

Indiana University Department of  
**Mathematics**  
**Alumni Newsletter**  
 College of Arts & Sciences Alumni Association

### Chair's Corner

ELIZABETH  
HOUSWORTH



First things first: We have a great faculty. This past academic year, **Mihai Ciucu** and **Dylan Thurston** became the fourteenth and fifteenth faculty members elected as Fellows of the American Mathematical Society. **Kevin Zumbrun**, already a Fellow of the AMS, was elected Fellow of the Society for Industrial and Applied Mathematics. **Ciprian Demeter** was invited to speak at the 2018 International Congress of Mathematicians. A conference honoring the 60th birthday of **Russ Lyons** will take place at Tel Aviv University in September, and in January of 2018, a workshop at UCLA will explore methods developed by **David Fisher** who, collaborating with two post-docs at U. Chicago, made dramatic progress on the Zimmer conjecture this past year (more on both conferences under *Department News* below).

Early last April, we hosted a Sectional Meeting of the Ameri-

can Mathematical Society. It was a great success, with over 500 attendees. I was honored to introduce the 2017 Einstein Public Lecture speaker, Richard Evan Schwartz, Chancellor's Professor of Mathematics at Brown University. I got to hold up my very well-used copy of his children's book *You Can Count on Monsters*.

The department also continued its outreach with the arts by co-hosting the film *The Man Who Knew Infinity*. Special thanks go to **David Fisher** for organizing this and to **Michael Larsen**, guest speaker Elon Lindenstrauss, and Susan Seizer from Anthropology who, along with David, formed a discussion panel after the film. More on this delightful event under *Departmental News* below.

I have served for many years on the Budgetary Affairs Committee for the Bloomington Faculty Council. This past year, I was fortunate to also serve on the Campus and University committees that reviewed the Responsibility Centered Management budget model. Standard university budget models have all revenues flowing to the center. Schools within the university then request increments to their budgets from that center. Roughly speaking, RCM

gives back to each school the revenue they generate directly. Money to support shared services and the central administration is viewed as taxes or assessments on that income. Indiana University was an early adopter of RCM, and the model has been reviewed and tweaked roughly every five years since its adoption to address the institution's ever-changing needs. I am particularly proud of our report and look forward to its public release this Fall.

For the past year, I have also served on the College's Panel of Chairs which morphed into the Strategic Planning Oversight Committee. This committee took the reports and ideas generated by eight subcommittees and drafted a strategic plan for the College of Arts and Sciences. The plan was circulated in draft form to all the faculty and responses were incorporated into the final version. The resulting Plan will also be made public in the Fall. One nice feature is its recognition of the basic research done in all areas in the College. It may be unlikely that a math theorem will cure cancer in the next 5 years, but mathematics often turns out to be fundamental to new discoveries and to new technology in surprising ways. It is nice for that to be recognized.

The Strategic Plan will guide the College as it navigates past several years of fiscal contraction. The financial situation does appear to be improving: the College will do some normal hiring this year, and we are very happy to be one of the departments with an open search this coming year.

As for me, I am leaving the Budgetary Affairs Committee and the Panel of Chairs. At the University level, I am turning my attention to rules! I have been elected Parliamentarian of the Bloomington Faculty Council and will be brushing up on faculty governance documents and Roberts Rules of Order. And I will continue as Chair of the Math Department. Along with Dean Singell, the Department agreed to extend my term for 2 more years. So you should be hearing from me again next year, and from a new chair the year after that.

Finally, I want to convey my gratitude to **Peter Sternberg**, who served as Associate Chair for my first three years. He is now stepping down, and **Bruce Solomon** will take that role going forward. I thank them both for working together to produce this newsletter as part of the transition process. ⊗

## Department News

### Conference honoring Lyons' 60th

*Elegance in Probability*, a conference honoring Rudy Professor **Russell Lyons'** 60th birthday, will take place in early September at Tel Aviv University in Israel. Fields Medal-

ists Stanislav Smirnov and Wendelin Werner will give talks at the week-long conference, along with 23 other invited speakers from Princeton, Stanford, Cambridge, and other prestigious institutions around the world.



Russ Lyons

Lyons got his Ph.D. in 1983 at the University of Michigan, and joined the IU math department in 1990 after working at the University of Paris and Stanford. He has held numerous visiting positions in the interim, and makes particularly frequent visits to Microsoft Research in Seattle, where he collaborates with Yuval Peres. His many publications (100 and counting) include a recent book with Peres, *Probability on Trees and Networks*, published by Cambridge University Press (2016).

The recipient of numerous awards, fellowships, grants, and other honors, Russ is also a superb expositor of mathematics, traveling frequently and widely to speak about his work.

In 2014, Lyons became the James H. Rudy Professor of Mathematics at IU Bloomington. ⊗

### Workshop on Fisher breakthrough

In January 2018, researchers from the US and abroad will gather at

UCLA's Institute for Pure and Applied Mathematics (IPAM) for a workshop called "New Methods for Zimmer's Conjectures."



David Fisher

The methods in question were developed by IU Math professor **David Fisher**, along with U. Chicago postdocs Aaron Brown and Sebastian Hurtado, in recent breakthrough work on a decades-old conjecture by geometer (and Fisher Ph.D. advisor) Robert J. Zimmer, who now serves as President at Chicago. In 1983, Zimmer predicted that certain infinite discrete groups—"lattices" in Lie groups of real rank at least 3—can act non-trivially only on manifolds of sufficiently high dimension. He saw this as a first step toward a more ambitious program: classifying actions of higher-rank Lie groups on manifolds. The precise conjecture is easy to state, and motivated lots of activity in geometric rigidity theory since he posed it. But it resisted any truly general progress until last year, when Fisher and his collaborators were able to prove it for a major class of lattices in essentially any dimension. As of this writing, there are still "pockets of resistance" but according to Fisher, "This is way closer to the full conjecture than anything that had been done before."

Dynamicist Amie Wilkinson of U. Chicago, a member of the IPAM

board of directors, recruited Fisher to organize a workshop there. As advertised on the IPAM website, “The recent breakthrough dramatically improves the state of knowledge, and involves many novel ideas and contributions from diverse areas of mathematics.” These areas include rigidity theory, smooth dynamical systems, homogenous dynamics, measure theory, and operator algebras. The proof of a well-known conjecture is always newsworthy, but the unifying connections between these areas, as newly revealed by Fisher and his coauthors, make their work especially exciting.

Rigidity theory has, in recent years, attracted some of the best minds in geometry. Fisher is the IU math department’s resident expert in the area, working in it since the late 1990’s. He came to Bloomington in 2005 after postings at Yale and the CUNY Graduate Center in New York. He first began to tackle the Zimmer conjecture in 2001 and had worked on it intermittently since then. “The closest I came was in a paper with Lior Silberman, published in 2008,” he says, “where we made significant progress on a related conjecture of Mikhael Gromov. But while a handful of special cases of the conjecture had been known... the conjecture itself remained wide open for over 30 years.” ⊗

### Panel Discussion on the “Man Who Knew Infinity”

On a Monday evening last April, the IU Cinema, in conjunction with the departments of Mathematics, and India Studies, screened *The Man Who Knew Infinity*, a major Hollywood film devoted to the astounding life of Srinivasa Ramanujan (played by Dev Patel) and his

relationship—as student, collaborator, and ultimately friend—to G. H. Hardy (Jeremy Irons) at Cambridge in the early twentieth century. The film is based on the same-titled book by Robert Kanigel.



The story of Ramanujan is amazing but bittersweet. His seemingly superhuman talent produced notebooks full of esoteric number-theoretic identities long before he had any formal training in mathematics. Yet he reached almost all his results without leaving a clue as to how to prove them formally—leaving no way for other mathematicians to understand, much less verify them. Long efforts have, over the intervening decades, yielded proofs for most of his discoveries, but Ramanujan himself lived only 32 years. He spent his final six years at Cambridge University in England. His mentor Hardy considered his “discovery” of Ramanujan—and his fruitful collaboration with him—to be a high point of his own career.

The packed screening was introduced by IU math professor **David Fisher**, who noted how hard it is

to capture the excitement of mathematical discovery on film, given how much of it happens “behind closed eyelids.” He pointed out that the shyness common to so many mathematicians also works against the big screen. (An extroverted mathematician, Fisher joked, is one who, in conversation, looks at *your* shoes.)

Afterwards, Fisher was joined, for a panel discussion by **Michael Larsen** of the math department, Anthropology colleague Susan Seizer (an expert on both Indian culture and Drama), and notably, Fields medalist Elon Lindenstrauss of Hebrew University. Lindenstrauss was visiting the math department that week as the annual Seymour Sherman lecturer.

Larsen launched the discussion by crediting Hardy for recognizing Ramanujan’s talent. Prominent as he was in the mathematical world of his day, Larsen said, Hardy probably got scores of letters purporting to announce breakthroughs of one kind or another (proving Fermat’s last theorem, squaring the circle, or proving the twin prime conjecture, for instance. Nowadays, many of us get email spam of this type). Unlike others whom Ramanujan had contacted, however, Hardy recognized signs of genius in the young Indian’s letter.

By contrast, Lindenstrauss noted that one of the best aspects of mathematical culture is precisely its openness to good work like Ramanujan’s—when actually correct—no matter how unexpected its origin. Recent case in point: In 2013, Yitang Zhang, a hitherto unknown lecturer at University of New Hampshire sent the *Annals of Mathematics* a short paper claiming to break through on the twin prime conjecture. The journal has undoubtedly rejected hundreds of bogus manuscripts making similar



claims. But Zhang's work was recognized as correct, and quickly published.

Lindenstrauss also suggested that now, 100 years on, mathematics has perhaps bridged more of the gap between rigor and Ramanujan's intuition. Today, we may be closer to getting a rigorous glimpse of whatever it was that Ramanujan's astonishing intuition let him see. "Ramanujan would have been much happier with the current state of mathematics than he was in Hardy's time," he surmised.

Larsen agreed that mathematics has indeed gotten enormously more sophisticated since Ramanujan's time, and we can now answer questions that we couldn't even have imagined 100 years ago. Still, he pointed out, many of the simplest questions—questions "that might occur to a curious high school student" still frustrate our most advanced tools.

Anthropologist Susan Seizer found Ramanujan's history—and the movie's storytelling—heartbreaking. The portrayal of Indian culture and the villainization of Ramanujan's mother-in-law both struck her as false. On the other hand, the all-too-believable depiction of the cultural rigidity and insensitivity that Ramanujan, a vegetarian, encountered at Cambridge, felt tragic to her. As she put it, "They kept him in a freezing cold room, he ate nothing, and he died of tuberculosis."

Fisher wrapped up by cautioning the audience—particularly the students—not to succumb fully to the romantic message about mathematics that *Man Who Knew Infinity* and many other popular accounts tend to promulgate: That success in mathematics is reserved for people touched in some way by genius. It can also come to those willing to

combine far more modest gifts with persistence, determination, and hard work. Yitang Zhang's story, also the subject of a recent movie, *Counting from Infinity* makes that point quite forcefully.

Both *The Man Who Knew Infinity* and *Counting from Infinity* (which was screened at the IU Cinema in late 2015) can be purchased online. ⊗

## New Course targets students from Arts and Humanities

Every IU undergraduate must pass a Mathematical Modeling course. For students majoring in the Arts and Humanities, the standard path to meeting this requirement—by passing M118 (Finite Mathematics) or M119 (Calculus)—too often seems both difficult and onerous. Last year, aiming to make a difficult hurdle more engaging, the Math Department launched a course that fulfills the requirement while focusing on material more likely to intrigue Arts and Humanities majors. The course, M106, is called *The Mathematics of Decision and Beauty*.

Comprised of separate—and largely independent—units lasting a few weeks each, M106 introduces students to game theory, graph theory, and the mathematics of voting systems. It also features units on geometry and art, and on mathematics and music, with plans to include a unit on symmetry and groups in future versions of the course.

The rationale for M106 hinges on three goals that distinguish it from M118 and M119. First, since the unit topics don't depend on each other, the course offers students various points of re-entry in case they struggle or fall behind in grappling with the material of a given unit. M118 (and M119 even more so) build

week by week on previous concepts, so that students who hit a rough patch during the semester often find themselves unable to recover.

Secondly, M106 provides a less symbolic, more visually oriented alternative to the traditional offerings. It relies less on numerical and algebraic manipulation, emphasizing visual modeling of relationships, and critical/conceptual reasoning instead. Finally, the course is designed around topics more likely to engage Arts and Humanities majors, and to include more activity-based learning.

Two years in the making, the Mathematics of Decision and Beauty was first taught during the 2016 summer session. Two sections, limited to 25 students each, have been offered every term since then. Senior lecturer **Andrew Dabrowski**, finds the new course rewarding. "Teaching voting in the Fall of an election year was quite fun. I think many of the students had never thought critically about voting systems and how they might affect the government we get. Personally, I also enjoy teaching music. The mathematical underpinnings of math and art are intricate, and that material is usually new even to music majors." Dabrowski brought in string players to demonstrate intervals and harmonics for the unit on music and felt it worked well.

**Shabnam Kavousian**, another senior lecturer, taught a unit on graph theory during that first summer and also had a positive experience. "I had some wonderful students who were so interested in graph theory and were also creative and very good thinkers. They mostly did not consider themselves 'good in math'. In fact, most of them hated math, but they did really well in graph theory!"

Both Dabrowski and Kavousian were members of the committee that devised the course. Chaired by Pro-

fessor **Bruce Solomon**, it included Senior lecturer **Will Orrick** and Lecturer **James Hendrickson** as well.

At this point the Math Department offers one faculty-taught section and one taught by a graduate student each term. The graduate student teachers are trained by assisting faculty-taught sections before they take on a class of their own. ⊗

—Peter Sternberg

## New Faculty

The **Zorn Postdoctoral Instructorship** is a three-year research/teaching position. A slightly reduced teaching load facilitates the holder's research. Five new Zorn Postdocs are joining our faculty in fall of 2017.

**Graham White**, a student of Persi Diaconis at Stanford, looks forward to working with mentor **Russ Lyons**. He works in combinatorics, probability, Markov chains, and related areas.

**Guillem Cazassus** will be coming to us from Nantes University. His Ph.D. advisors there were Michel Boileau and Paolo Ghiggini. Guillem wrote a dissertation about instanton homology, and will be working here with Prof. **Paul Kirk**.

**Wai-kit Yeung** also got his Ph.D. in topology—from Yuri Berest at Cornell, with a dissertation entitled *Representation homology and knot contact homology*. His mentor here will be Asst. Prof. **Ajay Ramadoss**.

**Siao-Hao Guo** is coming here to work with geometric analysts **Peter Sternberg** and **Nam Le**. Siao-Hao earned the doctorate under Natasa Sesum at Rutgers, at the interface between Differential Geometry and Partial Differential Equations.

**Nicholas Miller** doesn't have to move far: He got his Ph.D. under

the tutelage of Ben McReynolds at Purdue. His interests include arithmetic, hyperbolic geometry and algebraic groups. He's planning to work here with **David Fisher**.

Four new **Visiting Faculty members** will also help us fulfill our teaching mission:

**Chris Johnson**, with a 2014 Ph.D. from Clemson, will be coming to us from Wake Forest. His research on translation surfaces overlaps the interest of several other faculty members.

Chris' wife **Christa Johnson** has been teaching at Guilford Technical Community College. She holds a Master's in Mathematics from Clemson.

**Nikolay Shcherbina** will be visiting us from Bergische Universität in Wuppertal, in Germany.

**Benjamin Texier**, a longtime collaborator of Professor (and former Chair) **Kevin Zumbrun** is returning to Bloomington as a Visitor. He's a member of the Institut de Mathématiques de Jussieu-Paris Rive Gauche, France's largest Mathematics research institute. ⊗

## Farewells

For the first time in some years, the Math Department had no retirements last May.

But we do have one farewell: Lecturer **Palanivel Manoharan** ("Mano" to us) is leaving Bloomington to take a position at Virginia Tech. Thousands of our students have benefited from Mano's skill and warmth since he first taught M118 (Finite) and M119 (Calculus) here in the fall of 2010. We wish him every success going forward. ⊗

# Graduate Program



Michael Mandell, Director of Graduate Studies

Greetings from the Graduate Studies office! We had a very successful year this year, graduating 13 new Ph.D.'s, with an additional 11 students earning MA or MAT degrees. Congratulations to all our new Doctors and Masters!

Congratulations also to all our graduate students who won awards this year (see *Awards* below), but let me highlight the two awards we give to advanced students for research excellence.

**Henry Horton** won the Outstanding Thesis Award for his thesis "A Functorial Symplectic Instanton Homology Via Traceless Character". According to Henry's advisor **Paul Kirk**, his results have earned widespread attention from the topology community, along with invitations to speak at conferences and seminars. Henry will graduate this summer and move on to a prestigious postdoctoral post at Princeton University in the fall.

**Hongmin Nie** took the William B. Wilcox Mathematics Award. Nie, according to his advisor **Kevin Pilgrim**, shows remarkable independence, initiative, and the ability to master mathematics well outside his original specialization. He is working in dynamics and is expected to complete his PhD in Spring 2018.

We had a very successful recruiting season for the 2017 entering graduate class. Twenty-six new students will embark on graduate studies here in the fall, and they come from across the US and from five foreign countries. Eight students will arrive with master's degrees. All are receiving full support and many of them will have spring semester, or even full-year fellowships. We're excited to get to know them, and we wish them all a great year. If you meet any, please remind them to study for the qualifying exams!

—*Michael Mandell*

## Undergrad Program



Jee Koh, Director of Undergrad Studies

This past year—my first as Director of Undergraduate Studies (DUS)—

presented many challenges. Fortunately I had the generous support of my colleagues and in particular, from my predecessor Kevin Pilgrim. Among my many new responsibilities, the most enjoyable was getting to know our amazing majors. Here are a few of their most notable achievements:

- For the third year running, one of our majors earned a **Goldwater Scholarship**—one of only two on campus. **Baptiste Dejean** is earning double degrees in math: a Bachelor of Science and a Master of Science. Though only a sophomore, he has already performed extremely well in some of our advanced graduate courses!

- Our majors earned awards from the College of Arts and Sciences too. **Baptiste Dejean** and **Noah Schlossberg** (math and physics major) were among three students earning the 2017 Marshal H. Wrubel award, administered by the Department of Astronomy. Sixteen math majors were elected to Phi Beta Kappa.

- Sophomore **Baptiste Dejean** and senior teammates **Andrew Vander Werf** and **Ben Briggs** placed 52nd in the 2016 national Putnam Competition. Locally, IUB was once again victorious in the Indiana College Math Competition. We fielded two teams: earning 1st place was the team of **Baptiste Dejean**, **Andrew Henderson**, and **Benjamin Briggs**. First-time competitors **Leigha Amick**, **Nanjie Chen**, and **Anthony Coniglio** also made a strong showing, finishing in the top half of 30-team field.

- Several graduating seniors are going on to pursue Ph.D. studies in math: **Taylor Ball** is headed to Notre Dame, **Rebekah Eichberg** to the University of Utah, **Samuel Pilgrim** to the University of Hawaii, and **Andrew Vander Werf** to Ohio State

University. **Michael Peters** will pursue a physics doctorate at MIT and **Grant Schumacher** will do so at Yale. **Benjamin Briggs** plans to pursue a Ph.D. in mathematics, but will first take a year to study Mandarin Chinese at National Taiwan University.

We send them all off with pride and best wishes. ☒

—*Jee Koh*

## Careers



Kevin Pilgrim, Alumni & Career Liaison

### Alumni Giving Back

Three distinguished alumni visited us this past year to support our current students in generous ways.

**Anne Koehler** (B.A. 1962, M.A. 1963, Ph.D. 1968) returned in September to meet with faculty and students. Among the latter was the fall 2016 Koehler Scholar **Catherine Blankensop**. We're very grateful to Anne; she recently expanded her endowment for undergraduate renewable scholarships. In fall 2017, the Donald Koehler Scholarship is going to incoming freshmen **Alex Kokot** and **Gavin Whelan**, both from Indiana. The Anne Koehler Scholarship goes to **Amanda Suleski** from Massachusetts. All three stood out for

their enthusiasm for math and music. Anne also has our profound appreciation for her ongoing support of math majors on Careers field trips (see below).

In October, **Mark Johnson** (BS & MA in Computer Science and Math, 1993) visited us through the College's Luminaries Program. Mark served as student manager of our basketball team and went on to earn a Ph.D. in applied math. He now consults around the world on issues related to data science. During his visit he shared his experiences with a diverse audience of students from around the College, and with our Math Club, where he discussed his pioneering of analytical methods in baseball.

**John Brown** (BS English & Math 2012), now works as a Business Technology Analyst at Deloitte in Chicago. He returned for his third visit as an alum this past April. John also spoke both to a group of diverse College students and to our Math Club, where we learned about machine learning and neural network simulation. There's a neural network "sandbox" online that he used for demonstration purposes; Check it out at <http://playground.tensorflow.org/>.

## Extracurricular Math

Our student-led active Actuary Club continues to assist students preparing for careers in the actuary profession. Supported again by faculty member **Russ Lyons**, the Club was led this past year by **Alexander Dewhirst**. In the Fall, it hosted returning alumnus and past Club president—and now Senior Actuarial Assistant—**Bradley Hipsher** during the AllState Insurance company's IUB recruiting visit. In 2017–18, the

Club will be led by **Chase Abram**. Chase will work with our faculty to increase the Club's visibility on campus, and to continue supporting student preparation in this ever more competitive field.

A new interdisciplinary initiative, led by Math and Informatics faculty member **Esfandiar Haghverdi**, supported a team of 5 students from Economics, Math, Finance, and Informatics in developing algorithms for trading commodities. Their academic foundation was also supported by Esfan's instruction in the Math-M 451 Mathematical Finance course—and his leadership in weekly evening training sessions throughout the fall term. The team headed to Chicago in January 2016 to compete against four other experienced teams (some consisting entirely of grad students) in their first Algorithm Showcase contest, sponsored by Chicago firm Trading Technologies. Our team's hard work earned them an award for best risk-adjusted return. They also competed at the University of Chicago in a related contest in Spring 2017.

Last September, math majors **Andrew Maben** and **Xi Qian** '17 joined Economics Chair **Gerhard Glomm** and I to meet IU's Walter Career Center staff for a field trip to St. Louis. The busy schedule included visits to Procter and Gamble headquarters, lunch with two young women from Venture for America, and a panel discussion (with tour) at the new office building of retail analytics firm 84.51°. Math alumna **Pam Matsko** '87, a Senior Accountant at Carew Realty, hosted us for a visit to the top of Carew Tower, where we had a magnificent view of the Ohio river and the historic bridge. It was a great trip; we look forward visiting St. Louis again in September '17!

Happily, we're now hearing more

and more often from our graduates about their jobs, internships, and future programs of study, thanks to new initiatives that help keep us in touch. Between 2012 and 2015, at least 40 of our graduates have gone on to doctoral programs, with at least 45 going to Masters' programs. Noteworthy among the latter is international student **Xiaohan Xu** '16, currently completing an Economics and Education Masters program at Columbia University, with financial support. New graduates have headed to companies from the large and distant (GM, Amazon) to the small and local (Bloomington-based Hanapin Marketing and Megaputer). Among their job titles, "Analyst" and related titles seem to be common. Need advice on buying Google ads? Hanapin's Digital Marketing Production Associate **Brett Schrank** BS '14 MA '16 can help. Companies like Epic and Qualtrics (healthcare and survey IT) and financial firms continue to find great value in our graduates and their skillsets.

I look forward to continued collaboration with alumni, recruiters, faculty, advisors, and IU's Walter Center for Career Achievement. Our goal is simple: to help students find the "sweet spot" where their passion and technical skills meet. ⊗

—Kevin Pilgrim

## Bookshelf

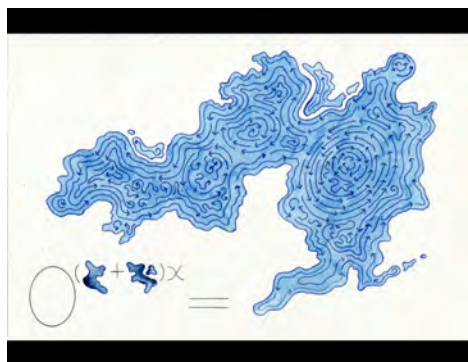
### Zero Space Omega

Mathematics enjoys a unique position straddling science and art. Its grounding in precisely articulated definitions and axioms somehow offers a freedom to create new



objects and engage old concepts in completely new—and sometimes surprising—ways. **Erica Isaacson**, a highly popular Lecturer in the Math Department, devotes much of her free time to exploring this interplay

Recently Isaacson found herself embarking on a literary and artistic journey inspired by her love of mathematics. The result is an extraordinary picture book, **Zero Space Omega**, that is thought-provoking, visually gorgeous, and honestly a bit mind-blowing.



Isaacson grew up in Bloomington and graduated from I.U. with an undergraduate degree in math. She went on to complete a math Ph.D. at UC Berkeley. Recently, she began the year-long project that produced **Zero Space Omega**, writing and illustrating a story that taps into the mystery and excitement of mathematical discovery itself.

Though difficult to summarize, Isaacson’s book has the feel of a fever dream involving the journey of the author into a strange place “hidden inside the number zero.” The text describing this surreal trek is enhanced by spectacular illustrations like the one above, that Isaacson created using pencil, ink and watercolor. Her images involve mathematical symbols stunningly integrated into scenery featuring plants, sky and bodies of water. “Although they are imaginary, there is a fair amount of structure to the formulas and equations in the pictures,” she

said.

At this point, **Zero Space Omega** can only be viewed online (<https://zso2017.wordpress.com/2017/01/09/download-zero-space-omega-here/>) but Isaacson is submitting the book to publishers in hopes of seeing it materialize in physical space too.

With the fall 2017 term, Isaacson will return to teaching IU undergrads. She started her lecturing career at IU back in 2012 as an adjunct, stepping into a full-time lecturer position here two years later.

What lies ahead for her on the creative front? “I am working on a number of small projects about mathematics, art and the occult,” she said, “which I hope to start posting soon—on the same website as *Zero Space Omega*.”

We personally can’t wait to see what she comes up with next. ⊗

—Peter Sternberg

## Awards

### Undergraduates

We currently have close to 300 math majors, of whom roughly 100 graduate each year.

Among the undergraduates winning academic awards and scholarships at this year’s award ceremony on April 28, were 2 first-year students:



Thomas Sweeney and Jacquelyn Parkes

- Thelma Abell Prize: **Jacquelyn Parkes**
- Jeffrey and Deborah King Scholarship in Mathematics: **Thomas Sweeney**

Six second-year students:



Embry, DeJean, Lowry, Coniglio, and Abram

- Cora B. Hennel Memorial Scholarship: **Chase Abram, Anthony Coniglio, and Nathaniel Lowry**
- Marie S. Wilcox Scholarship: **Baptiste Dejean, Alexandra Embry and Hannah Sakaluk**

Ten third-year students:



Chen, Miller, Wenning, Henderson, Schiefer, Moorhead, and Hu

- Thelma Abell Prize: **Jonathan Hu, Trenton Moorhead, and Mary Presto**
- Ruth E. Gilliatt Memorial Scholarship: **Leah Schiefer**



- Cora B. Hennel Memorial Scholarship: **Andrew Henderson** and **Derek Wenning**
- Juma Shabani Book Fellowship: **Doryan Miller**
- Marie S. Wilcox Scholarship: **Nanjie Chen**, **Chuhan Jie**, and **Xinlu Zhang**

Ten fourth-year students:



Eichberg, Peters, Ball, Vander Werf, Briggs, Pilgrim, and Stitsworth.

- Thelma Abell Prize: **Karoline Stitsworth**
- Ciprian Foias Prize: **Samuel Pilgrim**
- Ruth E. Gilliatt Memorial Scholarship: **Mary Smart**
- Trula Sidwell Hardy Scholarship: **Ben Briggs**
- Cora B. Hennel Memorial Scholarship: **Grant Schumacher** and **Andrew Vander Werf**
- Jeffrey and Deborah King Scholarship in Mathematics: **Taylor Ball**, **Michael Peters**, and **Samuel Pilgrim**
- Rainard Benton Robbins Prize: **Taylor Ball**
- Marie S. Wilcox Scholarship: **Rebekah Eichberg** and **Jennifer Huang**

Last but not least: **Andrew Henderson**, **Braden Palmore**, and **Kaileigh Pieroth** won the M118 Undergraduate Intern Award.



Pieroth and Henderson.

## Graduate Students

- Hazel King Thompson Fellowship: **Dami Lee**, **Anuj Kumar**, **Dimitrios Sakellariou**, **Dylan Spence**, **Truong Vu**, and **Andres Zuñiga**
- College of Arts and Sciences Fellowship: **Sanjana Argarwal**, **Gökçen Büyükbaş Çakar**, **Seok Hyun Byun**, **Adnan Cihan Çakar**, **Yaqing Hu**, **Homin Lee**, **Ian Montague**, **Ryan Stees**, **Siyuan Tang**, **Krutika Tawri**, **Jonathan Wood**, **Daodao Yang**, **Alfed Yerger**, and **Ramazan Yol**
- Robert E. Weber Memorial Award: **Homin Lee**
- James P. Williams Memorial Award: **Seok Hyun Byun**, **Anuj Kumar**, **Homin Lee**, and **Siyuan Tang**
- Muriel Adams Stahl Graduate Fellowship: **Sanjana Agarwal**
- Robert K. Meyer Graduate Fellowship in Mathematics: **Robert Rose**

- Rothrock Summer Fellowship: **Seth Lehman**
- Rothrock Teaching Awards: **Patrick Haggerty**, **Steven Husung**, **WonTae Hwang**, **Emily Rudman**, **David Sprunger**, **Brady Thompson**, and **Ryan Vitale**
- William B. Wilcox Mathematics Award: **Hongming Nie**
- Glenn Schober Memorial Travel Award: **Alper Gur**, **Aranya Lahiri**, **Xuqiang Qin**, **Edward Timko**, and **Zhao Yang**
- Educational Opportunity Fellowship: **Brady Thompson**
- College of Arts and Sciences Travel Award: **Wai Kit Lam** and **Zhao Yang**
- Outstanding Thesis Award: **Henry Horton**

## Faculty Awards

- The Rothrock Mathematics Faculty Teaching Award went to Prof. **Christopher Connell**.
- The IU Trustee's Teaching Award went to Professors **Michael Jolly** and **Paul Kirk**, and to Senior Lecturer **Stephen McKinley**.



Connell, Jolly and McKinley

# In Memoriam

## Grahame Bennett



Grahame Bennett

Born in Gateshead, England on January 23, 1945, Grahame Bennett received his Bachelor of Science from the University of Newcastle in 1966. He then went to the University of Cambridge, earning his Ph.D. under D.H.J. Garling in 1970.

He spent the 1969–70 academic year at Lehigh University, at the invitation of Albert (Tommy) Wilansky. There, Tommy told Grahame about twelve problems he was currently trying to solve. Grahame solved all twelve!

Grahame came to IU in the fall of 1970 as a Research Assistant Professor. He was promoted to Associate Professor in 1975, and to Professor in 1979.

He held a Sloan Fellowship in 1977–79, and NSF grants from 1972–1997. In 1979 he was one of just two people in the country with an NSF grant in classical analysis.

From the late 70's through the early 80's, his wife pursued a degree in pharmacy at Purdue. Grahame took care of their three chil-

dren. He had few publications during this period, but continued to read, discuss mathematics, and attend departmental colloquia and seminars.

His early research focused on Banach spaces, especially sequence spaces, and properties of their morphisms. When he resumed his research he turned to the study of inequalities, proving several deep and beautiful results, and solving a long-standing conjecture of Littlewood.

Grahame published over 60 papers, all of high quality. We quote a referee of one of his research proposals: "When I was a graduate student, my professor was fond of saying that a particular theorem was O.K., but it would not set the Thames on fire. The mathematics that Grahame describes in this proposal might set the Thames on fire."

Grahame's wrote and spoke with clarity, wit, and humor. He gave invited talks around the US, and at many international conferences, including a 1975 conference in honor of Littlewood, the 1987 Polya Conference in Birmingham, England, and in 2003, the plenary address in Poznan, Poland honoring the Centennial of Orlicz.

A fine teacher at IU, Grahame received a Teaching Excellence Recognition Award in 1997. He taught a wide variety of courses at all levels, and produced two Ph.D. students. Grahame was also among the first in our department to use computation in his research, as a method to "look for the answer in the back of the book".

Grahame also did his share of departmental service, and played a key role in starting the now large and successful Advanced College Program (ACP). This program links high schools and IU with a strong, rigorous program for dual credit. The program started with the two pub-

lic high schools in Bloomington and with two departments at IU (Chemistry and Mathematics). Grahame was the key contact person for the Math Department; he helped get the program off to a strong start and to expand its math component to many high schools around the state.

Grahame continued his research after retirement, right up until his heart attack. After an extended time in a rehab facility, he died on December 16, 2016. ⊗

— *Hari Bercovici, Dan Maki, and Billy Rhoades*

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—*Bruce Solomon*

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