

Chair's Corner

Kevin Pilgrim



Some thirty years ago, my fiance Jane and I were in Brazil Indiana an hour west of Bloomington getting ready for our IU graduation ceremony. It was snowing. "Yes," said the person on the telephone, "oh yes, commencement will be in the Stadium." Naturally, when we reached the campus, we learned that plans had changed, and we waited around all morning until our half of the festivities took place in Assembly Hall. "Life is change," says a small sign on my wall. Indeed it is.

In January 1986, I was a freshman in Professor Chuck Livingston's Honors Linear Algebra course, and I fell in love—twice. Once with Jane, and once with Math. Now, after 6400 miles' worth of moving, two kids, and 40 research papers, I find myself chair of the department that launched my career.

As a teenager I did a bit of whitewater canoeing. The moment before plunging into whitewater is both exciting and terrifying. As I approached the beginning of my term on July 1, I experienced vaguely similar feelings. There's now a crucial difference though: I have lots of support. In my 18 years here at IU as a faculty member, I have come to appreciate just how amazing our faculty, staff, and students are. By any measure (no pun intended), whether it deals with research, teaching, or service, we excel—as will be amply seen in the pages of this newsletter.

We excel by making strategic investments in people and by finding elegant solutions to complex problems. To use a basketball analogy, our bench is very, very deep; there are lots of colleagues to whom I have turned, and can continue to turn, for support in my new role as Chair. As we prepare to celebrate IU's 200th anniversary in January 2020, I'm confident we have what it will take to tackle the inevitable changes and challenges that IU's third century will bring.

Thanks to the skillful stewardship of our predecessors, we are wellpositioned for that. I especially thank our outgoing Chair, Elizabeth Housworth, for her selfless, creative, and energetic leadership—not to mention her infinite patience in answering my uncountably many questions over the last several months. I thank our Accounting Associate, Jamie Chapman for 30 years of excellent service to our campus and department, and I wish Jamie the best in her well-deserved retirement. Our current Director of Graduate Studies, Michael Mandell, and our Associate Chair Bruce Solomon, both complete their administrative terms this summer. I thank them both for carrying out that service so ably, and I am grateful to colleagues Matthias Strauch and Chris Judge for stepping up to succeed Michael and Bruce respectively in those roles.

Last but not least, I thank Professor Chuck Livingston (see the article on Chuck's retirement below) for lighting the spark, 33 years ago, that kindled my passion for mathematics. \otimes

Parting Thoughts

Elizabeth Housworth



Last year, I wrote here about some of the things I expected to miss after stepping down: big things like promoting my colleagues, and littler ones like having a master key to the department. This note is a brief farewell-to-being-chair message.

I am grateful to all our faculty and staff for being so wonderful to work with and so helpful during my term as chair. I also want to wish Kevin Pilgrim the very best as he assumes his new leadership role in the department. Kevin and I have been meeting weekly ever since his election, aiming to make the transition as smooth as possible for everyone.

I did not get to rest when my term as Chair ended on June 30. To the contrary, I was in the middle of teaching our first Online Finite Mathematics course, a course I designed during the Spring semester. Sometimes it seemed harder than being Chair! IU's online learning management system, Canvas, has a slew of features that can make it challenging for faculty to wield well. Many of these features make it nearly ideal, however, for online instruction.

Designing the course was interesting and made me think about how we teach and how students learn mathematics. Recently, a pro football player who became an MIT Math PhD wrote an article suggesting his early math teachers should use more of a "coaching" style when teaching math. The online course I have designed tries to do that. Maybe in next year's newsletter, I can tell you how it went!



A mathematician's career impact has usually become fairly clear by the time he or she turns 60. When that impact is truly far-reaching and widely recognized, colleagues and students traditionally organize a celebratory 60th birthday conference.

As our readers may recall, professor **Russ Lyons** was feted that way with a 60th birthday conference called *The Elegance of Probability* at Tel Aviv University in late 2017.

By the time you read this, two more of our faculty members—professors **Peter Sternberg** and **Kevin Zumbrun** will have enjoyed the same honor. They have, incidentally, worked with each other on five papers during their many combined decades at IU.

Peter Sternberg 60th Conference at the Fields Institute

Professor Peter Sternberg turns 60 in October of this year. Peter earned his Ph.D. from NYU's Courant Institute in 1986, and joined our faculty two years later after a postdoctoral stint at Stanford. Using a combination of techniques from geometry and differential equations, he has deepened our understanding of a wide range of variational optimization problems. Often collaborating with other mathematicians from around the world and with his own graduate students (he has fourteen Ph.D. descendants and likely more to come) he now looks back at a truly substantial record of discovery and progress. His research has been supported by grants from the NSF and Simons Foundation, and in 2013, he was named a member of the inaugural class of AMS Fellows.

Sternberg's energetic research program hasn't stopped him from serving our department generously too. He was our Director of Graduate Studies in the late 1990's, and then held the post of managing editor of the highly respected IU Math Journal for five years in the early 2000's. From 2014–2017, he served as Associate Chair of the department. An excellent teacher at all levels, he won the department's highest faculty teaching honor, the Rothrock Award, in 2000.



Peter Sternberg

While Sternberg shows no sign of slowing down going forward, his 30+ years of impressive past accomplishment—and his impending 60th birthday—inspired his collaborators and students to organize a conference in his honor. The event, a workshop called New Trends in Variational Models: From Superconductors to Liquid Crustals, was held at Canada's Fields Institute at the University of Toronto. Well-equipped for lectures and interaction, the Fields Institute also forms a natural location because Sternberg has coworkers in several Canadian cities.

The workshop aimed to chart current mathematical challenges in the variational analysis of problems from materials science, and physical and biological systems, and to spark in-depth discussions on possible routes towards overcoming those challenges.

More than 20 invited speakers came from the Americas, France, Ger-

many, Greece, Israel, Italy, and Japan, including several of Sternberg's former Ph.D. students, along with his own doctoral advisor, Robert Kohn of NYU.

Asked to comment before the event, Sternberg said he anticipated it eagerly, though perhaps with a bit of wistfulness: I'm certainly looking forward to spending a week with many of my favorite mathematicians and former students. These include friends going all the way back to graduate school. I do have some ambivalence about turning 60, though. I've been to a number of these 60th birthday conferences and honestly it feels shocking to me that now that number has come up for me!

For more details, visit the conference website:

https://tinyurl.com/y5h5u6ll

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Kevin Zumbrun 60th Conference at the Poincaré Institute in Paris

Professor **Kevin Zumbrun** and his career were likewise recognized with a 60th birthday conference in early July. Called *Stability of Nonlinear waves: Analysis and Computation* the event took place at the Institut Henri Poincaré in Paris, France.

Zumbrun came to Bloomington in 1992 after post-doc positions at SUNY Stony Brook and Stanford. He, like Sternberg, got his Ph.D. at the Courant Institute. That was in 1990, and in the 29 years since, few mathematicians anywhere have been as productive.

MathSciNet currently credits Zumbrun with more than 170 publications involving some 65 different collaborators, including many of his

own Ph.D. students, along with IU colleagues **David Hoff**, **Russ Lyons**, **Peter Sternberg**, and the late **Bill Ziemer**. Though he works mostly in partial differential equations, where his work on nonlinear stability of large-amplitude shock waves has produced a celebrated series of breakthroughs, he has also ventured into related fields, statistical mechanics and computer science among them.



Kevin Zumbrun

Zumbrun has mentored 16 doctoral students through to completion, all at IU, and many of them now have impressive careers of their own. At least two have now given him Ph.D. grandchildren. His latest student, **Zhao Yang** won a Dissertation Year Fellowship in 2018 (see last year's Newsletter) and this year, Yang won our department's Outstanding Dissertation award.

Our 2018 newsletter featured yet another Zumbrun student, Toan Nguyen (2009), who won the prestigious AMS Centennial Fellowship in 2018–19. Nguyen is now an Associate Professor at Penn State.

In the midst of all this, Zumbrun somehow found it possible to serve very ably as Director of Graduate Studies (2006–2008) and then Department Chair (2009–2014). Having attained the rank of Professor already in 1999, he was given the title of Distinguished Professor in 2015.

The Paris conference honoring Zumbrun's 60th birthday was organized by former students and post-docs. The Institut Henri Poincaré, where it will be held, is familiar ground for Zumbrun: He has visited there many times, and in 2015, he spent four months there as a *Chaire d'Excellence*, giving a mini-course on shock waves and related topics.

Asked about his feelings in advance of the conference, Zumbrun said "I am really touched and excited. The speaker list is fantastic, from both personal and mathematical standpoints. Above all, I look forward to reconnecting with old friends, a number of whom I haven't seen for a good while.

"One of the really pleasant surprises in my mathematical career has been the extent to which personal contact and friendship play a role. While I take pride in theorems proved, I also cherish fond memories of many collaborations, with their absorbing stories of joint investigation, false trails, breakthroughs small and big, and with luck, success, often in much different form than originally planned. These experiences have been the most rich and rewarding part of my 30 years in mathematics—and not just for me, but for my whole family as well."

The Zumbrun conference website can be found at

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Zorn Postdoc Andrea Giorgini wins Cuozzo Prize

Andrea Giorgini joined our department in last fall (2018) as a Zorn Postdoctoral Fellow to work with Professor **Roger Temam**. He soon learned that he had won Italy's Cuozzo Prize. Established in memory of Michele Cuozzo, the prize recognizes the best Italian math Ph.D. thesis of the year. The recipient receives a monetary prize, and an invitation to lecture at the Università Tor Vergata in Rome.



Andrea Giorgini

Giorgini, delighted and honored to get the news, traveled to Rome in October to give the invited lecture, and got to meet the Cuozzo family in Rome when he accepted the prize.

Giorgini's Ph.D. dissertation, on the mathematical analysis of Diffuse Interface models in Fluid Mechanics, describes the evolution of two globally immiscible, incompressible and viscous fluids. The complicated systems of partial differential equations he had to analyze shows up in other applications with binary fluid mixtures as well.

When asked about the prize, Giorgini was quick to express gratitude to his advisor, Maurizio Grasselli at Politecnico di Milano. As for his first year at IU, Giorgini said he had a wonderful welcome from professor **Roger Temam**, along with the rest of the PDE group here. He also had warm words for the staff, the overall atmosphere, and our daily 3:30pm tea break, which helped him to make new friends and become part of our departmental "family" soon after arriving.

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Puri, 90, joins Presidents Circle

Emeritus professor **Madan Puri** celebrated his 90th birthday this spring—but not before adding to the long list of honors he has accumulated during a long and extremely productive career.



Madan Puri

IU President Michael McRobbie, at a luncheon he hosted last year, inducted Puri into the Presidents Circle, the select group of donors who have shown exceptional generosity to IU over the course of their lifetimes. McRobbie personally presented Puri with a medal struck using metal from the original bells from the IU Student Building's old carrilon.

Puri's record of professional achievement is at least as exceptional as his generosity, however.

He was a full professor here from 1968 until he retired in 2003. That year, his 3-volume *Selected Collected Works* was published. Recognizing that a scholar's collected works almost never gets published during their lifetime, Kumble Subbaswamy, then Dean of the College of Arts and Sciences, created the title "Distinguished Research Scholar" for Puri in 2004.

One of the world's most prolific researchers in statistical theory, Puri has been honored by universities around the world. He is an elected fellow of the Royal Statistical Society, the Institute of Mathematical Statistics and the American Statistical Association. He is an elected member of the International Statistical Institute and the New York Academy of Sciences, and he is an Honorary Fellow of the International Indian Statistical Society. Twice, Puri has received the Senior U.S. Scientist Award from the Alexander von Humboldt Foundation in Germany.

In 2008 Puri received the American Statistical Associations' prestigious Gottfried E. Noether Senior Scholar Award, and in 2014, the same organization awarded him their Samuel S. Wilks Award.

Professor Puri has filled 90 years with exceptional discovery and generosity. We wish him many more years in which to take pride in the enormous contributions he has made to his field and our department.

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New Faculty

Our department maintains its research vitality thanks in part to the excellent Zorn Postdoctoral Fellows we have been fortunate enough to recruit early in their careers. Our good fortune on that score continued this year with the hiring of six new Zorns.

The Zorn Postdoctoral Fellowship is a 3-year position targeted at mathematicians no more than 2 or 3 years into their careers. Not everyone we hire stays for the full 3-year term, so the number of openings varies year to year, but we had five such positions to fill this year, and we're very pleased with the talent we were able to recruit:

- Colleen Delaney recently got her Ph.D. at UC Santa Barbara under former IU Math Professor Zhengan Wang. Though she took her Bachelor's degree in Physics (at Caltech) she now works in topological quantum computation, and will be mentored at IU by professors Noah Snyder and Julia Plavnik.
- Victoria Noquez got her 2017 Ph.D. at the University of Chicago, and then spent two years as a visiting assistant professor at Harvey Mudd. She works in Continuous Logic and Model Theory. Professor Larry Moss will mentor her here. Victoria loves animals—she volunteered at the Shedd Aquarium during her graduate studies—and card tricks.
- Ali Pakzad spent the last academic year as a visiting assistant professor at U.C. Riverside. A 2018 U. Pittsburgh Ph.D, he uses computational fluid dynamics and numerical analysis to analyze large eddies in turbulent flows—models of hurricanes and tornados, for instance. He will work here with professor Mike Jolly.
- Jane Wang earned her Ph.D. this year at M.I.T., under Fields medalist Curt McMullen (who advised both our current chair, Kevin Pilgrim, and Professor Matt Bainbridge too). She studies dynamics on moduli space, Teichmuller geometry, and translation surfaces. She will work here with

Bainbridge and professor **Chris** Judge.

Jane's husband **Matthew Bates** will also be joining our faculty—as a visiting lecturer (see below).

- Angela Wu, a recent Ph.D. from UCLA, works in the interface between complex dynamics and geometric analysis, which often requires analysis of fractals. Angela grew up in Hong Kong, and after her time in LA, looks forward to the distinct seasons and natural environment of Bloomington. Mentored at UCLA by Professors Mario Bonk and John Garnett, she comes to IU to work with professor Kevin Pilgrim.
- Zane Li a 2019 Ph.D. student of Fields medalist Terence Tao (UCLA), will come here to work with Professor Ciprian Demeter. Zane will have full support this academic year as an NSF Postdoctoral Fellow. He works in harmonic analysis and its connections to analytic number theory and dispersive PDE's.

In addition to our new postdocs, two new lecturers will be boosting our undergraduate teaching mission this fall.

• Matthew Bates will take charge of building out and coordinating *The Mathematics of Decision and Beauty* (M106), a math modeling course we introduced in 2016. A new Ph.D. from U. Mass. Amherst, Bates has taught underprivileged middleschool students in the UK, highschoolers in Tanzania, gifted students at summer programs in the US, and college students at U. Mass. As mentioned above, Bates is married to incoming Zorn postdoc Jane Wang.

• Matthew O'Dell will come aboard as Director of our Math Learning Center, taking over from our excellent current director, Chris Parks (who will stay on as our Scheduling Officer). O'Dell has a 2017 Ph.D. from U.C. Riverside and a passion for teaching that he discovered at the math learning center at U. Idaho, where he got his Bachelor's degree. Matthew comes with a special interest in helping first generation college students (like himself) succeed.

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Visual Math

Inspired by Inference

During the Spring semester, the National Science Foundation held a contest. They chellenged anyone doing NSF-supported work in mathematics to submit a 3-minute video making their work exciting and accessible to a broad audience. The *We Are Mathematics Video Competition* aimed to bring math to life and break down barriers for those who might not otherwise understand what it means to do mathematics research.

Professor Larry Moss, a member of our department, had never made a video before, but thought it would be fun to try. He hoped to raise public awareness about applications of logic to linguistics and artificial intelligence, and to show that that it can lead to humanly interesting applications. Moss also felt that, since he could explain his work with virtually no symbols, he could make a strong showing in the contest—especially with original artwork. Tapping artist Jeffrey Fine for assistance with the latter, and his wife Madi Hirschland for help with narration, he created a video called *Math Inspired by In-ference*, and took home honorable mention. You can see his video (and those of all other semifinalists) at https://tinyurl.com/y5xnj8nr.



Professor Larry Moss

Though he knew nothing about making videos when he started, Moss says he "simply opened iMovie and then watched some youTube videos about how to use it." He learned by doing, called the experience "a blast," and says he would be happy to help show colleagues how to use video art to communicate their own research. \otimes

Math meets Origami

Artist Jiangmei Wu is an assistant professor at IUB's Eskenazi School of Art, Architecture and Design. Wu's art is inspired by origami, and she creates visually beautiful, foldable polyhedral structures. In 2018, these structures led her to ask some questions she wasn't equipped to answer. Thinking mathematics might help, she brought her questions to professor **Matthias Weber** of the math department.

Weber had explored similar periodic spatial structures in the mathematically venerable context of minimal surfaces. He turned out to be exactly the right collaborator for her, and their collaboration quickly bore fruit—both artistic and mathematical.

Mathematically, their work produced a joint paper, Biplanar foldings, that describes and analyzes a method for constructing bifoldable polyhedral complexes—polyhedral complexes that collapse very naturally into planes in two very different ways. They speculate that the technique could have implications in the design and fabrication of smart meta-materials, air or hydraulic filtration systems, robots, large-scale inflatable structures, and breathable architectural skins. Their beautifully illustrated preprint can be viewed on the ArXiv at https://tinyurl.com/y5zy2xzd

Meanwhile, Wu has based some striking art on their discoveries. Her blog exhibits some stunning photos and visualizations of two examples (called *Butterfly* and *Dos Equis*) at https://tinyurl.com/y2ztppqs.

She also proposed a public art project based in part on her joint work with Weber. Called *Orix*, Wu's proposal was one of five finalists though not ultimately the winner that city officials considered for a large installation at the new Gateway Plaza in Bloomington's Trades District.



The Orix proposal

Weber has long produced beautiful images of his own geometric mental world, by the way, especially in the context of his main research, which focuses on minimal surfaces. Some of his work will be featured at the annual fundraiser for Bloomington's *Wonderlab* in September; see https://tinyurl.com/y5y2u3mq.

The opportunity to collaborate with a colleague from the Art School was completely unexpected, however, and, according to Weber, great fun.

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Graduate Program

As our Chair noted above (page 1) our Director of Graduate Studies for the past few years, Prof. **Mike Mandell**, has completed his term. One of Mandell's last DGS memos to our faculty reported another good recruiting year, and thanked the many faculty, staff, and grad students who interacted with prospective students during their recruiting visits to Rawles Hall.

The incoming class of 23 will include 12 from the US, 4 from China, 3 from India, and individual students from Colombia, Taiwan, and Turkey.

Last academic year, our department signed off on 29 new graduate degrees, 15 of them doctoral.

Meanwhile, we were delighted to see 5th year grad student **Didac Martinez-Granado** win a Dissertation Year Research Fellowship from the College of Arts and Sciences. Currently studying with professor **Dylan Thurston**, Martinez-Granado received his dual Math/Physics Bachelor's degree in Barcelona, and got an MSc degree in 2014 from Cambridge University. The fellowship will relieve him of teaching duties during the 2019–20 academic year so he can focus fully on completing his PhD thesis.

Martinez-Granado was also one of this year's Lab of Geometry mentors (see below).

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Undergrad **Program**



Avelet Lindenstrauss, Director of Undergrad Studies

The most important innovation in the undergraduate program in 2018– 19 was the introduction of the Laboratory of Geometry in the Spring 2019 semester. Led by Professor Dylan Thurston, Zorn Postdoc Nick Miller, and graduate students Didac Martines-Granado and Maxime **Scott**, this is a program that aims to get teams of students to understand a geometric concept deeply enough that they are able to program a computer to produce meaningful images of it. Those images then enable the students or other mathematicians to

gain further insights into the concept.



Hopf fibration, as 3D printed by our Lab of Geometry team

In Spring 2019, undergraduates T. Britt, Jeff Coulter, and Phuong Dong Le worked on creating a 3Dprint of the Hopf fibration, which is a way of viewing the three-dimensional sphere as a twisted collection of circles indexed by a two-dimensional sphere. To read more about the visit Laboratory of Geometry, https://sites.google.com/view/ laboratory-of-geometry-iub/home

The Laboratory of Geometry joins the Directed Reading Program as another way for math majors to go beyond the standard curriculum and get a taste of mathematical research and more advanced topics.

In the summer, of course, Indiana University continues to hold its Research Experiences for Undergraduates Program, supported by the NSF and run by Professor Chris Connell, for excellent undergraduates from the entire country. Our undergraduates have benefitted from the REU programs both here and in other institutions.

It has been a good year for our undergraduates in terms of external ates competing for IU in math com-

honors: fourteen of them were inducted into Phi Beta Kappa. Graduating senior Anthony Coniglio was one of 16 Churchill Scholars chosen from across the US to complete a nine-month master's degree in mathematics at the University of Cambridge. Jenny Huang, who got her BS in mathematics as well as a BA in social and cultural analysis from IU last year was announced this year as one of the 32 Rhodes Scholars chosen from across the US to study at Oxford University. Junior Julian Gass, who is also a physics major, is one of the 2019-2020 Goldwater Scholars.



Lab of Geometry. Standing, Le, Britt and Coulter (undergrads), and grad assistant M. Scott. Seated, Postdoc Nick Miller, Professor Dylan Thurston, and grad assistant Didac Martínez-Granado

The Directed Reading Program pairs undergraduates with graduate students to learn an advanced topic of the undergraduate's choosing, and has benefits for both. Its webpage is math.indiana.edu/undergraduate/ drp.html

Three other outstanding seniors won IU Senior Recognition Awards: Alexandra Embry got the Clara Goodbody Award, Chase Abram the Kate Hevner Mueller Award, and Hannah Sakaluk the Susan Butler Award.

There have been a lot of undergradu-

petitions: a team of three students competed in the Putnam Competition in December, and nine students competed as three teams in the Indiana College Mathematics Competition. Some of the top competitors have graduated, but we have some very strong freshmen and some very promising incoming students to replace them.

SPEAKERS

CAMERON KINCAID

MANASSE KWETE

NATHANIAL LOWRY

ots and Manifolds

JOSH SEIDMAN

Some Games and How to Win Them

MITCHELL SPANGLER

The Dedekind Zeta Functio

JIONGRAN WANG

Group representations and a glimpse of analysis

Fubini Theorem for the Lebesgue Integral

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DIRECTED READING PROGRAM PRESENTATIONS

WHEN Wednesday April 24 6:00pm – 8:00pm

WHERE Swain East 245

FOOD AND DRINK WILL BE PROVIDED

INTERESTED IN NEXT YEAR? GO TO THE DIRECTED READING PROGRAM WEBSITE:

Poster for the spring DRP event

We are grateful to our donors who enable us to support our talented and hardworking students. This year, we had a new scholarship, the Corev M. Manack Memorial Scholarship. Corey Manack was a mathematician who got his Ph.D. at Indiana University under Distinguished Professor Michael Larsen in 2010, specializing in Lie groups, and also a dedicated and successful teacher. After his very untimely death, his family established this scholarship to support a student who had done or shown promise in mathematical research. This was awarded to Alexandra Embry, who had done research in two REU's and is going to the University of Texas for graduate work in mathematics.

-Ayelet Lindenstrauss

Three Retirements...

Three of our longest serving department members recently retired: Professor **Chuck Livingston** and staffers **Connie Wright** and **Jamie Chapman**. Between them, they represent a full century of service.

Chuck Livingston

Professor Charles (Chuck) Livingston retired at the end of 2018 after 37 years on our faculty. He made profound contributions through his research, his teaching, and his service to the department and university.

Chuck grew up in California, began college at UCLA, and then transferred to MIT, receiving a B.S. in 1975. He earned his Ph.D. in 1980 under Rob Kirby at UC Berkeley. He then spent a year at Rice before coming to IU in 1981. He earned tenure in 1987 and was promoted to full professor in 1992.



Chuck Livingston

Chuck is a widely cited expert in knot theory, with over 85 refereed research articles, two monographs, and an award-winning book entitled *Knot Theory*. He mentored eight Ph.D. students, and was supported by grants from the National Science Foundation and the Simons Foundation. He also won numerous teaching awards and served as our Director of Undergraduate Studies from 1987 to 1989.

Chuck has an amazing facility with geometric visualization, and a special knack for producing knots that illustrate subtle phenomena. In conversations he exhibits a vast reservoir of knowledge combined with mathematical common sense. As a result, Bloomington has had a steady stream of visits by the best young knot theorists in the world.

Chuck's book *Knot Theory* was chosen by the Association of American Publishers as the outstanding mathematics book of 1993. His paper *Enhanced Linking Numbers* won the Mathematics Association of American (MAA) Lester Ford award for expository writing. He co-authored, together with his colleague Paul Voakes in the School of Journalism, a book called *Working with Numbers* and Statistics: A Handbook for Journalists.

Chuck is an excellent teacher. He won the Rothrock Teaching Award in 1993 (the department's highest award), the Trustee's Teaching Award in 2001 and 2012, and the Indiana Section of the MAA Award for Distinguished Teaching in 2013. He has a reputation for being a kind yet demanding instructor. He has taught a greater variety of courses than any of his colleagues, and has long been devoted to teaching courses for future primary and secondary mathematics teachers. Several of his PhD students are now successful scholars and his collaborators.

Chuck's topology parties, typically featuring his own baked desserts, have been the glue of the department's topology group. He also has passions for cinema and crossword puzzles, and went through an intensely focused pottery period. He loves the great outdoors and has

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hiked in many of America's splendid parks.

We thank Chuck for his many contributions, his friendship, his mathematical generosity, and we wish him a most pleasant retirement.

-Jim Davis & Paul Kirk

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Connie and Jamie

Anyone who has worked for the math department—including undergrad or grad alumni who worked as graders or assistants since 1993—had a mailbox in our mailroom, and hence knows **Connie Wright**, who managed both our mail delivery and our document duplication needs. Tens of thousands of exams, quizzes, handouts and syllabi passed through her hands every semester.

Starting as a typist, Connie joined the department in 1979 when it still resided in Swain East. She soon moved to the duplicating room, where small windows near the high ceiling gave very little natural light. That room was also noisy and "aromatic" thanks to the mechanical processes and fluids that technologies in that era required.



Connie Wright

When the bulk of the department moved to Rawles in late 1992, things

got much better. Duplication moved to quiet, odorless electronic copy machines with automatic collating and stapling. Connie was so pleased with the new equipment that she gave her main copier a name: "Johnny."

Moreover, the new duplicating and mail rooms formed a single suite, and department members coming in to check their mail could say hello. Connie was often the first "hello" of the morning, and her sardonic humor frequently lightened the day for us. In many ways, her mail/duplicating suite was the emotional heart of the department.

For over three decades, we could all count on Connie to quickly fulfill every requests for an exam, quiz, or handout. Even when we violated her "24-hour-in-advance-rule," Connie would do her best (after a playful roll of the eyes) to produce the copies and save our pedagogical bacon.

During one period, she kept a fourfoot "Bozo the Clown" inflatable behind her door. She put a certain faculty member's picture on its face with Bozo's bulbous red nose protruding through. Connie then welcomed any and all department members to come by and punch it whenever they felt the urge.

The faculty member in question actually took pride in the unique status this situation conferred upon him. He would bring visiting colleagues down to see it, while taking full advantage of the opportunity to protest, tongue in cheek, that this was how he was treated in the department! \otimes

Jamie Chapman came to IU as a Bookstore employee in 1989, but moved to the math department as our receptionist in 1995. Jamie has an unfailingly cheerful attitude, and was a wonderful receptionist, but her additional strength including bookkeeping experience had her moving up to our business office as an Accounting Associate in 1997. She spent the rest of her career serving us with skill and creativity there.

Handling grants, purchases and accounts—that all require adherence to interlocking systems of rules and procedures at the College, University, State and Federal levels—she has been a full-time problem-solver ever since. She will gladly tell you that she loved it.

Jamie's day at the office was usually just the beginning, however. Though she never showed it at work, she had to overcome huge personal challenges years ago when she took on the care of a newborn grandson, Colton. Colton, who calls her "Mama," was never expected to reach his first birthday in the face of severe congenital health problems. Unwilling to accept that grim diagnosis, Jamie showered Colton with love to help him survive and grow his abilities. Amazingly, Colton will turn 19 this year, and Jamie is retiring partly so she can spend more time with him. Plans include a trip—with Colton to the Atlantic ocean.

We wish Chuck, Connie, and Jamie all long and very enjoyable retirements.

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...and two staff promotions

Staff members Clay Collier and Mandie McCarty both moved into positions of greater responsibility this year.

Clay, who has been with us since 2003, moves from our accounts office to the Chair's suite: He is now the Administrative Services Program Manager which, among other things, makes him the Chair's right hand.

Mandie, who joined us way back in 1997, first worked with the IU Math Journal. More recently she (like Clay) assisted Jamie Chapman as an Accounting Rep. She has now succeeded Jamie as Accounts Associate.

Both Clay and Mandie are off to good starts in their new roles. We are fortunate to have them on our team and congratulate them on their promotions.

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Lunar Landing Anniversary Films

To help celebrate the 50th anniversary of the first lunar landing, our department proudly cosponsored screenings of two films, both preceded by short talks on the math and science of that historic mission.



The Dish , which screened in Swain West on Monday July 15, recounts the key role played by the Parkes Radio Observatory in Australia towards maintaining communication with the Apollo 11 astronauts, and enabling the now-iconic live broadcast of mankind's first moon walks to an international audience.

On Friday of that same week, *Apollo 11* was shown. This critically acclaimed 2019 documentary consists solely of contemporary footage and newly public archival clips including classic narration by Walter Cronkite—to tell the story of that epoch-defining mission.

Professors **Kevin Pilgrim** (Monday) and **Shouhong Wang** (Friday) lectured briefly before the screenings about *Math and the Moon Landing:* the 3-body Problem.



If you can do math, you can do anything.

We often tell our students this, and indeed, they consistently go on to do amazing and diverse things. Here is a small sample from among our recent graduates:

Neil Shah '09 is a Vice President at Systima Capital Management LLC in Chicago.

Sarah Loos '09 earned a Ph.D. in Computer Science from Carnegie Mellon. She is now a Senior Software Engineer at Google Research, where she works on Deep Learning Algorithms.

Valkyrie Savage '10 completed her Ph.D. at Berkeley. She is now CEO of her own company, Savage Internet, in Toronto, Canada.

Jacek Skryzalin '10 finished his Mathematics Ph.D. at Stanford and now works in cryptography at Sandia National Labs in Albuquerque.

Laura Goins '11, now Laura Callahan, recently earned her Ph.D. in Philosophy at Rutgers and will begin a Assistant Professorship at Notre Dame this fall.

John Brown '12, a Cambridge Gates Scholar, worked in data science for Deloitte consulting. He teaches high school in Chicago, IL.

Rob O'Connell '12, works in Technical Services at Epic Systems, a major health care services provider in Madison, WI.

Juanita Pinzón-Caicedo got her Ph.D. in 2014 under Professor Paul Kirk. She will join the Notre Dame faculty this fall as an Assistant Professor following postdoctoral stints at U. Georgia in Athens and more recently, North Carolina State University in Raleigh.

Dimana Tzvetkova '16 is an Associate Editor for Mathematics Publishing at Springer Nature. If you've ever opened one of Springer's trademark white and yellow math texts, you've seen her team's handiwork.

Zhao Yang, Ph.D. '19, wrote an outstanding thesis (under professor **Kevin Zumbrun** on modeling shallow water flow. It not only won our departmental Outstanding Thesis Award as noted elsewhere; it also earned him a prestigious J.L. Doob Postdoc at the University of Illinois in Champaign Urbana, starting this fall.

If you too have news to share or a story to tell, visit https://math.indiana.edu/forms/ alumni-stories.html and let us know!

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Alumni & friends give back

Energy economist **Frank Graves** '75 is a Principal of the Brattle Group (which does economic and regulatory consulting). He is also a parttime professional violinist, and serves on the Dean's Advisory Council for IUB's Jacobs School of Music.

Anne Koehler (B.A. '62, M.A. '63,

Ph.D. '68) supported undergraduate students **Jorge Gamboa**, **Ann Marie Matheny**, and **Jared Roush** on the Fall '18 Careers in Economics & Mathematics field trip to Chicago. Roush won a William Ziemer Student Assistance grant and will begin a master's program here at IUB in Fall 2019.



Jared Roush plays piano at the Alliance Francaise in Chicago

Highlights of that trip included an alumni mixer at the famous Berghoff restaurant, a tour of Trading Technologies, Inc., and a stop at the Alliance Francaise for a fascinating display of underwater photography by IU alum Gregory Regnier.

Corey Manack earned his PhD from IUB in 2010, but tragically passed away in 2016. This past April we were honored with a visit from his mother Alice Manack and brother Josh, who donated funds for the Corey M. Manack Memorial Scholarship to support undergraduate math students who have shown promise and/or excelled in undergraduate research. The inaugural recipient was **Alexandra Embry**, who will begin studying for her Ph.D. this Fall at the University of Texas, Austin.

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Over the past year, donations to our

Math Enrichment Fund from alumni and friends supported so many activities that benefitted our department and especially, our students. They let us award scholarships to students in special situations. They support our Math and Actuary Clubs. They help students travel to attend career events, competitions, and conferences, and they help us host events that bring alumni, faculty, friends, and students together. We are profoundly grateful for the opportunity do these things.

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Career Spotlight

Many of our students find fulfilling careers working in industry. As mentioned above, **Rob O'Connell** '12, works at Epic Systems in Madison, WI. Rob returned to IUB last Fall to recruit for Epic—a unique and interesting company.

A unique recent New York Times article described it as a health care services provider whose CEO, Judy Faulkner, is a mathematician—and a reclusive billionaire. The NYT article on Epic can be found at https://tinyurl.com/y7o2yjcx.

Business, Industry, and Government ("B.I.G.") careers for the mathematically trained are ever more common, even as the academic job market gets ever more competitive. A new book called *BIG Jobs Guide: Business, Industry, and Government Careers* for Mathematical Scientists, Statisticians, and Operations Researchers expands on this phenomenon. Written by Rachel Levy, Richard Laugesen, and Fadil Santosa, the book offers practical and specific advice for math degree holders.

The same topic was featured in the Early Career section of the April

2019 Notices of the AMS, with articles with titles like *Careers in Financial Engineering*, It's a BIG World, and Transitioning from Academia to Industry.

Interested in recruiting our students, and/or in visiting our campus? Write to us directly or to the College of Arts and Science's Walter (Career) Center at https://careers.college.indian a./edu/alumni/

-Kevin Pilgrim

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Interview: Math Alum Daniel McDonald

Daniel McDonald is an Associate Professor in IU's Statistics Department. He has a 2006 IU BA in Economics, along with a Bachelor of Science in Music and an Outside Field, namely math. After a year at the Federal Reserve Bank in St. Louis, he enrolled at Carnegie Mellon, earning a Ph.D. in 2012. He then took a tenure-track job with the IU Statistics Department.



IU Statistics Prof. Daniel McDonald

Last summer, McDonald won a prestigious NSF CAREER Award, a 5year early-career grant. He was in mid-sabbatical at U. Chicago when we spoke to him by phone.

Alumi Newsletter: Why did you choose a career in academia?

Daniel McDonald: My undergrad Econ profs told me to take lots of math, which led to a job at the Fed. But there, I got interested in statistics and data analysis. I saw that statistics could answer questions from a variety of areas.

Finishing my Ph.D., I interviewed at Yahoo and Google, but it didn't feel right to me. I didn't want to work out better ad placement strategies; I wanted to follow my curiosity and have the exploratory freedom that academia offers. I've certainly had students at IU who wanted a corporate career, but it wasn't right for me.

AN: Why do you think your Economics profs encouraged you to take math courses?

DM: There's lots of calculus in Econ, and it's usually easy. But it's not enough to just take a calculus course. You have to understand enough to know when you're getting lost in calculations, and can perhaps intuit where the answer's going to be. That kind of intuition comes from a deeper study of math.

AN: *How did you choose IU for college?*

DM: I grew up in Carmel, Indiana. In high school, I decided to study music. I was playing cello in regional orchestras, getting good experience, and I wanted to go far from home for college. I auditioned at some east coast schools, but started to see I wanted some sort of backup, not knowing what the future held, musically. Having taken AP Economics in high school, I thought I'd study Economics too.

AN: In case the music career didn't pan out? Or in case you didn't like the lifestyle? **DM:** I wanted a degree with more than just musical training. That feeling got stronger at IU; there were so many other cellists, many of them phenomenal. Other aspects bothered me too. As a musician you spend so much of your time practicing alone and being hypercritical about it. Academic research has some of that, but you get to spend more time solving problems rather than criticizing each aspect of your skill.

The IU Music School's Batchelor of Science in Music and an Outside Field has you take 4 credits per term outside the music school in lieu of some instrumental practice credits.

AN: So at some point, you decided not to pursue a career in music.

DM: It was my sophomore year. I took Calculus 3 (M311) and Honors Linear Algebra from Prof. Russ Lyons. His course was so rigorous, with lots of proofs. I wasn't used to that. I spent a lot of time in Prof. Lyons' office, and a lot of late nights trying to prove abstract statements I didn't even understand very well. But hard as it was, I enjoyed it.

I also liked it because in that setting, you connect with other classmates, all working on the same thing. You develop a cameraderie, and you work on stuff together. I really like that.

AN: People view mathematicians as anti-social. They don't realize that we do most of our learning, not by reading papers or books, but by pestering other mathematicians!

DM: Yes—and it was the same in grad school. I wouldn't have survived without forming study groups and working with others.

AN: How would you describe what you do now?

DM: It's a combination of statistical theory and statistical comput-

ing. I think a lot about how to implement calculations effectively on a computer. This morning, I wanted to estimate a probability density function, and there's a dumb way to do it that takes a lot of machine time. There's a smarter way using the Fourier transform. Convolution lets you just multiply Fourier transforms together. But the details that arise with real data make it very tricky to implement that on a computer.

AN: Do you have a core group of collaborators, or do you just follow your own lights?

DM: I had a frequent collaborator, but he recently left academia and our collaboration has tailed off. Recently, I've worked more on my own, or with grad students, but in my current sabbatical, I'm trying to grow my group of collaborators. I find it more fun to work with others—and I get more done that way too.

AN: That relates back to the way you worked in school.

DM: Yes, and it helps to have collaborators with complementary strengths.

AN: Tell us about your career award.

DM: The NSF Career Award differs from standard NSF grants. You have to apply pre-tenure, it's a 5-year award instead of the usual 3, and there's a significant education/outreach component.

AN: Do you know what you'll do for the latter component?

DM: Not yet! I'm on the first year of the grant, and on sabbatical, so this is not the year to do it.

But my idea is to teach an Intensive Freshman Seminar, and have the students read things like Nate Silver's *The Signal and the Noise*, or *Moneyball*, and talk about how analyzing uncertainty can aid decision-making.

AN: In high school, you were determined to go far from home. Not only did you fail to escape for college, but now you've come back again!

DM: Haha... that's true. When I was on the job market, I looked for a bigcity cultural experience. For instance I did not apply at Purdue. But having gone to IU, I knew it had the kind of cultural offerings that attract me.

AN: Have you been happy here?

DM: Absolutely. I'm really glad I came back. The Statistics department has been great. It's a young department, with just one full professor so far, and about five lecturers. The original group who split off from the math department are all retired now, but we're laying the groundwork for a strong future.

AN: How do you feel about your work/life balance? Do you still play music?

DM: Yes, I still play, though less than I used to. I also used to run, but it didn't help me clear my mind. I'd think about my research as I ran! I find weight-lifting works better; it requires more focus. And I like going out to concerts, dinner, and socializing with friends. I love to cook, so I spend a lot of time experimenting with recipes.

AN: Do you have any advice for current IU undergrads?

DM: Clarify your priorities. College presents so many opportunities and distractions—diverse course offerings, friends, parties, family, study abroad, volunteering/activism, research, romantic relationships... You can't do everything. Explore, but find what's most important to you in life more than for a career—and give it your all. That's my advice.

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Awards

As usual, we held our annual awards ceremony and reception on the last Friday of instruction last April. We proudly list the winners here.

Undergraduate Awards

THELMA ABELL PRIZE

- Carolyn Krutz
- Joshua Seidman
- Mallory Smith
- Tiancheng Xu



Abell winners Krutz and Seidman

GAIL HOMAN ADELE SCHOLARSHIP

- Yijia Chen
- Maureen Lynch
- Emma McCardwell

CIPRIAN FOIAS PRIZE

• Abe Leite

RUTH E. GILLIATT SCHOLARSHIP

• Jean Chiu

• Rebeka Man

Trula Sidwell Hardy Scholarship

• Julian Gass

CORA B. HENNEL SCHOLARSHIP

- James Atterholt
- Matthew Denney
- Nathanial Lowry

Jeffrey and Deborah King Scholarship

- Frank Storino
- Timothy Vincent

RAINARD BENTON ROBBINS PRIZE

• Nathanial Lowry



Hennel winners James Atterholt and Nathanial Lowry (who also won the Robbins prize), and Wilcox winner Jingyi Feng

Shabani Book Fellowship

• Zaynab Ahmed

Donald Otto Koehler Scholarship

• Gavin Whelan

MARIE S. WILCOX SCHOLARSHIP

• Jingyi Feng

- Ellen Hine
- Hannah Sakaluk
- Bihan Shen
- Greta Stephenson
- Jiongran Wang

WILLAM P. ZIEMER STUDENT AS-SISTANCE FUND

- Jared Roush
- Dalton Sconce

M118 UNDERGRADUATE INTERN AWARD

- Miriam Hu
- Lindsey Hume

COREY M. MANACK MEMORIAL Scholarship

• Alexandra Embry



Manack Scholarship winner Alexandra Embry

Graduate Awards

HAZEL KING THOMPSON FELLOW-SHIP:

Sanjana Agarwal, Yu Cao, Anthony Isenberg, Anuj Kumar, Aranya

Lahiri, Xuqiang Qin, Luke Wojtalik, COLLEGE OF ARTS AND SCIENCES Zhao Yang

College of Arts and Sciences FELLOWSHIP:

Myungsin Cho, Shival Dasu, Dimitrios Diamantidis, Jacob Guttman, Woojeong Kim, Yi-Lin lee, Michelle Leung, Casey Noll, Stephen Sarutto, Luca Scerbo, Samuel Scheel, Yue Shi, Ricky Simanjuntak, Zhifeng Wei, Luke Wojtalik, Long Zhao

ROBERT E. WEBER AWARD: Myungsin Cho

JAMES P. WILLIAMS AWARD:

Myungsin Cho, Shival Dasu, and **Zhifeng Wei**

ROBERT K. MEYER FELLOWSHIP (For a student in logic demonstrating the potential to make major breakthroughs):

David Fisher

WILLIAM B. WILCOX AWARD (For an outstanding student): Homin Lee

GLENN SCHOBER TRAVEL AWARDS:

Seok Hyun Byun, Yu Cao, Daniel Condon. Joshua Edge, Cemile Kurkoglu, Michael Novack, Emily Rudman

College of Arts and Sciences TRAVEL AWARD Aranya Lahiri, Homin Lee, Didac Martinez-Granado

ROTHROCK TEACHING AWARD:

Gökçen Büyükbaş Çakar, Cemile Kurkoglu, Aranya Lahiri, Didac Martinez-Granado

OUTSTANDING THESIS AWARD Zhao Yang

Dissertation Research Fellow-SHIP

Zhao Yang

Faculty Awards

ROTHROCK FACULTY TEACHING Award

Professor Christopher Judge

IU TRUSTEE'S TEACHING AWARDS

- Professor Michael Larsen
- Professor Larry Moss

DEPARTMENTAL LECTURER AWARD

 Rothrock Lecturer Vladimir Eiderman

ZORN POSTDOC TEACHING AWARD

- Dr. Alex Kruckman
- Dr. Nicholas Miller

Coming Soon...

Watch your email in April 2020, when we're planning to jointly celebrate IUs Bicentennial and Math Awareness Month! Curious about our deep departmental history? Check out our evolving annotated timeline at https://math.indiana.edu/about /history.html

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Acknowledgements

This newsletter is a department-wide effort. Thanks to all the colleagues who supplied ideas, facts, and copy for it—and to our Undergrad Advisor, Elizabeth Smith, for some of the photos.

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Giving

The Department of Mathematics is grateful for all of the support it receives from its generous donors. The Department has several funds to which you can give. Donations may be made using the attached Indiana University Foundation Donation Form or through the Give Now link at

http://www.math.indiana.edu/

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- Glenn Schober Memorial Fellowship Fund (I380008692): Gifts to this fund support fellowships in the department. The fellowship may support such things as travel and registration fees for students attending national meetings.

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