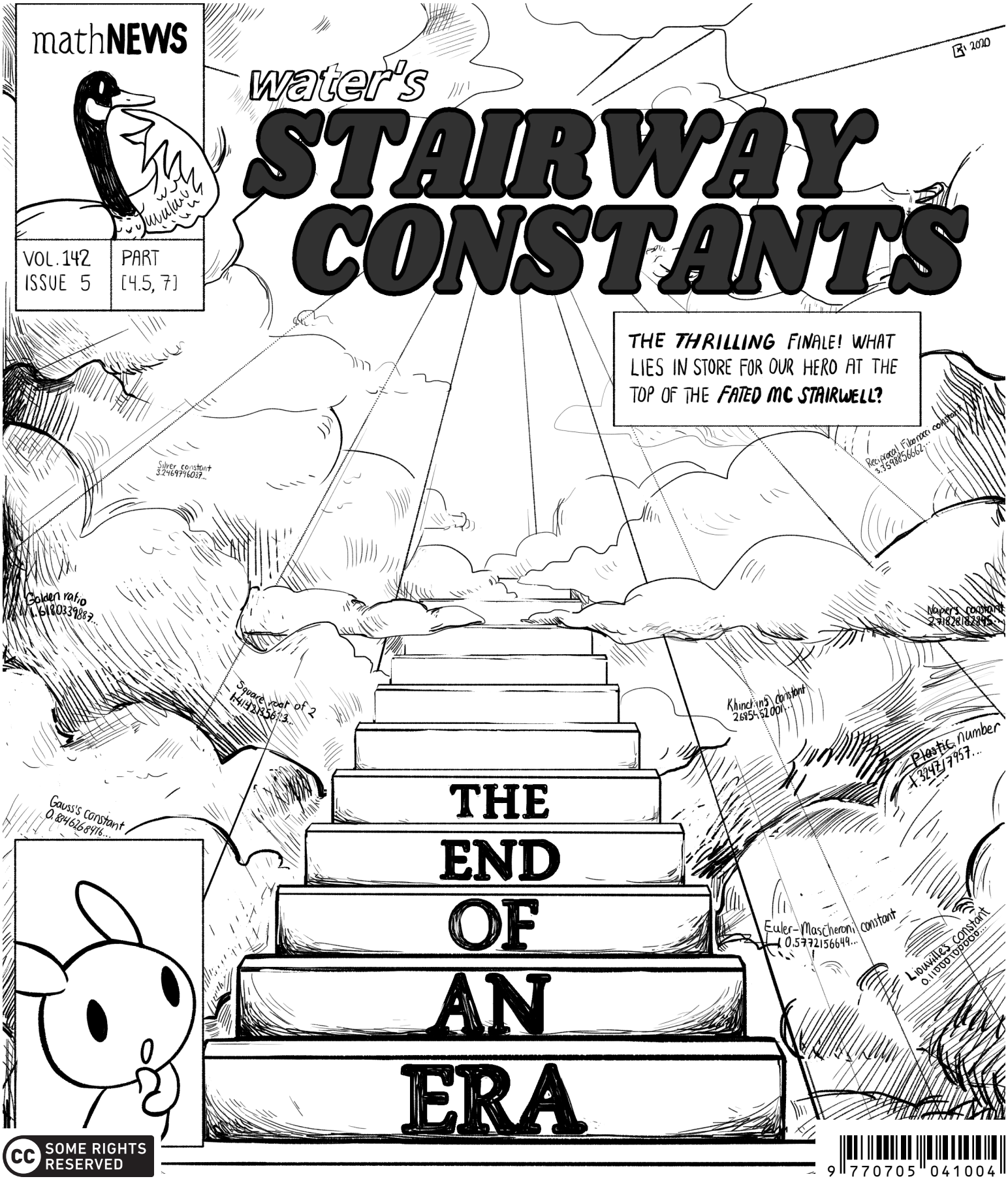
mathNEWS

VOLUME 142 • ISSUE 5

MARCH 13, 2020



9 770705 041004

mastHEAD

"IF YOU WERE A CLEARANCE SECTION ITEM IN A GROCERY STORE, WHAT WOULD YOU BE?"

Welcome back to yet another edition of itorED using the **mathNEWS mastHEAD** as their personal journal.

This time it's at the request of no fewer than two contributors, so I can pretend I'm not just writing this because of my huge ego as usual (though I do admit their requests have further inflated my ego accordingly).

Today, I will recount the tale of the most on-point birthday present I have ever received.

As those close to me are aware, I love grocery shopping and getting a good deal. (When I bought a 10lb bag of potatoes for $2 one time, I kept bringing it up in regular conversation for the next two months.) As such, a fitting birthday wish that I conveyed to my dear friend extrovertED was for her to drive me to the holy land of T&T so that I could purchase groceries and scope out the clearance section.

There, I found a prepackaged version of a food I had eaten many times in my childhood, 红烧烤麸. This is a Chinese vegan dish, popular among Buddhists, consisting of wheat gluten, wood ear mushroom, lily flower, and other delicious yet healthy ingredients. My dad always complained about how arduous it was to make this dish, yet he would do so whenever I requested it. Having not lived at home since early 2015, I missed eating it, and fantasized about the food regularly.

I was lucky that this specific food was marked down from $3.99 to $0.99, merely a quarter of its original price! I immediately purchased 12 packs (along with other grocery needs), and went home to judge its flavour. Eating it cold out of the bag, I was overwhelmed by the memory of sneaking down to the kitchen in the wee hours of the night and eating pieces of 烤麸 straight out of the fridge. Upon this, I resolved to return to T&T soon and buy out the rest of their stock.

The next day, extrovertED came by to eat curry, and offhandedly offered to drive me back to buy more 红烧烤麸. I excitedly accepted.

To be continued, in a future issue…

itorED
Editor, **mathNEWS**

skit	A box of cereal that fell off the shelf last week and is a bit crumpled but the cereal inside is fine but people don't pick it up because they don't want a crumpled box and they didn't need cereal anyways and now sits in a pile of cereal boxes buried in shitty cereal mascots except Tony the Tiger, he's hot.
Deriving for Dick	A 1.75L bottle of Gold Peak Tea.
Octopodes	Knock-off animal crackers where the only shapes are deep sea creatures.
jeff,	Skit, you okay pal?
Various Pseudonyms	Those cookies they bake in-house — I'm cheap but still sweet ;)
Hœ Chi Minh	A stale baguette in Zehrs.
Herbie	Eggo waffles — specifically original flavour, specifically expiring soon.
ITSH	Lucky Charms, the universally accepted gayest foodstuff.
Sillycone	Bananas that someone put a "for rectal use only" sticker on.
waldo@<3Le-Gasp.ca	BREAD. Always bread, because I have a short lifespan before I break down completely.
swindlED	Ice cream that's more freezer burn than edible matter.
itorED	99 cent 红烧烤麸 from T&T.
confusED	Ginger snaps.
terrifiED	Tic Tacs.

ARTICLE OF THE ISSUE

This week's article of the issue goes to water for *Stairway Constants, part [4,5,7]*, though really it's for the series as a whole. On the one hand it's the most actual math we've had in **mathNEWS** in a while, on the other hand the *Stairways Constants* series have been by far the hardest articles to format since Zethar's cuneiform magnum opus, so you best be damn grateful we've deigned to give you the prize 😛

Don't forget to swing by the **mathNEWS** office in MC 2020 to pick up your prize!

swindlED
Editor, **mathNEWS**

God damn I love wheat gluten. I'm not even vegetarian!

MIN ZHU, mathNEWS EDITOR FOR WINTER 2020
ALONG WITH JAMIE ANDERSON, TERRY CHEN AND ANUJ OPAL

mathASKS 142.5

FEATURING PROF. KEVIN HARE, INTERIM DEAN OF MATHEMATICS

SILLYCONE: SO WHAT DOES THE DEAN OF MATH ACTUALLY DO ON A DAY-TO-DAY BASIS?

Meetings, meetings, photo ops and more meetings. And of course planning the annexation of all Engineering buildings to be converted into space for laser tag and/or paint ball and/or indoor humans vs zombies.

πLLIOW PRINCESS: WHERE IS YOUR FAVOURITE WASHROOM ON CAMPUS?

It hasn't been built yet. But luckily people trust me to talk to the architect involving in planning of the next Math building (which I'm currently calling "Math House"). Hopefully soon I will have a favourite washroom on campus that I can be proud of. My favourite washroom ever is in the Island in the Mur Cafe, in Graz Austria. It is sort of like the infinity room at the AGO, but much smaller, with a toilet, and with mirrors that are curvy enough so that it isn't creepy using the toilet.

On a related note, I have been told that the Math House can't have a paternoster, so I'm really hoping to get my way with the washroom plans.

WATER: WHAT IS YOUR FAVOURITE STAIRWAY CONSTANT? (REFERRING TO THE NUMBER LINE IN THE NORTH-NORTHEAST STAIRWELL OF MC)

The first Pisot–Vijayaraghavan constant. But most of my PhD thesis was on Pisot numbers, and most of my research is on numbers between 1 and 2, so I am probably biased.

SANDWICH EXPERT: DO YOU READ mathNEWS?

Yes. Especially this issue.

VINCENT MACRI: HOW DO YOU FEEL ABOUT THE UNIVERSITY OF WATERLOO INVESTING IN THE FOSSIL FUEL INDUSTRY?

I feel that students (and the wider university community) have the right to hold their university to account if they feel that it is not meeting its responsibility. This is equally true be it on environmental issues such as its involvement in the fossil fuel industry, social issues such as equity, diversity and inclusivity, or upon the quality of education. The previous list is in no way exhaustive. I feel it is the responsibility of the University to take such concerns seriously, and change if necessary. This does not mean that everybody will always agree, but everybody should always be willing to listen and try to understand, and to act as their conscience dictates. When the University says that today's students are the leaders of tomorrow, it is more than just empty words. We strongly believe, and I personally strongly believe, that this is true. If you would like advice on the best avenues to advocate, please reach out to my office (deanmath@uwaterloo.ca). Alternately I am sure that both WUSA and MathSoc would also be able to give excellent advice on this matter.

ITSH: WHAT IS YOUR FURSONA?

I have to admit that I had to look up what a fursona was. About the closest I get is that I have a superman onesie and I have a t-shirt for my spirit animal (bunny wielding two chainsaws). According to the fursona generator personality quiz that I found online, my fursona is JW the Yak. I'm not quite sure what that means though.

HOE CHI MINH: WHAT'S THE BEST CARLY RAE JEPSEN SONG OFF OF THE EMOTION ALBUM (DELUXE EDITION)?

My favourite Carly Rae Jepsen song isn't acutally on the Emotion album, nor even sung by Carly Rae Jepsen for that matter. It is "Share it maybe" by the Cookie Monster.

VARIOUS PSEUDONYMS: HOW ARE YOU DOING?

Good

ALUMNIUTUS: ARE YOU EXCITED TO COME TO GRAD BALL? WHAT ADVICE WOULD YOU GIVE TO THE CURRENT GRADUATING CLASS?

Absolutely. I just arranged to buy an entire table.

To quote Ellen DeGeneres "Follow your passion, stay true to yourself, never follow someone else's path unless you're in the woods and you're lost and you see a path then by all means you should follow that."

To misquote Bertrand Russell, "I would advise you not to follow this advice."

A MEDIOCRE KITTY: IN YOUR BRIEF TIME AS DEAN, WHAT DO YOU HOPE TO ACCOMPLISH? WHAT ARE YOUR HOPES FOR MATH STUDENTS IN GENERAL?

I hope to be able to annex at least three Engineering buildings before June 30th, and have plans well in hand for the incoming dean to annex the rest before the end of the year.

My hopes for math students in general is to have sufficient repurposed Engineering buildings to meet their paint ball / laser tag / indoor humans vs zombies needs.

NARF DERT: TIME IS SHORT AND SO IS YOUR TIME AS DEAN. DO YOU PLAN TO FIND AN EQUATION TO CHANGE TIME TO MAKE IT LONGER THAN GOING AT A RATE OF ONE SECOND PER SECOND? WOULD YOU WANT TO?

I hadn't actually considered spending my time this way. I'm too busy plotting the annexation of various Engineering buildings. I don't think I would actually want to do this even if I could.

QUANTUM GOOSE: WHAT IS YOUR FAVOURITE TYPE OF MILK? WHAT DO YOU LIKE TO DIP IN IT?

I normally pour skim milk on my cereal in the morning. So I guess in answer to the second question — my spoon.

UNTITLEDMATHPUBLICATION: HOW OFTEN DO YOU COLLABORATE WITH KATHRYN HARE? ALTERNATIVELY, HOW OFTEN DO OTHERS CONFUSE THE TWO OF YOU?

According to my webpage we have 11 co-authored publications, and at least one more on the way. So far, only Needles Hall has managed to confuse the two of us, and even that hasn't happened in a long time.

SWINDLED: WHAT'S A SURPRISING OR INTERESTING PIECE OF TRIVIA FROM YOUR FIELD OF STUDY THAT MOST PEOPLE PROBABLY WOULDN'T KNOW?

Pisot numbers are useful in the study of quasi-crystals. Quasi-crystals are in turn are useful for making non-stick frying pans. So I'm really a Food Engineer. Hence, the fact that I was accidentally made the Vice Dean of Engineering (January 1st, 2018–January 17th, 2018) might not have been as crazy an idea as it sounds. Unfortunately I didn't notice in time and hence wasn't able to annex any Engineering buildings.

CONFUSED: DO YOU CUT YOUR SANDWICHES VERTICAL, HORIZONTAL, OR DIAGONAL? IF YOU DO EACH, PLEASE GIVE YOUR PROBABILITY DISTRIBUTION OF SANDWICH CUTTING.

I don't often cut my sandwiches. I think the distribution is about 1% vertical, 1% diagonal, 98% can't be bother to cut them.

TERRIFIED: WHICH ENGINEERING BUILDING WOULD YOU ANNEX FIRST?

I haven't decided yet. E3 has the advantage that is already connected to DC, and hence nicely connected to the Faculty of Math. I am told that the Waterloo Architecture Campus has a gorgeous view of the Grand River. Lastly E7 has really cool robots. I'll probably annex them all at the same time, hence saving me the hassle of making a decision.

Before we settle that definitively, let's muddy the waters a little bit first.

BRAD LUSHMAN

KEN:

An odious miasma — likely a consequence of the densely littered Beyond Water cans — permeates the air in the stout bungalow. Thumbtack-thread spiderwebs radiate forth from behind the closed office door at the end of the hall, spanning every room in the neglected hovel. Inside the office, peering out into the choking blizzard through the smallest aperture he dared allow himself, is Ken. He had fled the bar following djao's ascent, eluding his honed optimisation techniques by a harrowing margin. Now, back in his home, he rifles feverishly through one of the many stacks of papers accumulated in the room, searching desperately for something (even our omniscient narrator is unaware of exactly what). His electricity was lost long ago, but this had hardly perturbed him until now, as he greedily pilfers his work, guided only by a meagre, quivering candlelight.

Across the room, marking the epicentre of the innumerable emanating threads, is a singular word, varying in visibility under the straggling candle. It contains an unremarkable six characters, but to Ken it is treacherous, bizarre, and arcane, its definition forever eluding him. He wasn't sure how, but his supreme mathematical intuition told him that something, somehow, connected it to djao. "Piazza," Ken mutters the word aloud, shaking his head as he does so.

Ken nears the bottom of the stack. The candle has waned and the only perceptible features remaining in the room are Ken's hunched over figure, the discarded papers within a metre radius of him, and his audible lamentations as the end of the pile looms nearer. With a pitifully sized stack remaining, his hope had all but been devoured by the fraught, accelerating dread. But then, second from the bottom of the pile, he unearths it. A wild, uninhibited grin breaks through and he leaps to his feet, as if the paper had dispelled all the treachery that had so imperilled him. He looks back down at the book, as if confirming it wasn't a hallucination. His grin returns. Below him — his magnum opus; his zenith; his apotheosis — *"MATH 145 Course Notes - By Ken Davidson."* He realigns his attention and snatches the papers from the pile, securing them in his trademark satchel. This was how he would face djao.

With renewed determination he slings on his black windbreaker, slips on his sandals, and exits through the front door, leaving it open and sending his papers billowing behind him in a swirling tide.

Against the delicate sheen of the freshly fallen snow, a lone sable revenant.

Your move, jeff.

SupermagicTesseract

BLASPHEMOUS FOOD COMBINATIONS THAT MAY OR MAY NOT BE HYPOTHETICAL

THE CROGUETTE

A croissant baked in the shape of a baguette. May or may not be deep-fried.

Slogan: *Oui oui croissant une baguette.*

Taste: Like a croissant, but longer and straighter.

Blasphemy level: French.

KRAFT CHOCO-DINNER

KD made with chocolate milk.

Slogan: *Gotta be KC!*

Taste: Cheesy, chocolatey goodness. Even better mixed with the vomit in my mouth.

Blasphemy level: Ohmygodiwanttothrowupjustwritingthis

KETCHUPIZZA

Every university student's favourite midnight snack, and also the unofficial currency of **mathNEWS**, but with tomato sauce substituted for a similar, tomato-based condiment.

Slogan: *Red and saucy, as always.*

Taste: Not that bad, at least compared to what else is in this article.

Blasphemy level: Uhhh

GARLIC MASHED CORNFLAKES

Take everyone's favourite side dish, garlic mashed potatoes. Now take everyone's favourite breakfast dish, cornflakes. Now put them together, and according to logicians you should get everyone's favourite breakfast side dish.

Slogan: *Garlicky, mashy, corny goodness.*

Taste: Everyone who told you that garlic makes all recipes better is wrong and should be summarily executed.

Blasphemy level: Dr. Kellogg is spinning in his grave at relativistic speeds. Physical consequences are left as an exercise to the reader, if you can run away fast enough from the impeding shock wave of doom.

BEEREAL

Crunchy bread × liquid bread. Just bread, bread, bread. Dip your actual bread in it for good measure, too. Need I say more?

Slogan: *Why carb load once when you can do it thrice?*

Taste: There's a wide spectrum of taste here, from the mildly gross pairing of a cold lager with Cheerios all the way down to the pits of hell that is a warm IPA with Fruit Loops.

Blasphemy level: Even my cereal-munching, beer-loving friends don't support this.

SPAGHETTIBALLS

I love stuffed meatballs. So much so that I made an eversion of the traditional spaghetti meal and stuffed my meatballs with pasta.

Slogan: *His palms are sweaty, knees weak, arms are heavy / He's not yet ready, to face mom's inside-out spaghetti.*

Taste: Like the Flying Spaghetti Monster's noodly ~~appendages~~ viscera, I would imagine.

Blasphemy level: I'm being sued by the EU, Italy has declared war on my person, and IKEA just permabanned me from their cafeterias.

HUMVEEMUS

Hummus brought on combat tour to Afghanistan, returned due to being past the expiry date, now on liquidation before it gets drafted into World War III.

Slogan: *Drive through anywhere, anything, anytime — because you're going to want to after eating this.*

Taste: Fifteen divisions of ISIS surrendered after a hungry U.S. soldier cracked open a container three miles upwind.

Blasphemy level: Haram. Definitely haram.

KOMBUHTCHA

Kombucha, treated with Ultra High Temperature pasteurization.

Slogan: *None of the taste with none of the health benefits!*

Taste: Well, it's just overpriced water now, isn't it? You could also add a bunch of flavouring and sweeteners, give it a healthy-sounding name, and sell it for a even more ridiculous amount. Maybe call it “vitamin water” or something, idk.

Blasphemy level: I tried asking my kombucha-addicted friends for their opinion on this, and now I no longer have any kombucha-addicted friends.

your local food explorer

☘☘FLAG REVIEW 7: PROVINCES OF IRELAND EDITION☘☘

FLAG REVIEW 👐

Whenever there's talk of Irish flags, politics is guaranteed to get tied up in this entire mess, as experience on the internet[1] has shown me quite often. Consulting my Official Style Guide, Nth Edition, we will cover the following terms. Ireland in this context will refer to the entire island of Ireland, and all related terms, and derivatives. Any other usage of the word Ireland will have clear modifiers for its meaning.

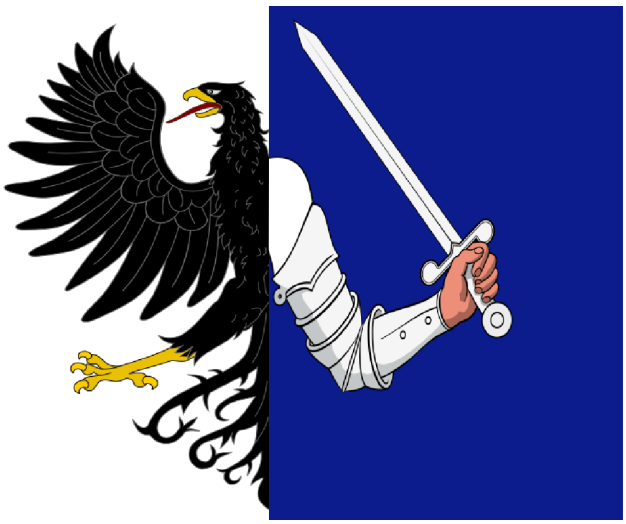
Getting that out of the way, I will now review some of the least known Irish flags there are. These flags are the traditional provincial flags of Ireland, of which there are four. These flags are all basically the provinces' coat of arms turned into banners, but they look cool, so that's what I'm going with. Let's get started in alphabetical order.

Here is my rubric, like before:

The flags will be scored out of 10 stars, with five of those being my holistic subjective score, and the other five being based on each of the five basic principles of flag design as defined by the North American Vexillological Association (NAVA). They are:

- Keep it simple
- Use meaningful symbolism
- Use two or three basic colours
- No lettering or seals
- Be distinctive or be related

CONNACHT



Starting off with the smallest province, we have Connacht. Quite an odd one to start off with, and certainly one with a lot to talk about. There's clearly two parts to this flag, one of a black eagle on white, and the other of a left arm holding a sword on blue. Neither of these two halves appear to have an Irish origin. I was interested in its origins too, and doing some research, it became clear that it seems no one is quite entirely clear where it comes from. Some sources I saw mention the O'Conors as an origin, and some say it has a link to some Gaelic monastery in the former Holy Roman Empire, or even from the O'Briens dynasty. So, I can't really say for sure exactly what symbolizes what and how on this flag, nor its historical origins.

Nevertheless, this flag is surely unique considering that there often aren't many flags that are dimidiated, or split in two into left and right halves. The white and the blue backgrounds work with each other nicely; they are good contrasting colours with the blue half standing out bold against the white half. The eagle and the arm halves work the same way but oppositely. The black eagle is the one which stands out clear compared to the white arm and sword. Furthermore, each half's colours also do the same. The black eagle on white, and the white arm and sword on blue. Overall, the colours work really well in this flag. The balance the colours provide to this flag is just impeccable.

The flag overall has its downfall from the complexity in its construction, but the colours work wonders despite that. I can't stress that enough.

Design Score: ★★★★☆

Subjective Score: ★★★★☆

LEINSTER

Jumping up to the most populous province, we have Leinster. Personally, I view this one as the least quirky and interesting. It is just composed of typical Irish imagery. It's just the Irish harp on a background of Irish green. It looks quite similar to the arms of the Republic of Ireland, which is the same except for a blue background instead. It can be seen though, how the symbol seen here for Leinster specifically is also used for Ireland as a whole.

King Henry VIII adopted the use of the harp symbolizing Ireland when he decided to create a Kingdom of Ireland of which he made himself King. Despite declaring himself as King of Ireland, he only realistically controlled what is known as The Pale, a region around Dublin. The rest were outside of

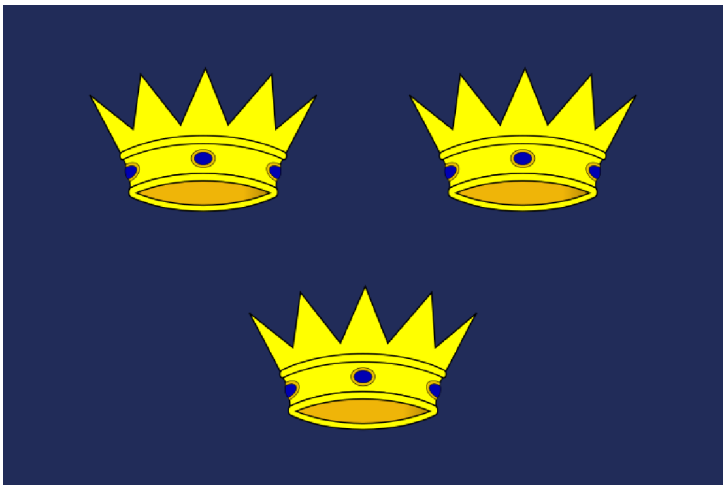
his control. The Pale is entirely located within Leinster. So. it's seen how the use of the harp as a symbol for Ireland by Henry VIII lead to a more specific usage since for Leinster.

Sure, it's a simple flag, but like I said before, the overlap in how the flag looks between Leinster and Ireland as a whole just does not make it really interesting at all.

Design Score: ★★★★★

Subjective Score: ★★★☆☆

MUNSTER



This next flag has some doppelgangers. Don't confuse these three crowns on a field of blue as the other three crowns on a field of blue commonly associated with Sweden, as seen on their coat of arms and in official government contexts. As this design has been around since basically antiquity at this point, it's very unlikely that there exists anything to conclusively prove how the design was independently created in Munster as did in Sweden.

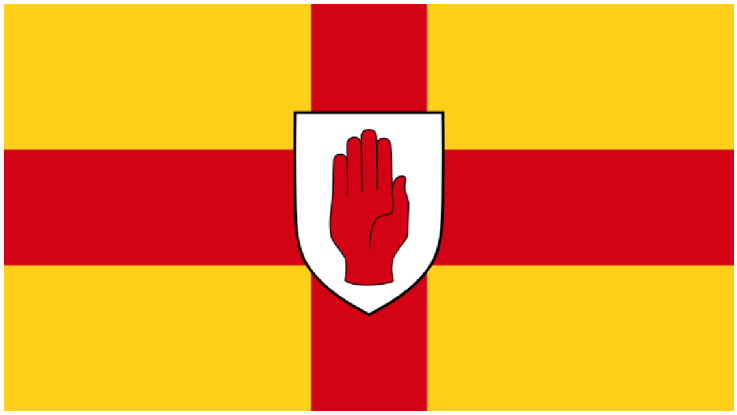
However, despite information being lost to history, some things are very clear to us. The crowns on this flag are different to those of Sweden; these are of a much simpler design and shape. The crowns have featured on the arms of the Lordship of Ireland before, though King Henry VIII as mentioned before changed all that. Again, with flags of uncertain origins due to its history, there are many possibilities of where this design comes from. Some mention that the three crowns represent the different rules from when Munster was fractured into three.

Compared to the other three, I see this flag as having the least flair and finesse. The design of the yellow crowns are simple and with the blue used as the background it does not work well just as a banner. It works when used as part of the coat of arms of Connacht, but as a banner, it needs more. Just like Leinster, it remains uninteresting.

Design Score: ★★★★☆

Subjective Score: ★★★☆☆

ULSTER



This flag is probably the one that the average person will be most likely to encounter outside of Ireland, considering its international usage. For example, if you watched the Rugby World Cup last year, you would have seen this flag alongside the Republic of Ireland flag during the introduction of the Irish team. That is because Ulster is sometimes used as a flag for Northern Ireland, although it must be noted that Ulster is not exactly the same as Northern Ireland. Counties Donegal, Cavan, and Monaghan of Ulster are located in the Republic of Ireland, so I guess those counties were represented twice in the Rugby World Cup, but I digress.

Starting with the more simple aspect of this flag, is the background. The red cross on a yellow background comes from the coat of arms of the House of Burke, whose members held the title of Earl of Ulster. Since the start from these Anglo-Norman aristocrats, the arms of the House of Burke have been used in representing Ulster as a whole.

The main focus of this flag is the legendary red hand of Ulster. Many may have already heard of the legend of this red hand, where a tl;dr version is below[2]. Among symbols used in representing subnational divisions, I believe it is one of the most distinct and historical ones that exist. Not only is there the folklore and legend passed down since basically time immemorial, but it is a symbol that is uniquely Ulster's. There will only ever be one unmistakable meaning behind the red hand, and Ulster has definitely taken advantage of it. Often times in quite the political context, but undoubtedly still a strong usage in representing Ulster.

Overall, the theme from the red hand works really well, cooperating with the yellow to provide a great colour scheme for Ulster. The symbolism and history is also deeply entrenched into this flag. Out of all the provincial flags, I think this one is the one that comes out on top.

Design Score: ★★★★★

Subjective Score: ★★★★☆

One may wonder what use these provincial flags have in modern Ireland, since no Irish jurisdiction officially uses them; they are more traditionally used rather than in an official context. Outside of traditional use, you'll see it most often used in neutral contexts like in sports.

Often there are many ideas thrown around for proposed flags to represent a united Ireland and one such proposal is to use the four provincial flags. Unlike some of the weirder proposals, this idea is more realistic. The only question that arises is the order of the quarters in the proposed flag, as historical examples of the quartered provincial flags have used different orders. So, keeping it neutral, it should be based on the geographic location of the provinces on the island, should one be created now. So the ordering of the quarters would be, Connacht first, then Ulster, Munster, and Leinster.

These provincial flags should get more use. Many more people should be able to witness the greatness and beauty that are these flags. So far, Ulster has seen the most international prominence, and the other three should also get their fair share internationally. If Texas' flag can gain some international prominence as a state flag, these Irish provincial flags should be able to achieve the same. I hope to see the day when they do.

For the next **mathNEWS** issue, I have some peculiar flags in mind. It will be quite the challenge to review them, so it's yet to be seen how that will turn out. As always, you can send in flags for me to review too. Bonus flags never hurt anyone.

boldblazer

1. As well as a friend of mine when drunk
2. In the race for rule over Ulster, the first to touch the shore of Ulster would win. Someone decided to hack off their hand and throw it on land to technically be the first person to do so. The red comes from the blood of the hacked-off hand.

WIND

Wind back the clock and watch an addict grow backwards.
I'm the product of the sickness,
a reminder to the bastards
there is peace inside the moments that'll hit after disaster.
You can block out the sun but the moon won't come faster.
Tried to master reflection, all I could muster were drawings -
scribbled onto pages soaked from my eye bawling.
A fly guy falling, trying to find god,
why didn't he answer my calling?
I exchange my high, then rearrange the sky into something I
can pretend is less appalling.
I'm fine, I'm fucking fine until I need a hit then I'm all in.

ITSH

MATHSOC COUNCIL ADOPTS DIVESTMENT MOTION

On March 9, 2020 MathSoc Council voted to adopt a motion in favour of the University of Waterloo and Mathematics Endowment Fund divesting from fossil fuels. This policy has MathSoc adopt an advocacy stance on fossil fuel investments.

The following motion put forward by PMATH/AMATH/CO Program Representative Vincent Macri. It was adopted with none opposing.

Whereas the University of Waterloo (UW) and Mathematics Endowment Fund (MEF) hold investments in the fossil fuel industry[1]; and

Whereas the Region of Waterloo has declared a climate emergency[2]; and

Whereas the fossil fuel industry contributes negatively to the climate crisis; and

Whereas the University of Waterloo has committed to becoming a signatory to the United Nations Principles for Responsible Investing; and

Whereas organizations around the world are divesting from fossil fuels due to environmental concerns; and

Whereas young people, including the undergraduate students in MathSoc, will suffer the most from the effects of the climate crisis; then

Be it resolved that MathSoc is opposed to investments of UW and the MEF in the fossil fuel industry; and

Be it further resolved that MathSoc believes that funds students voluntarily pay into should not invest in the fossil fuel industry; and

Be it further resolved that MathSoc will advocate for the divestment of UW and MEF funds from the fossil fuel industry.

[1] http://mathnews.uwaterloo.ca/wp-content/uploads/2020/02/Energy-Exposure-Report-as-at-Q3.pdf

[2] https://www.therecord.com/news-story/9639714-waterloo-region-declares-climate-emergency/

A motion to have MathSoc formally ask the University Board of Governors to take action is on the agenda for the upcoming MathSoc General Meeting, scheduled for Monday March 23, 2020 in MC Comfy from 5:30–8:30 pm EST. All MathSoc members are encouraged to come and vote on the motion.

Vincent Macri

MATH MAJORS JUDGED BY AN ENVIRONMENT KID

Tired of a bunch of **mathNEWS** articles about programs that do you dirty? Fear no more! Presenting—giving our resident Environment member a list of the programs and seeing what he thinks. You can't say anything bad if you don't know anything at all! Pulling some 200 IQ moves here.

Actuarial Science - I don't know what it is but it has "science" in it so it should be in science.

Applied Math - Taking this is the equivalent of raising your hand in math class and asking "When are we going to use this in the real world?"

C&O - I've been looking at the UWaterloo site definition and I'm still confusion, America explain.

CFM - Computers! Finance! T e c h n o l o g y!

CS - Oh, I know someone in CS, I say, knowing full well that not every Geomatics reject knows each other.

CS/BBA - Geomatics rejects but we eat them like we eat the rich.

Data Science - Is that like statistics?

FARM - I see Financial Analyst and think of Estee Lauder from A Series of Unfortunate Events.

Math/BBA - ngl i'm actually curious what laurier is actually like

Math/Business - There's a difference?

Math/CPA - Husband's a CPA / her dreams went out the door, when she turned 24 / only got one man, what happened to her plan

Math Econ - I took economics in high school, but I can feel my sanity slipping.

Math Finance - I'm not kidding my head is starting to hurt and I haven't even done any math yet

Math Physics - the equivalent of that lady who looks at the screen while math equations appear around her (alternative: sigma or winston overwatch)

Mathematical Studies - imagine taking this for fun

Math/Teaching - oh i had a math teacher…once.

Pure Math - ??? Are you guys okay???

Software Engineering - Please repeat this slowly and tell me why these peeps aren't in Engineering?

Statistics - Oh I took like one step of stats.

Undeclared - my opinion is, like your life choices, also undeclared.

A very tired ENV kid

DOUG FORD HELPS STOP THE SPREAD OF COVID-19 BY KEEPING KIDS OUT OF SCHOOL

Residents of Ontario were shocked last week when one of Doug Ford's policy decisions actually had a positive impact. By refusing to even bargain in good faith with the teachers he is effectively stopping large gatherings of people that could spread the disease.

Critics were quick to point out that if Doug Ford just kept class sizes at their previous numbers, like the teachers want, that would also limit the virus spread by having smaller gatherings of students . The premier replied that this is why his mandatory e-learning policy is truly preparing students for this modern society where everyone is quarantined at home. Members of the press were a little skeptical at this explanation given the fact that these policy decisions were made before the start of the current crisis and that technically it was the teachers striking for the students' well-being that was causing the effect.

When asked to comment Lecce, the minister of education, said that the government policy decisions weren't about systematically and slowly destroying Ontario's education system but instead about stopping the spread of the virus and systematically and slowly destroying Ontario's education system.

When asked why the government actually seems to care about COVID-19 versus pretty much every other issue it has dealt with, the response was given that they were especially concerned about the coronavirus biased political targeting of the conservative voter base. It's just not good for democracy to have a disease that is disproportionately killing our most reliable voters.

Beyond Meta

STAIRWAY CONSTANTS, PART [4.5,7]

FOREWORD AND CORRECTION

Probably to avoid having to squeeze the footnotes of last issue's *Stairway Constants* onto a fifth page, the editors dropped the conclusion of $\sqrt{\tau e}$. Here it is as an exercise:

Exercise: fill in the rest of the steps to derive the identity $\lim_{n\to\infty} \sqrt{n}\,(\omega_n)^{\frac{1}{n}} = \sqrt{\tau e}$.

After going from floor 0 to 4.5 over the last 4 issues of **mathNEWS**, this installment of *Stairway Constants* covers the remaining 2.5 floors of the MC north-northeast stairwell number line, in one fell swoop. But first, I should clear up a little something. If you consult any building plan of MC, the stairwell housing the number line is actually dead north relative to the centre of the building, not north-northeast. Either way, you probably know it as the stairwell in the corner of MC with the DC and M3 bridges.

Take this article with you to the 4.5th floor of that stairwell. We have an adventure to complete.

FLOOR 4.5

We left off here last time. Between here and the top is about ⅓ of MC's height, but only around ⅕ of the stairwell constants live here. Big numbers just aren't as special, for the most part.

Just a few tick marks right of the big pink 4.5 is the first of the last stairway constants.

F
Freiman's constant
4.5278295661…

(For more digits, see OEIS A118472.) Currently 94 years old, Russian mathematician Gregory Abelevich Freiman is Professor Emeritus at Tel Aviv University. Around the age of 50, he discovered this constant's very weird exact value:

$$F = 4 + \frac{253589820 + 283748\sqrt{462}}{491993569}$$

If you handed that expression to someone and told them that it's the answer to a pretty fundamental question in number theory, I bet they would be very surprised. As with many of the constants in this stairwell, Freiman's constant has to do with rational approximations. Suppose I gave you a real number x. We can measure how well a fraction $\frac{p}{q}$ (in lowest terms) approximates x with an efficiency function:[1]

$$E\left(x, \frac{p}{q}\right) = \frac{1}{q^2\left|x - \frac{p}{q}\right|}$$

As we make the denominator q bigger, we can get arbitrarily accurate approximations, so $\left|x - \frac{p}{q}\right|$ approaches zero, making $E(x, \frac{p}{q})$ bigger. However, big denominators are hard to compute with, so there is a growing cost q^2 associated with the approximation, making $E(x, \frac{p}{q})$ smaller. The efficiency function thus indicates the balance between the two. Large values of $E(x, \frac{p}{q})$ mean that $\frac{p}{q}$ is both accurate and cheap to compute—the criteria for an "efficient" (good) rational approximation.

For example, last issue we covered $\frac{22}{7} = 3.142857...$ as an unreasonably efficient approximation for π.

$$E\left(\pi, \frac{22}{7}\right) = \frac{1}{7^2\left|\pi - \frac{22}{7}\right|} = \frac{1}{49 \times 0.0012644...} = 16.139...$$

Exercise: what's the most efficient rational approximation for π? That is, what rational number $\frac{p}{q}$ maximizes $E(\pi, \frac{p}{q})$? $\frac{22}{7}$ is pretty darn efficient, but it's only accurate to 3 digits. This is why mathematicians care more about *infinite sequences* of efficient rational approximations. Having an infinite sequence means that there's always another more accurate but similarly efficient approximation further down the road.

Let's choose an efficiency threshold c, and take all rational approximations at least as efficient as c. We want c to be as high as possible. As long as infinitely many approximations are at least as efficient as c, then we have our sequence! This maximum possible value of c has a special name: the Lagrange constant $\lambda(x)$, named after the French-Italian mathematician Joseph-Louis Lagrange. $\lambda(x)$ isn't really constant; its value changes with x. It indicates how efficiently we can approximate x with rational numbers.[2] For example, the golden ratio ϕ has no efficient rational approximations, so its Lagrange constant is small. In fact, $\lambda(\phi) = \sqrt{5}$ is the smallest of all Lagrange constants.

The set of all possible values of $\lambda(x)$ is called the Lagrange spectrum. It starts at $\sqrt{5}$, skips to $\sqrt{8}$, and skips and skips again. Does it have an end? No, but in 1947, Marshall Hall, Jr. proved that beyond *some* point, the spectrum stops skipping. Every real number past that point is part of the Lagrange spectrum. 28 years later G. A. Freiman found what that point was, and it is now named Freiman's constant F in his honour. 4.5278…, the end of the last skip in the Lagrange spectrum.

δ
Feigenbaum constant
4.66920160910…

(For more digits, see OEIS A006890.) Mitchell Jay Feigenbaum passed away recently in 2019. He was an American mathematical physicist whose work on turbulence led him to study chaos. Specifically, Feigenbaum used a simple pocket calculator (highly advanced by 1975 standards) to play with a chaotic recurrence relation called the logistic map:

$$x_{n+1} = rx_n(1 - x_n)$$

The significance of the logistic map is often explained using a "reproduction" analogy, but given the current state of global affairs, a coronavirus analogy is perhaps more fitting. Let x_n be the proportion of people in the world who are infected with coronavirus today. Each infected person runs into some number of people, and infects k of them. The infected person then recovers overnight with probability p. Then on average, each infected person today is responsible for $k + 1 - p$ infections tomorrow. Let $r = k + 1 - p$:

$$x_{n+1} = rx_n$$

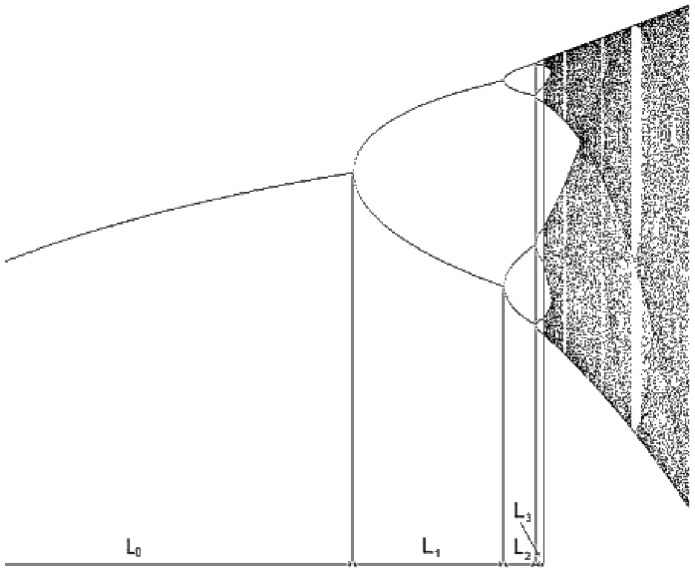
This incorrect model gives us exponential growth: $x_n = x_0 r^n$. Let's run with it for now. Even if x_0 is 1 person out of 7.77 billion, this is going to escalate as long as $r > 1$. Grant Sanderson from the math YouTube channel *3blue1brown* gives 1.15 as the current best guess for r.

Let's use the number from Worldometer: 45,039 active coronavirus cases at the time of writing.[3] Then the exponential model predicts less than 87 days until we're all infected by early June 2020. Obviously, you can see the model falling apart. It falls apart completely by mid-July, when it starts to predict trillions of infections. The key problem with an exponential model is that in a city where everyone's coughing on everyone else, there should be no new infections because there's nobody left to infect. In general, more sick people means fewer healthy people you can encounter and infect. Thus, the logistic map is a better model:

$$x_{n+1} = rx_n(1 - x_n)$$

As the proportion of infections x_n approaches 1, the growth should sputter because the proportion of healthy people $1 - x_n$ goes to zero. For now, the spread of coronavirus still looks exponential because $1 - x_n$ continues to be really close to 1, but it makes more sense to label this pandemic as logistic. After all, the logistic model never predicts trillions of people infected.[4]

Of course, the logistic map isn't bulletproof. For $1 < r < 3$, x_n approaches some fixed point as n goes to infinity. The bigger r is, the bigger that fixed point is. *Exercise: for $r = 1.15$, how many infections does the coronavirus stabilize at? Is this a sensible estimate?* But once you push past 3, things escalate quickly. Instead of one fixed point, the number of infections oscillates between a higher and lower number. At Waterloo, that would be as crazy as everyone coughing in your MWF lectures, but the same classmates being healthy in your TTh lectures! From $r > 1 + \sqrt{6} = 3.4494897...$, infections cycle between four numbers. At about 3.544 the cycle doubles in size to eight numbers. It continues doubling faster and faster… At $r = 3.5699...$ (OEIS A098587) the logistic map loses the plot completely and explodes into a chaotic mess. Every day would have a wildly new number of infections, impossible to draw a trendline through.



AS R INCREASES ALONG THE HORIZONTAL AXIS, THE POINTS OF STABILITY DOUBLE FASTER AND FASTER UNTIL ALL HELL BREAKS LOOSE. *Image by Jarosław Bielak.*

Feigenbaum noticed that the distances (L_0, L_1, L_2, etc. in the diagram) between each doubling seem to shorten at a regular rate. Each time it doubled, the next doubling would happen about 4.67 times faster than the last. That's why the onset of total chaos comes so soon after 3.544—imagine clapping to a beat that sped up 4.67 times each time you clapped. More formally, we can write Feigenbaum's observation as

$$\delta = \lim_{n \to \infty} \frac{L_n}{L_{n+1}}$$

where δ is *the* Feigenbaum constant. There's another one ("Feigenbaum's second constant") that is less talked-about than this one. Why is this one cooler? From the diagram you can see that the graph of the logistic map's points of stability is like a fractal. One point of stability splits into two branches, which split and split and split again. In fact, Feigenbaum's constant shows up in all sorts of other fractals. Most famously, it's the ratio between the sizes of various self-similar blobs in the picturesque Mandelbrot set.

FLOOR 5

Five. V. Olympic rings, toes, platonic solids, senses (in the classical sense), and categories of hurricanes. Google "star" and you'll see a bunch of five-pointed, probably-yellow figures used in many rating systems (which are also often out of 5).

The centuries-old Goldbach's weak conjecture states that 5 is the last odd number that can't be written as the sum of three (not necessarily distinct) prime numbers. It is generally accepted that the Peruvian mathematician Harald Helfgott achieved the first proof of this in 2013.

There are less than 5 constants left to explore. What are we waiting for?

$\frac{\pi^3}{6}$
Volume of the unit sphere in $\mathbb{R}^6$
5.16771278300…

(For more digits, see OEIS A164105.) The plaque is wrong! If you punch $\frac{\pi^3}{6}$ into any respectable calculator (or just check the OEIS), the digit 3 in …78300… is not supposed to be there. The correct value should be 5.16771278004997… How many other errors are there in this stairwell? I'm not going to check.

There are a bunch of ways to derive the volume of the unit sphere in $\mathbb{R}^6$ yourself. In homage to the next constant up ahead, the volume of the unit sphere in $\mathbb{R}^5$, I'll show you a way to compute it from that number.

For some yet-unspecified ω_5, let $\omega_5 r^5$ be the volume of a sphere of radius r in the 5-dimensional space $\mathbb{R}^5$. Just like how we can cut a sphere in 3 dimensions into a stack of circular slices, we can cut a 6-dimensional sphere into a stack of 5-dimensional spherical slices.

If the centre of the 6D unit sphere is at height 0, then its bottom is at -1 and its top is at 1. As is true in any number of dimensions, the Pythagorean theorem tells us that the slice at height h has a radius r such that $r^2 + h^2 = 1$. Rearranging, we can isolate $r = \sqrt{1 - h^2}$. Thus, the volume of the 6D unit sphere is

$$\omega_6 = \int_{-1}^{1} \omega_5 r^5 dh = \omega_5 \int_{-1}^{1} (1 - h^2)^{\frac{5}{2}} dh$$

You can solve this integral through trigonometric substitution! Draw a line between the origin and the 5D sphere at arbitrary height h. It makes an angle θ with the plane $h = 0$. Thus, $h = \sin(\theta)$ and $dh = \cos(\theta)d\theta$.

$$\begin{aligned}
\omega_6 &= \omega_5 \int_{\arcsin(-1)}^{\arcsin(1)} (1 - \sin^2(\theta))^{\frac{5}{2}} \cos(\theta) d\theta \\
&= \omega_5 \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (\cos^2(\theta))^{\frac{5}{2}} \cos(\theta) d\theta \\
&= \omega_5 \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^5(\theta) \cos(\theta) d\theta \\
&= \omega_5 \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^6(\theta) d\theta
\end{aligned}$$

Exercise: finish evaluating the integral by using the double angle formula $\cos(2\theta) = 2\cos^2(\theta) - 1$. *You'll need it more than once!* At the end, a bunch of terms cancel out and you get $\omega_6 = \frac{5}{16}\ \pi\omega_5$. (Notably, $\frac{5}{16}\pi$ is just less than 1…) Now what was ω_5 again?

$8\frac{\pi^2}{15}$
Volume of the unit sphere in $\mathbb{R}^5$
5.263789015…

(For more digits, see OEIS A164103.) (The last digit on the plaque is off by 1…) Aha! That's what ω_5 is. $\omega_5(1)^5 = \omega_5$ is the volume of a 5D sphere of radius 1. Now we can plug it in and finish computing the volume of the 6D unit sphere.

$$V_6 = \frac{5}{16}\left(8\frac{\pi^2}{15}\right)\pi = \frac{5 \times 8}{16 \times 15}\pi^3 = \frac{1}{6}\pi^3$$

As mentioned in the discussion around the stairway constant $\sqrt{\tau e} = \sqrt{2\pi e}$, the 5D unit sphere has the largest volume of any unit sphere in any number of dimensions. Why? Suppose that instead of finding the volume of the unit sphere in 6 dimensions, we wanted it in n dimensions. We could set up a similar integral and use trig substitution again:

$$\omega_n = \int_{-1}^{1} \omega_{n-1} r^{n-1} dh = \cdots = \omega_{n-1} \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^n(\theta) d\theta$$

Each volume is $k = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^n(\theta) d\theta$ times the previous. Stepping back from the integrals, k represents the area under the curve $y = f(x) = \cos^n(x)$ between $-\frac{\pi}{2}$ and $\frac{\pi}{2}$. What do the graphs of $f(x) = \cos^n(x)$ look like? Without even graphing, you can probably fill in some common points like $f\left(-\frac{\pi}{2}\right) = 0 = f\left(\frac{\pi}{2}\right)$ and $f(0) = 1$. After graphing, you might notice that the graph hugs closer and closer to the x-axis as you increase n. *Exercise: why? If $n < m$, prove $\cos^n(x) < \cos^m(x)$ in the range of our integral, except at the common points mentioned above.*

This means k is strictly decreasing with n. For $n \leq 5$, the area is greater than 1. ω_n increases for $n \leq 5$, because $k > 1$. However, at $n \geq 6$, k drops below 1 and just keeps plummeting all the way to 0. These two things together are why the 5D unit sphere has the greatest volume.

FLOOR 5.5

As you reach another big pink number, you realize that this time it only took 10 steps, breaking the pattern of 11 steps per flight that's been in force since floor 1. It stays that way for the rest of the stairwell.

FLOOR 6

Six. "Habitable" floors of MC. Legs on an insect. Faces on a cube. In fact, if you look directly at the corner of a cube, you'll see a hexagon. Hexagons (irregular) tile all across the facade of QNC to represent the structure of graphene. 6 sides is the most that a regular polygon can have and still be able to tile the plane.

6 is a really nice number. You might even call it *sexy*.[5] It's a perfect number, because its divisors 1, 2, and 3 sum to its value (6). Most numbers don't have nearly enough divisors to do that.

Up from here, the stairs narrow, leaving a gap for you to look down and marvel at all the steps you've climbed to get here—but we're not at the top yet.

τ
Tau
6.2831853071…

(For more digits, see OEIS A019692.) On June 28, the rebel scum of mathematics gather for their annual unconventional convention. Why June 28? It marks the day that the first three base-10 digits of τ (a.k.a. 2π) coincide with the Gregorian calendar. The cult has made a name for itself by denouncing the celebrated circle constant π in favour of its one-legged counterpart τ. Their goal: to replace π with $\frac{\tau}{2}$ and 2π with τ in common and academic discourse. They cite a plethora of reasons, including:

1. τ is the ratio between the circumference of a circle and its radius, which is much easier to state than the diameter nonsense used to define π. This gets us really nice angle notations like $\frac{\tau}{4}$ to represent 90 degrees, a *quarter* of the way around the circle.
2. The period of the sine and cosine functions is τ.
3. A lot of formulas that contain π actually use 2π, which can be written more succinctly as τ. For example, take the stairway constant $\sqrt{\tau e} = \sqrt{2\pi e}$.
4. Euler's formula becomes $e^{i\tau} = 1$.
5. A bunch of physics I'm not qualified to speak about.
6. Contrarianism is good for press.

You can find a whole lot more at https://tauday.com/. Unfortunately for the rebels, their campaign barely makes ripples in the face of the establishment, because…

1. τ looks uglier.
2. π tastes better.
3. It doesn't matter. Even if all literature and people switched to τ overnight, we wouldn't gain any new insights into mathematics.
4. Inertia.

Or maybe I'm wrong, and τ will be the fashion in another 10 years. After all, the τ movement started only 10 years ago when Michael Hartl published his manifesto online and introduced τ as the symbol for this previously faceless constant.

For serious reasons why π is worth defending, you can find the Pi Manifesto at http://www.thepimanifesto.com/.

Exercise: celebrate March 14th by throwing a pie at your local τ supporter!

FLOOR 6.5

Just a little further…

2^e
Froda constant
6.5808859910…

(For more digits, see OEIS A262993.) This constant manages to escape the mostly-exhaustive coverage of Steven R. Finch's *Mathematical Constants*. Apparently, in 1963 the Romanian mathematician Alexandru Froda exhibited a proof that this number is irrational, but I can't find the paper. All sources that mention this proof also add a mysterious remark that nobody (not even Froda, if he were still alive) knows whether the proof is valid.

In general, it is very hard to prove if a number like the Froda constant is rational. The problem is the weird composition of crazy numbers. Other numbers whose rationality is unknown include various spellings of "pie" like $\pi + e$, πe, $\frac{\pi}{e}$, and π^e. That said, we do know that e^2 and e^π are definitely irrational, since they are transcendental.

Exercise: prove or disprove whether the Froda constant is irrational.

FLOOR 7

Seven. The most random number between 1 and 10. The number of members in Maroon 5. There are seven sides on a regular heptagon, the simplest polygon that can't be constructed with compass and straightedge alone.

You stand upon my favourite spot in all of MC. It's pretty spacious up here. The gap between the stairs lets you look down and get a true sense of how high up you are: 148 steps above floor 0. The stairway constants, the big pink numbers, the hundreds of tick marks… they all spiral away below you. Heck, not even eduroam makes it up here. This place is sacred. Adding to the heavenly feel, beautiful lights shine up from the walls to illuminate the ceiling.

The stairway constants are done, and I hope you've learned something along the way. Slightly to the right of the big pink 7, the number line ends just as it started—it runs straight into the wall and stops. I guess Peano was wrong after all, and Randall Munroe was right—there really aren't any numbers above 7.[6] Maybe if they made MC taller…

Despite the huge pipes that run straight through the number line, it's not too loud up here. If you listen closely, you can hear the invisible dragons that nest on the roof of MC. "Thanks for not taking the elevator," they whisper.

water

1. Efficiency is something I made up to explain things in this article. This comes from a background of little formal training in number theory, so don't go using "efficiency" in your papers.
2. $\lambda(x)$ can be infinite. That is, some numbers can be approximated with infinite efficiency, including the first stairway constant, Liouville's number.
3. Many people are convinced that certain countries are accidentally/intentionally undertesting/underreporting…
4. However, the logistic model does a terrible job of estimating how slowly people get better. You can see this by setting $x_n = 1$. If everyone is infected today, then $x_{n+1} = r(1)(1-1) = 0$, and nobody will be infected tomorrow.
5. "Sexy prime" is serious mathematical terminology.
6. See the extremely strong Goldbach conjecture (xkcd 1310).

CREATIVE LIBERTIES AND BLACK MESA

Ever play *Half-Life*? Yeah, I know you haven't, but I'm going to spend a few pages talking about it for the one (1) of you that has. Well, technically not — I'm going to spend a few pages talking about *Black Mesa*, the 14-years-in-the-making fan-made re-imagining of the original revolutionary 1998 first-person shooter *Half-Life*. Google it for some pictures or something, compare between *Black Mesa* and the original. It looks fucking fantastic. And it *is* fucking fantastic. And it just fully released out of early access a few days ago on Steam.

It's so much fun reliving the original game with such a well-done facelift, and it really goes to show just how well Half-Life, in essence, still holds up today. The environments are beautiful, the music takes liberties but does good with them, the attention to detail is spectacular, and I'd argue it plays better than the original.

But I'm not here to talk about how great it is. No, I'm here to talk about the very worst part of the game.

Beneath all the good, there are still a few things in Black Mesa with which I take issue. Some of these are holdover issues from Half-Life, and some are new issue. One of the biggest issues I have is, perhaps unsurprisingly to many, the chapter INTERLOPER. It's pretty much unanimously regarded as the worst chapter of Half-Life, and despite the best efforts of the Black Mesa developers, it still just sucks so bad. God it's the worst.

The chapter sets you in the alien world Xen, navigating your way through some sort of brutal, morbid alien factory on your way to take down the Nihilanth, the big baby alien boss. Sounds cool, right? Kinda. I'll get to that later. But from a pure gameplay perspective, it's just *boring*. It flips the gameplay from the game's otherwise characteristic fast-paced shooter/environmental puzzle combo to what's essentially a glorified platformer. Seriously, you spend most of the chapter just trying to find ledges to jump on to get to the next area, or jumping around on a network of huge alien conveyor belts. Admittedly, the game does engage you in combat once in a while, but it's not fun. You just get a bunch of alien controllers or grunts thrown in front of you that you have to power through to proceed. Little tact, and not very engaging.

However, I feel like a large part of why INTERLOPER falls flat isn't just the gameplay, but also the absolute lack of direction throughout the whole chapter. There's virtually no dialogue, and no clear-cut goal. You're just wandering around this huge alien factory, and while it's cool seeing all the alien tech and scenery, it gets old after a while, and starts to look kind of same-y. Press mystery alien button, it turns on some move-y alien contraption, and you use a move-y platform on it to move ahead. Contrast this to the past chapters where the goal was generally pretty out-in-the-open and visible, in that there was always some sub-goal as part of the larger goal you were trying to achieve, and you were reminded of these subtly now and again. Moreover, *there was always some story being told*. Most of the story wasn't even explicit/spoken. It was environmental, and you picked up more interesting stuff and learned more about the world and what was happening the further you went. This was backed even more by environments that changed fairly regularly: the disaster-stuck anomalous materials labs; a headcrab-ridden office complex; a rocket silo with a giant tentacle monster; the surface, ravaged by the marines sent to cover up the whole mess (that mess includes you). Each chapter is reasonably short and has a lot of variation; you're always being thrown into something new, and there's this constant sense of meaningful progress and headway.

Then later, INTERLOPER starts, and it's cool! Look at all of the enslaved aliens and the factory equipment. It's a little morbid, but intriguing. Some nice environmental storytelling going on. But then the environmental storytelling starts running dry, and the chapter starts to overstay its welcome. Then it drags on. And drags on. And it just feels like it'll never end. Beyond some environmental eye candy here and there, nothing extra interesting really happens beyond the first level. The sense of progress fades, and you're left frustrated, seemingly forever damned to a loop of platforming and occasional annoying combat encounters. You can't even see the Nihilanth's lair in the distance like you could in XEN, which was a nice visual indicator (and a gorgeous one at that) of your progress to the finish line, reminding you of what it's all for.

Still with me? Alright, so INTERLOPER sounds pretty bad, huh? But all of these things I'm complaining about were also issues with the original *Half-Life*, for the most part. *Black Mesa* is supposed to be a re-make of the original, so it may seem counter-productive and wrong to fault the *Black Mesa* developers for adhering to the faults of Valve, *Half-Life*'s developer. But the issue is, *Black Mesa* isn't just a re-make, and the developers have made that abundantly clear; it's a *re-imagining*. If nothing else, XEN makes it abundantly clear that the developers were incredibly liberal with their creative liberties. *Black Mesa*'s XEN plays *nothing* like *Half-Life*'s, and this worked entirely to *Black Mesa*'s benefit. In the original *Half-Life*, XEN ranked pretty low among players, down in the bottom with INTERLOPER. But I feel the *Black Mesa* developers managed to turn XEN into one of the most fun chapters of the game. Go play it if you haven't, it's awesome. So, what happened with INTERLOPER? The developers clearly knew what they were doing, as evidenced by the rest of the game being *fantastic*.

I think that part of what happened is time. As I said, development has been stretching about 14 years. I can't imagine dedicating myself to one project for fourteen whole years. I can certainly imagine, so close to the finish line, the developers would be eager to get the damn thing done. And as one of the last chapters of the game (the last full-length one), INTERLOPER may have just happened to end up getting a little less love than everything else. In a similar vein, regardless of burnout, spending so much time so close to a

project can eventually yield diminishing returns. This happens with long-run projects like these all the time. Having a pair of fresh eyes can do really great things, and *Black Mesa* was sorely lacking in pairs of fresh eyes—that is, until they put the Xen-based chapters into early access a few months ago.

Another very real potential issue (this one comes from that last thing about early access) is that people suck at giving feedback. By and large, players praised everything in the Xen beta. Not necessarily because everything was perfect, but because, for the most part, Xen was actually really good! It had a really strong, beautiful opening two quarters, a pretty but boring quarter, and then a really strong, beautiful ending sprint with NIHILANTH. But that means that, by the time you've beat the game, you've probably almost forgotten that INTERLOPER wasn't that much fun. You probably won't even remember it as well as XEN and NIHILANTH (the first and final Xen chapters, respectively) afterwards—likely some primacy/recency effect at play.

Lastly, saving the bulk of Xen's beta release until a few months before the final release may have hurt it in the long-run. By the time the Xen beta content had been put out as early access, it was already roughly 95% through the development pipeline. Perhaps from sunk cost fallacy, or perhaps because they just wanted to be done with it, it's pretty unlikely that the developers would change anything substantial at this point. Even if people *had* vocally hated INTERLOPER, re-conceptualizing an entire chapter of the game would undo months years of work, pushing back the full release potentially more years and ultimately embarassing the developers. I can understand this and sympathize, and I don't think there's anything wrong with it considering the circumstances. It's just interesting to see just how heavily the development process influences the final product.

Anyway, that about wraps up my rambling. Do I think *Black Mesa* is bad? No, of course not, what the hell are you talking about? It's incredible. Hell, all things considered, INTERLOPER isn't even really too awful. I'm just miserable and can't enjoy things for what they are. Go play it, even if you've never played the original game. It's such an amazing and worthwhile experience, and it shows just how much love there still is for the franchise. Seeing it finally properly released makes me indescribably happy.

Btw, who's ready to experience *Half-Life: Alyx* through a YouTube video?

jeff

MCS IN MC: AN INTRODUCTORY POST

Friends, strangers, people, acquaintances.

Today, we are gathered here today to celebrate the birth of the newest— and provable potential to be the raciest, raunchiest — **mathNEWS** column……

MCs in MC!
(Missed Connections in Mathematics & Computer)

That's right!

Instead of pining away on your sub 100 Karma Reddit account and crywanking like every other UW student (way to live up to the stereotype!), why not send a tweet to @UW**mathNEWS**, or email a lovelorn email to mathnews@gmail.com?

Long gone are the days of longwinded, sweet words of poetry that the bards of old sang and crooned and recited to their object of affection — without crywanking. Perhaps it's time to revisit the atavistic mating rituals of our ancestors and compose a nice poem or two for your MC in MC.

We look forward to your dehydrated poetry. May your MC never stay an MC, unless it's the building itself.

baked like a woodoven pizza
(formerly known as staplED)

p.s. It seems like one of our readers has caught wind of our birth, so please do check it out. It could be you!

MCS IN MC

I rushed to campus at 6:15pm on a Tuesday, desperate to print and hand in my assignment for the 3-hour long elective course I had chosen to torture myself by taking. I had managed to catch you the last time this happened, but I was not so lucky this time. The door I usually found you waiting behind was locked, and when I knocked you did not answer. I miss you. It's not the same using the W print printers in the hallways of MC. I hope to encounter you again on a different Tuesday evening, and send my document to your heart so that it may be printed for my records.

Anonymous

WHAT STAIRWAY CONSTANT ARE YOU?

The personality quiz you never knew you needed! Thanks, water.

THE RULES

Select one answer per question and keep track of your answers. Your final result will be determined by the letter that you most frequently chose as an answer. Answer the **TIEBREAKER** question if and only if there is a tie between your top *n* choices, to break the tie. For example, if you have a tie between (A) and (B), break the tie by answering (A) or (B) in the **TIEBREAKER** question—whichever answer you identify with more.

QUESTIONS

Q1: ARE YOU A QUIET PERSON?

A) Yes. I'm very shy, even around people I know. I always hear about how quiet I am from others.

B) Yes, but I'm not shy. I just don't say a lot, especially during small talk or conversations about topics I'm not interested in.

C) I'm much more talkative around my friends than around others.

D) I've never been called quiet, but I've never been called talkative or loud either.

E) Definitely not.

Q2: WHICH OF THE SEVEN SINS WILL BE YOUR DOWNFALL?

A) Envy.

B) Pride.

C) Lust.

D) Sloth.

E) Wrath.

Q3: WHAT DO YOU USUALLY HAVE FOR BREAKFAST?

A) Nothing. I don't eat breakfast.

B) Leftovers or meal prep.

C) I treat breakfast as a full meal like lunch—I'll spend more than 20 minutes in the morning making it.

D) Something light, like a slice of toast or a fruit.

E) I usually buy breakfast from Tim's or the CnD on the rare chance I haven't slept in.

Q4: WHEN DO YOU GET TO SLEEP ON WEEKDAYS?

A)10–11PM.

B) I do a lot of studying at night, so around 1–2AM.

C) 12AM.

D) I go to sleep when I'm tired. I don't know the exact time.

E) 3–5AM.

Q5: YOU'RE IN PAC, WAITING BY THE DOORS TO THE MAIN GYMNASIUM. YOUR FINAL EXAM FOR YOUR TOUGHEST COURSE BEGINS IN FIVE MINUTES. HOW DO YOU FEEL?

A) Extremely nervous. Almost panicky.

B) I feel good about it—I studied a lot over the term for this course, so I feel prepared.

C) I'm mentally steeling myself for the worst. I start to doubt myself and the preparation I've done, frantically going over my notes before the exam doors open.

D) Not really stressed. I've done everything I can do by then, so there's no use in worrying. I feel calm.

E) I feel some nervous energy, but I try to channel it into excitement by mentally reassuring myself that the exam won't be too bad and I'll do good on it.

Q6: WHAT IS A BEST FRIEND TO YOU?

A) A best friend is someone who will be always be there for me whenever I need help.

B) A best friend encourages me to grow and improve as a person; we help each other achieve our goals.

C) A best friend is someone I feel totally comfortable with and can share my weird philosophical thoughts with.

D) Someone who's so close and who I trust so much that I consider them family.

E) Best friends are people I like talking to the most and have the most fun with.

Q7: WHAT ARE YOUR THOUGHTS ON TAKING PERSONALITY TESTS LIKE THE MYERS-BRIGGS OR ENNEAGRAM?

A) I don't like them. Taking them feels vain and self-absorbed.

B) They're kind of pointless and a waste of time, since the results are bogus anyway.

C) I think we can learn new things about ourselves and our personalities from them.

D) They're generally accurate, even though I don't think personalities can be as neatly classified as these tests make it.

E) They're very fun to take. Not nearly as fun as the super esoteric BuzzFeed quizzes though.

Q8: HOW TALL ARE YOU?

A) I'm short.

B) I'm an inch or two below average.

C) I'm average.

D) I'm an inch or two above average.

E) I'm tall.

TIEBREAKER: PICK A PIE FLAVOUR.

A) Cherry.

B) Pecan.

C) Chocolate silk.

D) Apple.

E) Strawberry.

YOUR RESULT

If you answered with (A) the most, you are ϵ (epsilon: an arbitrarily small positive number). You're quiet, mysterious, and when most people bring you up in conversation, they hardly have much to say about you. Not that you fault them: you *are* a pretty private person. You're also extremely self-effacing and self-sacrificing, nearly to a fault. Taking a stand for yourself and carving out your own rightful place on the number line one of these days may not be such a bad idea.

If you answered with (B) the most, you are σ_1 (the smallest known Salem number: 1.1762808183…). Being σ_1 is no easy task, as I'm sure you know. It's a busy life being a Salem number—and you're the smallest one to boot. You have a pioneering spirit abundant in perseverance, and you seek to be a leader in your field and among your friends. But remember where your roots lie: you're also a root of Lehmer's polynomial, a sibling to nine others who weren't nearly as lucky as to be inducted into Salem's ranks. Check up on them once in a while, ya know?

If you answered with (C) the most, you are the Golden Angle (2.3999632297…). You'd agree with the statement that "beauty is everywhere"—you like to philosophize about beauty, and you might fancy yourself an esthete if the term wasn't shrouded in pretentiousness. Because although your heart might be in the clouds, your head is firmly grounded. Your realism and idealism can both compliment and contradict each other; continue to walk the line between them as you've always done.

If you answered with (D) the most, you are $\frac{22}{7}$ (3.142857143…). People mistake you for someone else: a more well-known sibling/cousin, or a celebrity. You brush it off with a laugh. You're not bothered, and you know your worth: you're the only rational stairway constant. You're easygoing and self-assured; a rock in the lives of others. You can keep your cool and think logically in even the most stressful of situations. Life can get a little dull, but that's the price you pay for stability.

If you answered with (E) the most, you are τ (Tau: 6.2831853071…). Aren't you popular? You've got quite the charisma, and a ~~follower~~ friend count to show for it. You're outspoken and accomplished, and you inspire loyalty and devotion in many. Of course, your charm isn't for everyone, and there's a few folks out there that have beef with you. Some people think you have a superiority complex? What can I say—you're divisive.

Finchey

N BOPS TO LISTEN TO WHEN YOU WANT TO FEEL LIKE YOU'RE THE LEAD IN A COMING-OF-AGE FILM

As of lately, my music taste has been quite messy in (what I'd like to consider) the best way possible. From A$AP Rocky to Caroline Polachek, I really love having a variety of artists from various genres to keep my playlists interesting and fun. I'm not really sure why but I really can't pick one aesthetic to dream about and live by to save my life. Usually I'm striving to be a rich corgi owning self-made millionaire lady living in a fancy penthouse in an upscale Toronto neighbourhood, but lately I've been listening to music that has influenced my current aesthetic goals to make me want to feel as if I'm starring in a coming-of-age film. So with that, I present to you: "n bops to listen to when you want to feel like you're the lead in a coming-of-age film".

ARE YOU BORED YET? BY WALLOWS (FEAT. CLAIRO)

Who would ever guess that the wonder bread guy from that horrible Netflix show, *13 Reasons Why* would be the lead singer of a pretty decent rock band? I definitely wouldn't have. Well, Dylan Minnette's vocals on *Are You Bored Yet?* mix in such a perfect way with Clairo's feature and the summer vibe on this single that it makes you overlook the fact he's on that awful series. *Are You Bored Yet?* is an incredibly chill song that you would definitely hear playing during a scene set at a county fair or maybe even the local beach in a film as the sun sets. It's the dreamy vocals and "shimmery" sounds in the beats that make this song easy to vibe with. Definitely worth a listen.

HOT ROD BY DAYGLOW

Sloan Struble really snapped with his record, *Fuzzybrain*. Although *Can I Call You Tonight?* is one of the more popular tracks on the album, *Hot Rod* is definitely my favourite. I'm not really sure what I love most about this song, but I guarantee you it would fit perfectly in a scene where the token quirky, close knit friend group of a coming-of-age film goes on a spontaneous late night drive or a summer road trip. *Hot Rod* is a song that reflects on a relationship between two people who realize that their relationship is not what they thought it would have been like. The addictive beat will have you hooked on this song for a while.

YAM YAM BY NO VACATION

Yam Yam is the perfect bedroom pop song for a day at the beach. From the calming vocals to their cute rhythms, this song is just so great to bump to when you imagine yourself as a character in a coming-of-age film staring at your ceiling for hours in your bedroom or even like driving with your windows rolled down as you speed down the expressway.

A WORLD ALONE BY LORDE

Pure Heroine is a whole masterpiece and you really can't change my mind even if you tried. *A World Alone* is probably one of, if not: my favourite track on this record. It's because of the amazing amount of genius work put into this song that makes me love it so much. From the iconic line "Maybe the internet raised us" to the background noise of the sounds of conversations playing as she sings "The people are talking", I just have so many things that I love about this absolute bop. If this was in the soundtrack for a coming-of-age film, I could definitely imagine it playing during a scene where the lead reflects and begins to struggle with the heavy thought of having to grow up too quickly. Ugh, it's just such a good song. Give it a listen (as well as the rest of the album) if you have not already.

DREAMS TONITE BY ALVVAYS

Alvvays (pronounced *always*) is actually a cool indie band based in Canada. *Dreams Tonite* is a song one of my childhood best friends, Kim introduced me to while we were listening to music in her room. This song is so soft and beautiful, it's great to listen to when you want to fall asleep or cry (I don't know, some of us are just emo Waterloo students).

SEVENTEEN BY PEACH PIT

Peach Pit is also an amazing indie pop band based in Canada. *Seventeen* is personally my favourite track, if there's any song that truly earned it's place on this list: it's this one for sure. The catchy, repetitive line *"I'm seventeen, don't hold your breath"* will have you listening to this song on repeat. It has such an amazing, fun beat you're bound to enjoy. Give it a listen!

UNCONDITIONAL BY HOAX

HOAX is definitely a new favourite music artist of mine, *Unconditional* is genuinely such a beautiful song. This song uses so many of the best elements you would find in most smooth pop songs and combines it with the most fitting, lovely vocals in order to produce this beauty of a song. It's just such a beautiful song, like it just leaves me at a loss of words y'all. It's just so great to cry to but also like to listen to as you commute back home after a long day and you want to feel like *everything will be just fine*. Maybe it's the fact that I've been listening to a lot of mental wellness podcasts and watching those self-improvement/advice Youtube channels like Lavendaire and Rowena Tsai or maybe it's that my period is next week, but this song really just **hits different**. It's just so amazing, worth your time and so calming.

If you'd like to check these songs out as well as others that fit the same vibe, you can check out my playlist on Apple Music!

https://music.apple.com/ca/playlist/songs-to-make-you-feel-like-youre-lead-coming-age-movie/pl.u-JPAZZ9NtDY5lLkk

Hoe Chi Minh

HOW LONG DOES IT TAKE TO GET FROM MC TO RCH?

According to Google Maps, it takes approximately six minutes to make the journey from our beloved Mathematics & Computer to the dreaded J.R. Coutts N-jineering Lecture Hall.

If you really go for it though, I assure you that it is completely, 100% possible to get there in three-and-a-half while maintaining at least one point of ground contact at any given moment.

(Midterms are great motivation to really crank up that velocity dial.)

You could probably get there faster by running, or you could just go early or something, but why the hell would anybody do that? (Excessive punctuality is *definitely* government propaganda anyway.)

juste à temps

[LEAK] MATH ORIENTATION 2020 TEAM NAMES

Theme: Sadomathsochism

- mx + bestiality
- Integralcest
- S&eMpty Set
- Tangentacles
- Scatistics
- Asymptoes
- Golden Ratio Shower
- $e^{x\text{hibitionism}}$
- Voyeurisomorphism
- Vorethogonal
- Fisting
- Coq & Ball Torture

Deriving for Dick

PMATH/AMATH/C&O MATHSOC COUNCILLOR OFFICE HOURS

Are you a Pure Math, Applied Math, or Combinatorics and Optimization major who has academic concerns? Think a certain course is missing from the curriculum? Concerned that certain courses aren't being offered often enough? Have literally any complaint about anything related to your undergraduate experience? Then come to your PM/AM/CO MathSoc Councillor's office hours from 4:00–5:00pm every Tuesday in the PMAMCO Club room (MC 3033) and complain to me. I will bring your complaints to MathSoc Council, and hopefully get something done about it. If 4:00–5:00pm on Tuesdays doesn't work for you, then try coming by the PMAMCO Club room at any time. I'm usually there, especially in the afternoon and evening.

For other constituencies, refer to teamup.com/ks2e3xr-8n5aumyc48s to see when your Councillor's office hours are.

Vincent Macri

~~PMATH/AMATH/C&O MATHSOC~~ MATHEMATICS TEACHING COUNCILLOR OFFICE HOURS

Are you a ~~Pure Math, Applied Math, or Combinatorics and Optimization~~ Mathematics Teaching major who has academic concerns? Think a certain course is missing from the curriculum? Concerned that certain courses aren't being offered often enough? Have literally any complaint about anything related to your undergraduate experience? Then come to your ~~PM/AM/CO~~ Mathematics Teaching MathSoc Councillor's office hours from ~~4:00–5:00pm~~ 10:30–11:30am every ~~Tuesday~~ Wednesday in the ~~PMAMCO~~ TSA Club room (MC 3033 3031) and complain to me. I will bring your complaints to MathSoc Council, and hopefully get something done about it. If ~~4:00–5:00pm~~ 10:30–11:30am every ~~Tuesday~~ Wednesday doesn't work for you, then try coming by the ~~PMAMCO~~ TSA Club room at any time. I'm usually there, especially in the afternoon~~ and evening~~.

For other constituencies, refer to teamup.com/ks2e3xr8n5aumyc48s to see when your Councillor's office hours are.

~~*Vincent Macri*~~ *Caleb Lew*

[Editor's note: it's a trap, I once went to his office hours and he made me clean the entirety of MC.]

HOW TO GET AN ARTS MINOR, PT 2.

I've given a collection of arts minors a rating out of 5 based purely on the structure of the course requirements, NOT the content of the courses. Minors get points for not being too restrictive while still providing a roadmap to make sure you actually know what you're doing. This list is incomplete; more to come!

FINE ARTS STUDIO

8 courses with a cumulative average of ≥65, including FINE 100, FINE 112, FINE 101, one additional FINE art history course, and 4 FINE studio courses.

The required courses provide a good, but not complete, foundation for taking later studio courses; you'll only find yourself missing a prereq if you explore specific specialities like computational digital art.

★★★★★

VISUAL CULTURE IN A GLOBAL CONTEXT

8 courses with a cumulative average of ≥65, including VCULT 200, VCULT 300, one of (FINE 101, FINE 102), and 5 courses chosen from a list of 100 courses, or DAC, or FINE studio courses to a limit of 2.

While a wide range of courses are permitted, the list of courses is long and difficult to parse, and the required courses aren't particularly useful for fulfilling prereq requirements for other courses you'll want to take.

★★★☆☆

GENDER AND SOCIAL JUSTICE

8 courses from GSJ with a cumulative average of ≥65

The maximum freedom you can expect in pursuing a minor. Despite this, the structure of GSJ courses themselves provides some framework to ensure you have some sort of direction; GSJ has clearly marked introductory courses that are required for later courses, making sure the student has the experience necessary to finish the minor.

★★★★☆

HISTORY

8 courses from HIST with a cumulative average of ≥65, including 2 courses numbered above 250, and no more than 2 at the 100 level.

A level of freedom similar to GSJ, but with slightly more structure at the minor requirement level to compensate for the large number of HIST courses offered. Most HIST courses have no course prereqs, so the lack of explicit introductory courses is less of a weakness.

★★★★☆

HUMAN RESOURCE MANAGEMENT

8 courses with a cumulative average of ≥70, including one of (AFM 102, AFM 123), HRM 200, 2 of (PSYCH 238, PSYCH 339, PSYCH 340), three of (HRM 301, HRM 303, HRM 305, HRM 307), and one additional course from the above or from (HRM 400, PSYCH 439, PHYCH 467, MSCI 311, PACS 202)

One of the most restrictive minors; by virtue of this, the structure is mostly guaranteed. Despite this, there are structural failures in the list—for example, of the PSYCH classes on the list, leaving out PSYCH 238 will leave you unable to take PSYCH 439 later.

★☆☆☆☆

HUMAN RIGHTS

8 courses with a cumulative average of ≥65, including HRTS 101,102,201,202,203,301,305, and one course from a list of 9.

Possibly the most restrictive minor; you simply take every HRST course, plus one more course because there are only 7. By virtue of that, there's not much more to say.

★★☆☆☆

HUMAN STUDIES

8 courses with a cumulative average of ≥65, including HUMSC 101, HUMSC 102, one of (HUMSC 201, HUMSC 301), one of (HUMSC 401, PHIL326J), two of (PHIL 100J, PHIL 118J, PHIL 120J, PHIL 204J, PHIL 210J, PHIL 218J), one of (SOC 355J, SOC 369J), and one of ITALST 291, ITALST 311, ITALST 312, ITALST 360, ITALST 370)

Another very restive minor, with a number of small lists to choose from. As a consolation, it's easy to figure out what you need to take.

★★☆☆☆

INDIGENOUS STUDIES

8 courses with a cumulative average of ≥65, including INDG 201, 272, 216, and 301, and 4 more from a list of 8.

This looks quite restrictive, but actually takes a similar form to the ECON minor, with the difference being there are much more than 8 ECON courses at the 200 level or above. This does make the program more restrictive, of course, but you can't fault the person who designed this program for that—unfortunately the final result is the same.

★★☆☆☆

INTERNATIONAL STUDIES

8 courses with a cumulative average of ≥65, including one of (INTST 101, PSCI 150), PSCI 387, two language or culture courses from the same subject area, and four more courses from a list of 77, with at most 2 from the 100 level and at most two from the same subject area.

Reading this list is not fun, especially when you take into account the two layers of restriction. It's also very scattered, and on top of that you have to pick a language to take two courses from.

★☆☆☆☆

INTERNATIONAL TRADE

8 courses with a cumulative average of ≥65, including one of (ECON 100, 101, 201, 290), ECON 102, ECON 231, PSCI 150, PSCI 283, PSCI 402, and two language or culture courses from the same subject area.

Interesting option if you want to do ECON, PSCI, and learn a language, but structurally speaking somewhat lacking; the diversity of subject areas involved forces the requirements to be quite specific.

★★☆☆☆

LEGAL STUDIES

8 courses with a cumulative average of ≥65, including LS 101, SOC101, three LS courses at the 200 level, and 3 LS courses at the 300 level.

Lots of freedom spending out of a good base that gives you access to most LS courses. The only nitpick is this: why not let a student take 2 courses at the 200 level and 4 at the 300 level, or even use some 400 level LS courses?

★★★★★

Octopodes

PSA: STOP FUTURE PISCES & SCORPIOS

Please stop conceiving kids in the month of June or late May. I got too many birthdays in March I gotta celebrate. Also stop conceiving in February we got too many scorpios. It is unfair for the other zodiac signs when we gotta celebrate so many birthdays in a single time span.

Thank you for listening to this public service announcement.

EXTRAverted

profQUOTES 142.5

MUSIC 140: SIMON WOOD

“ Now, I can give lots of reasons to ban a 50 cent concert. Lots of them involve having good taste.

“ Prof: How was the test, not too bad?
Student: BAD!

“ No one should die in an elective.

“ I don't listen to what I say.

“ Always assume I am a well intentioned idiot.

“ It's part of being English, you know you're better than everyone else, but you don't say it.

“ Any of you Leafs fans? Any of you Leafs fans but don't want to put your hand up?

PHIL 259: NICHOLAS RAY

“ Why even bother parenting?

“ I'll just pretend to be Halle Berry for a second. Shouldn't be too hard, we look practically the same.

“ Hey, I said Benedict Cumberbatch's name right! I usually say “Cucumber Flappy-flaps” or something.

STAT 332: SAMUEL WONG

“ In Florida, a Python Challenge is very different from what you think.

“ I told this story because I saw some people sleeping. Alright, back to the boring stuff!

“ You have a sample size 1 to predict if there is a bonus question for the midterm.

THE BEST FOOD COMBINATION

Mashed Potatoes and Cornflakes.

Yes, you read that correctly! It tastes awesome. Would not recommend eating cornflakes with any flavoured mashed potatoes though, only plain ones (the garlic and herb version does NOT go well with the sweetness of the cornflakes).

Eat THAT, your local food explorer.

Narf Dert

2020 WATCH
EPISODE V: THE BIDEN STRIKES BACK

Welcome back everyone. I probably picked the worst time to miss an issue. When I last wrote this:

- Buttigieg, Klobuchar, Warren and Bloomberg were still running
- Bernie Sanders was going to win the Presidency
- Joe Biden was doomed to retire in ignominy

Life comes at you fast.

Bernie Sanders: Endgame

Did Bernie Sanders build a time machine to recover the Infinity Stones? No, but you might be forgiven for thinking so, because he's on track to lose in an unfortunately familiar way. And Sanders might need the Stones to save his candidacy. After a chaotic few months, with surges from pretty much every candidate (except Tulsi, sorry), one thing was clear: Biden was underperforming. He turned in poor performances in the first three states, and it seemed like his run was over. But, then came South Carolina, and suddenly it all fell away. A thirty point win led to Buttigieg and Klobuchar dropping out, which led to twin Biden endorsements, which led to a crushing Super Tuesday Biden win, which led to now.

Biden has consolidated the moderates, and like 2016, Sanders once again faces the twin problems of the moderate wing of the party combined with black voters. While Biden's delegate lead is small now, only about 90 compared with the 1991 needed to win, Sanders looks to suffer a death by a thousand cuts, because of his poor polling numbers in almost all of the remaining states. Even if he keeps the margins close, or wins some by small margins, Sanders will keep falling behind, especially given Biden's heavy strength in Southern states and the delegate-rich Florida.

Sanders has staked it all on Michigan to turn his campaign around, canceling events everywhere else. In 2016, Sanders pulled off a historic upset here, beating his polls by more than twenty points. Only you know if he pulled it off again. (Can't wait until we go to a real time production schedule).

UW Unprint

N THINGS OVERHEARD AT mathNEWS

- I used to work for imprint, this is my redemption arc.
- You're doing the kind of stats where you actually calculate things with numbers, I don't know how to do that.
- So this one time her boyfriend was sucking her toes…
- It's kinda cute to read someone's thesis without their consent
- We have some *real* homosexual vibes here
- I think living people should be granted the right to be buried.
- I'd like to remind you that anyone can go buy a shovel and bury themselves!
- Gays that can drive are from the alternate universe.
- Gang signs would look like beyblades.

swindlED

ISSN 0705-0410
UW'S BASTION OF ERUDITE THOUGHT SINCE 1973

mathNEWS is a normally fortnightly publication, funded by and responsible to the undergraduate math students of the University of Waterloo, as represented by the Mathematics Society of the University of Waterloo, hereafter referred to as MathSoc. **mathNEWS** is editorially independent of MathSoc. Content is the responsibility of the **mathNEWS** editors; however, any opinions expressed herein are those of the authors and not necessarily those of MathSoc or **mathNEWS**. Current and back issues of **mathNEWS** are available electronically via the World Wide Web at http://mathnews.uwaterloo.ca/. Send your correspondence to: **mathNEWS**, MC3030, University of Waterloo, 200 University Ave. W., Waterloo, Ontario, Canada, N2L 3G1, or to userid mathnews@gmail.com on the Internet.

GRIDXGRID

01100111 01110010 01101001 01100100 01010111 01001111 01010010 01000100

gridCOMMENT *142.5*

Welcome back everyone! Nothing witty to say, I'm a half-tired person who didn't even get the opportunity to snag pizza.

There were 2 submissions to last issue's **gridWORD**, both of which were fully correct. Name/Moniker followed by their answer to the **gridQUESTION**, "What is the best answer to a question that doesn't exist?

- Sharko: "Will this question be on the midterm?"
- Anne, Kathy, Martha, Leanne: "YOUR MOM"

The first answer resonates with me as someone who is struggling to figure out what snarky questions will be on the midterm, so congratulations! Go annoy the editors for your prize.

To first-timers here at **mathNEWS**: the **gridWORD** is a feature column of **mathNEWS** wherein a tiny and edible crossword can be solved at your leisure. You may choose to submit it either via the **blackBOX** mounted next to the Math C&D's neon sign, or electronically to mathnews@gmail.com. The deadline for v142i5 is March 23, at 18:00. Please include your name, optionally a moniker, and a **gridWORD** with your solution attempt on it. Also optionally your answer to this issue's **gridQUESTION**, "Who in UW are you most scared of, and, why?"

Happy solving!

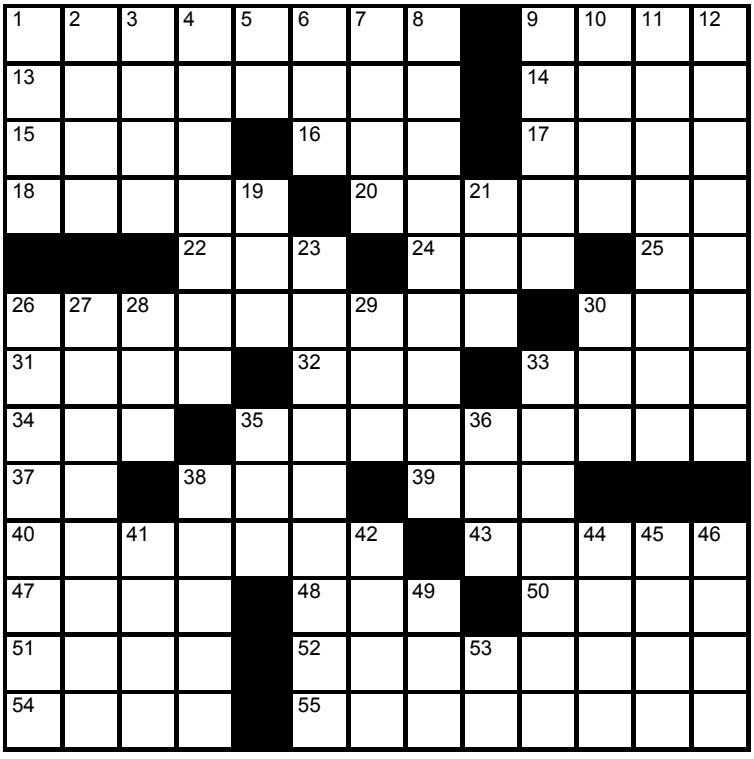
Solar-Flare

ACROSS

1 Bombed city in Japan (8)
9 Common Asian last name (4)
13 Charged universities (8)
14 Asian mountain man (4)
15 1760th of a standard atmosphere (4)
16 Deduce wrongly (3)
17 Breakoff cult (4)
18 Decorative hair net (5)
20 Little squealer (7)
22 Friend (3)
24 God of the underworld (3)
25 142.3, Also 25-Across (2)
26 Entirely conceptual (9)
30 Ask humbly (3)
31 A lot of noise (4)
32 By means of (3)
33 Verbal challenge (4)
34 On the brink of (3)
35 Mannered male (9)
37 - (2)
38 1729 (3)
39 Treaty of Rome creation (3)
40 Plant climbing support (7)
43 Condor's smaller cousin (5)
47 Un agency headquartered in Montreal (4)
48 Correlation coefficient of a population parameter (3)
50 8-Down, i.e. (4)
51 Winter 2020 (4)
52 Old World rodent (8)
54 A restaurant review site (4)
55 What mathNEWS probably isn't (8)

DOWN

1 Stunned craziness (4)
2 4chan commenter (4)
3 Aircraft type (abbr.) (4)
4 With reference to (7)
5 Something Waterloo students probably don't have (2)
6 Mostly pale drink (3)
7 Small track racer (4)
8 Shine (9)
9 Body fluid pouches (5)
10 Rear part of foot (4)
11 Create, and so on (2,6)
12 Most prevalaent air gas (8)
19 Lentil dish (3)
21 First of 3 X's (3)
23 5-Down, e.g. (9)
26 A matrix with 1's in a diagonal and 0's everywhere else (8)
27 Woman formerly married (8)
28 Benz tag (3)
29 Similar to 6-Down (3)
30 Slug noise (3)
33 10-sided geometric figure (7)
35 Girl, informally (3)
36 Shelter from sleet (3)
38 Tread noisily (5)
41 Noble sort (4)
42 Results in 30-Down (4)
44 Emptying bottle noise (4)
45 Short end (4)
46 Water Pitcher (4)
49 Objective Response Rate (abbr) (3)
53 Force (2)



I wrote for mathNEWS → I get free pizza

lookAHEAD

SUN MARCH 15	MON MARCH 16	TUE MARCH 17	WED MARCH 18	THU MARCH 19	FRI MARCH 20	SAT MARCH 21
		☘ Saint Patrick's Day ☘	Add/Drop appointment time for Spring 2020 available in Quest	Spring (Vernal) equinox	Last day to drop a course with WD *Animal Crossing: New Horizons* released, swindlED goes missing due to unknown circumstances	Drop with WF period begins

SUN MARCH 22	MON MARCH 23	TUE MARCH 24	WED MARCH 25	THU MARCH 26	FRI MARCH 27	SAT MARCH 28
	Spring 2020 Add/Drop begins MathSoc W2020 General Meeting (5:30–8:30pm) **mathNEWS** 142.6 production night	Spring 2020 Add/Drop begins WUSA General Meeting (4:30pm–whenever someone calls quorum check)			**mathNEWS** 142.6 released	

MATHSOC WINTER 2020 GENERAL MEETING

MathSoc is calling ALL MATH STUDENTS to come out and join us at the Winter 2020 General meeting from **5:30–8:30 pm on Monday, March 23rd in MC Comfy**. We'll be discussing issues and passing motions relevant to every MathSoc member. The agenda can be found here: https://tinyurl.com/w2020agenda.

If you have any concerns about MathSoc, WUSA. or the Faculty you would like to bring to our attention, there will be time during the GM for public discussion. However, please first email president@mathsoc.uwaterloo.ca with your topic.

Make sure to come out and have YOUR voice heard, and stay until the end for your chance to win the raffle draw! (And of course, we'll have food!)

We hope to see you soon.

Yuqian (Ina) Wang
MathSoc President, Winter 2020

Drop your gridWORD solutions off at MC 3030. And yes, we do award points for creativity.

A PERPETUALLY BORED mathNEWS EDITOR

LAST WEEK'S gridSOLUTION

M	A	T	H	■	M	A	R	M	O	S	E	T	
I	■	U	■	M	■	H	■	U	■	C	■	O	
S	E	N	D	U	P	S	■	L	Y	I	N	G	
N	■	I	■	L	■	■	■	T	■	E	■	A	
O	S	C	I	L	L	A	T	I	O	N	S	■	
M	■	■	■	I	■	L	■	C	■	C	■	E	
E	N	V	■	G	U	A	N	O	■	E	N	G	
R	■	I	■	A	■	M	■	L	■	■	■	G	
■	P	O	I	N	T	O	F	O	R	D	E	R	
B	■	L	■	S	■	■	■	R	■	I	■	O	
E	V	I	C	T	■	E	T	E	R	N	A	L	
A	■	S	■	E	■	A	■	D	■	A	■	L	
U	N	T	O	W	A	R	D	■	A	R	T	S	