learned about in grade school is much more than ordinary. Mathematicians, in fact, are still learning about it. And today is the day to celebrate the magical series of digits. March 14 is when math classes, science centers and other devotees fete pi.

Why is Pi Day on March 14? Because it's 3/14 … ah, now you get it. Most celebrations involve baking and eating pie, either fruit, custard or pizza varieties. Hazelwood West High School will test students' memories by seeing who can remember the most digits of pi. But the school district stages Pi Day mostly as a way to celebrate math, said Cathy French, Hazelwood's mathematics coordinator. Few people even know that pi is the relationship between the circumference of a circle and its diameter, French said. She uses pi as a way to introduce concepts such as infinity to students. "The numbers just keep going on and on," French said. "That's kind of an awesome thing."

Clayton High School challenges its students to come up with creative celebrations. Last year's winners of the Pi Day contest wrote a rap and performed it in a video. They got a gift certificate to a restaurant (which they lost), but most enjoyed basking in the glory. "The real thing that motivated us was the bonus points," said Jake Lewis, a senior and one of the pi rappers. Lewis and classmates Aaron Cannon, Seth Vriezelaar and Percy Olsen made a new video this year. They'll eat all kinds of pie and watch their entry and the competition in math classes today.

Pi is so prevalent because it is a measurement of the properties of such a common shape: a circle. And the number has been around for eons. The Babylonians and ancient Egyptians used it. In the Bible, God's instructions to Noah about how to build the arc approximate pi, though they were closer to 3 instead of 3.14. The number was first referred to with its distinctive Greek letter about 300 years ago.

Pi Day has been around for only about 20 years. It started at the Exploratorium, a science museum in San Francisco, in 1988. Larry Shaw, a physicist and museum employee, was discussing the mysteries of the universe with colleagues at a party. Pi came up in the discussion, and the staff decided to place a pi shrine in the museum. They did just that two weeks later — on March 14. The first celebration involved marching around the shrine. Two years later, Shaw's daughter pointed out that Pi Day is also Einstein's birthday. The message about Pi Day eventually spread over the Internet.

Victor Wickerhauser, a Washington University mathematician, is still awed by pi's mysterious ways. For instance, pi is widely held to be a normal transcendental number, which means it has an even distribution of numbers — the digits zero to nine each appear about one-tenth of the time. And because pi is a normal transcendental number, everyone's phone number or Social Security number should appear at some point in the ever-expanding decimals, Wickerhauser said.

But you'll never find a customer in the 314 area code with the first 10 digits of pi (314-159-2653) as their phone number. The Missouri Public Service Commission doesn't issue numbers with exchanges starting in one or zero to avoid confusion with long-distance or operator-assisted calls.

The celebration of pi kicked into high gear this past weekend at the St. Louis Science Center. The staff is using trivia, jokes, scavenger hunts, pizza, stickers and buttons to trick visitors into having fun with math. Then the "learning by subversion begins," said Dwight Curry, director of gallery experience at the center. "You don't hit people with math when they come in the front door unless you want them to turn around and walk out again," he said.

(Please see "Pi" continued on page 19)

MATHEMATICS AROUND THE WORLD

1

PROFESSOR RICHARD ROCHBERG WRITES: In the summer of '06 I gave a talk at the International Conference on Function Spaces at SIUE in Edwardsville, Ill, I gave a talk at the International Conference on Analytic Function Spaces at Joensuu, Finland, and I gave a min-course on discrete models for function spaces at Helsinki University in Helsinki Finland.

This summer I will give a talk at the conference Strobl07 Trends in Harmonic Analysis in Strobl, Austria

PROFESSOR GARY JENSEN ON TALKS: I've travelled more this past semester than is my custom. I left St. Louis on Easter Sunday to attend the International Congress on Pure and Applied Diferential Geometry (PADGE2007) April 10-13 in Brussels, Belgium. I gave one of the plenary talks on joint work with Tom Cecil and Quo-Shin Chi on isoparametric hypersurfaces. Tom Cecil also gave a plenary talk on some other joint work he, Chi, and I have done on the problem of Dupin hypersurfaces. This was a large conference attended primarily by mathematicians from Europe. Our hotel was 100 feet from the Grande Place and about 100 yards from the conference site, and the weather was beautiful.

From Brussels I went to Parma, Italy, to visit my former student Emilio Musso (Ph.D. 1987) and his collaborator Lorenzo Nicolodi. They organized a conference for two of the days I was there. I repeated the Brussels talk, which had the distinction of being the only talk of the conference given in English. During my visit there I think that I persuaded Emilio and Lorenzo to join me as joint authors of a graduate text book to be called "Surfaces by Moving Frames". After working for ten years on this project, frequently using notes that I had gotten from Emilio and Lorenzo, I realized that without help with this project it very likely would never be completed. I'm comfortable with the possibility that this joint project might require some more trips to Italy.

The Midwest Geometry Conference (MGC) was held this year May 17-20 at the University of Iowa in Iowa City. This MGC was larger than usual (this was, I think, the sixteenth MGC), probably due to the fact that it was organized in honor of the memory of Tom Branson, a distinguished young mathematician at Iowa who died suddenly of a heart attack one year ago. Tom had always been a strong supporter of the MGC, and had written the proposal to the NSF for the last three-year cycle. I again gave the isoparametric hypersurfaces talk. One of the high-lights of the conference was a talk by Tom's brother, James Branson, who is an experimental high energy physicist. Jae-Hyouk Lee and Rodrigo Montes also represented our department. It was a pleasure to see there our former Ph.D. students Mary Shepherd (1996), Carlo Morpurgo (1993), and Luigi Fontana (1991).

May 30 - June 1, I attended the workshop "Critical Issues in Education: Teaching Teachers Mathematics" at the Mathematical Sciences Research Institute (MSRI) located on the hill above the University of California campus at Berkeley. As an Academic Sponsor of MSRI, our department is asked to send a representative to these annual education conferences. I gave a talk about my text book "Arithmetic for Teachers". This was my first experience giving a talk to a group that included mathematicians, math educators, and school teachers (mostly at the middle and high school level). My wife Jen and daughter Leah,

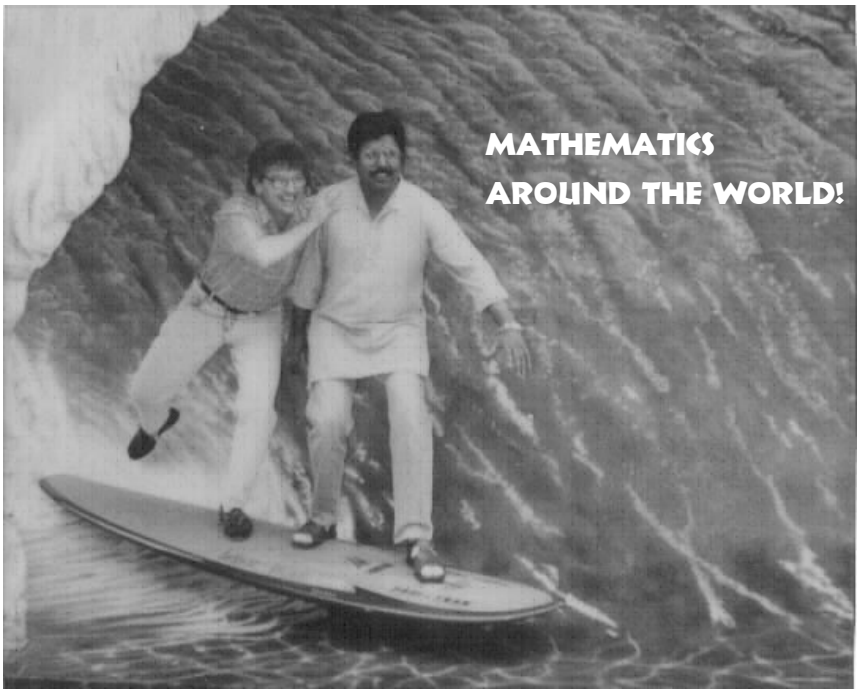
both certified teachers in the state of California, attended the talk. Their unbiased opinion was that it was outstanding. Joel Zeitlin, a Washington University colleague during 1969-1972, was at this conference.

GRADUATE STUDENT QING LI gave a talk titled "Using Iterative Nonparametric Quasi-likelihood Method to model gene expression measurements" at the Interface 2007 conference on Computing Science and Statistics -- System Biology which was held in Philadelphia, PA, on May 23 to 26.

PROFESSOR STAN SAWYER WRITES: I went to an NIH panel on Genetic Variation and Evolution in June. This was held in the Foggy Bottom neighborhood of Washington DC, not far from the Kennedy Center, but, unfortunately, I didn't get a chance to do any sightseeing. It turned out that Nathan Baker, who was an outside reader from the WashU Medical School for Amei's PhD thesis defense last May, was on the same plane. He was going to a different NIH panel that was being held in the Watergate complex, which is also in Foggy Bottom.

PROFESSOR LARRY CONLON WRITES: I was an invited speaker in the International Conference on Foliations, Topology and Geometry at P.U.C. (Pontificia Universidade Catolica) in Rio de Janeiro, held in honor of Paul Schweitzer's 70th birthday, August 6-10.

I gave a talk as part of the opening ceremonies entitled: "Paul Schweitzer, His Life and Mathematical Work", and a research paper: "A New Look at the Theory of Levels".



Guess Who?

Answer: Professors Wright and Kumar!

Sara

(continued from page 1)

The Iranian New Year party: **Front** (left to right): Andy Womack, Josh Brady, Greg Knese, Joyce Meyers, Peter Townsend, Sara Gharahbeigi, Corine Kidicho-Jones. **Back** (left to right): Larry Lin, Yajun Wang, Becky Gill, Jim Gill, Brady Ng, Scott Cook, Geir Arne Hjelle, Megan Cook, Bo Zhao and Joost Berson

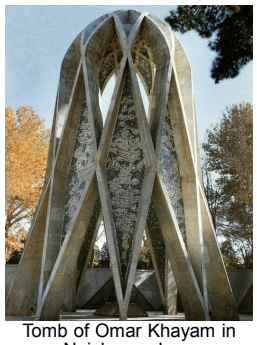
I was impressed and touched by the number of people from the department who had come out to support the event and to celebrate with me this cultural occasion.

I still recall my first day in the department when one of my professors confessed that he had turned down many invitations to give talks in Iran because he was told the country was not safe to travel to. Although this comment upset me at first, I came to understand that fear – and lack of accurate information about other cultures – keeps many of us from breaking barriers and getting to know one another.

Now, let me welcome you and give you a brief tour of my hometown and my country. I am from Shiraz, a city of a population of about 2 million in southwest Iran. Many of you may be familiar with the name. Certainly anyone who is a wine connoisseur knows a little about Shiraz. Yes, it is true--the grapes for Shiraz wine originated from Iran. Shiraz is also called the city of love and is famous for its hospitality. "Straight to Shiraz I will flee! And a hundred friends I'll find at every stop" said the medieval poet Baba Taher. Others will tell you that Shiraz is the capital of literature in Iran, the hometown and birthplace of world renowned poets such as Hafez and Saadi. One of Saadi'e famous poems graces the entrance to the Hall of Nations of the UN building in New York with this call for breaking all barriers: "The sons of Adam are limbs of one another. Having been created of one essence". "When the calamity of time afflicts one limb, the other limbs cannot remain at rest".

"This is a mathematical newsletter is it not, so what does Iranian history have to do with mathematics?" you might ask. A fair question. Let us now explore the relevance of Iranian history as it relates to mathematics. For example, Omar Khayyam, born on May 18, 1048 Nishabur, Iran, and died on December 4, 1131) was an Iranian poet, mathematician, philosopher and astronomer. Interestingly enough, outside Iran, he is best known for his poetry, for the quatrains (rubaiyat) which was popularized through Edward Fitzgerald's recreated translations.

However, during his life-time in Iran, Omar Khayyam was famous as a mathematician. He wrote the Influential Treatise on Demonstration of Problems of Algebra (1070), which laid down the principles of algebra, part of the body of Arabic Mathematics that was eventually transmitted to Europe. In particular, he derived general methods for solving cubic equations and even some higher orders.



Tomb of Omar Khayam in Neishapur, Iran.

From Indian mathematicians, we have learned methods for obtaining square and cube roots, methods which are based on knowledge of individual cases, namely the knowledge of the squares of the nine digits 1^2, 2^2, 3^2 (etc.) and their respective products, i.e. 2 × 3 etc. Iranians have written a treatise on the proof of the validity of those methods and that

(Continued on next page)

they satisfy the conditions. In addition Iranian mathematicians have increased their types, namely in the form of the determination of the fourth, fifth, sixth roots up to any desired degree. No one preceded them in this and those proofs are purely arithmetic, founded on the arithmetic of The Elements. - Omar Khayyam: Treatise on Demonstration of Problems of Algebra. His method for solving cubic equations by intersecting a conic section with a circle(see some examples with a parabola worked out on a calculator. Although his approach in achieving this had earlier been attempted by Menaechmus, Mahavira Acharya and others, Khayyám provided a generalization that extended it to all cubics. In addition, he discovered the binomial expansion. His method for solving quadratic equations are also similar to what is used today. In the Treatise he also wrote on the triangular array of binomial coefficients known as Pascal's triangle. In 1077, Omar wrote Sharh ma ashkala min musadarat kitab Uqlidis (Explanations of the Difficulties in the Postulates of Euclid). An important part of the book is concerned with Euclid's famous parallel postulate, which had also attracted the interest of Thabit ibn Qurra. The Arab scientist, al-Haytham had previously attempted a demonstration of the postulate; Omar's attempt was a distinct advance, and his criticisms made their way to Europe, and may have contributed to the eventual development of non-Euclidean geometry. Omar Khayyám also had other notable work in geometry, specifically on the theory of proportions. In addition, Omar Khayyam also was part of a panel that introduced several reforms to the Iranian calendar, which was accepted by Sultan Malik Shah on March 15, 1079. This calendar known as Jalali calendar is based on actual solar transit which is more accurate than the Gregorian calendar.

Sheikh Lotf Allah Mosque in Isfahan, Iran

However, to Iranians, mathematics was much more than a field of theoretical and abstract calculation. It affected every aspect of their lives from building complex structures to designing attractive geometric shapes to decorate them. The examples are many. To name one, literary scholars will tell you that the metric structure of Iranian poetry constitutes a mathematically intricate web of short and long vowels and consonants.

Iranian Architecture:

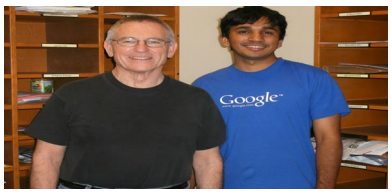
Architecture through the ages, has embraced a wide variety of arts and sciences. By using mathematics, Iranian architecture has achieved a high level of beauty and perfection. It is evident that advanced geometry was used by the prominent architects at that time. Geometry was used not only to solve structural problems, but also in the details of the designs of various structures. These range from the immense high entrances of Friday Mosques in important cities, to entrances of ordinary homes. By reviewing examples of medieval Iranian architecture, one becomes aware of its close relationship to scientific fields such as mathematics, geometry, cosmology, and astrology. This relationship made it possible to achieve perfection, monumentality and poetic beauty. It is wisdom within art.

The transition of a square into a circle by using triangles is one of the characteristics of Iranian architecture from the pre-Islamic period. Later, Iranian architects used this process to create more complicated and elaborate form in the design of their buildings. The center point of the square, marked by the intersection of two diagonals, is the most important point of in its transition to a circle process. This called for a further geometrical solution in the corners in order to create the desired forms and volumes. In order to create the vast varieties of forms which were achieved by the turning, rotating, and twisting of a simple square, the usage of circles and triangles was common and widely used in much of the medieval Islamic Iranian architecture.

Imam Mosque, Iran

[Special thanks to all who contributed to the writing of this article. Resources: Omar Khayyám - en.wikipedia.org; Iranian Architecture - Hourieh Mashayekh]

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Professor Gary Jensen on:

Recruitment

During the past academic year the department has formulated a plan to recruit graduate students from schools that have not usually sent us students. The target for this effort comprises minority students and students who might ordinarily not consider graduate school in math. In February I visited Spelman College and Morehouse College in Atlanta, Georgia. These are historically black colleges, for women and men, respectively, that have strong mathematics programs each with a large number of mathematics majors. The purpose of these visits was to lay the ground work for this and future years. Most likely I will visit these schools again this fall. At both schools I was given the opportunity to speak to their math majors. At Spelman the occasion was a "mandatory majors meeting" at which I was given fifteen minutes to talk about graduate school in math in general, and graduate school at Washington University in particular. At the buffet dinner after the meeting I had the opportunity to speak to many students individually. The next day at Morehouse College I spoke at a regular meeting of their Senior Seminar, which had about 25 students enrolled in it. At the suggestion of their department chair, I first gave a 30 minute math talk (on the quaternions) and followed that with my graduate studies talk. The chairs of each department were very helpful in setting up meetings for me with many of their faculty. I had a good visit with our student, Greg Battle (Ph.D. 1995), who is in the math department at Morehouse.

As part of our enhanced recruitment plan, we are going to offer an extended orientation to all entering graduate students in math. The inaugural offering will run from August 8-29 this year. Five of our new graduate students have indicated that they will attend. The plan is to cover course-like activities in Analysis and Linear Algebra, with a heavy load of problem solving, to be done while working with each other and with the help of graduate student and faculty mentors. On Mondays, Wednesdays, and Fridays we'll meet in the classroom to go over new material, work jointly on some new problems, and critique solutions of past problems. Mornings will be devoted to analysis and afternoons to linear algebra. On Tuesdays and Thursdays the students will meet to work together, but without any formal classroom structure. There will be social activities, such as lunch together most days and a bar-b-que each weekend, to give the new students opportunities to become well acquainted with each other and with their student and faculty mentors.

Department of Mathematics Graduate Students 2007-2008

Haley Abel
Cathleen Aubuchon *
Joe Bohanon
Josh Brady
Robert Brieler
Jonathan Browder
Timothy Chumley *
Scott Cook
Anthony Delaney
Wei Deng *
Michael Deutsch
Marina Dombromvskaya*
Chunlin Fan
James Gill
Sara Gharahbeigi
Adam Hafdahl
Michael Hamm
Brad Henry
Robert Houska
Weikang Hu
Xiao Huang
Zhiyong Huang
Tomoko Katayama *
Jeffrey Langford
Andrew Lewis
Qing Li
Larry Lin
Tim Lott
Benjamin Manning*
Brian Maurizi
Baili Min
Brady Ng
Jasmine Ng *
Kunj Patel
Safdar Quddus *
Emily Ronshausen
Nic Sedlock
Bennett Standeven
Peter Townsend
Andrew Womack
Ruibin Xi
Ji Yan*
Wei Zhu

(*Please see "New Student"s on page 16)

2007-2008 New Graduate Students:

Washington University's Department of Mathematics welcomes to our graduate program the following incoming students.

• **Cathleen Aubuchon**, who received her undergraduate degree from the University of Missouri, St. Louis. *(Advisor: Nik Weaver)*

• **Timothy Chumley**, who received his undergraduate degree from Marquette University. *(Advisor: Guido Weiss)*

• **Wei Deng**, who recieved his undergraduate degree from Zhejiang Unversity. *(Advisor: Xiang Tang)*

• **Marina Dombrovskaya**, who received her undergraduate degree from St. Louis University. *(Advisor: John Shareshian)*

• **Tomoko Katayama**, who received her undergraduate degree from Mills College. *(Advisor: Rachel Roberts)*

• **Benjamin Manning**, who received his undergraduate degree from the University of Missouri, St. Louis. *(Advisor: Victor Wickerhauser)*

• **Jasmine Ng**, who received her undergraduate degree from the University of California, Los Angeles. *(Advisor: Rachel Roberts)*

• **Safdar Quddus**, who received his undergraduate degree from the Indian Statistical Institute. *(Advisor: Xiang Tang)*

• **Ji Yan**, who will study for his M.A. in math while continuing to pursue a Ph.D. degree in economics at Washington University. *(Advisor: Stanley Sawyer)*

Masters Congratulations:

The following students received M.S. degrees during the 2006-2007 academic year.

- Michael Deutsch
- Chunlin Fan
- Chen John Lin
- Yonhow Larry Lin
- Adela Piña

Graduate Awards 2007

Dean's Award

Scott Cook

Robert McDowell Award

Benjamin Braun

ALUMNI UPDATES

New '07 Ph.D. Ben Braun Writes:

WASHINGTON UNIVERSITY HAS BEEN A great home to me for the past five years. From the quals to the research stage of the program, I have felt welcomed and supported here. I see three reasons for this: first, the other graduate students have been great friends and colleagues. Despite the insane amount of work we did in the quals and the multitude of frustrations that came up when doing research, I never felt alone in this process.
Second, the faculty always challenged us; we were never bored to say the least. Finally, the math program here taught me mathematics in the right way. I want to say a little more about this last point to make it clear what I mean. A lot of the graduate students I have met from other institutions have not had to master the breadth of material that is required of us. I have always been encouraged to see mathematics as a unified discipline and told that this is the right way to look at things. The qualifying courses are structured to follow through on this philosophy. Not only do we have to know point set topology, we have to take a year of differential geometry/ algebraic topology. Not only do we have to know basic analysis, we have to take a year of measure theory/functional analysis. The algebra and complex analysis requirements are similarly deep. Having a broad education in these areas that is taken seriously by students and faculty has allowed me to engage people in the mathematical community in ways that I would not have been prepared for by many other institutions, and for that I am grateful.

While I am looking forward to heading off to new adventures, I will certainly miss being here. Thanks to all of you who have contributed to my wonderful experiences; my graduate school days have brought me lots of joy. I hope all of our paths continue to cross and I look forward to seeing you in the future.

The fifth Vasi Popov Prize Awarded to WUSTL '02 Ph.D. Mauro Maggioni

Mauro Maggioni is an Assistant Professor at the Department of Mathematics of Duke University. He received his Ph.D. in Mathematics in May 2002 from Washington University, St. Louis, under the supervision of Guido Weiss.

THE POPOV PRIZE HONORS THE memory of Vasil A. Popov (1942-1990), the Bulgarian analyst best known for his work in nonlinear approximation. The Prize is awarded every third year to a young mathematician (less than six years removed from the Ph.D.) who has made outstanding research contributions in approximation theory and/or related areas. Previous Popov Prize winners are Albert Cohen (Paris), Arno Kuijlaars (The Netherlands), Emmanuel Candes (California Institute of Technology), and Serguei Denissov (California Institute of Technology). The Sixth Popov Prize will be awarded in 2010.

Mauro Maggioni was recognized for his contributions to Harmonic analysis on graphs, in particular for his work on diffusion geometry and the construction of Multiscale analysis and wavelets based on diffusion processes on graphs. Maggioni has introduced novel ideas and powerful new techniques which allow him to seamlessly integrate empirical applied mathematics with the deepest theoretical tools in pure mathematics. His work has already had a seminal impact in the fields of information organization, machine learning, spectral graph theory, Image analysis, and medical diagnostics.

The Prize, which consists of a marble pyramid trophy and a cash award, was presented to Maggioni by Pencho Petrushev of the University of South Carolina on behalf of the Selection Committee. The other members of the Committee were Charles Chui, Wolfgang Dahmen, Paul Nevai, Allan Pinkus, and Edward Saff. After the Prize presentation, Mauro Maggioni presented a plenary lecture entitled "Diffusion processes on graphs and multiscale analysis of highdimensional data."

'06 Graduate David Opela Writes from NYC:

I WAS LUCKY TO LAND A JOB THAT DOES NOT force me to change too much. I still wear shorts and a t-shirt (yes, occasionally, I take one with holes in it) to work, hang out with math geeks, but I admit that I can no longer get up at noon on weekdays. Perhaps, the place has change my life more than I think. People in NYC walk faster than anybody anywhere else. Since moving here more of my friends have visited me in NYC in less than a year, than had during the entire time I studied in St. Louis.

I currently live in Carroll Gardens, Brooklyn, and must say that I am proudly the least trendy person in the neighborhood. Manhattan is great, but it is too fast and lively to be there 24/7. Recently, I visited Taiwan for about 10 days, and conquered its tallest mountain, Yushan (3,950 meters).

My warmest regards to all in the Math department

David

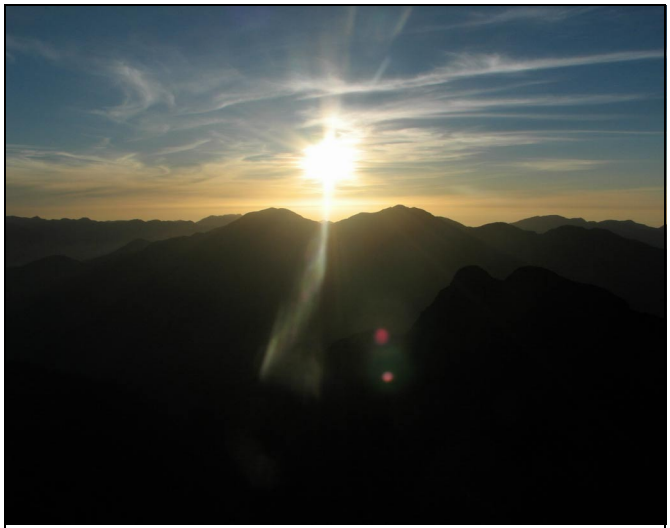


Photo of the skyline at Mount Yushan

Don’t fear the reaper; fear the math homework

By Bob Rybarczyk

Photo of '07 Graduate Lina Lee

I'M AFRAID OF A GREAT MANY things. Cancer. Earthquakes. Meteors. Bird flu. Star Jones. Country music. Literally, I could go on for like three weeks. But there are few things I fear quite as much as one particular four-word phrase. The phrase in question? “I have math homework.”

If you have kids in grade school these days, and they aren’t the second coming of Stephen Hawking, you know of what I speak. “I have math homework” doesn’t just mean that the child has a sheet of math problems to finish. It means “there goes all of Daddy’s free time tonight.” It means “we’re all going to be in a bad mood in less than 10 minutes.” It means “one round of mind-crushing headaches, coming right up.” Starting to get the picture? I’d rather eat a telephone than do math homework. I’d rather listen to an entire week of Rush Limbaugh broadcasts. I’d rather see how many pool balls I can fit up my nose.

The problem with math isn’t that it’s hard. I mean, it can be hard, yeah, but I was pretty good at math when I was a kid, and thanks to my unnatural obsession with Microsoft Excel, I still have a few chops. No, the problem with math these days is that it isn’t math. It’s…different.

Darn it, George, this is so screwed up it must be your fault I stopped participating in organized math around 1987, or about a week before the discovery of fire. Sometime between then and now, the powers-that-be (I don’t know who, exactly, so I’ll go ahead and blame President Bush) decided that the way I learned math 30 years ago was sick, twisted and wrong. So, they changed everything. Well, not everything; 100 divided by 4 is still 25. The difference is that the way kids are taught to divide 100 by 4 is pretty much completely different. I used to do a simple little equation when doing division. Even though we called the approach “long division,” it actually was fairly simple.

I can’t even begin to describe to you the way my 9-year-old daughter is being taught to perform division these days. I asked her to show me how she does it, and I even sat there and watched her do it, and I’m telling you, it made no sense to me. She was putting numbers off to the side and adding them up and drawing all these lines and boxes…by the time she was done it looked like she had attempted to recreate a scene from Good Will Hunting. To me, it looked like the mathematical equivalent of building a tractor trailer from wood chips and used squirrel parts just to open the mailbox. And I’m supposed to be able to help my kids with their homework?

We’re not talking about collegiate math majors here, either. My kids are still young enough to think that Haunted Mansion is Eddie Murphy’s best film. You try explaining multiplication concepts to someone who laughs out loud at SpongeBob jokes.

Things generally go OK when the kids understand how to do their math homework and it’s just a matter of forcing them to do it. Where we run into problems is when the kids bring their worksheet to me and tell me they don’t get it. It would be one thing if the kids had textbooks that I could read. That’s another thing about schooling today that’s all out of whack. The kids don’t have math books.

When I was a kid, at the beginning of every school year, I was handed a math book that weighed as much as a Buick and that was that. If I didn’t know how to do something, I looked it up in my book. All my kids bring home these days is a math workbook. No explanations of anything, just page after page of math problems. If I’m not sure how to do something – or at least, how to do something the way their teachers want them to do it – and my daughter can’t explain it to me, we’re all pretty much hosed. Maybe vertical is the new horizontal. Sometimes, even when I think I know what they’re supposed to do, I end up botching things.

Last week, my stepdaughter,

(Continued on next page)

Farewell to Librarian Barbara Luszczynska

by Professor Richard Rochberg

IN 1981 BARBARA LUSZCZYNSKA became the Librarian of the Mathematics/CSDP Library. That was quite a while ago, Bob McDowell was department chair and the library catalog then was paper cards in wooden boxes. Since then we have had four other department chairs, the card catalog is totally electronic catalog, and CSDP is half forgotten [1]. Barbara stayed. She earned her Master of Library Science degree in 1984 and was department Librarian until her retirement this spring.

I wanted to offer some thoughts on Barbara's contribution to the department. I speak for myself but I know from conversations that my feelings are widely shared.

For more than twenty five years Barbara did a great job as a librarian. When I asked her help in locating something she has never failed to find it. When asked if we could buy a particular book or subscribe to a particular journal she was always helpful as possible. When decisions needed to be made that concerned us, questions such as "Could this journal be moved to Olin?", or "Henry Schaerf left these books here, what should we do with them?", she always consulted the faculty. She always treated the library as if its most important function was helping us, our visitors, and our students in their research and their studies.

In many different ways she did much more than was necessary. Her plants made the lounge attractive. The decision to make bound volumes of papers by faculty members was hers. The decision to have a "browsing shelf" of histories, essays, etc. in the library was hers. She did most of the work in building a special collection of books on undergraduate problem solving and contests. She gave tutorials in our writing class. Most especially, she always made a special effort to help students and visitors and let them know all the services the library could provide them.

She always radiated a cheerfulness that helped make Cupples I a very friendly place. It was great having her here.

Best wishes for the future Barbara.

[1]CSDP is the Center for the Study of Data Processing. During the 70's and 80's they had a fairly large role in the continuing soap opera *Who Controls the Space in Cupples I.*

Reaper (Continued from page 18)

Melon Ball (not her real name), had homework that was actually a math-flavored variation of the classic game "Battleship." We each had a sheet of paper with a grid on it. The grid included numbers ranging from 10 to 10, both vertically and horizontally. We hid our sheets from each other and drew one big ship on our grid. Then, just like in "Battleship," we had to guess at where the other person's ship was. To make our guesses, we had to say things like "positive five, negative two." If we got a hit, the other person said so. If we missed, the other person told us how many spaces away we were. Simple, right? Hard to screw that up, right? Yeah, right.

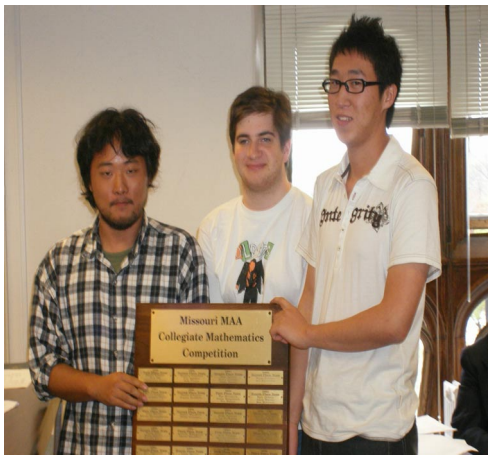
It took us about 15 minutes to play, and I happened to win the first game. "That was actually kind of fun," I said to Melon Ball. "Yeah," she said. "I can't believe you got my ship so fast." She held up her paper, showing me the horizontal line of X's that represented her ship. I looked at my own grid. The five X's on my map, which were supposed to represent her ship, were in a vertical line. We fell silent as we looked at each other's sheets. You could practically hear the haze of confusion settling over our brains.

"How the heck did we do that?" I asked. Melon Ball stared blankly at me for a second, then at her sheet. "I don't think we did this right," she said quietly. "Maybe so," I said, "but at least we did it. Wanna play Dance Dance Revolution?" "Yay!" Take that, Mr. President.

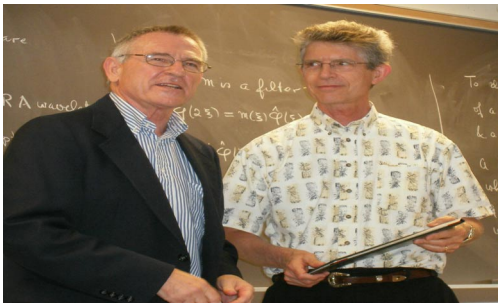
Pi (continued from page 9)

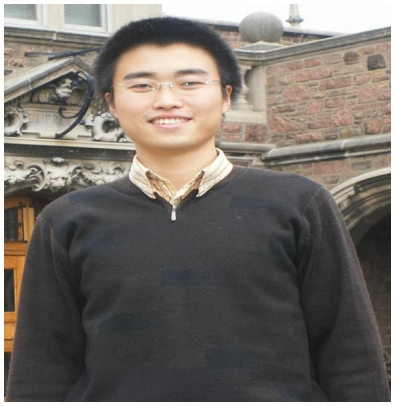
The science center is planning a special surprise for 1:59 p.m. today (3/14, at 1:59 p.m. because pi's first six digits are 3.14159). "We've talked about dropping pies (from the third floor) but want to consider how much of a mess we want to make," Curry said.

Department of Mathematics alumni, faculty, students, staff and friends 2006 - 2007



Department of Mathematics alumni, faculty, students, staff and friends 2006 - 2007





UNDERGRADUATE NEWS

Director of Undergraduate Studies, Professor Ron Freiwald writes:

THE 2006 WILLIAM LOWELL Putnam Mathematical Competition was held on Saturday, December 2, 2006. This year the competition drew 3640 students from 508 colleges and universities in the United States and Canada. The WU team, consisting of Justin Gilmer, Jon Pinyan and Eric Wofsey achieved an Honorable Mention, ranking 9th in the contest out of 402 teams participating. Among the 3640 individual contestants, senior Jon Pinyan ranked 70.5; juniors Eric Wofsey and Justin Gilmer ranked 106.5 and 342.5; sophomores Huajia Wang and Jeremy Diepenbrock ranked 185.5 and 266 respectively.

In the Putnam competitions from 1976-2006, Washington University teams have placed in the "top ten" in 19 of 31 competitions, including eleven "top five" performances.

The 12th annual Missouri MAA Collegiate Mathematics Competition was held on March 29-30 at the College of the Ozarks in Point Lookout, MO. About 90 students, making up about 35 teams from colleges and universities across Missouri. Two Washington University teams tied for 3rd place.

During the 2006-2007 academic year, the Math Department graduated 40 math majors (28 men, 12 women). This is the largest number since sometime before 1992-1993 where my records begin. About 30% of them were in each of the traditional, applied and probability/statistics tracks. The others were in major tracks for students interested in education or economics. About two-thirds of them had more than one major.

This year, rather than taking graduating seniors to lunch, the department hosted an open house for seniors and their guests on the Thursday before Commencement. With the help of Bon Appetit and all the graduate students, we transformed room 199 and the Lounge into reception areas. Probably about half the majors showed up, with families—who seemed pleased to be able to meet some of the faculty and other graduating students. We thought this was a great success and plan to continue it next year.

Ben Robinson and Alex Mueller graduated with honors (summa cum laude). Ben's honors thesis (with Guido Weiss and Ed Wilson) was titled *Refinable Functions in $L^2(R)$ with Composite Symmetry*. Alex worked with Al Baernstein and Renato Feres on a project titled *An Application of Harmonic Functions in Estimating the Conversion Rate of a Heterogeneous Catalyst*. Six additional graduating majors earned honors in other departments.

The annual Ross Middlemiss Prize was awarded to Alex Mueller and the Martin Silverstein Prize to Joe Guinness. The Putnam Prize—for consistent participation and performance in the Putnam Competition—was awarded to Jon Pinyan. Over 4 years, Jon placed in the top 100 three times (he ranked a mere 100.5 the other year).

Three majors who graduated are entering graduate programs in math or statistics at University of Michigan, University of Chicago, and North Carolina State. A total of 38% of the graduating majors were entering some kind of graduate program (including one with a Fulbright in music and off to the Royal Academy of Brussels).

Several landed good jobs with companies like Mercer HR Consulting, Ariel Capital Management, Bank of America, State Farm, and Goldman Sachs.

Three graduating majors were elected to Phi Beta Kappa.

Undergraduate Awards from Math

Ross Middlemiss Award:
Ben Robinson
Alex Mueller

Martin Silverstein Award:
Joe Guiness

Putnam Prize:
Jon Pinyan

Majors Elected to Phi Beta Kappa
Alexander Mueller
Andrew Newman
Rosalind Moussa
Eric Wofsey

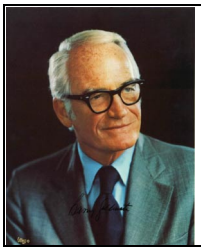
Mathematics Department Boasts One 2007 Goldwater Scholar Junior Eric Wofsey

WUSTL ARTS & SCIENCES UNDERGRADUATES made another impressive showing in their annual quest for prestigious national scholarships and fellowships, including three students receiving the Barry M. Goldwater Scholarship. Widely considered the most prestigious award in the U.S. conferred upon undergraduates studying the sciences, students who receive the Barry M. Goldwater Scholarship are among the very best scholars in the country. The University's Goldwater winners are physics major Kevin M. Mercurio; chemistry and philosophy major Dafang Zhang; and one of our math majors, Eric R. Wofsey.


Eric Wofsey

A junior majoring in mathematics, Eric plans to pursue a doctoral degree and a career in mathematics research within an academic institution. He was a member of the university's math team for the 2006 William Lowell Putnam Mathematical Competition, which placed ninth in the nation out of 402 teams participating.

Established by Congress in 1986 in honor of former US Senator Barry Goldwater, the Barry M. Goldwater Scholarship and Excellence in Education Program's goal is to provide a continuing source of highly qualified scientists, mathematicians, and engineers by awarding scholarships to college students who display intellectual curiosity and intensity; and possess potential for significant future contributions in these fields. The Scholarship is awarded to about 300 college sophomores and juniors from a field of 1,081 mathematics, science and engineering students nominated by the faculties of colleges and universities nationwide and provides up to $7,500 per year for educational expenses. Competition for the Scholarship is exceedingly intense. In awarding scholarships, the Foundation Board of Trustees considers the nominee's field of study and career objectives and the extent to which that individual has the commitment and potential to make a significant contribution to his or her field.



Senator Barry M. Goldwater, served his country for 56 years as a soldier and statesman, including 30 years of service in the U.S. Senate.

Goldwater Scholars Top 20 of the 2,000 four-year colleges in America:500 state; 1,500 private
March 2006

1. Princeton University 64
2. Harvard University 60
3. Duke University 58
4. Kansas State University* 57
5. University of Chicago 53
6. Penn State University* 52
7. University of Illinois-Urbana* 51
8. California Institute of Technology 51
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The St Louis Metro Math Teachers' Circle

THE AMERICAN INSTITUTE OF Mathematics (AIM), one of the leading math institutes in the U.S., announces the launching of the Teachers' Circle project, a new initiative that empowers middle school math teachers to bring new excitement and interest in mathematics to their students.

Teachers' Circles are collaborations between research mathematicians. middle school math teachers, and school administrators. They are motivated by the principle that mathematics is better taught as a part of the process of problem solving and critical thinking. This has been a successful approach for engaging the interest of young people in the classroom.

The main activities of a Teachers' Circle are lively discussion sessions led by a research mathematician. The first Teachers' Circle was started in August, 2006. The Circle brought together 25 middle school mathematics teachers and 5 professional mathematicians for an intense week of work at AIM. Monthly meetings followed, both at AIM and at the home schools of some of the teachers. Based on the sustained success of the Circle, AIM sought to create Teachers' Circles throughout the U.S.

Last week, seven teams from around the country, including a team from St Louis, participated in the week-long workshop at AIM. The purpose of the workshop was to provide training and develop resources as each team returns home to create its own local Teachers' Circle. According to Ann Podleski, Professor of Mathematics at Harris Stowe State University, “I'm excited about teachers' circles. It is a chance for me, as a university professor, to reach out to the community, develop relationships with teachers, and help students strengthen their mathematical understanding.”

Although the Teachers' Circle is for teachers, the real focus is on students. "Working with the teachers allows us to reach many more students,” said AIM Executive Director Brian Conrey. “Mathematicians are a wonderful resource for teachers, providing a model for the problem solving nature of mathematics,” Conrey continued.

Our focus is on problem solving and learning how to craft solutions to problems," said Joshua Zucker, one of the organizers of the AIM workshop. He went on to explain, "An *exercise* is something where you already know what to do and you just have to go through the motions. Exercises are boring. A *problem* is a challenge where you have to first figure out how to approach it. That is what we want students to learn, and the Circle helps the teachers bring this into the classroom." According to Beth Lias, a participant at the first Teacher's Circle, "I definitely see a difference in my attitude and how I approach problem solving in the classroom. Problem solving is important for everything, not just math, and the Teachers' Circle has helped me incorporate this into the curriculum.”

We want to replicate the model for Teachers' Circles we have developed," said Tatiana Shubin, mathematics professor at San Jose State University and one of the organizers of the AIM workshop. "I am inspired by the dedication of these teams who are going to create their own Teachers' Circles." Amy Swartman, math teacher at Hancock Middle School, is enthusiastic, “I'm looking forward to our Teachers' Circle because it offers a unique opportunity to work with university professors and mathematicians to problem solve and deepen my understanding of mathematics in a safe environment.”

Math Circles and Teachers' Circles: The idea for Teachers' Circles grew out of "Math Circles," an activity for children that has its roots in Europe. Math Circles typically involve middle school or high school students meeting after school with a mathematician. The activities are often a mixture of lecture, discussion, and problem solving. Mary Fay-Zenk, Assistant Principal in the Cupertino, CA, school district, initiated the idea of the Teachers' Circle. "I would attend Math Circles with my students, but they have a rule that adults are not allowed to participate. This was very frustrating because it was so interesting! I decided that we needed something like this for teachers." Co-creator of the Teachers' Circle Tatiana Shubin elaborated, "Teachers' Circles are a way for us to reach a lot of students because we can get the teachers to bring the excitement of mathematics into the classroom." Teachers' Circle participant Michele Ban agreed, "It's true that I have learned

(Continued on next page)

Teachers' Circle (Continued from page 24)

a lot and it helps me to be a better teacher, but the reason I keep going to the Circle is because it is so much fun."

The Teachers' Circle workshop was funded by the National Science Foundation through the American Institute of Mathematics.

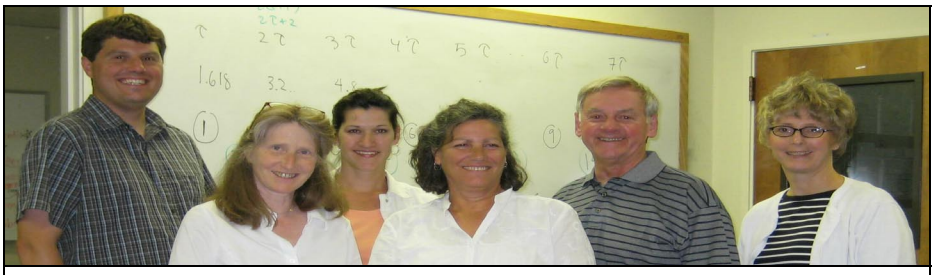
About the American Institute of Mathematics: The American Institute of Mathematics, a nonprofit organization, was founded in 1994 by Silicon Valley businessmen John Fry and Steve Sorenson, longtime supporters of mathematical research. AIM is one of the seven mathematical institutes in the U.S. funded by the National Science Foundation, an independent federal agency that supports mathematics, computer and social sciences. The goals of AIM are to expand the frontiers of mathematical knowledge through focused research projects, by sponsoring conferences, and helping to develop the leaders of tomorrow. In addition, AIM is interested in helping preserve the history of mathematics through the acquisition and preservation of rare mathematical books and documents and in making these materials available to scholars of mathematical history. AIM currently resides in temporary facilities in Palo Alto, California, the former Fry's Electronics headquarters. A new facility is being constructed in Morgan Hill, California. For more information, visit www.aimath.org.

About the St Louis Metro Math Teachers' Circle:
Members and Affiliations
Dr Blake Thornton, Washington University
Dr Richard Lodholz, Mathematics Consultant
Dr Ann Podleski, Harris Stowe State University
Vicki Adams, The Metamo4ic Math Center
Amy Swartman, Hancock Place Middle School
Wendy LaRose, Steger Sixth Grade Center, Webster Groves

Plans for the St Louis Math Teachers' Circle:
The St Louis Math Teacher's Circle will begin meeting in the Spring semester of 2008.

Spokespeople for AIM:
Brian Conrey, AIM Executive Director,
David Farmer, AIM Director of Programming

Spokespeople for the St Louis Metro Math Techers' Circle:
Dr Blake Thornton, Coordinator of Lower Division Teaching at Washington University,
Dr Richard Lodholz, Mathematics Coordinator



The St. Louis Teachers' Circle Team

The Washington University Math Circle

MATH CIRCLES IS A PROGRAM FOR MIDDLE SCHOOL and high school students who enjoy math and are looking for mathematical challenges. This program started in September 2001 and has met regularly at Washington University during the fall and spring semester.

The goal of the Math Circle is to help the students improve their problem solving skills and to expose the students to mathematics they probably would not otherwise see until much later (if ever). Our approach is to engage the students in discussion rather than lecture to the students. We want to try a variety of techniques and ideas to attack a problem and we want the students to discover solutions together with us. During the 2006-2007 year, there were 21 Math Circle meetings that were led by faculty, graduate students and even an undergraduate student.

The Washington University Math Circle program will continue in the fall. We encourage you to recommend student who you believe would enjoy and benefit from this program. We are happy to answer any additional questions you may have regarding the Washington University Math Circle. Please contact us:
http://www.math.wustl.edu/mathcircle/

Blake Thornton blake@math.wustl.edu.

The 2007 Math Circles presenters and topics were:

Victor Wickerhauser	The Pigeonhole Principle
Ben Braun	Pick's Theorem
Brian Maurizi	Mobius Bands
Lisa Kuehne	Divergent Series
Jeff Blanchard	The Orchard Problem
Greg Knese	Euler's formula and the five Platonic
Bob McDowell	Liars and Truthtellers
Scott Cook	Graph Theory
Al Baernstein	Probability and coin tossing
Michael Deutsch	Primes
Blake Thornton	Triangle disections
Aaron Wiechmann	Knots Ann Podleski Brick Wall Patterns
Robert Houska	Fibonacci sequence
Xiao Huang	Probability
Paul Koester	Ramsey Theorey
Emily Ronshausen	Graph Theory
Larry Conlon	Euler Characteristic of Surfaces
Michael Buchenholz	Infinite Series
Prof Al Baernstein	Gambling With Dice
Geir Arne Hjelle	Chaos

Mathematics Library

The Mathematics Library welcomes virtual or in-person visitors. The Math Library is located in Cupples 1, ground floor, room 16. Many services are available through the web at http://library.wustl.edu/units/math, including current hours and links to the catalog and catalog services (such as, book request/renewal, MOBIUS request), online databases, and services (such as, interlibrary loan and Ask Us!) After-hours access (and book check-out) is available to math department graduate students and faculty.

News from the Mathematics Library is distributed at http://wulibraries.typepad.com/mathnews. Please visit this site regularly or add its RSS feed to your email or RSS reader. We have recently begun a couple of long-term projects:
1) an inventory of the collection, so there might be fewer unfindable books in the future
2) review of our paper and online journal subscriptions.

Ruth Lewis, our new mathematics librarian, is eager to help and hear from math department students and researchers. Questions, suggestions and complaints can be sent via email to rlewis@wustl.edu or math@wumail.wustl.edu. That's probably the best way to make an appointment to discuss library issues or questions also.

Fall 2007 William H. Roever Lectures
October 19-20, 2007

Guest Speakers:
Professor John Morgan, Columbia University
Professor Gang Tian, Princeton University

Lecture Location: Lopata Hall, Room 201
Host: Professor Gary R. Jensen

- All are welcome to attend -

Friday, October 19, 2007
LECTURE 1
Tea: 12:45pm
Time: 1:30 - 3:00 pm
Title: "*The Poincare Conjecture and the Geometrization Conjecture*"
Abstract: A general introductory lecture on these conjectures, followed by an introduction to Ricci flow and an overview of the major steps in the proof of these conjectures.

Friday, October 19, 2007
LECTURE 2
Time: 4:00 - 5:30 pm
Title: "*Ricci Flows*"
Abstract: Models for singularity development in Ricci flows, surgery on Ricci flows, the existence for all time of a Ricci flow with surgery and the topological and geometric control that one has on these, finite-time extinction of certain Ricci flows.

Saturday, October 20, 2007
LECTURE 3
Time: 9:00 - 10:30 am
Title: "*Proof of the Poincare Conjecture*"

Saturday, October 20, 2007
LECTURE 4
Time: 11:00 am - 12:30 pm
Title: *"Proof of the Geometrization Conjecture"*
Abstract: This lecture will conclude with a brief discussion of future directions.

Department of Mathematics Fall '06 - Spring '07 Colloquium List

Fall Semester 2006

Tuesday, August 29, 2006
Speaker: Professor Phil Kutzko
University of Iowa
Title: *"Equity and inclusion in graduate education: a moderom the heartland"*
Host: Professor Gary Jensen

Thursday, September 28, 2006
Speaker: Professor Bill Ross,
University of Richmond
Title: *The Cauchy Transform*
Host: Professor John McCarthy

Thursday, October 19, 2006
Speaker: Professor Xuming He,
University of Illinois at Urbana-Champaign
Title: "*Quantile Regression"*
Host: Professor Nan Lin

Wednesday, October 25, 2006
Speaker: Professor John Benedetto,
University of Maryland
Title: *"Frames, coarse quantization, and waveform design in harmonic analysis"*
Host: Professor Guido Weiss

Thursday, November 2, 2006
Speaker: Professor Jakob Jonsson
Department of Mathematics, M.I.T.
Title: *"Homology of the Matching Complex"*
Host: Professor John Shareshian

Thursday, November 16, 2006
Speaker: Professor Wenhua Zhao
Department of Mathematics, Illinois State University in Bloomington
Title: *"The Jacobian Conjecture and the Laplace Eigenfunctions"* Host: Professor David Wright

Thursday, November 30, 2006
Speaker: Professor Charles Akemann
Department of Mathematics, UCSB
Title: *The Kadison-Singer Problem from the perspective of "nearly equal sharing"*
Host: Professor Nik Weaver

Thursday, December 7, 2006
Speaker: Professor Ying Wei
Department of Mathematics, Columbia University
Title: "*Time-Dependent Bivariate Growth Charts"*
Host: Professor Nan Lin

Thursday, December 14, 2006
Speaker: Professor Meera Mainkar
Department of Mathematics, University of Western Ontario
Title: *"Examples of Anosov Lie algebras"*
Host: Professor Renato Feres

Spring Semester 2007

Thursday, February 8, 2007
1ST ANNUAL I.I. HIRSCHMAN LECTURE SERIES
Speaker: Professor Richard Askey
Department of Mathematics, University of Wisconsin-Madison
Title: *"What I learned at Washington University and from I.I. Hirschman and its impact on mathematics research and my teaching"*
Hosts: Professors Ed Wilson & Guido Weiss

Friday, February 9, 2007
Speaker: Professor Richard Askey
Department of Mathematics, University of Wisconsin-Madison
Title: *"Mathematical content knowledge of teachers, a view from the past and present"*
Hosts: Professors Ed Wilson & Guido Weiss

Thursday, February 15, 2007
Speaker: Professor Ilijas Farah
Department of Mathematics and Statistics, York University (Canada)
Title: "Rigidity conjectures"
Host: Professor Nik Weaver

Thursday, February 22, 2007
1ST ANNUAL TAIBLESON LECTURE SERIES
Speaker: Professor Hrvoje Sikic
Department of Mathematics, Washington University and University of Zagreb (Croatia)
Title: Besov spaces on domains and Brownian motion
Hosts: Prof. Ed Wilson & Prof. Guido Weiss

Thursday, March 8, 2007
Speaker: Professor Louis Billera
Department of Mathematics, Cornell University
Title: *"The geometry of the space of phylogenetic trees"*
Host: Professor John Shareshian

Tuesday, March 27, 2007
4th ANNUAL LOEB UNDERGRADUATE LECTURE IN MATHEMATICS
Speaker: Professor Karen E. Smith
Department of Mathematics, University of Michigan
Title: *"Algebraic Geometry from Antiquity to the Cutting Edge of Modern Mathematics"*
Host: Professor Ron Freiwald

Friday, April 6, 2007
Speaker: Professor Francois Ledrappier
Department of Mathematics, University of Notre Dame
Title: *"Linear drift for isometries"*
Host: Professor Renato Feres

Thursday, April 12, 2007
Speaker: Professor Loredana Lanzani
Department of Mathematics, University of Arkansas
Title: *"Cauchy-type singular integrals in Several Complex Variables"*
Host: Professor Al Baernstein, II

Friday, April 13, 2007
Speaker: Professor Luca Capogna
Department of Mathematics, University of Arkansas
Title: *"Mean curvature in sub-Riemannian setting"*
Host: Professor Al Baernstein, II

Thursday, April 19, 2007
Speaker: Professor Arne Bathke
Department of Statistics, University of Kentucky
Title: *"Nonparametric Tests for Multivariate Data, and Applications"*
Host: Professor Nan Lin

Thursday, April 26, 2007
Speaker: Professor Will Kazez
Department of Mathematics, University of Georgia
Title: *"Contact topology and automorphisms of surfaces"*
Hostess: Professor Rachel Roberts

Thursday, May 3, 2007
Speaker: Professor Sergio Fenley
Department of Mathematics, Florida State University
Title: *"Ideal boundaries of pseudo-Anosov flows and uniform convergence groups, with connections and applications to large scale geometry"*
Host: Professor Renato Feres

Friday, May 11, 2007
Speaker: Sir Michael Atiyah
Department of Mathematics, University of Edinburgh, Scotland
Title: *"The role of Quaternions in Algebra, Geometry and Physics"*
Host: Professor David Wright

Please check our Talk List online: www.math.wustl.edu Go to -> Resources-> Talk List for our most up-to date information on talks and colloquia.

Washington University in St.Louis

The *Department of Mathematics Newsletter* is annually published at the beginning of each Fall semester by the Department of Mathematics at Washington University in St. Louis.

THANK YOU to all our alumni, faculty, and students who contributed to this edition of our newsletter. Thumbs up to another successful year!
Special thanks to Professors Rochberg, Weiss, Jensen, Freiwald and Thornton; staff members Shar Weber, Sara Quigley, Mary Ann Stenner, and Steven Xiao; and to the St. Louis Post Dispatch for keeping mathematics in the news.

TO OUR ALUMNI: Please keep in touch. We would like to hear from you!

Please contact:
Corine Kidicho-Jones
coco@math.wustl.edu
if you would like to submit an article or would like to receive a copy of the Mathematics Newsletter.

Arts & Sciences

Department of Mathematics

Fall 2007 Newsletter

David L. Wright, Chair

Washington University in St.Louis

WASHINGTON UNIVERSITY IN ST. LOUIS
Department of Mathematics
1 Brookings Drive
Cupples I, Campus Box 1146
St. Louis, Missouri 63130
(314) 935-6760
www.math.wustl.edu