

## A Message from the Chair

*Lance L. Littlejohn*

I cannot remember being more excited than I am now in anticipation of the start of this academic year! We have so many exciting events planned for our students and faculty this year that I can hardly wait for the new fall semester to begin!



In early September, in consecutive weeks, we will host speakers in both of our annual lecture series. First up is Professor Brian Conrey, the Director of the American Institute of Mathematics and an expert on the Riemann Hypothesis, who will speak in our second annual Baylor Undergraduate Lecture Series in Mathematics. A few years ago, I heard Brian speak in San Diego and it was then that I knew he would make a terrific speaker in our newest lecture series, aimed at our undergraduate majors and graduate students. Brian is well known for his activities in outreach programs to high school students who are interested in mathematics. Shortly after Brian leaves campus, Professor Sir Michael Berry arrives to speak to us in our third annual Baylor Lecture Series in Mathematics. Sir Michael is a multi-honored physicist/mathematician from the University of Bristol (U.K.) who has agreed to treat us to three lectures while he is with us.

In late October, the Department will host Dr. Edward Burger, Professor of Mathematics at Williams College, who is a finalist for the Robert Cherry Award for Great Teaching at Baylor University. Ed is a well-known and popular figure in mathematics and a very gifted lecturer. It would be terrific to have Ed join our department for a semester; one of my goals as Chair is to significantly increase the number of mathematics majors we have and Ed has had terrific success in doing this at Williams College.

In April 2010, Professor George Andrews, current President of the American Mathematical Society, will be the speaker in the fourth annual Baylor Lecture Series in Mathematics. Dr. Andrews is the world's leading authority on the life and work of the late Indian genius, Srinivasa Ramanujan; the title of George's lecture will be "*Ramanujan and His Amazing Lost Notebook*".

From October 16-18, Baylor will host a regional meeting of the American Mathematical Society, a 'first' for our university. The meeting will be held in the Baylor Sciences Building. I have a strong feeling that the conference participants – and we expect more than 200 mathematicians – will be impressed with the venue site; the BSB is

one of the most spectacular buildings I have ever seen on any of the more than 80 campuses I have visited throughout the world.

And speaking of spectacular facilities, mathematics at Baylor is fortunate to have a recently remodeled Sid Richardson department thanks to our administration. And more good changes are in the works – thanks to some very generous alumni. I will keep everybody updated on some very exciting news that we will break sometime in the fall on this front!!



As we start a new academic year, I would like to welcome five new members to our “family”. Dr. Leonardo Mihalcea is a new Assistant Professor in our department. Leonardo, a native of Romania, just finished a three-year post doctoral position at Duke University after receiving his Ph.D. degree from the University of Michigan and visiting at Florida State University. His area of research is algebraic geometry. Dr. Guglielmo Fucci is a new post doctoral visiting professor in our department. Guglielmo, from Naples, Italy, works in mathematical physics. He comes to us from the New Mexico Institute of Mining and Technology. The department is also very pleased to have Jill Nichols (and her husband Curt, a new faculty member in the Department of Political Science), on board as a part-time lecturer. Jill finished her M.S. in Mathematics last spring at Texas A&M University. For the fall semester, we also hired one of former graduate students, Brittany Noble, to teach two classes for us. And, last but certainly not least, we have successfully wooed Professor Eugene Tidmore out of retirement to teach a calculus class for us this fall semester.

I would like to extend an open invitation to all of our mathematics alumni to come by the Department whenever you are in the ‘neighborhood’. One of the best parts of my job is meeting our alumni and I would like to get to know all of you!

Best wishes,

Lance Littlejohn

## Department News

### **AMS Regional Meeting at Baylor University**

From October 16-18, Baylor University will host a regional meeting of the American Mathematical Society. All lectures will be held in the Baylor Sciences Building. For more information, please visit the link <http://www.baylor.edu/math/index.php?id=63149> on our departmental web page.



Baylor Sciences Building

### **100<sup>th</sup> Anniversary Homecoming 2009 Reception**

On Saturday, October 24, from 10:30am until 12:00 noon, the Department of Mathematics will host a homecoming reception for Baylor alumni. The reception will be held in the west wing atrium area of the third floor in the Sid Richardson (home of the Department of Mathematics) building. All alumni are invited to attend; our faculty is eager to see former students so please consider attending! Light snacks and refreshments will be served.

### **Department Teaching Awards**



John Davis

Patricia Bahnsen

Professor John M. Davis was one of 29 recipients nationally to win a prestigious Distinguished Teaching Award from the Mathematical Association of America. He was honored at the annual meeting of the Texas Section of the MAA in April 2009. A quote – and a common theme from his students: *“Quite simply, I classify Dr. Davis as the best mathematics professor under which I have studied.”*

Dr. Patricia Bahnsen won a Teaching Award from the Baylor Athletic Department in Spring 2009. Patricia was honored for consistently going the ‘extra mile’ in helping Baylor athletes in and out of the classroom.

Congratulations to both John and Patricia for these well-deserved honors!

### **Teacher Quality Grants Program**

Dr. Mary Margaret Shoaf and Dr. Tommy Bryan have been working actively for several years with middle and high school teachers. This June, they led a professional development program that was attended by twenty-five

teachers from Killeen to Glen Rose and Mexia to Goldwaite. Every summer since 2005, they have organized this workshop and obtained funding for it through the Teacher Quality Grants Program for higher education. Currently they are in the middle of a two-year grant that amounts to more than \$80,000 per year. The Teacher Quality Grants Program is a federally funded source that works through the Texas Higher Education Coordinating Board to support teaching and learning at K–12 in various areas of mathematics and science to “promote improved instruction in mathematics and science for Texas schoolchildren by providing professional development for their teachers.” Many thanks and congratulations to both Mary Margaret and Tommy.

## **New Faculty in the Department**

The department is pleased to welcome aboard several new faculty members:



Guglielmo Fucci

Leonardo Mihalcea

Jill Nichols



Brittany Noble

Eugene Tidmore

Dr. Guglielmo Fucci is a new three-year post doctoral visiting professor. Guglielmo completed his Ph.D. degree in mathematical physics at New Mexico Institute of Mining and Technology in 2009. Hailing originally from Italy, Guglielmo has known, and worked with, Professor Klaus Kirsten in our department for several years.

Dr. Leonardo Mihalcea joins us as a new Assistant Professor. Leonardo’s expertise lies in algebraic geometry, specifically in Schubert calculus. He obtained his Ph.D. degree from the University of Michigan in 2005. He has held post doctoral positions at Florida State University, the Max Planck Institute für Mathematik, and Duke University. Leonardo is married with wife Stanca (also a mathematician) and young son Radu.

Jill Nichols is a new part-time lecturer in the department. She obtained her M.S. degree in mathematics from Texas A&M in 2009. Jill’s husband, Curt, is a new Assistant Professor in the Department of Political Science at Baylor University.

Brittany Noble is a temporary lecturer for the department for this fall semester. Brittany obtained her M.S. degree in mathematics from California State University at Northridge in 2007. Brittany’s husband, Alan, is a Ph.D. student in the Department of English at Baylor University.

The department is thrilled that we managed to woo Dr. Eugene Tidmore out of retirement to teach for us this fall. Gene retired in 2004; he previously taught at Baylor from 1963-65 and from 1971-2004. Gene earned his Ph.D. from Oklahoma State University in 1967 and, prior to returning to Baylor in 1971, taught at Texas Tech University.

## Top Mathematics Students for 2008-09



Zach Dorroh

Michelle Davis

Albert Ho



Eric Bunch



Jennifer Mothersole

The top mathematics students in our department for the past year are Zachary Dorroh, Albert Ho, Eric Bunch, and Jennifer Mothersole. In mathematics education, the department's pick as top student was Michelle Davis. Congratulations to all of these outstanding students!

## Mathematics Scholarship Recipients

The following Baylor students received scholarship support for the coming academic year. We are very grateful to the families that endowed these scholarships and we wish each of the chosen students continued success in the coming year!

**The John C. Lattimore Mathematics Scholarship Fund:** Erwin Gostomski, Brittney Turner, Lianne White

**The Earl, Maxine, Max, and Anita Bodine Mathematics Scholarship Fund:** Kathryn Ewing, Heather Levihn, Chelsea Mitcham

**The K. L. and Vivian Carter Mathematics Scholarship Fund:** Tiffany Moore, Courtney Novak, Lianne White

**The Jerry Johnson Mathematics Scholarship Fund:** Myles Baker, Beckah Brady, Matthew Hrna, Meaghan McNeill

**The Howard L. Rolf Mathematics Scholarship Fund:** Jessica Schwind

**The Hickey Mathematics Scholarship:** Kim Woodsum

**The Piziak Mathematics Scholarship Fund:** Brittany Berg

**Roy Donald Perry Memorial Endowed Scholarship Fund:** Shanna Ware

**The Professor Albert Boggess Mathematics Scholarship Fund:** Mikayla Chien, Janie Hoorman, Rachel McCurdy, Lauren Miksch

**The Ruth and Gene Royer Mathematics Scholarship Fund:** Erwin Gostomski, Benjamin Newcome, Zach

Reese, Deborah Ryan, Brittney Turner

### Putnam Exam and Math Modeling Competition

Jake Fillman, one of our exceptional undergraduate mathematics majors, finished in the top 10% of the 2008 William Lowell Putnam examination. Way to go, Jake!

Baylor's Math Modeling Team (Rachel Wilkerson, Meaghan McNeill, Jonathan Drake) received an Honorable Mention in last Spring's Math Modeling Competition. This is a terrific showing from three terrific students!

### Ph.D. Graduations this Year

A total of six graduate students have obtained or will obtain their Ph.D. degrees in our department during the calendar year 2009:



Andrea Bruder

Alex Cornelius

Brittany Hopkins



Leslie Jones

Alice Ramos

Davut Tuncer

Andrea Bruder graduated in May. Her thesis is entitled "*Applied left-definite theory: the Jacobi polynomials, their Sobolev orthogonality, and self-adjoint operators*"; her Ph.D. advisor is Lance Littlejohn. Dr. Bruder is now teaching at Colorado College in Colorado Springs.

Alex Cornelius graduated in August. His Ph.D. supervisor is David Ryden and the title of his thesis is "*Inverse Limits of Set-Valued Functions*". Alex and his wife, Ly, are heading to Portland, Oregon.

Britney Hopkins also graduated in May. Her thesis is entitled "*Multiplicity of Positive Solutions of Even-Order Nonhomogeneous Boundary Value Problems*"; her thesis advisor is Johnny Henderson. Britney is now an Assistant Professor at the University of Central Oklahoma.

Leslie Jones graduated in May. Leslie's major professor is Brian Raines and the title of her thesis is "*Adding Machines*". Leslie is a visiting professor at the University of Arizona.

Alice Ramos also graduated in August. Alice's Ph.D. supervisor is John Davis; the title of her thesis is "*Stability of Hybrid Dynamic Systems: Analysis and Design*". Alice is a new Assistant Professor at Bethel College in Mishawaka, Indiana.

Davut Tuncer will graduate in December. His thesis is entitled "*The Left-Definite Spectral Analysis of the Legendre-type Differential Equation*"; his major professor is Lance Littlejohn. Davut is now teaching at the University of Tennessee at Chattanooga.

## Distinguished Mathematicians to visit Department

### **Brian Conrey featured speaker in second annual Baylor Undergraduate Lecture Series in Mathematics**

Professor Brian Conrey is the speaker in the second annual Baylor Undergraduate Lecture Series in Mathematics on September 9-10, 2009.



Brian Conrey

Brian is a leading world authority on the Riemann Hypothesis, widely considered to be the most important and difficult unsolved problem in mathematics today. His two lectures will focus on this famous open problem. His first lecture, entitled “Primes and zeros: a million dollar mystery”, will be given on Wednesday, September 9 at 7pm in D109 of the Baylor Sciences Building. His second lecture is scheduled for 4pm on Thursday, September 10 in SR 344; the title of his second talk is “Random matrix theory and the Riemann zeta function”.

He is the founding Executive Director of the American Institute of Mathematics in Palo Alto, California. He obtained his B.S. in Mathematics from Santa Clara University in 1976 and his Ph.D. degree from the University of Michigan, under the supervision of Hugh Montgomery, in 1980. He has been on the faculty at Oklahoma State University (where he served as department head from 1991-1997) and at the University of Bristol in the United Kingdom. Dr. Conrey is very active in outreach programs for high school and undergraduate students interested in mathematics.

### **Sir Michael Berry to speak in third annual Baylor Lecture Series in Mathematics Lectures**

Professor Sir Michael Berry, Melville Wills Professor of Physics at the University of Bristol will visit Baylor from September 15-20, 2009. He will be the featured speaker in the third annual Baylor Lecture Series in Mathematics. The title of his lecture, set for Wednesday evening at 7:00 pm in D109 of the Baylor Sciences Building, is “Making Light of Mathematics”. Further information on his visit, and other lectures, can be found at the math department website <http://www.baylor.edu/math/>.



Sir Michael Berry

He is famous among other things for the Berry phase, a phenomenon observed in quantum mechanics and optics. He specializes in semiclassical physics (asymptotic physics, quantum chaos) applied to wave phenomena in quantum mechanics and other areas such as optics.

Among his many honors, Professor Berry became a member of the Royal Society of London in 1982, a Fellow of Royal Society of Arts in 1983, a Fellow of the Royal Institution in 1986, a member of the Royal Society of Sciences in Uppsala in 1986, a member of the European Academy in 1989 and a Foreign Member of the National Academy of Sciences in the United States. In 1996, he became a Knight Bachelor and, in 2000, he became a member of the Royal Netherlands Academy of Arts and Sciences.

### **Ed Burger named finalist for Cherry Teaching Award**

Dr. Edward B. Burger has been named a finalist for the prestigious Robert Foster Cherry Award for Great Teaching at Baylor University. Dr. Burger will visit Baylor University from October 25-28, 2009; further details are forthcoming on his lectures.



Edward B. Burger

Professor Burger has taught mathematics at Williams College since 1990. Since that time, he has been honored with numerous teaching awards, including the 2007 Award of Excellence from Technology & Learning magazine, the 2006 Reader's Digest "100 Best of America" as Best Math Teacher, and the 2006 Lester R. Ford Award, the 2004 Chauvenet Prize and the 2001 Deborah and Franklin Tepper Haimo Award for Distinguished College Teaching of Mathematics, all from the Mathematical Association of America.

He is the author or co-author of more than 30 research articles and 21 books and CD-ROM texts, including *The Heart of Mathematics: An Invitation to Effective Thinking*; *Coincidences, Chaos, and All That Math Jazz: Making Light of Weighty Ideas*; and *Extending the Frontiers of Mathematics: Inquiries into Proof and Argumentation*. He also is an associate editor for *The American Mathematical Monthly* and a member-elect of the editorial board for *Math Horizons*.

Burger also has written and appeared in number of educational videos, including the 24-lecture video series, "Zero to Infinity: A History of Numbers" and "An Introduction to Number Theory." From 2005-2007, he served as a mathematics adviser for the "NUMB3RS in the Classroom Project," with CBS-TV/Paramount Studios/Texas Instruments.

### **George Andrews, AMS President, at Baylor in April**

Professor George E. Andrews, Evan Pugh Professor of Mathematics at the Pennsylvania State University will be the speaker in the fourth annual Baylor Lecture Series in Mathematics on Wednesday, April 14, 2010. The title of Professor Andrews' lecture is "Ramanujan and His Amazing Lost Notebook".

Professor Andrews is the current President of the American Mathematical Society. He is also a member of the National Academy of Sciences and the American Academy of Arts and Sciences. He has been a Fulbright Scholar as well as a Guggenheim Fellow.

While visiting Trinity College in Cambridge (U.K.) in 1975, Professor Andrews discovered what is now known as 'Ramanujan's Lost Notebook'. This collection contains about 600 identities and equations that the famed, and enigmatic, Indian mathematician Srinivasa Ramanujan (1887-1920) had written during the last year of his life. Remarkably, yet mysteriously, nearly every formula in this book was written without proof. Working for the past three decades, Andrews and his co-workers have been able to produce proofs for most of the formulae in the book. Andrews' work in this area was featured in a 1987 episode of the PBS show NOVA that was devoted to describing the life and work of Ramanujan.



George E. Andrews

Professor Andrews is also nationally recognized for his compelling essays, provocative lectures, and tireless work in mathematics education. He is deeply concerned about recent national trends in mathematics education, the use of technology in the classroom, and *how* mathematics is being taught at all levels.

## **Undergraduate Student Profiles**

Katie Anders and Eric Bunch are recent graduates of the Department of Mathematics. They wrote the following profiles during their time at Baylor. Both are now studying mathematics in graduate school -- Katie at the University of Illinois and Eric at Kansas State University.

### **Eric Bunch**

I am a mathematics major from Fort Worth, Texas, and if all goes well, I will graduate in May 2009 with a B.S. Degree. Deciding to come to Baylor was largely based on the small class sizes, which give the students a great opportunity to have a relationship with their professors.



Eric Bunch

As a freshman, I was a physics major, but quickly took up a mathematics major as well. After the math that I was exposed to this past semester and this summer I made the decision to go to graduate school in mathematics, and so have dropped down to a physics minor in order to fit more math classes into my schedule. After graduating from Baylor, I plan on working toward a Ph.D. in mathematics and, after that, a career as a professor. In the summer of 2007, I took part in a Research Experience for Undergraduates program at Kansas State in Manhattan, Kansas. My research project dealt with a formula for the acceleration of sequences applied to the partial sums of a general Fourier Series. I enjoyed the program because it allowed me to gain research experience and exposed me to many areas of mathematics that were new to me, all of which were extremely interesting.

The strongest part of Baylor's Math Department is the professors. Every math professor that I have taken a class from has been outstanding. They are willing to answer questions outside of class and are personable and approachable. The courses I have taken have all been exceptional and I feel confident in pursuing mathematics further after my years here at Baylor.

### **Katie Anders**

I chose Baylor because I wanted to attend a Christian university with a strong academic reputation. I started my studies at Baylor as an undeclared major and began taking math classes. I enjoyed the math classes so much that I kept taking more and eventually decided to major in mathematics. I have also participated in several of the extra-curricular activities offered by the math department, taking the Putnam Exam and serving as the Baylor University Mathematics Society Vice President. After graduating from Baylor, I hope to pursue a Ph.D. in mathematics followed by a career in industry or as a professor.



Katie Anders

In the summer of 2007, I participated in the Stochastic Modeling in Actuarial Science and Financial Mathematics Research Experience for Undergraduates at the University of Illinois at Urbana-Champaign. My research project focused on racial differences in life expectancy, and I constructed a model for increasing black life expectancy by reducing infant mortality, homicide, and HIV. The REU provided me the opportunity to gain research experience as well as live and work with students from across the United States and several foreign countries.

My favorite thing about the Baylor Math Department is definitely the faculty. I have enjoyed my classes because all my professors have been excellent teachers. They have been very helpful and always available to answer questions about homework and lecture notes. They have encouraged me as I have applied to REU programs and graduate schools. My courses have been outstanding, and I know that I will be well prepared for graduate

study.

## Graduate Student Profile

Andrea Bruder graduated with a Ph.D. in May. She now has a position at Colorado College in Colorado Springs.

### Andrea Bruder

I spent much of the first year of my life in a chemistry lab, as my mother was finishing her Ph.D. in chemistry at the University of Frankfurt in Germany. Being raised by two chemists, I grew up around science, and mathematics was always my favorite class in school, closely followed by physics. After my junior year in high school (the German *Gymnasium*), I spent a year in Green Bay, Wisconsin, as a foreign exchange student. I decided to take an AP Calculus class, and spent many afternoons going through the proofs of the theorems I had learned in class.

After completing the coursework for a medical degree, I found my way back to mathematics and received a master's degree (*Diplom*) from the Technical University of Munich in 2004. The lectures that I enjoyed most were the ones in analysis taught by Professor Rupert Lasser. He taught us for seven consecutive semesters, starting with convergence of sequences and series via measure theory and functional analysis through spectral theory. I am very thankful for this solid and consistent education in analysis.

Early on during my time in Munich I met my thesis advisor Dr. Andreas Ruffing. He gave me the opportunity to write my master's thesis on completeness of  $q$ -Fourier systems at Arizona State University. A dedicated teacher and mentor, he took a group of students under his wings, encouraged us to do research early in our careers, took us to conferences, and organized seminars for us. It was during one of his seminars in Slovenia that I first met my current academic advisor, Dr. Lance Littlejohn. I had just taken Prof. Lasser's spectral theory course, and Dr. Littlejohn's lectures on left-definite spectral analysis really caught my attention - the subject hasn't let go of me since. I wanted to learn more, and started working on my Ph. D. with Dr. Littlejohn at Utah State University in 2005.



Andrea Bruder

In 2007, Dr. Littlejohn became the new chair of the mathematics department at Baylor, and I transferred to Baylor to continue studying with him. My dissertation is on the Jacobi polynomials for negative integer parameters, their Sobolev orthogonality and self-adjoint operators. I use left-definite theory as well as techniques from functional analysis and operator theory in my research. Currently, I am exploring an application in mathematical physics, and in particular in quantum mechanics.

My advisors and mentors have inspired my research and my teaching: it's their enthusiasm and their passion for their field that makes things come across, and I strive to pass this on to my students. I hope to be a mentor who makes a difference myself some day. I have taught analysis courses in Munich, calculus at Utah State and precalculus classes at Baylor.

In my spare time, I started rock climbing at Baylor, and I have become quite passionate about it. I love to climb outside, but do most of my climbing at the Baylor rock wall. I tell my students to check at the Rock when they can't find me at my office. What I enjoy most about climbing is the very thing that I enjoy most about

mathematics: the challenge, and succeeding after hard work.

## Alumni Profile

### A True Math Addict – Martha Anderson Cranor

*Baxter Johns*

Recently Martha Anderson Cranor, who graduated from Baylor in 1973 with a BA Degree in Mathematics, was named as one of the six top teachers in Colorado by the CCTM (Colorado Council of Teachers of Mathematics). Now one would think that this honor would be hard to top, but subsequently Martha was chosen as one of the 32 “American Math Heros” in a nationwide competition by the Raytheon Corporation. Martha is a woman of many talents. She is an outstanding teacher at Fossil Ridge High School in Fort Collins, Colorado, a dedicated spouse and mother, and a cancer survivor (nine years ago). So how does she do it all? Beats me!

Martha gives the credit for her accomplishments to others. When I asked her for permission to write this profile, she said, “I will be glad to do this because I really feel that I am a large part of the teacher that I am because of my experience at Baylor.” She also gives credit to her parents, husband, and sons, who have “put up with my math addiction” and to her colleagues.

Martha attended Baylor from 1973 to 1977. I asked her who her favorite professors were (self-serving note: I never had her in class). Here is what she said: “I really enjoyed studying under Danny Turner and both of the Hickeys. I remember the shock of failing my first calculus test under Dr. Jim Hickey. I hadn’t ever had to really study for a math test before. He spent a lot of time helping me learn to study. He helped me so much that I was able to make an A by the end of the semester and subsequently enroll in the Honors Calculus II class. I remember the surprise I had when I found out I scored the highest in the Honors class on the first exam! I read his obituary to my students and explained, with tears in my eyes, that he was one of the greatest influences in my studies.”



Martha Anderson Cranor

Martha met her husband Dave in the foyer of Moody Library; he maintains that when he saw her it was love at first sight! Dave is now a family practice physician in Fort Collins. Martha and Dave have two sons: David (a Baylor graduate who is beginning a Ph.D. program at MIT) and Matthew (an entering Baylor freshman).

After graduating from Baylor Martha earned an M.S. Degree from UTA and later, having developed a liking for statistics, worked toward a Ph.D. at Colorado State. However, family duties called and she did not have a chance to finish her doctorate (but it’s never too late).

Since Martha has won so many awards, we certainly should say a bit about her teaching style. In many classrooms the teacher covers a topic by first lecturing and then having the students work through a lot of rote exercises. Martha uses a style called “guided inquiry.” Here is her description: “For me in my classroom guided inquiry is the teaching method in which students are given a problem along with some carefully designed instructions and/or questions that guide students to solutions by their drawing on a variety of resources such as manipulatives, other students, their own ideas, and even research. After arriving at solutions, students develop

conjectures and present their results to each other. I absolutely love the rich discussions that take place. It is also very scary for me because I, being the teacher, feel the huge burden of making sure that responsible mathematics occurs.”

Here is an example of an activity that Martha uses: “I asked students to figure out how to cut a hole in an  $8\frac{1}{2}$  by 11 piece of paper large enough for an elephant to walk through. After they did this, their homework was to research the Dido myth and then apply what they learned from this activity and the myth to maximizing area.” Note from the writer of this article: I had to do a little research on this myself!

We were very pleased to have Martha visit us at Baylor several times over the past two years. She gave several talks to the students and faculty in math and math education, gave a talk at a conference for area teachers, and was part of the faculty for a two-week workshop for Waco middle school students and teachers.

It is clear that Martha qualifies as a true math addict. Her students accuse her of naming her youngest child Matthew because she loves math so much. She says that she just missed being born on pi day (her birthday is March 15).

We in the Mathematics Department have enjoyed reconnecting with Martha and are proud of her accomplishments. We are also delighted when we are able to reconnect with any of our graduates; if you are one of our alums, don't be a stranger!

## Mathematicians in History

### **Hans Julius Zassenhaus**

*Manfred Dugas*

Hans Zassenhaus was a great mathematician of the Twentieth Century. The purpose of this article is to introduce you to his life and work. Zassenhaus was born May 28, 1912 in Koblenz-Moselweiss, Germany, a small town near the confluence of the rivers Mosel and Rhein. This was 40 years before and some 60 miles north of where yours truly drew his first breath. His family soon moved to the big port city of Hamburg. In 1930 he entered the University of Hamburg to study mathematics and physics with an emphasis on the physics of the atom. As easily happens to a young man in college, he soon fell in with the wrong (or right?!) crowd, which in this case consisted of the world famous algebraists Emil Artin and Erich Hecke. The great Artin became Zassenhaus' major professor and supervised his dissertation research on sharply 3-transitive permutation groups, which are now called Zassenhaus groups. Hans Zassenhaus received his doctorate in 1934, at the tender age of 22. Let me hasten to say that in no way, shape or form am I comparing myself to Zassenhaus. I just find it mildly amusing that I entered the University of Kaiserslautern in 1970 and got my doctorate in 1974, again a perfect 40 year time shift.



Hans Zassenhaus

Zassenhaus soon became Artin's assistant professor and kept that position even after Artin was fired by the Nazis in 1937 because he had a Jewish wife. Artin went to Indiana and Zassenhaus stayed behind in Hamburg. In 1940 the Nazi government insisted that all university faculty be members of the Nazi party. Zassenhaus did not succumb to the Zeitgeist. He quit his position and joined the German navy, where he worked as a weather forecaster until the end of World War II. After the war, he could have become a professor at the prestigious university at Bonn, but he declined, insisting that the position be filled by somebody whose job had been lost under Nazi rule. Zassenhaus left Europe in 1949 (as I did 35 years later) and went to Montreal, Canada. He moved to Notre Dame in 1959 and eventually to Ohio State University in 1963, where he stayed until his retirement in 1981. He died in Columbus, Ohio on November 21, 1991. His list of publications has 188 items,

and he had about 40 students.

Zassenhaus' work had a huge impact in many areas of mathematics. He made lasting contributions to group theory, crystallography, nearfields and their applications to geometry, the theory of orders, representation theory, theoretical and computational(!) algebraic number theory, the geometry of numbers, (modular) Lie algebras and their application in physics, didactics and history of mathematics. At the time when the Bourbaki school ruled and everything in mathematics became abstract and axiomatized, Zassenhaus developed computer algorithms to compute the invariants of algebraic number fields, like their Galois groups, etc. As early as 1959 he pioneered the use of computers to run experiments in algebra, and he developed algorithms to factor polynomials and much more. At a time when research was valued much more than teaching, Zassenhaus was a passionate teacher, who liked to teach mathematics from a historical perspective. He even wrote articles on the teaching of High School algebra, bucking the Zeitgeist once more. He was a perfect model of Baylor University's paradigm of a scholar/teacher! In 1963, A. L. S. Corner († 2006) published his celebrated result that each ring  $R$  whose additive group  $(R,+)$  is torsion-free and reduced of finite rank  $n$  can be realized as the endomorphism ring of some abelian group  $A$  of rank  $2n$ . In a little noticed paper in 1967, Zassenhaus proved, in a constructive manner, that if  $(R,+)$  is free of finite rank  $n$ , then  $A$  can be constructed to have rank  $n$  only. Actually,  $A$  is sandwiched between  $(R,+)$  and its divisible hull. Working with my student, J. Buckner, such groups  $A$  popped up again all of a sudden as localizations of the ring of integers in the quasi-category of abelian groups, whatever that may be. During a recent sabbatical, I worked once again with Dr. Göbel and we generalized Zassenhaus' result to certain rings of infinite rank. This paper has appeared in *Fundamenta Mathematicae*.

At times there has been debate about the role of experiment in mathematics and the importance of proof. Zassenhaus had this to say: "Indem wir den Mut zum Experimentieren beweisen, werden uns Experimente den Mut zum Beweisen geben". Translation: By proving our courage to experiment, the experiments will give us the courage to prove.

#### References:

<http://www-history.mcs.st-andrews.ac.uk/history/Mathematicians/Zassenhaus.html>

<http://www.math.ohio-state.edu/node/19548/print>

In the paper with Göbel mentioned above, we called rings that satisfy the conclusion of Zassenhaus' result "Zassenhaus rings." We hope that this will stick.

## You are Important to Us!

We want to hear what you are up to and the role that your experience with the Department of Mathematics has played in your ongoing journey. We invite you to remain active in the life of the department. There are a variety of ways for alumni and friends to be involved.

- Stay in touch. Our current students welcome information about internships and other opportunities, and students greatly appreciate presentations by alumni and others who talk about their careers and share their insights into the employment landscape. If you are interested in giving a talk to our majors, please contact [Lance\\_Littlejohn@baylor.edu](mailto:Lance_Littlejohn@baylor.edu).
- Each of the 26 chairs within the College of Arts and Sciences administers a discretionary fund that directly supports his or her department. The Mathematics Excellence Fund supports undergraduate and graduate student scholarships, travel to conferences and other universities, and the departmental colloquium series. If you are interested in contributing to these funds, please see <http://www.baylor.edu/development/index.php?id=5350> or contact Eric Abercrombie in university development at (254) 710-8313 or at [Eric\\_Abercrombie@baylor.edu](mailto:Eric_Abercrombie@baylor.edu).
- As we pursue our goal of becoming one of the nation's top mathematics programs, endowed chairs, lectureships, and scholarships can play an important role. If you are interested in supporting the department through an endowed fund or scholarship, please contact [Eric\\_Abercrombie@baylor.edu](mailto:Eric_Abercrombie@baylor.edu) in university development.

Let us know what you are doing, and share your stories with us. We always enjoy talking with old friends, and we look forward to hearing about your successes.