

A Message from the Chair

Lance L. Littlejohn

Greetings from the Department of Mathematics! Since our last newsletter in the Fall of 2009 lots of exciting things have happened - or are about to happen - in the department.

Jim and Lisa Meyerhoff (both BS '78, MS '83) have made a significant financial contribution to the department to build a computer classroom in Sid Richardson. This classroom, which is expected to be ready for use in Fall 2010, will allow the department to teach several courses in mathematics and mathematics education using various types of computer technology. We are very grateful to the Meyerhoffs for their vision and generous support. There will be more information about this project in the next newsletter.



The Department was thrilled to learn in January that Dr. Edward B. Burger, Distinguished Professor of Mathematics and Gaudino Scholar at Williams College in Massachusetts, won Baylor's prestigious Robert Foster Cherry Award for Great Teaching. The award money, \$200,000, is the single largest prize for teaching in the country (possibly the world). Ed will be in residence at Baylor for Fall 2010 teaching two courses to both mathematics and non-mathematics majors and interacting with both our undergraduate and graduate students.

We have several distinguished lecturers visiting the department this semester. We are kicking off a new lecture series, Life Experiences in Mathematics, in February with Jim Meyerhoff (BSc. Mathematics, 1978) giving the inaugural lecture. The main intent of this lecture series is to expose our own majors and minors to various careers that use mathematics. Jim is Exploration Manager for Krescent Energy Corporation in Houston. The title of his talk on February 25 is *Lognormal Distributions and their Application to Exploring for Oil and Gas*.

George Andrews, Evan Pugh Professor of Mathematics at The Pennsylvania State University and current President of the American Mathematical Society, is the speaker in the fourth annual Baylor Lecture Series in Mathematics. George will visit our Department from April 13-16. His public lecture, slated for April 14, is entitled *Ramanujan and His Amazing Lost Notebook*. His second talk, *The World of q -Orthogonal Polynomials and Bailey Chains*, will be given in the department on April 15.

We are currently undertaking the large and important project of completing our math alumni database for our departmental web pages. While we are editing for consistency, we would truly appreciate hearing from all of our math alumni---please send us your bio sketches and even photos of you!

We invite you to regularly visit our departmental web page (<http://www.baylor.edu/math/>). It's a great way to stay connected with your old department, see exciting happenings on the horizon, and even become involved with math at Baylor.

Department News

Baylor University hosts the 1051st meeting of the American Mathematical Society

On October 16-18 2009, Baylor University hosted the 1051st meeting of the American Mathematical Society. This is the first time that Baylor has hosted an AMS regional meeting. More than 350 mathematicians attended this

three day meeting held in the beautiful new Baylor Sciences Building. Reaction from the AMS and participants was very positive and we are looking forward to hosting another such meeting in the future.



AMS participants enjoying the comforts of the BSB

There were 17 special sessions (where more than 250 talks were given) held during the meeting, six of which were organized by Baylor faculty:

- 1) Topological Methods for Boundary Value Problems for Ordinary Differential Equations (Johnny Henderson)
- 2) The Topology of Continua (David Ryden)
- 3) Numerical Solutions of Singular or Perturbed Partial Differential Equation Problems with Applications (Tim Sheng)
- 4) Mathematical Aspects of Spectral Problems Related to Physics (Klaus Kirsten and Jon Harrison)
- 5) Lie Groups, Lie Algebras, and Representations (Markus Hunziker, Mark Sepanski, and Ron Stanke)
- 6) Dynamic Equations and Tim Scales: Analysis and Applications (John Davis).

In addition, there were four plenary talks given:

- 1) Representation Theory and Gauge Theory (David Ben-Zvi, University of Texas at Austin)
- 2) Surface Quasi-Geostrophic Equation: a Review (Alexander Kiselev, University of Wisconsin)
- 3) Mathematics, Cell Metabolism, and Public Health (Michael C. Reed, Duke University)
- 4) Mathematics and General Relativity (Igor Rodnianski, Princeton University).

Williams College's Ed Burger Wins Baylor's Prestigious Cherry Award

Terrific news for the Department of Mathematics at Baylor University (and, of course, Williams College): Dr. Edward Burger, Professor of Mathematics at Williams College, has been named the 2010 winner of the Robert Foster Cherry Award for Great Teaching. He will be in residence at Baylor University during the 2010 fall semester. Congratulations to Ed - we are looking forward to soon having him 'on board' with us!! This is a wonderful opportunity for our faculty to interact with Ed and an equally wonderful opportunity for our Baylor students to learn from him!

The Department is grateful to Baylor University and, in particular, to the Cherry Award committee for selecting such an outstanding candidate from an exceptional pool of renowned teachers in higher education. For further information, please see the [Baylor Cherry Award site](#).



Here is the official press release from Baylor University:

WACO, Texas (Jan. 14, 2010) - Baylor University has named Dr. Edward B. Burger, Distinguished Professor of Mathematics and Gaudino Scholar at Williams College in Massachusetts, as the 2010 recipient of the Robert

Foster Cherry Award for Great Teaching, the only national teaching award - with the single largest monetary reward of \$200,000 - presented by a college or university to an individual for exceptional teaching. The award was announced at today's spring faculty meeting.

"Baylor University is very pleased to honor Dr. Edward Burger, truly one of our nation's most outstanding, passionate and creative mathematics professors, with Baylor's 2010 Robert Foster Cherry Award for Great Teaching," said Baylor Interim President David E. Garland.

"During our more than 160-year history, Baylor University has been recognized nationally for the emphasis we place on exceptional classroom teaching. Our students already benefit daily from our notable faculty, who understand and greatly appreciate the value of teaching," Garland said. "The Cherry Award allows us to extend that experience by bringing to our campus some of the world's greatest teachers, such as Dr. Burger. We congratulate our 2010 Cherry Award recipient and we look forward to welcoming him to Baylor University in the fall."

The Cherry Award program at Baylor is designed to honor great teachers, to stimulate discussion in the academy about the value of teaching and to encourage departments and institutions to value their own great teachers. Individuals nominated for the award have a proven record as an extraordinary teacher with a positive, inspiring and long-lasting effect on students, along with a record of distinguished scholarship.

Burger visited the Baylor campus in October 2009 to present a Cherry Finalist Lecture on "The Art of Exploring Invisible Worlds: Thinking Through the Fourth Dimension." As the 2010 Cherry Award recipient, he will receive the \$200,000 award, plus \$25,000 for his home department at Williams College. He will teach in residence at Baylor during fall 2010.

"The Robert Foster Cherry Award for Great Teaching committee was very pleased with the strength of the applications for the 2010 award," said Dr. Heidi J. Hornik, professor of art history and chair of the Cherry Award Committee. "All three finalists had successful visits and lectures on campus last fall. Dr. Burger demonstrated that he was not only a leading educator in his field but that he has truly committed his life to the effective teaching of mathematics."

"I am extremely honored and humbled to learn that I will receive the 2010 Robert Foster Cherry Award for Great Teaching," Burger said. "Now more than ever, our country is ready to begin a critical and honest discussion on the core tenets of education, which in my opinion include inspiring minds, fostering creative thinking and changing lives; and to consider imaginative means by which to realize these important goals. I hope that through Baylor University's deep commitment to teaching, I will be able to add my voice to this important national conversation. I am also delighted and honored to be invited to join the Baylor community and look forward to collaborating with and getting to know the students, faculty, staff and alumni of Baylor University."

Burger's national reputation has allowed him to serve as a consultant for the "NUMB3RS in the Classroom Project" with CBS-TV/Paramount Studios/Texas Instruments and most recently with NBC Learn, the educational arm of NBC News, on "The Science of the Olympic Winter Games." The 16-part video series, which explores the science behind individual Olympic events, will air on the "Today Show" and throughout the 2010 Winter Olympics coverage on NBC-TV. Burger is featured in the "Mathletes" segment, in which he discusses the math found in the Olympic games. The series is available online at <http://www.nbclearn.com/olympics>.

Hornik said that although Burger's main focus is on undergraduate education, the Williams professor also is concerned with math education on the secondary school level. In addition to teaching at Baylor in the fall, Burger plans to reach out to local schools and organizations to demonstrate his passion for mathematics and mathematical thinking.

"In fact, some Waco-area schools have used his math classroom video tutorials to great success," Hornik said. "His love of mathematics will be felt by students and faculty at Baylor, as well as throughout the Waco community."

Dr. Lance Littlejohn, chair of the department of mathematics at Baylor, said he and his colleagues look forward to Burger's presence next fall among his department's already award-winning faculty and undergraduates of all majors at Baylor.

"Ed Burger is, quite simply, a teaching phenomenon," Littlejohn said. "He is immaculately organized and extremely articulate with an engaging personality. He has an uncanny ability of taking very difficult mathematics concepts and making them understandable to students. It is well known that, in Ed's classes, students are pumped with excitement when his class starts and, at the end of his lectures, they leave his classroom with an even higher feeling of exhilaration.

"I want our undergraduate non-math majors to experience him as a teacher and, equally important, I want our math majors to learn from him," Littlejohn added. "Taking a class from Ed Burger will, I am certain, be a positive, indelible experience that our Baylor students will never forget."

In addition to Burger, Baylor also named two other distinguished scholar/teachers as Cherry Award Finalists: Dr. Roger Rosenblatt, Distinguished Professor of English at Stony Brook University, and Dr. Elliott West, Alumni Distinguished Professor of History at the University of Arkansas. The Cherry Finalists each received \$15,000, while their home departments also received \$10,000 for the development of teaching skills.

Students' Reaction to Ed Burger's Cherry Award Lectures

Dr. Edward B. Burger was on campus October 26-28 as one of the three finalists for the Cherry Teaching Award at Baylor University. During his site visit, he gave three lectures to packed classrooms, including close to 200 people jammed into a 136-seat classroom in the Baylor Sciences Building to hear his public lecture entitled *"The Art of Exploring Invisible Worlds: Thinking through the Fourth Dimension"*.

Below is a representative sample of quotes from students who attended Dr. Burger's lectures.

"I thought Dr. Burger was an incredibly interesting man. He was highly energetic and a great speaker. I generally shun math, but Dr. Burger had a way of bringing it to life and holding my attention. I went to his lecture at the BSB as well which was just as enjoyable, if not more, as the in-class lecture. I'm very glad I had the opportunity to hear him speak!" (Matthew Carrington)

"He was very stimulating and had a contagious enthusiasm for the subject - very effective, creative teaching that held the audience's attention. I didn't think it would be possible to make such a difficult theorem fun and easy to learn!" (Lauren O'Farrell)

"Engrossing. That was the first word that flowed through my mind after the close of the lecture. Throughout the lecture, Dr. Burger's animated style, fluid teaching, and colorful remarks made my already interested mind stay all the more focused. One of the more admirable aspects was his lack of note usage, which tends to denote a truthful care for and adeptness in his discipline. Also, his style did not let up - giving the audience the sense that his lecture was not a fore-fronted attention-getter. These and many more reasons left me with the strengthened conviction that teachers need not necessarily teach students, but cultivate in them the discipline; then that discipline will come naturally. He receives my whole-hearted praise!" (James Yang)

"Though those of us familiar with Flatland have heard the analogies between 2, 3, and 4 dimensions often, Dr. Burger made these geometric observations tie into how we figure out problems in other types of math, how we perceive art, and ultimately how we discover things about every other discipline." (Meaghan McNeill)

"When I was at the lecture yesterday, one of my favorite quotes the speaker gave was when he talked about how when you immerse yourself in the big ideas of one subject, it becomes a lens to see ideas of other subjects. (For example, the way we can look at art after studying dimension and geometry...)" (Kathryn Ewing)

"Dr. Burger does for mathematicians what we are sorely in need of right now: he presents an argument that is mathematical in nature but is accessible to the layman that conveys the essence of why the study of mathematics is absolutely necessary. Without mathematics, what invisible worlds would we be missing out on?" (Myles Baker)

Department Welcomes Distinguished Visitors to Speak in Lecture Series

Baylor Math Alum Jim Meyerhoff to Kick Off New Lecture Series in February

The Department of Mathematics is launching a new lecture series, ***Life Experiences in Mathematics Series***, which will kick off on February 25, 2010 when **Jim Meyerhoff**, a former Baylor mathematics student and current Exploration Manager for Krescent Energy Company in Houston, will speak on *"Lognormal Distributions and their Application to Exploring for Oil and Gas"*.

Jim Meyerhoff (BS '78, MS '83) of Houston, Texas, has built a distinctive career in the oil and energy industry. After graduation, Jim accepted a position as a geophysicist for Amoco Production Company and subsequently worked as Senior Geophysicist for Maxus Exploration Company, and then as Geophysicist and Rockies-Mid Continent Business Unit Manager for Noble Energy. Jim is currently a Partner and Exploration Manager for Krescent Energy Company, LLC in Houston. He has served on the Baylor Geology Advisory Board and is currently an ex-officio member of the committee.



Jim is married to Baylor alumna, Lisa (BS '78, MS '83), who received her juris doctorate from South Texas College of Law in 1990. Lisa is currently a partner with Baker & McKenzie LLP and has been named a Texas Super Lawyer in Intellectual Property Law (top 5 percent of attorneys in the state) for the past six consecutive years. She is a member of Baylor University's Women's Association of Houston.

George Andrews, AMS President, to Speak in Fourth Annual Baylor Lecture Series in Mathematics

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' public lecture is "Ramanujan and His Amazing Lost Notebook". His departmental lecture "The World of q-Orthogonal Polynomials and Bailey Chains" is scheduled for Thursday, April 15.

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 this 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.

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.

William Dunham headlines 2010 Undergraduate Lecture Series

Professor William Dunham, Truman Koehler Professor of Mathematics at Muhlenberg College, will be the lecturer in the third annual **Baylor Undergraduate Lecture Series in Mathematics**. These lectures will take place October 18-19, 2010; further information on the titles of his lectures will be made available in the coming weeks.

Professor Dunham is both a popular lecturer and prolific author on the subject of the history of mathematics. Among his best-selling books are *Euler: The Master of Us All*, *Journey Through Genius: The Great Theorems of Mathematics*, *The Mathematical Universe: An Alphabetical Journey Through the Great Proofs, Problems, and Personalities*, and *The Calculus Gallery: Masterpieces from Newton to Lebesgue*. For further information, please click on the link [Baylor Undergraduate Lecture Series in Mathematics](#).



Undergraduate Student Profile

Jake Fillman

Born October 4, 1987 the son of two teachers, I grew up in the not-so-small metropolis of Houston, Texas. Every young child has his own bizarre personality quirks, and mine was list-making. Almost as soon as I learned how to write, I began to make lists of anything and everything that could be listed, and some things that couldn't. In fact, for one of my elementary school science projects, I compiled a massive list of roughly eighty nutrients that the human body needs, together with their effects as well as the foods in which they could be found. As this was in the pre-Wikipedia era of democracy, this list was a rather laborious undertaking on my part. Alas, rather than admire my near-Puritanical work ethic, my teacher chose to lament my rather anemic creativity. Although Mom, Dad, and I didn't realize it at the time, this penchant for listing things was the first sign that I had the mathematics bug – the desire to see order, structure, patterns, and poetry where others might only see chaos and discordance.



Jake Fillman exuding the joy of mathematics

Whenever I tell people that I'm studying math, I always get one of two responses, and most of the time I get both. The first and most frequent response is a detailed description of when and where the respondent's own math education went awry, which invariably includes horror stories of dreadful teaching in a high school algebra class. This usually makes me somewhat uncomfortable, and I'm never quite sure how to reply – should I offer an apology on behalf of the mathematical community, or perhaps promise to not be a bad algebra teacher? Maybe the person I'm talking to would like to close a gap in his mathematical education and he's fishing for some free algebra lessons. Maybe the memory of high school math is so painful for the other person that I should just awkwardly change the subject (read: "So, uh, how 'bout them Cowboys?"). In any case, I spend an inordinate amount of time apologizing for studying math, which is rather odd, because I haven't done anything criminal in mathematics. Not yet, anyway.

The other most common reaction I hear is some variant of the following question: "What are you going to do with that math degree?" which has the rather ironic underlying implication that no one in his right mind would actually study something as worthless as mathematics. Of course, the absurd usefulness of mathematics in our modern world is undeniable, so I should be able to effortlessly answer this feeble inquiry with a nice long laundry list of applications of my math degree, but I never do, because it just wouldn't be completely honest. To put it simply, I became a math major because I love mathematics and I can't imagine myself doing anything else. The question of what I will do is wholly irrelevant, because math is not something I do, it is a part of who I am. The truth is, I don't really know what I'm going to do with my life, but as long as it's math-related, I'll be happy. And on the off chance that I end up teaching high school algebra, I'll make doubly sure that I'm extra-strength friendly to all of my students.

I have nothing but positive things to say about my experiences in Baylor's math department, and this praise is due entirely to the awesome people who comprise the department – the faculty, staff, and students. Baylor is truly blessed to have such a great group of people in its employ. The Baylor math faculty is just amazing, and I don't say that lightly. Each and every one of them is a credit to the university – professional, amiable, helpful, kind and respectful. They are all great teachers, and they care about their students, which creates a wonderfully unique and supportive learning environment. They are always willing to help out with homework, graduate school applications, or life in general. Thanks to them, I know that I am well-prepared for life in graduate school and beyond.

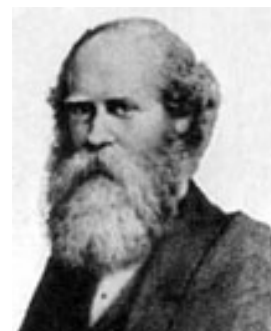
Sic 'em!

Mathematicians in History

Who was Henry John Stephen Smith?

Lance Littlejohn

Henry John Stephen Smith (1826-1883) is *now* ranked as one of the great British mathematicians of the 19th century. However, during the 19th century, his name was not well known and he was not compared with contemporary British mathematical giants George Stokes, Lord Kelvin, James Sylvester, George Boole, William Rowan Hamilton, George Green, or Arthur Cayley. A natural question to ask is.....why not? When Smith's mathematical achievements are now surveyed and taken into account, it is extraordinary to consider that Smith was, as Oxford mathematician Keith Hannabus recently labeled him, "*the mathematician the world forgot*".



Henry John Stephen Smith
(1826-1883)

Henry Smith was born in Dublin, Ireland on November 2, 1826 and the family soon thereafter moved to England. Smith entered Oxford University in 1844 after winning the top scholarship to Balliol College. In 1848, he gained first class honors in both classics and mathematics at Oxford and was named a Fellow and then a Tutor at Balliol.

In 1860, Smith was appointed Savilian Chair of Geometry at Oxford; it is noteworthy that some of his eventual successors to this position were G. H. Hardy, E. C. Titchmarsh and Sir Michael Atiyah. Moreover, Sir Edmond Halley, of Halley's Comet fame, was a predecessor to Smith in this Chair. In 1861, Smith was elected as a Fellow of the Royal Society of London (along with the physicist James Clerk Maxwell). He also served as President of the London Mathematical Society from 1874-1876.

Smith's mathematical work was extensive and bridged many diverse areas of mathematics. His earlier work, in number theory, is remarkable and shows his panoramic view of the subject; in fact, his "*Report on the Theory of Numbers*" is described as the 'most complete and elegant monument ever erected to the theory of numbers.' Smith's own work in number theory and algebra was highly regarded. For example, in 1861, Smith proved the existence and uniqueness of what is now called the Smith normal form of a matrix with integer entries. Smith's first application of this result was to determine when linear Diophantine equations have solutions, settling a longstanding problem first studied by the early Greeks.

In 1855, Smith published an ingenious new existence proof of Pierre de Fermat's famous two-squares problem; that is, he showed that any prime number p that is congruent to 1 modulo 4 can be written as the sum of two integer squares; remarkably, Smith wrote this two-page paper in Latin as an homage to his mathematical hero, Carl Friedrich Gauss. It should be noted that the first existence proof of this result was given by the great Swiss mathematician Leonhard Euler (who spent seven years working on the problem) in 1749. Interestingly, Smith's proof is quite easy to understand and seems to refute a claim made by Hardy in his "*A Mathematician's Apology*" that there is "*no proof within the comprehension of anybody but a fairly expert mathematician.*"

Smith's contributions to mathematical analysis are also outstanding...but, surprisingly, not nearly as well known. Only in recent years has Smith's work in this subject become more fully appreciated. In an 1875 paper "*On the integration of discontinuous functions*," Smith essentially constructs the middle-thirds Cantor set (some eight years *before* Cantor did!) along with the Sierpinski gasket and the Koch snowflake. In this paper, Smith also seems to have been the first mathematician to perceive the connection between measure and integral. In fact, he corrected a mistake in Georg Riemann's work on the relatively new (at the time) theory of Riemann integration; in fact, Smith showed that the scope of the Riemann integral is not quite as extensive as some had

claimed. It was unfortunate for Smith - in fact for all of mathematics - that his 1875 paper received far less attention than it rightfully deserved. The American mathematical historian, Thomas Hawkins, recently remarked that *"Probably the development of a measure-theoretic viewpoint within integration theory would have been accelerated had the contents of Smith's paper been known to mathematicians....."*

Henry Smith died on February 9, 1883. His funeral procession in Oxford was a quarter of a mile long. This display of final respect was due mostly to Smith's immense personal charm and popularity with his contemporaries. Even Smith's closest friends did not know of his mathematical achievements at the time of his death. Indeed, it now seems that a combination of his reluctance to self promote together with a serious miscalculation by mathematicians of his era led to his anonymity. Fortunately, mathematicians today are more aware of his manifold contributions to mathematics!



Keep in Touch!

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.
- Each of the 27 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 this fund, please see <http://www.baylor.edu/development/index.php?id=5350> or contact Eric_Abercrombie@baylor.edu in university development.
- 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 in university development.

Let us know what you are doing, and please share your stories with us. We always enjoy talking with old friends, and we look forward to hearing about your successes. If in the area, please come by and see us!