MATHEM@TICS

"All the ν's fit to print"

Department of Mathematics | Ithaca College
September 13, 2022 | Vol. 4 Iss. 1

ν_0: From the Desk of the Chair

I'm always unsure what to say in my dedicated from the desk of the chair "column" for the newsletter. So, as a test to see if anyone reads this, please send me an email and tell me what you'd like to read in my newsletter notes. tpfaff@ithaca.edu

I do think is important to make sure I recognize all the folks that support us. This is our first newsletter where we are thanking and recognizing those that donated to the math endowment during the last academic year. This was our first year in working to build this endowment and I'm grateful to those that donated. My personal goal is to eventually break the $100,000 mark and we are a little more than a quarter of the way there. We'll get there and if you'd like to help here is a link to make a donation: https://alumni.ithaca.edu/mathematics-research-fund

Thanks goes to the two alumni, Chad Barrett '93 and Walter Hannah '06, who took the time to answer our questions and be included in this newsletter. Additional thanks to Walter for giving a zoom talk to our department last spring. We'll be looking to keep that going and so if you like to talk, whether you have something to say or not, let me know and we'll get you on our colloquium list. Finally, thanks to Dave Brown our problem guru and Dan Visscher for starting and keeping these newsletters going.

Tom Pfaff, chair

ν_1: Students Doing Summer Research and Internships

Ithaca College math students participated in a variety of math-related projects this past summer. Read about their projects here and talk with them about their experiences. Summer math opportunities are usually advertised during the winter; stay tuned for announcements through this newsletter and the department webpage, or talk with a professor about your interest.

Tommy Angel '24 worked on mathematical research over this summer through the Ithaca College REU in Dynamical Systems with help from his mentor, Prof. Daniel Visscher and two colleagues from different universities, Bjorn Cattell (MSU Denver) and Ian Robinson (Murray State University). They researched about Billiard Dynamics, how orbits on different surfaces of revolutions give interesting results. Tommy used a vast amount of knowledge from Differential Equations, Linear Algebra, Calculus III, and plenty of computational work with Mathematica. Tommy and his colleagues currently have a poster on the second floor of Williams Hall and a 58 page long LaTeX document about their findings over the summer!

Ted Mburu '23 worked with Dr. Matt Sullivan in the Physics & Astronomy Department on an NSF funded research project alongside collaborators from SUNY Brockport and SUNY Polytechnic Institute. They worked towards understanding the structural and compositional modification of memristive Niobium Oxide films for neuromorphic computing applications. He handled the majority of the data analysis to make conclusions about the quality and properties of our devices. He used Python to read data from thousands of files then filter out all of the bad or corrupted data and make different kinds of plots for the good data.

Elliot Mintz '23 spent this summer working for Upward Bound Math and Science at Fitchburg State University as an academic mentor. He helped prospective first-generation college students (currently in high school) work on math and science related projects including a Sphero robotics project and a scale room building project. He worked with students in the classroom as well as offering homework help and assisted with collaboration and group project development time. The position was definitely a great experience and helped solidify Elliot's plans to become a high school math teacher.

Earth Sonrod '25 presented his math research "Some Properties of Fibonacci-Pascal Triangle" at the 20th International Conference on Fibonacci Numbers and Their Applications in Sarajevo, Bosnia at the end of July. The research was initially a part of a final project for the MATH 19000 course with his classmates, Colin Leyner and Kate Tanner, last fall. After the course had ended, Osman Yurekli asked Earth to continue this work in the spring and encouraged him to give a talk at the Fibonacci conference. The concept of this research was very simple: replacing the boundary of Pascal's triangle with the Fibonacci sequence and studying its characteristics. After meeting and discussing with other mathematicians, Earth got the idea of using combinatorial proofs to relate his triangular array to a form of generalized Pascal's triangle. He is working on a LaTeX document and refereeing another paper for the conference proceedings.

ν_2: Math Club

Do you know what comes after 3.14...? Think Amazon Prime is the rate of deforestation in South America? Practice writing the number 8 sideways?

Then Math Club is for you! Come meet and hang out with your fellow math enthusiasts.

The first meeting of the year is

WEDNESDAY, 9/14 at 7:00 PM
in Williams 310.

Students will elect the academic year Math Club officials and plan activities for this semester.

ν_3: Thanks to Endowment Contributors

The Math Department thanks the following individuals for donating to the math endowment. Your support of the math department and our current students is greatly appreciated.

David A. Brown ('95 and fac.), Erin C. Cassidy ('99), Dee Dee Dyer ('08),
Patrick J. Engle ('06), Matthew L. Halstead ('04), James R. Linsky ('74),
Jonathan D. Mack ('06), Laura M. Mansfield ('08), Justin M. Moczynski ('21),
Teresa Moore (fac.), Dani Novak (ret. fac.), Thomas J. Pfaff ('90 and fac.),
Matthew R. Schmidt ('06), Donny K. Tang ('05), Daniel J. Tjie ('17),
Katherine E. Ulicky ('09), Caitlin Worth ('03)

ν_4: Alumni Spotlight

This issue continues our interviews with IC math alumni. If you are a current or future student, we hope these will give you some perspective on your studies at IC and some inspiration for the future. If you are an alum yourself, we hope these give you a chance to reconnect or further connect with other IC math alumni. (Also, we'd love to interview you! Please email the chair at mathchair@ithaca.edu if this is something you might be interested in.) We hope you enjoy hearing below from Chad Barrett '93 and Walter Hannah '06.

Interview with Chad Barrett

DV: *Hi Chad. Welcome "back" to IC! (This interview is conducted by email, so the reunion is digital and asynchronous. . .) When did you graduate?*

CB: I graduated in 1993.

DV: *What do you do now? How did you get from graduation to where you are now?*

CB: My job title is Director of Solution Design. What this means is that I write proposals in response to requests from state education agencies and school districts throughout the United States. These proposals can be anywhere from 25 pages to 350 pages in length. The organization I work for provides assessment, accreditation, professional development, and school improvement services for many K-12 educational institutions in the U.S., and we have a global reach.

I started as a math teacher for a program working with at-risk students, then moved into public schools in Texas. In 2000, I left teaching and started developing math test questions for statewide testing programs. Since then I've held multiple positions managing projects and teams, working with state education agencies to develop and administer large-scale tests. I started my current position writing proposals, which is how our company gets and maintains business, in 2014.

DV: *What kinds of skills do you use in your job? How has being a math major at IC helped you in your career?*

CB: I use two main skills in my job. First and foremost, I am a writer. Writing proposals requires a thorough understanding of the work (which is highly technical), a grasp of what state education officials and district leaders are looking for, and proficiency as a writer. Second, I collaborate with subject matter experts from across our organization. I have to develop collegial relationships and use some investigative skills to ensure I integrate the correct information into a proposal. Finding the person with the right information, and getting them to share that with me, is essential to my work.

I don't use much math in my current position, but the education I received at IC was essential to getting to where I am today. I learned a lot of mathematics and pedagogy at IC, which helped me to be a successful teacher and successful as a content development specialist for large-scale tests. This opened many doors for me as I moved from content specialist to project manager to team leader to proposal writer.

DV: *Do you have a favorite memory as a math major at IC?*

CB: When I arrived at IC I had two potential paths in mind: working as a cameraperson in TV sports or becoming a high school math teacher. In the fall of my freshman year I took a writing seminar in mathematics with Prof. Dorothy Buerk. I never had so much fun discussing math and the work was really challenging. This course helped me make my decision to become a high school math teacher.

DV: *In terms of intellectual intrigue and growth, is there a math course you took at IC that stands out?*

CB: In the spring of my junior year I took Modern Geometry with Prof. Eric Robinson. The way he led us through the axioms of geometry to get to non-Euclidean geometry was fascinating. My math education courses, taken with Prof. Margaret Robinson, were also very challenging. I was well-prepared for my first teaching assignment.

DV: *What was your favorite non-math course at IC? Why?*

CB: In my freshman year I took a course called Media and Politics. This was a lecture course, but the professor was excellent and I feel as if it prepared me

for today's political and media climate. I am a better consumer of news because of the course. What other interests (e.g., another major/minor, team or club, etc.) did you engage in at IC? I worked as a resident assistant in the Terraces for three years. One of my favorite memories is of watching folks get outside on the first nice day of spring each year. I also worked for the sports radio team as a studio engineer and in-studio reporter. I was the studio engineer for our coverage of the 1991 Stagg Bowl, when IC won its third football national championship.

DV: *What advice would you have for a current student interested in doing what you do now?*

CB: I recommend taking courses that will help you become a better writer across many areas. Being a good writer will open up a lot of opportunities during your career. My writing skills, which I picked up through many courses at IC, helped me move into project management and leadership positions once I left teaching. They also helped me to secure small grants and other opportunities as a teacher.

I also recommend thinking about the skills you need after graduation, and not just the job you're looking to get. If you have a broad array of skills and experiences, that will open up many opportunities during your career. When I left IC, I didn't even know that there was a business focused on large-scale educational testing. Thankfully, I was able to use the skills I gained while at IC to grow and evolve throughout my career—a journey I'm incredibly grateful for taking.

Interview with Walter Hannah

DV: *Hi Walter. Welcome "back" to IC! (This interview is conducted by email, so the reunion is digital and asynchronous. . .)*

WH: Happy to be "back"! Although I really wish I was back in Ithaca, I would love to go hike to some of the waterfalls again, I really miss that. But at the same time I'm glad I never have to experience those lake effect snow events...

DV: *When did you graduate?*

WH: 2006.

DV: *What do you do now?*

WH: I usually tell people that I'm an "atmospheric scientist specializing in clouds", but my official title is "climate model developer". I spend most of my time writing code, but it's all in service of answering science questions and publishing the results, so I still consider myself a professional scientist.

DV: *How did you get from graduation to where you are now?*

WH: I was pretty lost when I graduated. For a year after graduation I worked miscellaneous jobs, including working for a land surveyor and a financial marketing company. I was never happy in any of those jobs and I really missed the mental challenge of my college classes. Then one day I came across a newspaper article about someone who scouted wind farm locations for a power company. His job paid really well and used a lot of math, so I was sold on this type career path. The following year I started grad school at Colorado State, and while I planned to get a masters and get out into the workforce I really fell in love with doing research and ended up staying for a PhD.

In retrospect, I should have known that this was the perfect career for me because I really enjoy thinking about esoteric questions that don't have a straightforward answer. For my PhD I studied this puzzling Tropical phenomenon called the "Madden-Julian Oscillation" (MJO). Scientists have struggled for decades to explain why the MJO exists and how it works. The MJO is difficult to describe and visualize so studying it requires a lot of abstract thinking and all these challenges really drew me in. Another curious thing about the MJO is that atmospheric models are notoriously bad at simulating it. A lot of my early work was focused on trying to understand this problem, although I didn't make much progress.

DV: *What kinds of skills do you use in your job? How has being a math major at IC helped you in your career?*

WH: In some ways atmospheric science is just a specific area of fluid dynamics, so we use a lot of calculus

to derive analytic equations that describe the relationship of various quantities at different time and space scales. For instance, the equations needed to understand turbulence near the ground are very different from the equations needed to understand the Rossby waves that drive most mid-latitude weather events. Linear algebra and multivariate calculus come in very handy all the time.

Things get even more complicated when we try to build models by turning these equations into code. There are many ways that correct equations can give wrong answers if they are coded poorly. Sometimes we can perform special stability analysis that will tell us exactly how a model will blow up and how to avoid it, and other times things get so complicated that we can only "guess and check" and hope that we find a reasonably stable implementation. In this regard, nothing from my undergraduate math studies could have prepared me to deal with the level of uncertainty I encounter everyday. However, I still think studying math is good training for honing the analytic thinking skills needed to be systematic and work your a solution to any given problem.

DV: *Do you have a favorite memory as a math major at IC?*

WH: I have fond memories of the Putnam competition. Some professors held a weekly meetup to prepare for the competition. They would present a problem or two from a previous Putnam exam and we would all try to figure it out. Most of the time I never got to the answer, but I really enjoyed the challenge. One Putnam problem that I remember vividly was about defining a line on a square dartboard that represents the halfway point between the center and edges (hint: it involves parabolas).

DV: *In terms of intellectual intrigue and growth, is there a math course you took at IC that stands out?*

WH: Calculus was always one of my favorite classes, probably because it was the first time I really thought deeply about the concept of infinity. Another one that stands out is "abstract algebra", or at least that's what I remember calling it, because we learned about "set theory" and how to solve a Rubik's cube.

DV: *What was your favorite non-math course at IC? Why?*

WH: I took a few basic physics courses, including the analog and digital circuits course. I really loved those classes and made use of those skills a few times building circuits on my own for fun. I would have taken more of those classes but they tended to be scheduled at the same time as math classes I wanted to take, and math was always a higher priority.

DV: *What other interests (e.g., another major/minor, team or club, etc.) did you engage in at IC?*

WH: I played a lot of music at IC. I would take lessons from one of the jazz professors and play gigs around town. I tried out for one of the school's jazz bands but I never had a chance of getting in when there were so many talented music majors around.

DV: *What advice would you have for a current student interested in doing what you do now?*

WH: If anyone is interested in any sort of Earth system modelling it's good to understand that the field is VERY diverse and there are many unanswered questions that could benefit from new points of view. Given the need for a wide variety of skill sets, there are many different paths to end up in this field. We have some people who only studied computer science or only studied chemistry, but in both cases they have ample opportunities to work in new areas and learn about new problems.

Despite the exciting aspects of working in science, there are a few downsides to be aware of. The salary of a government funded scientist is almost always less than what you can get in the private sector. If you're the type of person who can dive into machine learning and learn how to use it, you can make great money working for a tech company. But if you're the type of person who would enjoy having the freedom to explore the limits of human knowledge, then you might be happier becoming a scientist and living a less extravagant lifestyle.

Also, make sure you study partial differential equations (PDE), because they come up almost everywhere, and learn how to code as soon as possible. Python is quickly becoming the dominant language, but many other languages are valuable to know (ex. C++).

DV: *You gave a very nice colloquium talk in the IC math department last spring via Zoom. How was the experience of giving a talk via Zoom?*

WH: That was fun, it was a good opportunity to work on minimizing the "jargon" I rely on when talking to other atmospheric scientists. I was a little worried that it would be weird doing a talk like that over zoom, but I guess I've just gotten so used to zooming with people during the pandemic that it really didn't seem that awkward.

ν_5: The Archive

MATH/CS NEWSLETTER

September 1993, Number 3

Comments from the Chair

by Stan Seltzer

Welcome back. I hope you enjoyed the summer. I do wish there was some way I could extend it (or at least our recess) another two months or so.

The big news in mathematics is that Andrew Wiles completed a proof of Fermat's Last Theorem (FLT). I know you all heard about it—it was in all the papers, and even Jay Leno mentioned it. I'm not a number theorist, but I honestly never thought I would live to see the day that this 350-year old problem was solved. One aspect of this event that I found interesting is the way many of us heard about it. Some time on Wednesday, June 23, many of use received E-mail messages with the news. Evidentally, the global electronic village is here, and we are part of it.

Speaking of which, perhaps you also heard that the White House is on the Internet. In case you haven't, see "The Electronic White House," which also arrived by E-mail.

Best wishes for a good semester.

Many things have changed in our department over the three decades since the early '90's, but one thing that is the same: we had a department newsletter. According to hard-copy records found in Teresa Moore's desk, the Math/CS Newsletter ran from February, 1993 until at least November, 1995. (That's right—both Math and CS were in the same department! For more on this history, see Stan Seltzer's article "An Incomplete History of the Math Department: 1985–2020" in Volume 1 Issue 2 of the present incarnation of the newsletter.) Also the same: the newsletter started off with a few paragraphs from the department chair; the introduction to the September 1993 issue is to the left.

ν_6: What's the Problem... with Professor Brown

Compute the exact value of the following infinite product. A complete answer includes a mathematical justification for the value obtained.

$$5^{1/5} \cdot 25^{1/25} \cdot 125^{1/125} \cdot 625^{1/625} \cdots.$$

Send complete answers to Professor Brown at dabrown@ithaca.edu. Those submitting correct answers will have their names printed in the following newsletter. People who correctly solve all problems from Volume 4 of the newsletter will receive a special prize at the end of the year.

Professor Brown's Volume 3 Honor Role: Congratulations to Earth Sonrod and Austin Ruffino, who both solved all four of Professor Brown's Problems from last year's newsletters.

It is not nature that imposes [time and space] upon us,
it is we who impose them upon nature because we find them convenient.

—Henri Poincaré (1905, France)

Editor: Daniel Visscher