

The Newsletter of the Mathematics Graduate Student Association

Issue 4

November 2025

Happy holidays!

As the fall semester is winding to a close, the days are getting shorter, and the end-of-semester work looms, we hope that everyone is staying sane as best as we can!

This issue will hopefully provide a bit of relief from the stressors of daily life, and something to read over the upcoming break. Check out our puzzle column by Matthew (page 5), and the crossword by me (page 9), for some fun diversions. This is the first issue created with the new 2025-26 newsletter committee, and I'm proud to say that I believe the articles here exemplify the vision Herng Yi and I share of the newsletter as an avenue to share our interests and connect with other students in the department.

First, we have a follow-up to Maziar's article from the September issue about the importance of working out. In response, Alice answers the natural next question: how to start? If you've always wondered how, Alice's article offers some friendly suggestions about where to begin (page 4). This advice might come in handy for those

with New Year's resolutions on their mind!

We also have two music-related articles from incoming editors Charles and Robb. Charles paints intriguing pictures through a series of vignettes inspired by albums released this year (page 7); Robb ruminates on lived experiences in the Toronto music scene to deliver a compelling essay in praise of the art that proliferates at the margins of culture (page 11).

I'm excited to see people reading the newsletter and responding to the content, as well as using it as a venue for more creative outputs. I hope that you, the reader, will also be inspired to contribute your own writing to an upcoming issue. Get in touch with one of us to workshop an idea or share your thoughts on this issue, either through email, in person, or via the form at the end of this newsletter (page 14).

Happy Holidays from the MGSA, and have a safe and relaxing holiday break!

– Kevin Santos
MGSA Secretary □

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www.math.utoronto.ca/mgsa/newsletter

The Inside Scoop: A Word from the MGSA Executive Team

Updates on the MGSA's Advocacy by Kevin Santos

The MGSA has been working to serve you throughout the semester! Listed here are a few of the MGSA's activities in the semester so far.

Advocacy

Thank you to all who filled out the grad student survey! Your responses are essential to the MGSA's advocacy on behalf of you, the student body. The input from last year's iteration of the survey helped the MGSA effect some real changes in the department, such as instituting the new algebraic geometry course and other topics courses you requested. A report from our graduate affairs committee is forthcoming: it will contain the results of the survey, as well as recommendations to the department on how to best serve the interests of the student body. Please keep an eye out for it in your email! We hope that we can advocate for more changes this year.

Events

- **Halloween Party:** The MGSA Halloween party was a success, filled with candy, food, drinks, pumpkin pie, and fun games, culminating in a costume contest with prizes.
- **Tilt Arcade Night:** The MGSA held a raffle to grant four students free admission to Tilt Arcade, an arcade pub. It was a fun night of connecting and chatting over arcade games.
- **Pub Night:** Following teatime one Friday, we gathered at the Smith Social House's Pool Hop for a pub night featuring billiards. We hope to make pub night a more regular occurrence in the future!



- **Grad seminar:** The grad student seminar has been successful, despite some room changes. If you'd like to give input on when to hold the grad student seminar next semester, make your voice heard here: <https://www.when2meet.com/?33592942-4BeW1> (feel free to use your favourite pseudonym). This poll will close on December 1st.



Upcoming events

The MGSA is currently planning many exciting events!

- **Holiday Party:** This year's winter holiday party will be happening **Dec. 12**. Sign up for Secret Santa! Check the MGSA Weekly Digest in your email for the link, or scan the QR code below.
- **Bird's Eye Conference:** The 4th annual Bird's Eye Conference will be happening Jan. 31 – Feb. 1, 2026! Get to know what your fellow grad students are working on, or gain valuable practice in giving a talk on your research. More details will be sent out soon.
- **Faculty-Student Mixer:** Stay tuned for further information on the Faculty-Student Mixer happening next semester. In the past, the event has been a great way to get to know faculty and partake in some food and trivia. □



But what am I supposed to do at the gym?

by Alice Rolf

In the September 2025 issue, we gave you many good reasons why you should hit up the gym. But once you're there, what are you actually supposed to do? The options are overwhelming. This is advice from someone who started to lift heavy weights about two years ago.

I personally started by going to the Hart House gym and trying out their weight machines. These machines have descriptions printed on how to properly use them and which muscles they are supposed to hit. This makes them very beginner friendly. The risk of injury is low (but never zero) and especially in the beginning you will notice a fast progression. However, if you only rely on machines, it will be hard to train stabilizer muscles. In addition, you might start developing imbalances from side to side. Machines definitely have their place in a workout routine; some muscles are very hard to stimulate using weights. However, I would recommend to eventually incorporate exercises using barbells and dumbbells.

The most classic exercises using the barbell (the big metal rod where you have to put plates on each side) are the bench press, the deadlift, and the squat. I recommend learning those exercises using online resources. There are a lot of videos on YouTube giving great pointers for these exercises. I recommend you to watch a few videos on the form and focus on the thing all these videos have in common. Always focus on the proper form and not on the amount of weight to reduce the risk of injury. Another great website to learn some additional exercises is exrx.net; this website is a library of exercises sorted by muscles. In your first few workouts I encourage you to just try out some exercises. Af-

ter that, make a list with the exercises you want to keep, ideally covering all the muscle groups in your body. To see the best results, it is easiest to choose a few exercises and stick with them over a few months. Keep track of how many sets and how many repetitions you are doing and make sure to increase the weight, reps, or number of sets each week.

Another way to start could be group classes. In group classes you don't need to go through the process of designing the workout yourself. In addition, it will give you a specific time during which you have to workout, that is the scheduling will be also taken from you. Depending on what kind of person you are this can be an advantage. The athletic centre offers IMPACT training. In these classes you will be led through a structured workout, supervised by coaches who will critique your form. If you want to go off campus, you can try out different exercise classes with the app ClassPass.

No matter what you choose to do, the arguably most important part of success at the gym is consistency. Make sure that your workouts are hard but not too hard to discourage you from going. If it helps with your motivation, try and go with a few friends.

Finally, a huge part of my personal motivation is to set personal short and long term goals and see myself achieving them. There is a lot more I could talk about regarding the gym such as what goals to set, how to build a gym schedule, how many sets and reps to do of each exercise, how to build a warm up and cooldown routine, how to deal with injury... But for the beginning don't let perfect be the enemy of good, try out a bunch of exercises to see what sticks, and have fun! □

Puzzles

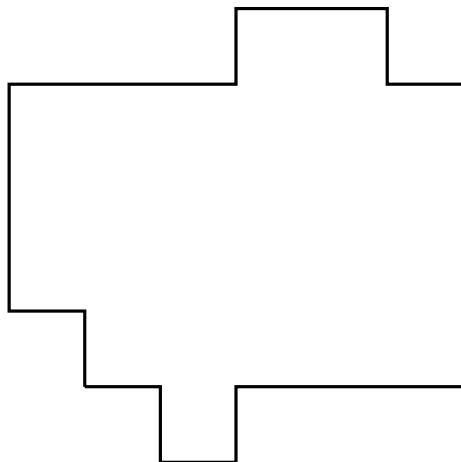
by Matthew Bolan

Math Puzzle

Suppose M is a finite set, and suppose $\diamond : M^2 \rightarrow M$ is a binary operation obeying $x \diamond y = ((x \diamond x) \diamond y) \diamond y$ for all $x, y \in M$. Show $x \diamond y = ((x \diamond y) \diamond (x \diamond y)) \diamond y$ for all $x, y \in M$.

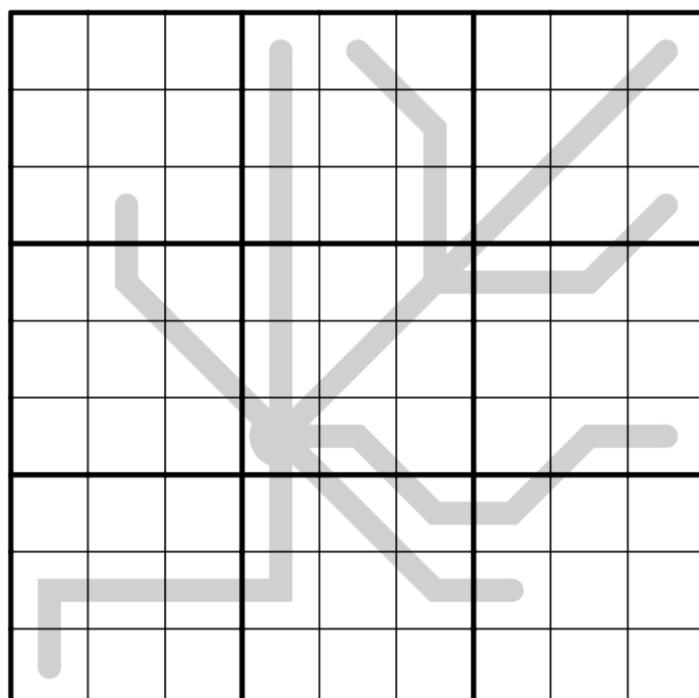
Equidissection

Making a single piecewise linear cut, divide this shape into two congruent pieces.



Thermosudoku

Normal sudoku rules apply. On thermometers, digits must strictly increase starting from the bulb (in this case, there is a unique bulb on cell 7 of box 5).



Good luck! E-mail all solutions to mgsa [at] studentorg [dot] utoronto [dot] ca

Solutions for Previous Puzzles

Chess Puzzle

There are 14 such games, one of which is 1.Nc3 d5, 2.Nxd5 Nf6, 3.Nxe7 Ne4, 4.Nxc8 Nc3, 5.Nxa7 b5, 6.Nxb5 Ba3, 7.Nxa3 Nb1, 8.Nxb1. The others are obtained by replacing 3.Ne4 by 3.Nd5 and/or reordering Black's moves. There is some general theory about counting linear extensions of posets which in principle allows one to count the number of allowable reorderings, but for this particular problem I prefer the method of just counting to 14.

Math Puzzle 1

This is an old chestnut, originally due to N. G. de Bruijn. Stan Wagon lists 14 proofs of it^a. The classic solution (number 2 in Wagon's article) is to observe that after translating so $A = [0, a] \times [0, b]$ with $a \notin \mathbb{Z}$ and $b \notin \mathbb{Z}$, the integral

$$\iint_S \sin(2\pi x) \sin(2\pi y) dx dy$$

is non-zero when $S = A$ and zero for $S = R_i$, meaning A cannot be decomposed as a disjoint union of the R_i .

Math Puzzle 2

Suppose for sake of contradiction that such a tile could cover an $a_1 \times a_2 \times \dots \times a_d$ grid. As then we can certainly cover a $2a_1 \times 2a_2 \times \dots \times 2a_d$ grid, we may assume each a_i is even. Color cell (i_1, i_2, \dots, i_d) of such a grid with the monomial $x_1^{i_1} x_2^{i_2} \dots x_d^{i_d}$. Then the sum of these monomials over all grid cells is

$$p(x_1, x_2, \dots, x_d) = \prod_{i=1}^d \frac{x_i^{a_d} - 1}{x_i - 1}$$

As $(t+1)^2 | t^4 + t^3 + t + 1$, the existence of such a tiling implies p lies in the ideal I generated by the polynomials $\{(x_i + 1)^2\}_{i=1}^d$. This is absurd, as

$$\frac{\partial p}{\partial x_1 \partial x_2 \dots \partial x_d}(-1, -1, \dots, -1) = \prod_{i=1}^d \frac{a_d}{2} \neq 0$$

(using that the a_i are even), but this derivative vanishes on all of I .

After posing this problem I found out that it has been considered before. It is claimed that Juha Saukkola has a proof of this result in 2 dimensions^b, though I could not find the specific proof.

^aStan Wagon. Fourteen Proofs of a Result About Tiling a Rectangle. In: The American Mathematical Monthly 94.7 (1987), pp. 601–617. url: <https://doi.org/10.1080/00029890.1987.12000693>

^bErich Friedman. Disconnected Polyominoes (Problem of the Month, February 1999). <https://erich-friedman.github.io/mathmagic/0299.html>. Last updated 3 March 1999.



by Charles Swaney

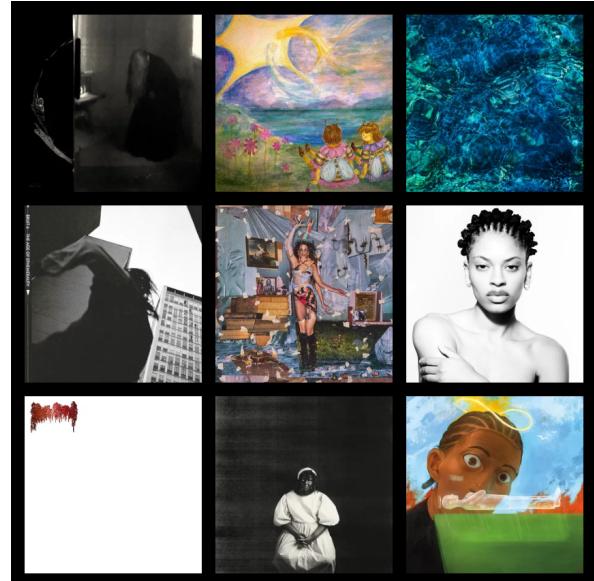
One of my biggest hobbies is discovering new music. Since the year is coming to a close, I thought I would talk briefly, in no particular order, about some of the albums from 2025 that I loved most. Each entry is a vignette that tries to capture how an album made me feel, and most also incorporate elements of what I perceive to be the corresponding album's themes.

Ethel Cain – Perverts (*drone, dark ambient*). Frigid water seeps through your boots, and your breath catches on the wintry air as the weight of the world presses down on you. You're all alone, just like you've always been.

Gingerbee – Apiary (*screamo, indie rock, chamber pop*). You're a lost locust, and you just stumbled into a cafe full of hornets. What is that incessant buzzing? Is she playing horns in the back? You're not sure, but here seems a safe place to rest your weary wings.

Ichiko Aoba – Luminescent Creatures (*chamber folk, new age, ambient*). Floating softly down the warm stream on your back, you peer through the morning-sun-dappled-leaves above. Something brushes against you, rousing you from your reverie: a looking glass, gently gyrating its way into your hand. As you press it to your eye, the sparrow flies out, not once looking back.

BRUIT ≤ – The Age of Ephemerality (*post-rock*). The walls are crumbling around you, and data is leaking from the pores of this world, coating your hands that are more than hands—your future flashes before your eyes; or is that the past? It's hard to tell from where you stand.



Marina Sena - Coisas Naturais (*alt-pop, Latin pop*). It's 3 A.M., and you're not tired. Pausing at the doorway as you leave the discotheque, the sensual vibrations, echoing faintly from behind the door, inject a calming warmth into the brisk night air that urges you to hurry up and make up your mind. The clouds part, and the stars, once hidden behind, now ebb and flow amidst your mind.

Annahstasia - Tether (*contemporary folk, chamber folk*). Stumbling through the roots, your fingers slip delicately over the lichens-growing-ever-upwards as you find your footing. Step by step, you walk a narrow tightrope through the grove, each root tracing a familiar wrinkle across your grandmother's hand. Reaching into your back pocket, you find an ineffable light, illuminating all the words you've ever wanted to say.

moreru - SEKAI: YYou && MMe (*noise rock, emoviolence*). Back and forth, the lawless crowd pushes itself from within. Suddenly, a bulldozer emerges from within the cauldron. People scream and shout, but you've seen this hologram before. It's the inexpressible chaos, trapped beneath the mire of filth and muck on which we stand, threatening to pull us under.

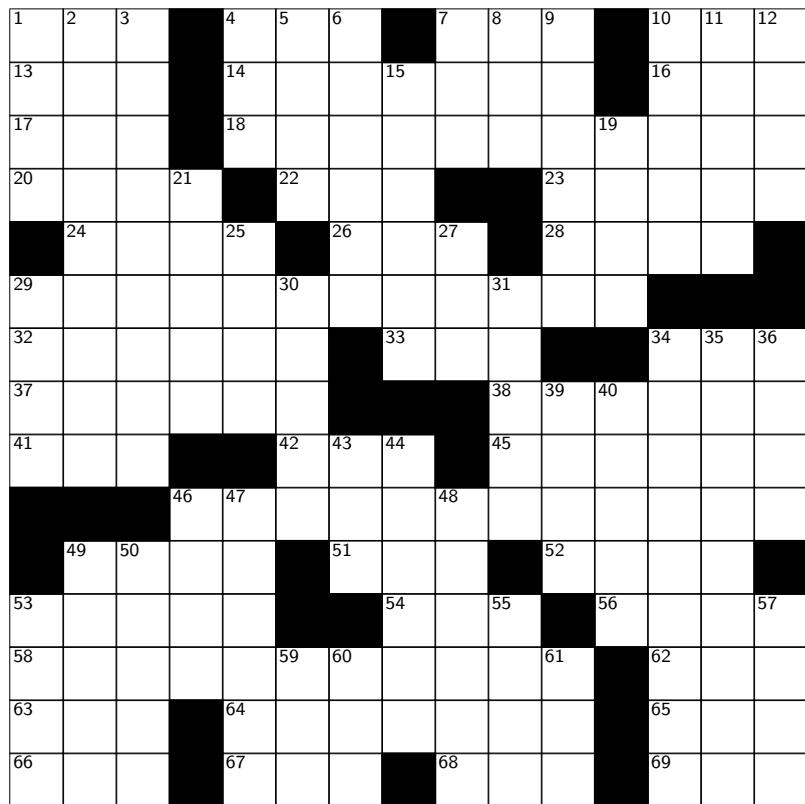
Backwash - Only Dust Remains (*abstract hip hop*). The great contraption before you whirs with the foreboding energy of heavy machinery, yet nothing about it is mechanical. The steam release valve hisses, long overdue, baring itself before you and obscuring your vision. After the steam dissipates, lit by the critical system failure warning light, the writing on the wall reads: “After this there is no going back unless you own it”.

McKinley Dixon – Magic Alive! (*jazz rap*). Cupping her hands tight to contain the wa-

ter, she runs home, sweltering afternoon sun at her back. A tiny eel swims between her palms. Brushing past the crowd, she trails drops of water on the pavement behind her, leaving a path of breadcrumbs for her two friends. How many more blocks? She rounds the last corner, and finds herself blinded by the sun—“a blaze of glory”; the eel, slippery as can be, slips through her pinkies. As day fades into night and water returns to air, she finally heads back home, only to find the eel placidly swaying in the tank beneath her mother’s baby photo. □

Crossword

by Kevin Santos



Across

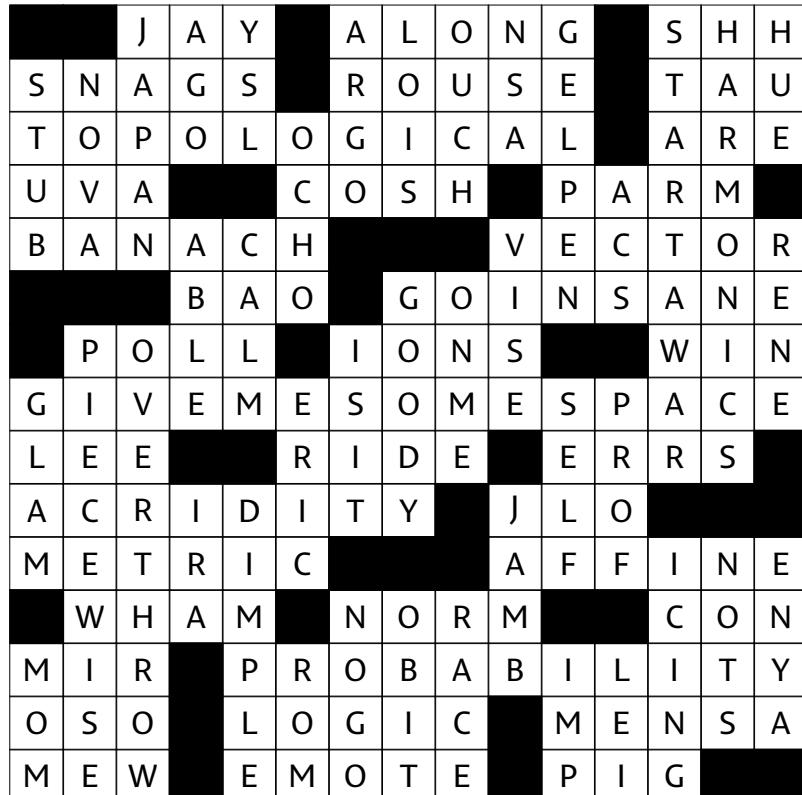
1. Cooling units (abbr.)
4. Russian space station
7. Member of a class, often
10. Measure calculated with one's ht. and wt.
13. Unkempt hair
14. Refreshing cold drink
16. Assistance
17. Post-L trio
18. *(╯°□°)━┻━┻, perhaps?
20. Other, in Spanish
22. Homer's neighbor
23. They're connected and acylic
24. Words after give or suck
26. Generalization of a sequence, in analysis
28. Greasy
29. *Course that requires absolutely no effort
32. Potatoes and yams, for example
33. Broadcast
34. Faux ____
37. Second most populous city in British Columbia, after Vancouver
38. Like italics
41. Reddit Q&A
42. Prefix meaning 6-Down
45. Adjective for a drag queen or a lion
46. *Almond milk, for example?
49. Plant with high-fibre seeds
51. Member of a now-obsolete geopolitical union
52. Springtime months (abbr.)
53. Sauce with a lot of garlic (and vowels)
54. Enzyme suffix
56. Jacques ____, namesake of a group and a metric
58. Property in category theory that the answers to 18-, 29-, and 46-Across could have
62. A deer, a female deer
63. Under the weather
64. Heart of the matter
65. Requirement for a PhD in the U.S.
66. Things you might pay to get rid of
67. Precursor to maple syrup
68. Stereotypically Canadian filler words
69. Clairvoyance, for short

Down

1. Paintballs, for example
2. c
3. Supportive athletic undergarment
4. Karaoke necessity
5. Clickable symbol
6. Like yesterday
7. Apt name for a soup lover
8. Ending with Hallow or velvet
9. It may form a sleeve
10. Literary name for a tower or a library
11. Singer Cyrus
12. Bad day for Caesar
15. Prefix for a certain Platonic solid
19. Operatic solo
21. _____ space
25. Trim
27. French pronoun
29. "_____ me, Mario!"
30. Justin Timberlake's former boy band
31. Knitting or crochet, for example
34. Pear tree inhabitant

35. Subjects of study in evolutionary biology
36. Suffix with hip or prank
39. Dancer and singer Jojo
40. Moved like a frog
43. Greek goddess of the dawn (that's also a lip balm brand)
44. Half-off, say
46. Baby cow or whale
47. Compounds that can form from exposure to moisture
48. Bearish
49. It has a characteristic
50. Hangs around
53. It spans eleven time zones
55. Engrave
57. Ooze
59. Our neighbours down south
60. Venomous snake
61. "Absolutely!"

Solution to the Previous Crossword



Going, going, gone: marginal aesthetics

by Robbert Liu

The poster reads THE LAST SOYBOMB HQ SHOW EVER, NOVEMBER 30 2024... The bands, the sound technicians, the audience, they all claim their places in this mirage of a concert, the only public event of this kind held here since the venue closed in twenty-seventeen. The headliner, a Toronto screamo band by the name of Animal Faces—situated at the nadir of the concrete halfpipe, the center of mass of this second-story apartment space—serves as a visual fulcrum, tightly insulated by ranks of concert-goers radiating outward and upward, lining the halfpipe at regular intervals of height like an amphitheater made for clowns, and crowdsurfers bobbing along the top of the formation with a synchronicity reminiscent of debris in a river. If one imagines the band as the center of a clock face, throughout the night my own body will orbit the tip of the small hand at seven o'clock, fighting for agency in the torrent of dancers, exerting just enough force as to not flatten my friend behind me. Every instant of this set makes for one of those visually unforgettable snapshots whose after-image surfaces in one's mind at later concerts to answer the question of what could have been, during those twilight moments after a crowd has receded to brace for the next onslaught without yet knowing they have already gasped their last breath.

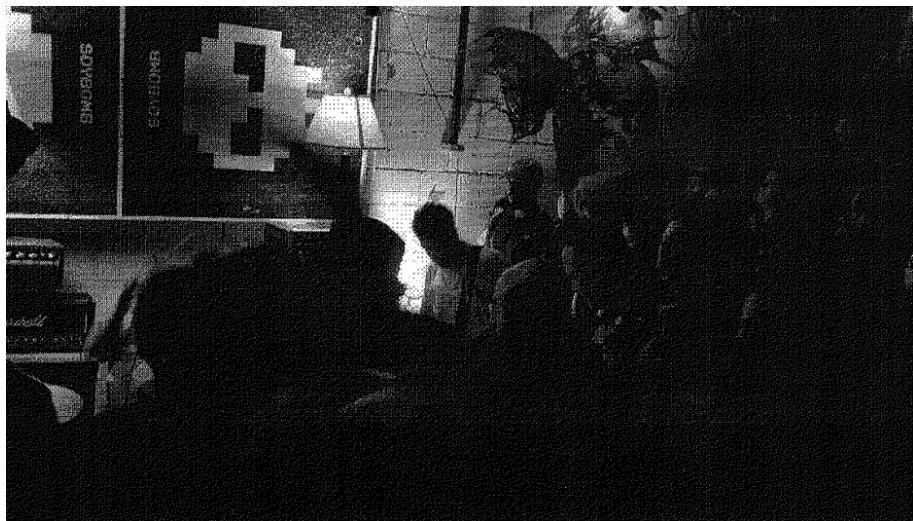
It is early in the night. The opener, the hardcore punk locals Piper Maru, has just played, and the concertgoers are nebulously sectioned by two lanes of people passing between the front door and the back of the venue, claustrophobically flanked on one side by a substantially slower moving lane—the bathroom queue—and the remains of Piper Maru's audience watching as the next band sets up on the halfpipe.

The two bands lined up to play, doom metal experimentalists They Grieve and BIG|BRAVE, based in Ottawa and Mon-

treal respectively, have devised unique sets drawing from ambient and drone, deviating from the tempos of the straight-played hardcore of Piper Maru and dissenting to the angular chord-melodies of Animal Faces in favour of more languid forms, with moments few and far in between resembling anything like a metal breakdown. Though it is impossible for me to know the deliberation involved in this detail, it interests me nonetheless: for the last show, an ambient-focused lineup certainly feels adventurous. The rest of the crowd are beckoned to ruminate about this detail by the opening notes to They Grieve's demonstration.

In the meantime, we indignantly bury this truth, that punk will never be reinvented in the same way it first emerged.

The transition of music consumerism to an internet era was matched with a newfound longing for the analog. This was perhaps best embodied by the ambient innovators of the aughts, among the likes of William Basinski or Tim Hecker, who wrote threnodies lamenting the passing of an entire culture founded on perishability and materiality that we unknowingly forfeited when we transitioned to digital. They understood too well that a new frontier of musical oversaturation was being engineered at a breathtaking pace, characterized by its digital hoards of audio and panoptic archives exhaustively documenting the past, and the eradication of value of individual recordings due to the newfound effortlessness with which music could be manufactured and distributed. And this development manifests in the current model of the popular music industry, built on a nostalgia for the parties of yesterday in their semblance of being louder and lasting longer in comparison to those of today. Intent on selling stagnation as progress, the music industry furnishes itself into a sort



of fossil fuel industry—through the mechanism of cannibalizing the musical aesthetics of the past, repackaging them in a hi-fidelity veneer, and marketing each such revival as a new wave. Though it is easy to reject the products of this mechanism with a knee-jerk reaction—after all, this is the same mechanism that challenges us to reinvent the methods with which we interface with music, to walk away from the concert halls and nightclubs towards empty warehouses and anonymous studios, inside sculptures and under bridges, eager to invert the laws of thermodynamics through performance art disguised as rave, hermeneutics as free improvisation—it is an impossible endeavor to free oneself from the mechanism. One finds themselves returning the same way they left: those in the room themselves are complicit in the mechanism. We peer voyeuristically, much like Paul Klee’s Angelus Novus, with film-grain goggles into an idealized past, one housing an autonomous underground free from material burden and pregnant with a priceless cultural capital, grasping desperately at clues for where to proceed, which scene to butcher next in the slaughterhouse of history, we who have blurred our eyes in bloodlust—and melded celebration into desecration. In the meantime, we indignantly bury this truth, that punk will never be reinvented in the same way it first emerged.

They Grieve have droned on with synthesizers and pedals for fifteen odd minutes, a quiet interlude that erupts without warning into a wave of clamor. The

crowd now moves as one, jerking in sync with the drum crashes, punctuated guitar stabs, and gravely shouts. The band’s crossover of doom and ambient expresses a kind of mourning which begins dignified and solemn and balloons into a deafening catharsis, a mirror of the venue’s own final statement.

This new scene too will burn brightly and briefly, since all endeavors that refuse to enter the sanctuary of conventionality are cursed to the marginalia of culture.

As BIG|BRAVE takes over the stage, the atmosphere transforms from somber to contemplative. The crowd plays wax museum, attentive to the torpid unraveling of pure tones into jagged sheets. Like needle pricks, the notes hang in place as if on tightropes before hesitantly blooming in thickness and diffusing into the lower frequencies. If doom metal is the marker of a tedious farewell, we can turn to the noise music as a harbinger of creation. We can see how the politics of noise are implicated by the sonic architecture of music halls: the punk house is where unconsecrated music springs forth as if sprouting from cracks in concrete, desperate not to be snuffed out, where calloused fingers are less concerned with playing the wrong notes and more terrified of not playing anything at all, where nascent microsymphonies of noise proliferate via instrumental feedback and



unfettered reverberation. The punk guitarist holds the body of their instrument to the amp cab, proclaiming without words more not less. Let us compare the punk house to the cafe as music venue: the latter is a utopia of silence defined by restraint, where every soundwave is policed and every performance is followed by delicate applause and disciplined enthusiasm. Here, any deviation from the silence is a manifestation of will, thus noise is made both sacred and profane: only revered in controlled doses. Just as Sontag, in championing Kafka over Joyce, favoured art which is “secreted, not constructed”, the qualities of the punk house become highlights in the manifesto of the punk underground’s belaboured endurance. And the drone of BIG|BRAVE becomes the worship hymn of the punk house, weaving together the cacophonous folk “melodies” heard within.

Before Animal Faces plays the final set, the crowd gathers close for a conversation with the founder of the space, Jason Wydra, who reminisces about his vicious first impression of the band, dismissing them as “some other... some more fucking mediocre suburban fucking screamo”, their subsequent redemption when Jason first attended an Animal Faces live set, and the decade long epilogue of their continued collaboration and codependence. Jason reminds of the closure the show symbolizes—the next day the apartment would be dissected, the halfpipe levelled, and the apart-

ment’s unique fixtures and mise en scène auctioned away. The last stand was already fought years ago*. And yet where one scene ends, another has been steadily growing out of its remains. Many of the key players in the scene were there at the last show, paying their respects to the home in which they grew up in. This new scene too will burn brightly and briefly, since all endeavors that refuse to enter the sanctuary of conventionality are cursed to the marginalia of culture. And the archipelagic music underground will continue to flicker on, indifferent to the absurd priorities of the external world, in basements and vestibules and mezzanines and on staple-holed telephones poles, in the guitar whines that emerge as the band closes out the song and the cabs scream their restless din and the moshers are poised, waiting for the band to play The music again, not entirely realizing that this, too, is The music.

An A&W materializes from behind a row of hole-in-the-walls hanging up CLOSED signs. I order a teen burger, onion rings, and a coke: one of my post-show rituals. I cannot remember the last time I ordered fries at an A&W, and furthermore I am mystified by the thought that no other burger joint I have eaten at cuts their onion rings the same way A-n-dub does—always too much batter and not enough onion. □

*In late 2016, a series of threads on the 4chan/pol/ subforum were opened targeting DIY venues in Toronto, which were successful in closing down several spaces that were suspected to violate municipal safety regulations, including one SOYBOMB HQ. For a more in-depth account of these events, see Transgressive DIY (Do It Yourself) Spaces, Mixed Virtual/Physical Affinity Spaces, And Building Code Vigilantism by Dr. Sara Gwendolyn Ross.



asking for a friend.

an anonymous Q&A column

Our advice column will be relaunching next issue! At a recent meeting of the newsletter committee, we received an anonymous note that someone had slipped under the door. It seems that an advice guru is willing to offer their services to help lost and confused grad students. If you have a pressing concern that you need guidance on, please submit it in the online form below and our anonymous oracle will be happy to provide their input. (If you're reading the print version, check the first page for a QR code to access the online issue!)

How to Contribute

Do you have some cool math to explain, or some art or craft to show us? Do you have someone you'd like to interview? Would you fancy a chance to dive into a non-math topic by writing a short essay about it? Send your potential ideas to mgsa [at] studentorg [dot] utoronto [dot] ca, and one of our editors will be in touch. No commitment required at this stage—let's just talk and see if anything cool emerges! You can also help us by giving feedback on this issue at this survey.

Credits

Design & Layout: Isabel Beach, Herng Yi Cheng

Typesetting: Isabel Beach, Kevin Santos

Editing: Brendan Isley, Robbert Liu, Kevin Santos, Charles Swaney, Derek Wu

Web Version: Dominic Shillingford