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## The Newsletter of the Mathematics Graduate Student Association

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Issue 1

November 2024

# Welcome!

Welcome to the very first issue of the brand new MGSA Newsletter! On behalf of the Newsletter Committee, I hope that you will find the stories and tidbits shared here fun, interesting, and maybe even useful. Think of this newsletter as a proof of concept: it will have two issues after this one, in March and May. Lessons from this experiment will shape the newsletter in future years.

As grad students, we were brought together from different walks of life by our pursuit of math, yet our non-academic lives and career paths are diverse. On top of that, our department can at times feel divided into many little islands that don't interact much with each other. I hope that this newsletter can build some connections by being a platform for conversation about the things that matter to all of us—in math or otherwise.

This newsletter will feature some regular content. Get your burning questions an-

swered in the anonymous Q&A column, Asking for a Friend (page X). Review the MGSA's latest advocacy for you in The Inside Scoop (page X). Find a fun diversion in the regular puzzle column (page X), or the comic series The Math Lounge (page X).

The newsletter will also include one-off articles, interviews, or artwork from any grad student—maybe even you! This issue, discover the pungent but beloved King of Fruits (page X), and vote for whether you want it at teatime. Relive the joy and pain of teaching through the Confessions of a TA (page X). Read an essay about the intelligence of the mathematical community and how it may relieve our individual burdens (page X). If you're interested in contributing some material to the newsletter, learn How To Contribute on page X.

Have fun reading, and fight on!

Herng Yi Cheng  
MGSA Secretary □

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# The Inside Scoop

## Updates on the MGSA's Advocacy

by Narmada Varadarajan, President, James Munday, Vice President, and Alisa Chistopol-skaia, Academic Chair

### Events



### Advocacy

**Graduate Planning Committee:** We collected feedback from graduate students about core courses, qualifying exams, and topics courses. Then we shared the results with the Department and advocated for the following changes: (1) Change the format of the qualifying exams (2) Add more core courses (specifically, algebraic geometry and applied math). At the end of November, the Department approved the following changes for the next year: (1) The old format of qualifying exams is back! This means there won't be just one comprehensive exam for all core courses in September; instead, there will be separate exams for each subject. (2) Algebraic geometry will be taught next year as a topics course.

Another part of our Survey was dedicated to topics courses. We contacted faculty members about proposing topics

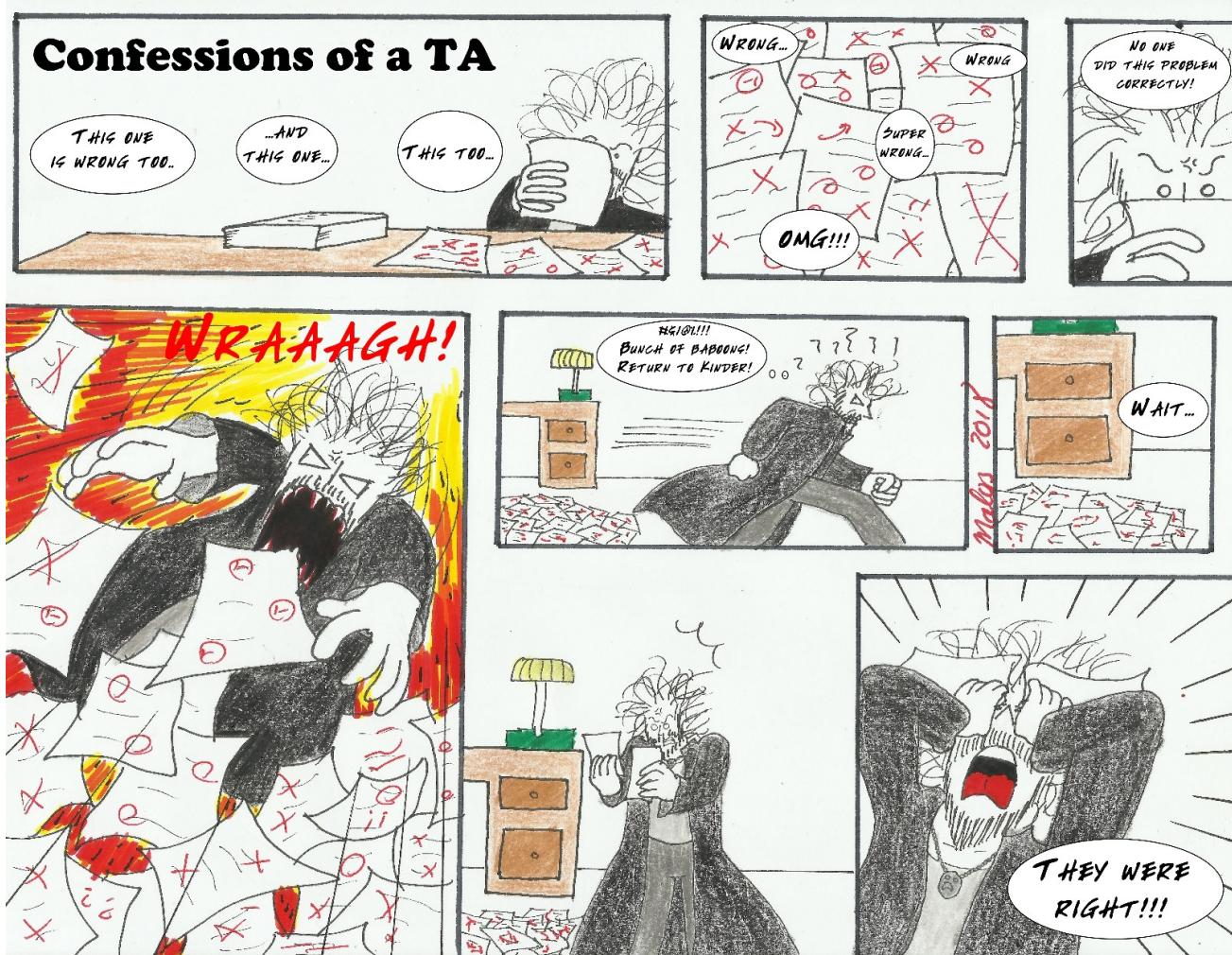
courses graduate students asked in the Survey; Many of them agreed. There will be a meeting in January where the Department will decide which topics courses will be in the next term, and we will advocate for the courses you requested! Stay tuned for more information!

**Math library:** At the Spring 2024 Departmental Council Meeting, Prof. Robert Jerrard (the Chair of the Department) announced that they plan to replace the math library with a combination of faculty offices and lounge space. The MGSA had several conversations with the Chair and other staff about how faculty offices will discourage graduate students from using any adjacent lounge spaces. Now, the Department's new proposal is to replace the math library with a lounge space (or, anything but faculty offices). We have also organized a "consultation session" for all graduate students to discuss this proposal with the Chair.

**EDI committee:** At the Spring 2024 Departmental Council Meeting, the Chair also announced the creation of an "EDI Working Group" to assess the EDI needs of the department based on the recent Climate and Culture Review. This working group would have served to create the terms of reference for an EDI Committee. The MGSA has been in conversation with the Chair throughout this process and recruited graduate student volunteers for the potential EDI Working Group. Now, the Chair has decided to directly create an EDI Committee without creating a Working Group. Stay tuned for more updates as we continue to work with the Chair's office! □

# Art: Confessions of a TA

by Malors Espinosa Lara



# Genius and "Scenius"

## Where Mathematical Ideas Come From

by Brendan Isley

**B**RIAN ENO is an artist whose influence surpasses his fame. He has released numerous acclaimed and groundbreaking solo albums since the 1970s, produced for countless artists including David Bowie, Talking Heads, U2, and Coldplay, and founded the genre of ambient music. Over the span of his career, he has worked on over 50 albums, and is still highly active to this day. He has been inducted into the Rock and Roll Hall of Fame. Along with his music career, he has hosted visual art exhibitions around the globe for the entirety of his career.

Given his long list of achievements, we would be justified in calling Brian Eno a genius. We may imagine him as an individual who is bursting with creative energy and always generating new ideas. We like thinking about geniuses whose talents and legacies rise above the rest. In mathematics, any of us can list off big names throughout history who are the faces of brilliant innovations. And given how prevalent some names such as Gauss and Euler are, it can seem like the majority of novel ideas come from a select few. It is easy to hold the belief that progress in mathematics is carried almost entirely by its geniuses.

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**In the mathematics community, we seem to be particularly convinced of the necessity of individual intelligence.**

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In high school, mathematics seemed to come easier to me than it did to my peers. As a result, some of them called me a genius. I believed them, and was enthusiastic about the impact I would make with my ideas. Surely many of us can relate to this experience. But mathematics is hard. In grad school, learning mathematics takes a lot longer, and being able to solve seem-

ingly simple problems is an uncertainty. It is clear now that I am certainly not a genius! The problem is, I had bought into this notion that the people who made a real impact on mathematics are the geniuses. So if mathematical progress is made only by the very brightest, am I smart enough to make any contributions? Is there any point in me working in mathematics at all?

Brian Eno challenges our beliefs about genius. He offers an alternative notion to consider which he calls scenius, the creative intelligence of a community:

“Being an artist, you hear a lot of talk about genius, which is the process of singling out certain people in art history and saying ‘those are the important ones.’ [...] Whenever you look at any of those artists, you find that they lived and drew from a very, very active, flourishing scene, and they were only one of the elements of that scene. All of these people who we call genius actually sat in the middle of something that I call scenius. Just as genius is the creative intelligence of an individual, scenius is the creative intelligence of a community. And what I want to see is more attention given to that possibility of creative behaviour.”

There are many examples of mathematicians respecting the value of scenius. The most typical example is Newton claiming to make progress by “standing on the shoulders of giants.” We can also look to Perelman, who refused awards for his solution of the Poincaré conjecture in part because he felt Hamilton’s ideas equalled his contribution. The most impactful mathematicians are also likely to organize conferences, work with collaborators, and build off the ideas of others. Of course, we do see recognizable names making many of the big steps of progress, but the point is that the achievement of a proof or a theory can be claimed by the community who worked on it

together, as the whole community was necessary in the process.

Personally, the concept of scenius takes weight off of my shoulders, because it emphasizes that it is okay that I'm not able to do everything on my own. In the past, needing help from others could feel like a sign that I was not smart enough to succeed. But our understanding of mathematics has never required us to do everything alone. In

fact, it's a good thing that we cannot, since if that were the case we could miss out on learning from others' ideas. So instead of aiming to create monumental ideas that require a genius, I can learn from others and focus on making any incremental improvements in understanding. That may be the best way for us to contribute to the scenius, and help the mathematical community thrive. □



by Firstname Lastname

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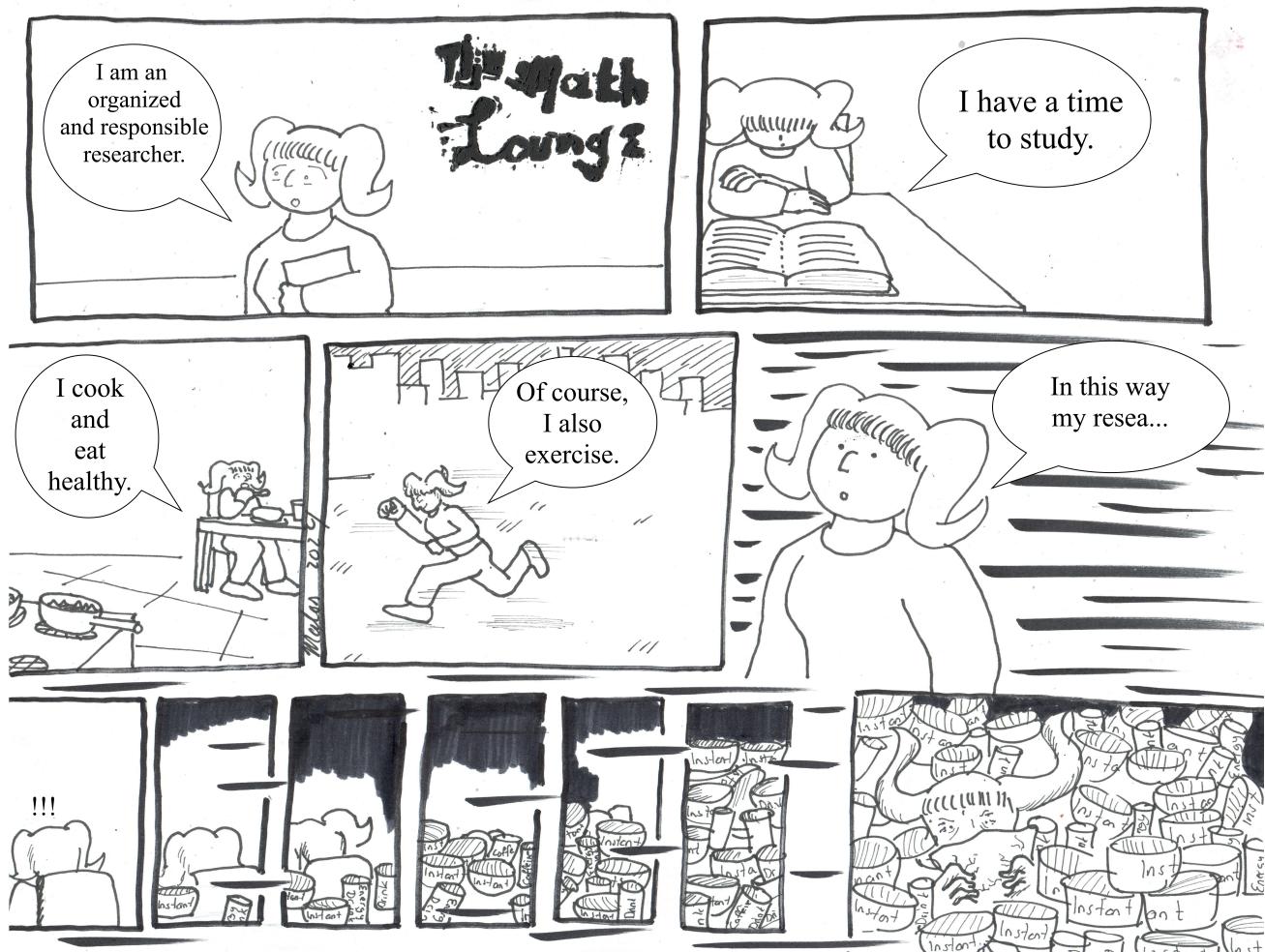
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# Art: The Math Lounge

by Malors Espinosa Lara

I am Malors, a postdoc here in the math department! I work in the Langlands program. I did my masters and my PhD here as well. When I was a graduate student I was for two years the president of the MGSA, and jokingly I would be called "El Presidente" in a very serious tone. Since then I have been very involved in supporting graduate students to the best I am able :D I have liked cartoons since I was a little kid and I find exploring mathematical ecosystems very alluring, which is the motivation behind The Math Lounge, since in the math lounge we see a lot of the math people narratives played out.



# To Durian or Not to Durian

by Derek Wu

In defence of an unfairly maligned fruit.

**D**ID you know there is a fruit who's flavour has been described simultaneously as caramel, rotten flesh, custard, vomit, honey and onions? In fact an early European who visited Asia described the taste as “to eat ... is a new sensation worth a voyage to the East to experience. ... as producing a food of the most exquisite flavour it is unsurpassed”, while my roommate’s (who happens to be the Tea Time Coordinator) response to asking about them was “I hate them, I’m banning you from bringing them to tea time”.

What kind of fruit can be simultaneously described as being so bad and so good at the same time? The answer is durian. Durian is a fruit from southeast Asia that looks a little like the business end of a man-o-war. It is about the size of a watermelon, and it’s covered in sharp thorns while also growing high up on trees. There are even news reports from some countries of durians falling on people’s heads and killing them. This death-trap of a fruit doesn’t just look like it can kill you, it smells like it too. The fruit has a pungent odour that is a mix of rotten flesh, garbage, gym socks, and garlic. However, don’t let the smell stop you from trying what’s often called the “King of Fruits”. Millions of people worldwide insist that durian is hands-down the most delicious fruit in the world. And this is why I have a proposal for the UofT mathematics graduate student community.

I want to bring durian to our Friday tea time snack.

Before we all immediately shut down this decision, there is a good reason for wanting to try durian. Despite its reputation, durian has one of the most unique and tasty

flavours in the world. In countries where it grows naturally, it is widely regarded as a national delicacy, and even holds the position as the national fruit in 3 different countries. Although it is known for its pungent odour, the smell should be fairly localized. So at a low cost of possibly stinking up the graduate lounge, we can all have the opportunity of eating what is widely regarded as the most delicious fruit in the world.

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### I want to bring durian to our Friday tea time snack.

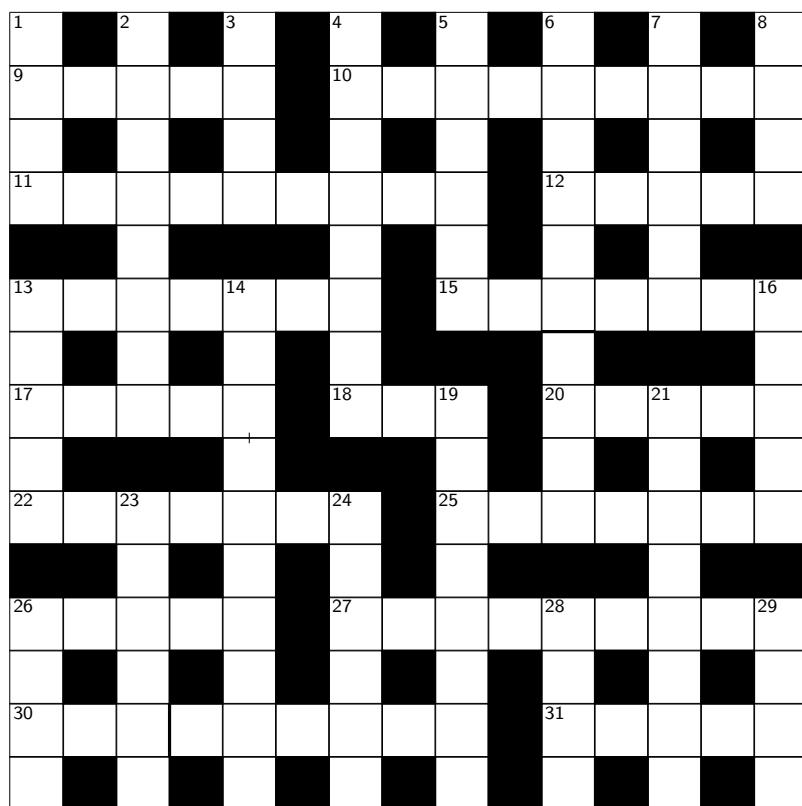
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Another potential issue is the cost of durian. Due to the very specific conditions needed to grow durian, the fruit must be imported from southeast Asia causing a hefty price increase. However, from my very trustworthy and accurate sources (my Thai roommate), we can purchase durian for only \$37! That is well within our tea time budget, and even leaves some leftover money to buy heartburn medication for those who may end up dry-heaving from the smell.

Unfortunately due to corruption and abuse of power in the tea time committee, I have been wrongfully banned from being durian to tea time. However, I was told that if popular demand insisted on durian, the tea organizers were willing to bend a knee. This is where you come in dear reader, I need you to make your voice known. We need the tea time organizers to realize that the math department wants durian. In the coming days I will be displaying a petition for tea time durian, and I need you to sign it. □

# Crossword

by Rishabh Prakash



## Across

9. Sufficient (5)
10. Assessment (9)
11. Number one Pokemon (9)
12. Innocent (5)
13. A soft toy (7)
15. Pains (7)
17. Occurrence (5)
18. Ancient gold contains secrets \* (3)
20. Shade of blue (5)
22. Extremely dirty and unpleasant (7)
25. Believe something but not firmly (7)
26. A place for dancing (or panicking?) (5)
27. What hummus is made of (9)
30. Aang was the last one (for a while) (9)
31. ~ (5)

## Down

1. A sheepish kid? (4)
2. Gesture of approval or admiration (8)
3. Juno's Greek counterpart (4)
4. Mexican pepper (8)
5. Greek city-state famous for its military prowess (6)
6. Where rockets take off from (6, 4)
7. Delegate (6)
8. Escape (4)
13. Reporters - iron (5)
14. Passionate (3-7)
16. Like honey (5)
19. Files (8)
21. Inconsistently (8)
23. Not certain (6)
24. Unit of time (6)
26. Like honey (4)
28. Bird - toy (4)
29. Fortune teller (4)

\* indicates a cryptic clue

# Puzzles

My name is Matthew Bolan, and I am a 2nd year PhD student working in algebraic combinatorics. Mathematical puzzles were my only entertainment in my hospital bed during a series of surgeries as a young child, and I have been in love ever since. In my spare time I play a number of classic board games badly, my favorites being chess and go. I am excited to share some of my puzzles with you, and even more excited to see what puzzles and solutions you all share with me.

## A Strange Endgame

Place the following pieces on the chessboard: a king, a knight and a pawn for White, and a king and queen for Black, such that neither king is threatened, the position is legal (no pawn on first or last rank), and White wins with Black to move.

This puzzle was shared with me by my good friend and collaborator Andreas Tsevas. We have confirmed that the solution is unique up to symmetry via an endgame tablebase, but perhaps someone can find an elegant argument for this.

Good luck! E-mail all solutions to matthew.bolan@mail.utoronto.ca

## $n^{\text{th}}$ Power Groups

Say that a group  $G$  is an " $n^{\text{th}}$  power" if there exists a subset  $A$  of  $G$  such that each element of  $G$  is expressible as a product of exactly  $n$  elements of  $A$  in a unique way. For each  $n > 1$ , find a non-trivial group which is an  $n^{\text{th}}$  power. Is any non-trivial finite group an  $n^{\text{th}}$  power?

The  $n = 2$  case of this puzzle arose naturally during Terry Tao's ongoing ``equational theories'' project. The solution in the finite case is especially nice, but not easy!

## Call for Submissions

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