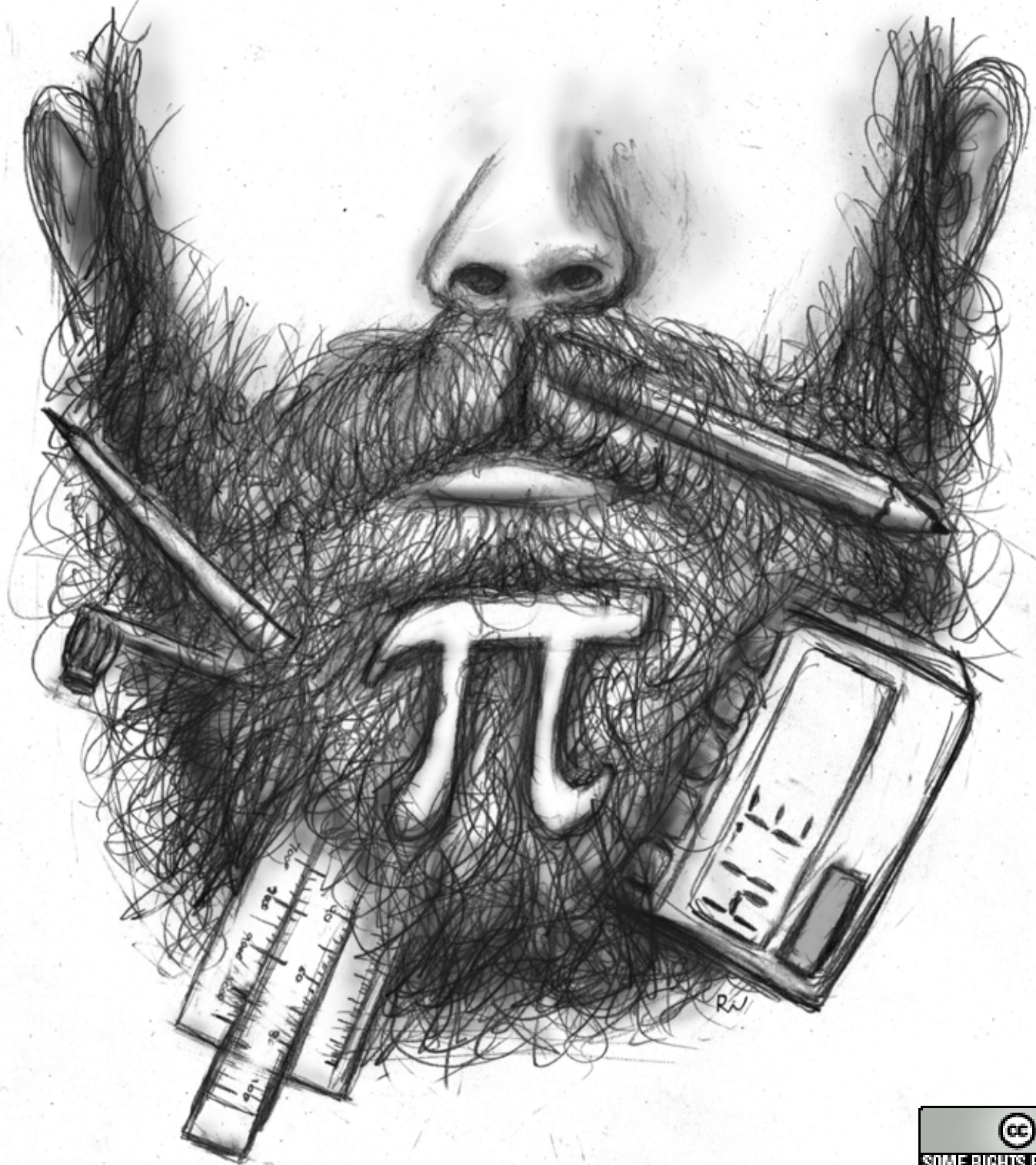


math NEWS

Volume 125, Issue 3

Friday, June 13th, 2014



lookAHEAD**mathNEWS**

June 13	Issue 3 steals your Pokémon and your hearts
June 23	<i>mathNEWS</i> meets at the Game Corner
June 27	Issue 4 blasts off again!

CECA

June 2-20	Employer interviews (main group)
June 20	First interview cycle ranking opens
June 23	First interview cycle ranking closes
	First cycle match results available (4PM)
June 25	Job post (main group) opens

University

June 20	Deadline for 50% tuition refund
June 30	University closed (extra day)
July 1	University closed (Canada Day)

Miscellaneous

June 15	Father's Day
June 17	Eat Your Vegetables Day

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mathNEWS is normally a 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* will eventually be available electronically via the World Wide Web at <http://www.mathNEWS.uwaterloo.ca/>. Thomas Baxter should really write us a new ISSN. What do you think? Send your correspondence to: *mathNEWS*, MC3030, University of Waterloo, 200 University Ave. W., Waterloo, Ontario, Canada, N2L 3G1 or to mathNEWS@gmail.com on the Internet.

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Murphy Berzish (Team Aqua), Katherine Tu (Team Magma), Rachel Wiens (Team Galactica)

mastHEAD

I was first introduced to tabletop roleplaying by my cousin, who is fifteen years older than me. I was around nine. He introduced it to a group of cousins, and I was the second-youngest.

Embarrassingly enough, I kept a journal throughout the campaign, which I found again recently. It was kept in a thin, lined notebook with a silhouette of Canada on the cover. My nine-year-old self decided to draw boundary lines for provinces and territories, and to label all of them (including Nunavut!) except the prairie provinces, likely because I was incapable of distinguishing between them.

We played *Rifts* and *Superheroes Unlimited*, systems of roleplaying with a science fiction theme and a hint of fantasy—at least, that was the way we played it.

Roleplaying is, perhaps, easier to grasp at a younger age, since imagination and fiction tend to become more and more foreign to us over time. Being able to do whatever we wanted in a make-belief world was a very familiar concept to us as children.

However, my favourite part was probably—as it still is today—character creation. As a kid, I decided I wanted to control electricity, perhaps because I liked electric Pokémon. My superhero name was something like “Electra” or “Zappo” because I was incredibly creative.

So, now that we're not nine-year-olds who think that peeing on enemies is the funniest thing ever, have our dreams of being superheroes diminished? It appears it has not, at least among our *mathNEWS* writers—and so, we asked them, “If you could have any superpower, what would it be?”

unit (“Cold War Russia”); tesseract (“dividing by zero”); Scythe Marshall (“24/7 spontaneous creativity.”); Stubbs (“Fly!”); your-localWHETHERgirl (“Mind reading. Makes hearing superfluous.”); theSMURF (“The ability to plug in USBs correctly on the first attempt.”); ScruffyED (“The power to place a comically oversized bathtub drain on any surface.”); guptashark (“Batman. (oh the irony)”); !bar (“The ability to read the question”); zysygy (“To count to infinity... and beyond!”); & (“Photographic memory and perfect recall in $O(1)$ ”); waldo@<3.LE-GASP.ca (“If something is lost, I would want to be able to instantly locate it!”); MuffinED (“spontaneous math & programming puns”); MadAboutVoting (“TWO votes!”); Ninja (“Invisibility”); psychomath (“Telekinesis, yo.”); Shay Blair (“Be able to come up with *mathNEWS* articles on demand”); Beyond Meta (“Winning at complex boardgames that I don't properly understand the rules to them. Though I have terrible beginner's luck to games that rely heavily on luck.”); Zethar (“To wit, I think the ability to arbitrarily delineate the boundaries of anything is what I would prefer, but in truth the myriad connections the conspiracy gives a good substitute.”);

bunniED (“The ability to summon bunnies to my side at will, so that I could spend time with my bunny Charlie at school, and so that I could summon some bunnies to chew up that embarrassing old roleplaying notebook.”)

WatsSFIC Sez

Hello, Mathies! WatSFic (the Waterloo Science Fiction and Fantasy Club) is continuing to meet and host events every week. We do all kinds of events, from movie nights to Humans vs Zombies to Writing Contests.

Our various schedules are:

- We are running a short story writing contest this term. The story must be either Science Fiction or Fantasy, and will be due in mid to late July. Submissions should be sent to watsfic.writing.contest@uwaterloo.ca. More details can be found at our weekly meetings.
- Plans for Humans vs Zombies this term are underway, likely running during the first or second week of July.
- We are doing a book club featuring Neuromancer this term. Meeting days are as yet undefined, but you should get your word in quick if you want to participate.
- We host bi-weekly movie nights, where we show really good and really bad Sci-Fi and Fantasy movies.
- We host bi-weekly Games Days, where we meet in the Math C&D every other Saturday to play board games.
- RPGA (for roleplaying games like D&D) every Friday at 7PM, in MC2017.
- FNM (Friday Night Magic, for those interested in Magic: the Gathering) every Friday at 6PM in MC2034.
- General meetings every Wednesday at 6:30PM in PHYS 150. Fun times and important topics are had. Frequently ends in a tournament bracket—figures from the realms of Science Fiction and Fantasy are gathered and pitted in fights to the death, to see who will come out on top.

If you are interested in getting more information (for instance on the movies we decide on, RPGs people are starting, etc.), sign up to our mailing list at <http://www.watsfic.uwaterloo.ca/contact>. We hope to see you at some of our events!

Daniel Resnick
WatSFic Minister of Propaganda, S14

Printed in Blood!!!

Many of you have probably experienced firsthand the extortionate cost of printer ink. You can probably imagine the enormous cost *mathNEWS* experiences every couple of weeks in printing hundreds of copies every couple of weeks. Many of you have probably at some point seen a list of comparisons between the cost of printer ink per gallon and other things per gallon. Blood is often on that list of comparisons and is considerably cheaper than ink. As an experiment, this issue was printed using blood instead of printer ink. This has in fact saved us a lot of money.

On an unrelated note, we're looking for new writers so that we can print more copies of *mathNEWS*. Writers with blood type A- are preferred.

Stubbs

mathNEWS Article Featured Actual Math

In an unusual turn of events, the previous issue of *mathNEWS* featured an article about real, legitimate math. Much to the shock of many readers, no part of this article was fabrication for the sake of parody.

We decided to interview the writer of said article to understand their motivations for such an uncharacteristic piece of writing.

Q: Beyond Meta, what prompted you to write about non-transitive dice?

A: To be quite honest, I kind of forgot to write a *mathNEWS* article that week. I wrote that article at 6AM, so I didn't really have the time to be witty.

Q: Were you worried that a serious article would be out of place for *mathNEWS*?

A: No, I had faith that *mathNEWS* readers would appreciate how cool math can be.

Q: Do you have any plans to write more math-related articles?

A: Well, at the moment, I am bit busy writing a meta article, but if I come across a really cool math topic, I will seriously consider it.

Beyond Meta

CSC FLASH

Not yet a member of CSC? IDENTIFY YOURSELF! Come to the CSC Office (MC 3036) to register. The office sells pop for 50 cents, provides access to office terminals, boasts an extensive collection of books, and has an array of staplers for all of your stapling needs. There are two upcoming events. You must attend. OBEY! OBEY!

- **CSC GOES OUTSIDE:** There will be s'mores, pop, and intense fire-gazing *tonight* at 7:30 PM at Laurel Creek Fire Pit. All are welcome to must attend!
- **BLOOMBERG TALK:** Bloomberg's lead developer, Max Ransan, will present a talk on the real-world applications of functional programming. The talk will cover UI generation, custom language, and algebraic representation. Food and Bloomberg swag will be provided. June 19, 5:30 pm, MC 4064.

Behold the might of the true Dalek race!

Calum T. Dalek
Chairbeing Extraordinaire

Bombing An Interview

You see a job posted and you decide to apply for it. It's an exciting opportunity to work in a distant place for the company of your dreams that has a workplace environment that you would love. Your mind wanders as you contemplate the endless possibilities of all the money you could be rolling in, and all the connections you could make. So, you edit your résumé a little bit to emphasize how good a fit you'd be for the job and write a stunning cover letter.

And then it sits in your active applications as the interviews and rejections start happening. It just sits there—until they bestow upon you an interview.

You go to the interview and get there early. Sitting and waiting, you take another closer look at the job description and that's where things start to go wrong. You start second-guessing yourself. "I don't really have that requirement." "They seem to be looking more for an engineer." "Why did I even apply for this? I'm not even remotely qualified!"

You see your name on the screen and now, with undermined confidence, make your way to the room. The interview itself is mostly a blur, but the little that you remember is the torrent of technical questions, of which you could answer none. Did you even get your name right? Did you enter the room and simply sit down and drool onto the table like some half-wit?

And so you trudge off home to find solace at the bottom of a beverage, having utterly bombed the interview. Or so you thought. Because when you finally get around to checking your e-mail there are two. The first is from JobMine saying you have a second, follow-up interview at the exact time you're supposed to be writing a midterm. The second is from the employer, asking for code samples.

At this point, the appropriate response is to assume you are some sort of demigod and start acting like it.

Stubbs

N Things to Do in Toronto During the Summer

This term in Toronto is the beeeest!

- Skinny dip at Toronto Island
- Buy shiny shoes at St. Lawrence Market
- Drink ALL the beer on ALL the patios
- Go to World Pride (June 29th)
- Play board games at Snakes and Lattes
- Have a picnic under a tree in Queen's Park
- Check out vintage clothing stores in Kensington Market
- Bury your toes in the sand on Sugar Beach

Seriously, if you have friends on co-op in Toronto (ahem ahem), you should go visit them. This city is amazing.

El Jengibre

Set Newtonian Photomist to Maximum!

Enjoy shouting? Always wanted to baste an Iotatoggle? Interested in trying a game that (gasp!) isn't Hearthstone? Then I have one word (that also looks suspiciously like two words) for you: Spaceteam!

The game boils down to shouting technobabble at your friends while frantically pushing buttons, flipping switches, and shaking your tablet/mobile device of choice as if a spider were perched on it. To keep things interesting, you'll encounter thermal storms, chromatic inversions, and the rightfully dreaded translation error.

Spaceteam is free, which is nice if, like me, you abhor the idea of paying for apps. There are also some extra game modes and stuff if you (or anyone else on your Spaceteam) are willing to throw money at it. I'm personally partial to symbolic mode, where instead of technobabble labelling each of your toggles and dials, you'll be screaming at your team to "Set person-wifi-thing to 7!" and "Flush people shouting!"

There are some issues getting a mix of Apple and Android devices working together, at least on a network like eduroam, and I've yet to see any spacewolves in the game, to my infinite sadness, but on the whole, it's a pretty great timewaster if you can get a couple of friends/acquaintances/kidnapping victims to join you.

$s, t \in \{2k, k \in \mathbb{Z}\}, 144$

How To Create an Artistic Masterpiece

1. Acquire bubblegum.
2. As you go, chew up as much bubblegum as you need, leaving some unchewed and unsticky if necessary.
3. Mold a rounded rectangular prism (R), approximately 2:1:1.
4. Mold a circle (C). Attach to the top of R on one end with a small rectangle.
5. Mold four L shapes. Attach to the bottom of R, one on each corner.
6. Mold an S shape. Attach to the opposite end of R from C.
7. Mold two triangles. Attach to the top of C.
8. Draw a face on C using a toothpick.
9. Draw whiskers on C using a toothpick.

Congratulations. You are now the proud parent of a bubble-gum cat.

Yours in artistic-ness,
Shay Blair.

How to Fill Extra Space in **mathNEWS**

1. Make up fake headlines.

Bad Math

Turing Test Passed

Once again, the distinction between machine and man has been blurred. Except it really hasn't. The Turing test, devised in 1950, is a measure of a machine's ability to mimic a human being in conversation. Note that this is not a measure of intelligence, only conversational ability.

The machine which passed the Turing test was programmed to simulate a 13-year old boy, and as per the rules of the Turing test, managed to make 30% of the judges be unsure if it was a human or computer. After 5 minutes of questioning, 10 out of the 30 judges were unable to tell that it was a computer. This was done entirely through a text messaging program.

The reason that this is "bad math" is that it is not a clear demonstration of anything except the ability of a program to mimic a human. Chatbots have existed for a long time, and this is merely a very advanced iteration. However, given our lack of experience with non-human advanced intelligence, it is not obvious what any good test would be for intelligence in computers, but certainly mimicry is not it.

MeaninglessQuips

Geese are Good

There is a famous Chinese poem dedicated to geese, which begins: 鹅鹅鹅, which roughly sounds like the majestic honking of a goose. If geese can be the subject matter of an ancient work of art, why are they so abhorred within the university? It would be very much preferred that humans revered us—I mean, *them*. I am not a goose!

Perhaps, for humans, the species of goose is important; after all, 鹅 refers to *domestic* geese, not Canada geese (加拿大雁). But these are the birds of the nation, like the eagle is for the United States. Except they're bigger, which is always better, and their cries are far superior to the petty squeaks of an eagle.

Many students complain about the large amount of goose poop on the pathways. But have you considered that maybe we—*they*—are doing humans a service? They do not, like most birds, poop in mid-air, reducing the potential of having poop on human heads. We all know that manure is good for plant life, so they are simply nourishing the grass that they devour, thus maintaining the circle of life.

Geese are beautiful creatures. This is an unbiased fact from a human. I am not a goose!

Not A Goose

WPiRG PRESENTS

CINEMA POLITICA

SUMMER 2014

**PIRACY, PRIVACY, AND
THE FIGHT FOR ONLINE FREEDOM**

MAY 28 JUNE 25 JULY 30





WE ARE LEGION takes us inside the complex culture and history of Anonymous. The film traces the collective's breathtaking evolution from merry pranksters to a full-blown, global movement, one armed with new weapons of civil disobedience for an online world.

Wed. May 28, 7:00pm

When **Pirate Bay** co-founders are found guilty, the hacker prodigy **Gottfrid**, the internet activist **Peter** and the network nerd **Fredrik** are confronted with the reality of life offline – away from keyboard. But deep down in dark data centres, clandestine computers quietly continue to duplicate files.

Wed. June 25, 7:00pm

With fascinating examples, comical gags and terrifying facts, filmmaker **Cullen Hoback** investigates what governments and corporations are doing with your "personal" information. This disquieting expose demonstrates how every one of us has incrementally opted into a real-time surveillance state, click by click.

Wed. July 30, 7:00pm

Princess Twin Cinema - 46 King St N, Waterloo

Admission is Free - All Films at 7pm

For more info: kalin@wpirg.org

www.cinemapolitica.org/waterloo

CINEMA POLITICA
SCREENING TRUTH TO POWER

Bad Math 2

Bad Math Harder: Political Edition

Ontario Liberal: Like most political platforms, the Liberal platform contains large amounts in spending promises, with the promise to get the revenue by increasing taxes on such things as tobacco and fuel, and on the wealthy. If previous results are any indication of future performance, not enough revenue will be generated, and deficit spending will increase. This will result in an increase in debt service payments, reducing potential future spending.

Ontario Progressive Conservatives: Tories seem to have trouble differentiating between job growth and job growth per annum. Also, the current unemployment rate in Ontario puts around 600 000 people unemployed, meaning there will be around 1.6 jobs per unemployed person. On the 100 000 job reduction, there are approximately 130 000 provincial jobs that are either directly in government, or in government enterprises. Cutting 100 000 jobs from this would be devastating. Thus, some of the cuts must come from elsewhere, which includes things like education and health care.

Ontario New Democratic Party: The NDP have had fewer numbers thrown around during the campaign. Like the Liberals, the NDP have committed to spending large amounts of money with no clear plan for where the money is going to come from. Personally, I am more inclined to cut them slack on their numbers, due to the fact that they have not been in government recently – in fact, I was three years old the last time the NDP was in power in Ontario.

MeaninglessQuips

Hudak Sees Success in Ontario

In a surprising turn of events, Hudak won 428 of 107 seats in parliament after counting each seat once for every year of his term. Hudak has declared that the Government of Ontario has been renamed to the Hudak Corporation. Following through on his election promises, Hudak has fired all professors and support staff at UW but has created several new administration positions to ensure the efficient and cost-effective distribution of education. Students will now be required to maintain a 95% average to retain their student loans, and tuition has been increased by 30% to cover the cost of the additional positions.

Additionally, all-day Go service has been established. However, since all transit operators have also been fired, the trains remain stationary in the Kitchener Via/Go station. When questioned on the matter, Hudak seemed genuinely surprised that train operators were important to the operation of the trains. To rectify the situation, traffic flow on the 401 will be increased by paying foreign investors to operate it as a toll road. This is expected to create over 10 million jobs.

#PCsEatMac

Election Drinking Not-A-Game

The election has happened, and, unlike all the previous voter polls, this one was the one that mattered.

Well, some time ago, the Bomber ran an election event called “Drink your vote.” But that was for one of those practice events; a game.

This is not a game.

Rules of the election drinking game:

- If your candidate of choice got elected, drink to celebrate
- Drink for every insult you last heard on a middle-school playground
- Drink for every accusation of corruption
- Drink for every attempted insinuation of corruption
- Drink for every ad hominem
- Finish your drink for every candidate elected on a platform indistinguishable from their opponent's
- Finish your drink for every riding with less than 50% voter turnout
- Finish your drink for every candidate who won by fewer than 500 votes
- If Tim Hudak has become premier, finish your drink. Then get another drink, out of sorrow. Get another drink, cry, and drink some more. Apply induction. Pass out from alcohol poisoning. Use your free health care, because this is the last time you will be able to do so before he takes it away. Observe the education system fall into disarray, and become an alcoholic for life.

This is why the drinking for this election is not a game.

tesseract

Election

Unfortunately, this was written on Monday. So the election hasn't happened yet.

But it is now Friday, and the election has happened. And it affects all sorts of things, in particular education and transit between here and Toronto. These are things you care about. So, if you haven't done so yet, go look at the results. At least get a sense of who won how many ridings. And who is representing you in Kitchener-Waterloo.

While you're at it, look at how many seats were won by a margin of fewer than a thousand votes (including, perhaps, this one). Look at the disparity between the percentage of popular vote and number of seats in Queens Parliament. Follow whoever was elected, figure out what they promised, and call them on what they do.

And look at FairVote Canada to see what people are trying to do about our election process. Or, for more immediate relief, turn to the *Election Drinking Not-A-Game* (above).

tesseract

Mike Schreiner to Lead Coalition Government

In a stunning election result, the people of Ontario are getting a remarkably bizarre government, a first in parliamentary history worldwide.

In the provincial election held yesterday, Tim Hudak's Progressive Conservative Party had the strongest showing, winning 52 seats, two seats shy of a majority in Ontario's 107-seat Legislative Assembly. Kathleen Wynne's Liberals and Andrea Horvath's NDP each won 27 seats. In the riding of Guelph, Green Party leader Mike Schreiner won in a landslide, the first ever Green MPP.

In a surprising and significant result—but carrying on the riding's 30-year tradition of voting the same way as the province and country—there was a dead tie in Kitchener Centre between the Liberal candidate Daiene Vernille and the NDP's Margaret Johnston. The returning officer cast the deciding vote for Liberal Daiene Vernille, giving the two parties an equal number of MPPs.

Kathleen Wynne has already resigned as Premier, and Lieutenant-Governor David Onley has appointed Tim Hudak, as the leader of the largest party in the Legislature. Unfortunately for him, it seems unlikely that his government will be able to win the confidence of the Legislative Assembly, as it seems that he will not find the two votes of opposition MPPs that would be necessary for his government to attain confidence.

The result will be that Lt.-Gen. Onley will be forced to either call upon another party leader or call an election. This is where it gets interesting.

After the bitter acrimony of the recent election campaign, both Kathleen Wynne and Andrea Horvath have stated unequivocally that they will not support a government led by the other. Yet, right after an election, ancient constitutional convention dictates that the Lt.-Gen. exhaust every possible option before dissolving the Legislature and propelling the voters into a second election.

Enter Green Party leader Mike Schreiner. All on his own, you might think him defenceless in the political landscape dominated by the PCs, the NDP, and the Liberals. But thanks to this remarkable election result, he holds the balance of power. And the NDP and the Liberals appear willing to support him.

The result would be an incredible 3-way coalition government: Mike Schreiner as Premier will mediate between the usually-opposing Liberal and NDP, free from allegiance to either party. Nobody knows what the policies of such a government would be, as the coalition agreement has not yet been finalized.

Prime Minister Stephen Harper had only this to say about the coalition: "It's obviously, flagrantly unconstitutional. It's entirely unacceptable that the elected representatives of the people of Ontario would attempt to put in a government other than the one chosen by Ontario. The people of Ontario should have a government that accepts the constitutional arrangements put in place by me in 2008. No doubt, if this were challenged in Court, the Supreme Court of Canada would uphold such a government because they are always wrong about the constitution."

The opinion of the new coalition government on Senate reform is unknown.

In some ways, this is the worst possible outcome for Ontario. This new government will be many firsts, but it also represents much uncertainty. With a government hanging so tenuously in the balance—ready to be upset by so much as an MPP getting into a car accident on the way to a vote—businesses in Ontario will be very cautious, unable to rely on anything from the government for more than even a few months into the future. It has been estimated that as many as 15,476 jobs could be lost, which is clearly a very important even though as many of 46% of those jobs could be 10/wk wading around naked in raw sewage.

Better get ready for a bumpy ride.

Algoweird

Surprise NDP Victory in Ontario

Andrea Horvath and the Party have won all 107 seats. Ontarians everywhere are struggling to figure out who their MPPs are. The Party however has been off to a roaring start. The province has declared bankruptcy, and has been bailed out by Germany. With the establishment of the secret police, more than 100,000 dissidents (earning more than 204k per year) will be brought to justice for their greed and not sharing their potatoes. To expedite their sentences, they will be shot tomorrow in the former Queen's Park, now known as Red Square.

#AllHailTheGloriousLeader

Schreiner paints Queen's Park Green

In a stunning turn of events the Green party has won all 107 seats. Citing enormous apathy from Ontario voters, turnout has fallen to an all time low of 107 with only Green party MPPs voting for themselves. The Greens have been off to a good start, declaring pollution a thing of the past. Climate change has been reversed in the province of Ontario. In somewhat of a disappointment, the Greens have achieved this via declaring cars and industry illegal. All Ontarians are now forced to find a simpler life, subsistence farming, or hunting (plants only) and gathering in the newly restored Ontario forests.

#Green4Life

Submit your *prof*QUOTES, grid solutions, and political rants to the BLACK BOX on the third floor MC!

Record-Breaking Two Weeks Since Last Rob Ford Headline

Oh wait.... Shit.

In what was supposed to be an uplifting article about how Toronto mayor Rob Ford had finally cleaned up his act and realized that he had better things to do than get into headlines, we have instead been hit with the depressing realization that we have nothing better to do than report on Rob Ford. There is a whole world of things going on out there, including riots in the Ukraine, football in Brazil, sex in my roommate's bedroom, and elections in Ontario. We could be using this space to discuss how Bill Gates pretty much single-handedly reformed the American education system while avoiding the government, or how Xenu will be saving us all when the apocalypse comes. But no, we're going to be talking about how Rob Ford has kept his head down for two weeks and acted like a normal human being, because that is more important.

Rob Ford has spent the last two weeks eating, sleeping, breathing, and presumably governing the city of Toronto. He has not had any more drug allegations, wild donkey orgies, or drunken stupors in the past fortnight. His children have been going to school every day, and are reportedly looking forward to their summer vacation. His wife Renata has continued to decline on commenting on his performance in the bedroom, although she did blush once. The only major development is that Rob Ford thought that he had some freckles, but upon further inspection it was only some dirt.

So there you go, your dosage of Rob Ford for the fortnight. Look forward to next issue, where we check in on the status of the sun (spoiler: it's still hot).

!bar

Liberal Victory at Queens Park!

In a surprising turn of events, Kathleen Wynne and her Liberal party has won a total of 111 of 107 seats in the Provincial Parliament, shutting out all her competitors and winning three Quebec ridings and one in Detroit. She has thus been declared dictator for life over all her domain. In response, Quebec has declared Ontario an enemy of the state.

Making good on her election promises, all Go trains will now run the Kitchener/Waterloo route, providing all-day Go service at the expense of anyone living in Rob Ford's city. A bullet train to London (England) is expected later today. Ontario's credit rating has also plummeted ahead of expected catastrophic transportation spending. The big three credit rating agencies now rate Ontario at only Sextuplet A(-). Egyptian investors are lining up to buy the 401 for slightly less than the cost of the KW LRT project.

#wynning

***mathNEWS* Is Your #1 Source
For Week-Old Election Coverage**

Why The C&O Department Does Not Have Karaoke Nights

To the tune of "Let it Go" from Frozen

The graphs are light in the course notes tonight,
Not a vertex to be seen.
A kingdom of propositions,
And it looks like I'm the queen...

The words are blurring on the page, this text is dry;
Cannot concentrate, Heaven knows I've tried

A network flow has properties,
Just three so don't forget them please:
Net flow: zero; skew symmetry,
Capacities~

Let it flow,
Let it flow,
Total weight is to be optimized
Let it flow,
Let it flow,
From the source out to the sink

I don't care
How efficiently,
Let the code run on
Big O's not the same as reality

degenerate

Did You Vote?

Canada is a glorious democracy, a country with a proud history of voting on things—things like alcohol (where Quebec voted 81.2 percent against prohibition) and voting reform (where not enough of BC voted and it didn't happen) but that's beside the point.

Last time our country had an election this important, we elected a Prime Minister, and it turns out that a lot of the country didn't believe in him, since less than 40% of the voters actually backed the Conservatives. I've been hearing a lot of people complaining about the government that we've had, and I'd like to say that at least we have a democracy. Some countries, like the USA, don't quite have a democracy (according to Professor Martin Gilens at Princeton, they have an oligarchy), so we should be happy that we have one.

So, to everyone, I'll ask you again: did you vote? Please tell me that you did, because you have absolutely no right to complain about our government unless you have. It's four years until we get to change our minds (or two until the federal elections), so make sure the government is built of people that you want in it, and not ones that will make you question whether they've been smoking hallucinogens.

glgambet

I Went to a Baseball Game With a Statistician

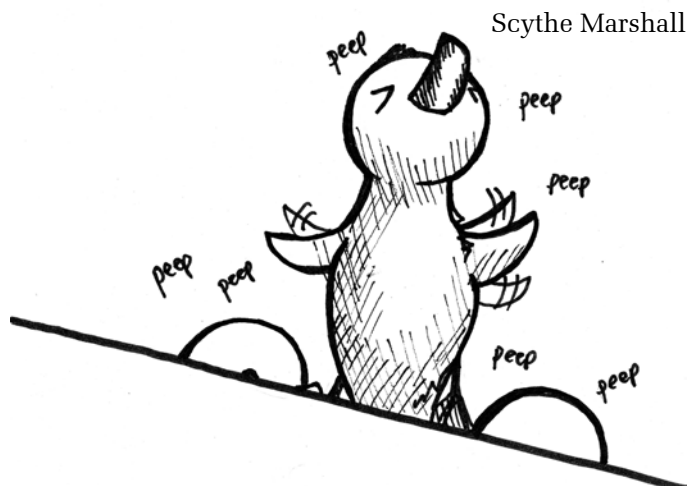
(who is not really a baseball fan)

So, the other day I attended a Blue Jays game at the Skydome. My friend and I had some... “fun” making our way to the stadium, due to subway maintenance, but we eventually made it to our seats via the miracle of technology! (... Long story.) The first thing I noticed was that the roof was open! Open-air baseball is fabulous. Much better than the last time I saw the Jays; playing baseball indoors is mildly... sad face, to use a terribly silly term. Oh well.

We took our seats, and proceeded to watch Mark Buehrle strike out six batters but walk only one fewer in his seven innings of work while giving up a solo home run to some random Cardinals outfielder. This was surprising. It was also fine, due to the fact he didn't give up more than the one run. We also saw Shelby Miller throw five no-hit innings, which I gleefully pointed out when the Jays broke it up. Spoilers, he threw a three-hit shutout anyways, and Aaron Loup blew up in the eighth inning. Oh well.

This fact is mildly amusing, because I had been explaining to my friend about baseball sabermetrics; we talked about how analytics-minded people have evolved from considering win-loss records and ERA in terms of pitching stats and batting average and runs batted in for hitters, to understanding that all of these stats are very context-driven and dependent, hence useless. So we consider FIP, wRC, and WAR, instead, which are based on linear weight models. Thankfully, my friend had taken STAT 331, and so was reasonably comfortable with the idea! Our whiteboard was full of fabulous acronyms and explanations, with a neat backdrop of Jose Bautista... striking out.

Even if the Jays lost (contrasting with the proposed narrative), it was a good day, because we all know that a single game isn't the end of the season, nor even the end of the series. There's plenty of time to watch EE take the parrot for walk, a bunch more times.



***mathNEWS*: Now with 300% more sports!**

I Went to a Baseball Game With a Baseball Fan

(who is also a mathematician)

So, the other day I went to the Rogers Centre to get a lesson on statistics. It was all about how to properly model success with respect to a real world problem. Sabermetrics was quite a fascinating topic, though the constant interruption of the lesson by people trying to hit a ball with a bat and running around a field was little bit annoying.

As luck would have it, baseball was on my list of sports that I knew the rules to, due to having read a manga about it. The manga, by the way, was *One Outs* by Kaitani Shinobu, my all-time favourite manga artist.

After getting a crash course in sabermetrics, I decided to pay attention to the game. The Blue Jays were losing, but I wasn't worried. I had read a lot of stories so I knew a thing or two about narrative structure. I knew if there would be a turnaround, it would happen in the the 9th inning. Though this is only true if the writer actually knows what they are doing, which may have been a bit too generous of an assumption to make. Another thing to consider was the meta narrative—the importance of the game in the season as a whole. The game was not a major plot point, so the outcome was a bit irrelevant.

The other thing that I noticed is that, from a humouristic perspective, there's a golden opportunity when a team named the Blue Jays loses to use the line “I am feeling Blue”.

Beyond Meta

Ducklings Win 3-0 Against Ledge

The season for the spectator sport, duckling-watching, is well underway, with the first game having been played at Waterloo Park last evening.

It was a spectacular win for the ducklings against the pond ledge, with ducklings managing to climb the ledge in under thirty minutes flat.

Though we expected no less from our Waterloo ducklings, they had a rough start, as all five ducklings were stuck in the pond a whole five minutes after Mama Duck had hopped onto land. She did not abandon her team, however, and watched carefully as the ducklings tried their hardest to clear the ledge.

Duckling #1 showed some amazing moves, leaping short of the ledge, but pulling off a back-flip before landing on its behind. Duckling #2 and #3 followed suit with less delicacy.

It was an exemplary show of good sport, and there is no doubt that this team of ducklings have a promising career of ledge-climbing ahead of them.

bunniED

Three Revelations of Hockey Analytics

No, not the book of Revelations.

1. Shootouts are a relatively new part of the standard regular season game in the NHL, having been implemented after the 2004-2005 lockout. It was intended to make every game end in a win, and to provide an interesting end to the game. The shootout has been a part of international hockey for a much longer time; the shootout in the Canada/Czech Republic semi-final at the men's hockey tournament during the 1998 Winter Olympics in Nagano is perhaps one of the most controversial things in hockey history.

However, it has been the subject of disdain amongst various fans of the sport, as it provides something of a fake ending to a game, and because teams have become more liable to play to get to the shootout once it's later in a game or in overtime. The points system in the NHL gives a point to both teams upon reaching overtime, and then awards a point to the winner of the game, either in overtime or in the shootout. This is a problem because, according to some people, the shootout is a crapshoot.

That is, statistics have shown [1,2] that while there may be players who are better at the shootout than others, this fact is lost in the statistical noise of the situation. Of course, there are the obvious outliers like Pavel Datsyuk on the one hand, and the Sedin twins on the other (/Canucks fan sadness), but in general, a team would be hard pressed to call their shootout winning percentage anything but luck. Of course, tell either Canadian fans watching the 1998 Olympics when Marc Crawford left Wayne Gretzky on the bench, or Maple Leafs fans watching the Islanders beat the Devils in a shootout on the last day of the 2007 season to edge the Leafs for the last playoff spot, and you may get a facewash for your trouble.

2. At the end of a hockey game, a team down by a goal or two will typically push the play much more than otherwise, by rushing their defense or hanging forwards high near the blue line. Another strategy allowed by the rules is to pull the goaltender for an extra skater, i.e. a forward or defenseman. This means you can have four forwards in the offensive zone battling for the puck or getting open for shot attempts, while still having two defensive players up top to guard against a counterattack. Conventional hockey wisdom says to pull the goalie with about a minute to a minute and a half left in the game, which was thought to be a happy balance between avoiding the dreaded empty net goal, and giving your offense enough time to actually score. If you've been following the NHL this season, you've noticed that Patrick Roy, of the Colorado Avalanche, has bucked this trend significantly (and has been for a while), and other coaches around the league have been noticing.

In [3], the authors use simulations and look at data to investigate situations of interest during a hockey game in which it may be a good idea to pull your goaltender. It is observed that not only does a team score more often with an extra man advantage, but more penalties are called on the team defending the lead, so pulling the goaltender leads to an extra advantage, in terms of situation. Moreover, it is observed that the minute and a half usually given to score 6-on-5 is not nearly enough time, and the

goalie should be pulled with much more time left on the clock. Most research corroborates this conclusion.

Coaches, of course, must face the consequences of their decisions, whether it be scrutiny by the fans or the players themselves, or scrutiny by their general manager. Thus, coaches typically act very conservatively and without straying too far from traditional viewpoints, so as to avoid stirring the pot, as it were. Thankfully, it looks as though most teams are embracing some of the newer strategies, and it's led to perhaps a more exciting brand of hockey, or at least, more fodder for sports columnists and bloggers.

3. The Plus-Minus (+-) stat has been around in hockey for a large number of years. It is intended to be a measure of how successful a player's team is while that player is on the ice. Computed as (goals for while on ice) – (goals against while on ice), only considering even-strength situations, it has long been an important stat for hockey fans and teams alike, to decide how good a player is at the combination of offense and defense; that is, if a player has a high +-, then they do some good combination of lots of points combined with strong defense, and vice versa in the case of a low +-.

However, analytics sheds some light on the subject. It turns out [4] that “+- is bad, and you should feel bad” about using it to evaluate individual players. +- doesn't do a good enough job of isolating a player's performance and involvement in the play, and as a result, is very team-driven as opposed to player-driven. For instance, a defenseman who has a terrible goalie behind them will end up with a worse +- on average, because while they may force shots from bad angles and otherwise make good defensive plays, the goaltender may still give up soft goals, thus slapping a shiny -1 onto that player's +-. These, and many other reasons, are more than enough justification to use +- as nothing more than a ‘what happened’ statistic, ie. it's not predictive nor evaluative, but merely gives a number.

Instead, one might wish to use any/all of Corsi, Fenwick, or PDO as more useful measures of a player or team's quality of play. Corsi and Fenwick use the differential of even-strength shot attempts (with/without blocked shots, respectively) to monitor a team's possession and quality of possession [5], and PDO is a BABIP-esque indicator of luck [6]. All three stats are beginning to find their place in the lingo of coaches, GMs, and broadcasters, which means they may find their way into the general hockey knowledge base. Wouldn't that be something? It might just knock the suit off Don Cherry.

Scythe Marshall

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I Will Go Down With This Ship

#slashwincest

It has come to my attention that some Poor Unfortunate Souls have not heard of the concept of shipping. This is appalling, and sad. Why would you take time to educate us, you ask? And so I say, to the tune of a well-known Disney tune;

My dear, sheltered child. That's what I do. It's what I live for.
To help unfortunate cave-dwellers like yourself.
Poor souls with no one else to learn from.

I admit that in the past it's been less well known
I'm not kidding when I say I am bewitched
With pairs like Dean and Cass
and which one takes it in the @\$\$
I've seen it all, and dear I've made the switch
Slash? Yes

And I fortunately know Cesare Borgia
and his sister's always best when she's undressed.
And dear reader, please don't laugh
That is merely half
Without Jamie and Cersei, I am depressed .. and desperate

You poor unfortunate souls
So sane, indeed
But which one will be the winner
Will Arthur stand by Guin?
Or leave for Merlin?
Both, such greed

You poor unfortunate souls
You're sad, and new
You come flocking to the fandoms
Demanding feels you don't understand
Should I amuse you?
Or tell the truth.

Now it's happened once or twice
A shipping so riddled with vice
I'm afraid I had to give a second thought
Yes I've had the odd doubt
But I'll never throw them out
These perfect ships cannot ever be forgot

Do you understand?

You will never escape once you have entered, nor will you want to.

In ships nothing is wrong, and in ships I do believe.

#notacult #nope #wellmaybe #fandomsaredefinitelycults #idrank-thekoolaid #youshouldtoo #itssofunguys #DRINKITNAOW #death-andhappiness4ever #winning #helpivefallenforHannibalandcantgetup #becauseheatemylegs #itsOKthough #love

psychomath

theSMURF Watches Doges

Wow, Such Review!

WARNING: PROBABLE SPOILERS AHEAD

WATCH_DOGS is a recently released game developed by Ubisoft, and I've spent the past two weeks playing through it. Although I have yet to complete it, I believe I have spent enough time to give it a fair review.

If you were looking for something new and original, this probably isn't it. This is a combat heavy game with hacking puzzles tacked on, rather than a hacking game with combat as an addition. There are some really neat parts for hacking, such as infiltrating an area by hacking without even stepping into it, but those sections are far and few between. Instead, the majority of the game involves taking cover behind chest-high walls, pulling out guns from your selection of 15 bazillion (somehow you carry more guns here than Borderlands), and shoot people in the face until they're all dead. There is a stealth option, but it's not always possible due to various story-based events, as well as Enforcer-type enemies that requires two grenade launcher shots in the face to kill.

The game can be pretty silly at moments. Your character questions his morals and actions after slaughtering his way to rescue his nephew (amusingly enough, I did this section with only non-lethal take-down, but I still "killed" them in the game's eyes), only to turn around and continue his murderous rampage. He makes a big deal of people going after his family, but does not hesitate to use other peoples' families as leverage. One time, I found a firetruck so I decided to follow it; however, I noticed that other cars did not heed the firetruck, and it ended up plowing through cars to get by. In the end, there wasn't even a fire to put out; rather, a simple message saying "the fire is contained, stand down" ended the firetruck's rampage.

Also, your character isn't really a hacker; he's more of a script kiddie, using hacks created by other people. I'm also fairly convinced that WATCH_DOGS is actually a fantasy game. Your "phone" is more or less magical: there is a "battery" system that is essentially mana, and you can swim with it, even hack with it from the water. That thing is a magical wand.

The game doesn't really differentiate itself much from other open world games such as GTA, but that's not necessarily a bad thing. GTA is pretty good, and I'm having a decent amount of fun with the game. It's not bad, but it's not amazing either.

The Good:

- The gunplay and combat elements are decent, and some of the hacking parts are really neat.

The Bad:

- The gunplay and combat elements are decent, and some of the hacking parts are really neat.

10/10, because the SpiderTank is the greatest thing ever

theSMURF

The Ballad of Milcent and Gertrude

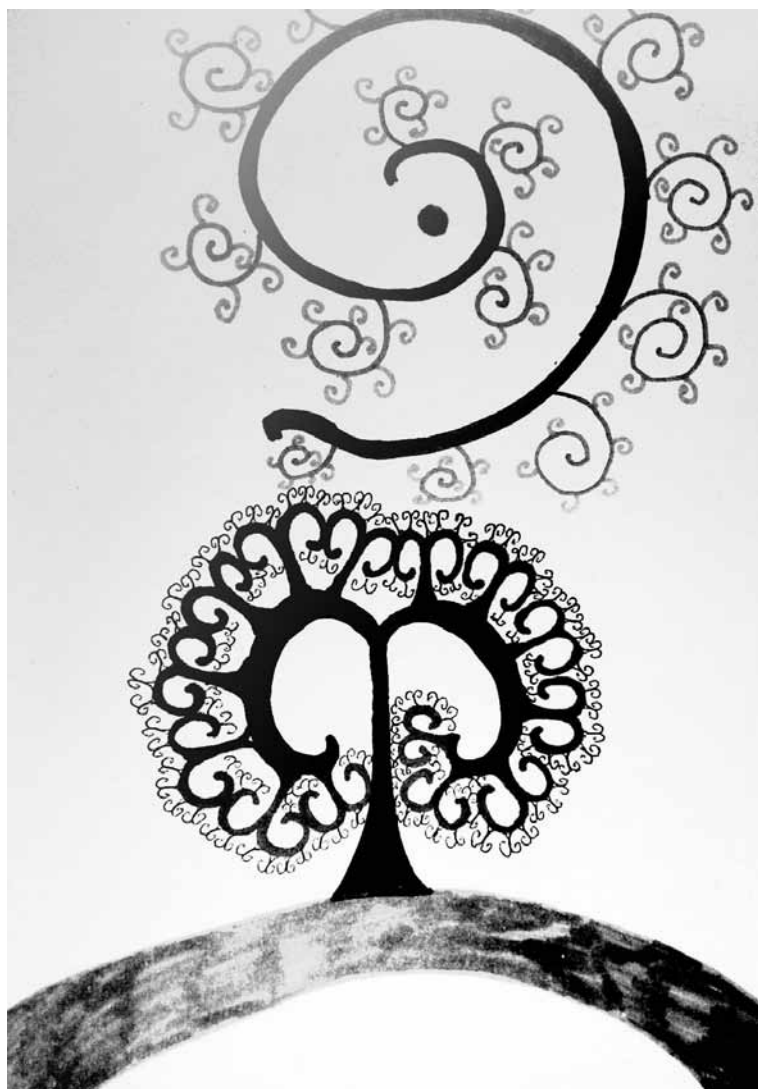
In time long gone, two beings lived in love,
But then their world did change so they did flee,
They bid their time til they returned above,
But when they did a diff'rent world was seen.

For weaker beings had o'erthrown their home,
But they did head across the land for fate,
For they had realized they weren't alone,
He brought a gift and they did procreate.

But trag'dy struck and killed their children new,
By fire cruelly slain, the pair must 'venge,
But in the righteous fight was Milcent slew,
And Gertrude tried to seek vengeance again.

But she was slain and thus their species ends,
They curse Godzilla and his human friends.

Yours in alternate interpretation,
Shay Blair.



N Ways League of Legends Made Me a Better Person

When I picked up League of Legends, it was supposed to be a simple game to waste time. Contrary to what my parents and media said, my quest to become better at the game amounted to (slightly) more than just a time sink.

Learning to have sympathy:

One of the most common reactions I saw when someone made a mistake or was underperforming overall was finger-pointing, often accompanied by hurtful and profane comments. The important takeaway here for me was attempting to understand what may have caused the situation. Are they new to the role or champion? Perhaps they're just having an off day? By forcing myself to make these sort of considerations for everyone, not just in League, I gained me a deeper sense of compassion for others.

Learning to control my emotions:

Even if someone did not find value in showing empathy towards others for moral reasons, getting angry and dumping rage into the chat is never helpful. If your goal is to win the game, telling someone they are terrible at the game, should uninstall, and go... do a sudoku puzzle does not positively contribute to you winning the game. People perform worse when berated and you, yourself, in your fit of rage, diverting so much energy into producing vitriol, will likely go on tilt and make mistakes.

On the flip side, it's also important to not get too caught up in success. Becoming overconfident and making cocky plays have been a source of many losses that should have been wins.

Learning the importance of introspection:

Whenever I was caught in a slump, one of the most powerful strategies I used to get over it was to look more carefully into my games; after all, the only absolute constant in all of my losses and failures was myself. However, it's important to not cheat here. You have to be harsh and find exactly what you specifically did wrong, because these are the only factors you can reliably influence. It may be easy to only frame things as the fault of someone else (even if it was the jungler), but you will do yourself a disservice and will not properly learn from this exercise.

When I eventually left the game, I came away with not only a cool collection of skins and a shiny gold border, but skills and lessons learned that can be applied to all aspects of my life.

zsysgy

Fig. (Left) A sunny day in the eyes of a math major.

Money... in Spaaace (Games)

Star Citizen: Money Makin'

So with the semi-MMO space simulator Star Citizen passing \$45 million USD in its crowd-funding, and likely to hit \$46 million soon, it continues to be the most funded of crowd-funding projects. Though it has been going on for one and a half years where most funding periods last a month or so, I recall it breaking record during its month on Kickstarter (where it raised \$2 million on Kickstarter, and another \$4 million on its own website).

Breaking through the \$45 million mark was brought on by the release of the next module in the alpha, Arena Commander (or the dogfighting module), where players can finally take their ships out of their hangars to fly them around, and shoot each other (or some AIs) up in small 4v4 battles. As servers are brought online, more players will be supported, and as development continues larger, multi-crew ships will be included.

In somewhat less important news, the contest for including a fan-made ship into the game has ended, with months of work by many teams resulting in many amazing ships. Sadly only one of these ships made it in, but with the planned modding available for private servers, all of these ships could be used in-game.

If you are interested in walking around inside and outside your own little (or large) ship as it cruises across a large galaxy full of merchants, pirates and bounty hunters, take a look at Star Citizen and why it is so well funded.

Soviet Canadian

The Best New TV Show You Probably Won't Watch

Recently John Oliver (of Daily Show with Jon Stewart fame) launched a new weekly show on HBO called Last Week Tonight With John Oliver. The format is a half-hour commentary on the major issues globally for the past week.

So far, I have enjoyed some of the coverage, explicitly of the Sultan of Brunei introducing Sharia legal penalties, as well as the coverage of a failed execution in the U.S. and then a longer segment on discussion of the ethics of it. I enjoy his humour and discussions.

The problem of course is, the fact that most people don't have HBO. On the one hand, it's a place where he can swear as much as he wants. I just don't know if the demand is there for his show, or if his market will pay up for HBO. I encourage everyone to talk to Peter Sunde about other ways to view it.

Ice Nine

One Day, We'll Even Web *mathNEWS!*

Boutique PC... Not for me!

You know, at Waterloo there are a lot of computers. And some computers are better than others. Computers in the Linux, Windows, and Mac labs are fine, with respectable power for whatever you need to do, so long as it isn't something too graphics-intensive or computationally demanding. But what if you do need a bit more raw power? Running Crysis 3 with full eye candy or rendering detailed video is going to need a new class of computer, the gaming machine. PC gaming has been here forever, as have been dedicated machines built just for gaming. Putting aside console-exclusive titles, PC gaming can be decidedly better. Your ultimate gaming PC can effectively overshadow PS4 or Xbox One. Blazingly fast processors and dedicated graphics cards can make quick work of the most graphically demanding games on three 2560×1440 monitors and it has been known that PC graphics are noticeably better than those supported by consoles. The power of your system depends on the depth of your wallet. How much would these ultimate PC's cost? A quick visit to alienware's website can show you machines that run upwards of 3000 dollars. For those who want specific parts on their computer, companies do exist to satisfy the niche market. These customers want a high quality computer that isn't pre-built from a large scale manufacturer, and they don't really want to build their own system. The main boutique PC makers that satisfy this need are Maingear, Digital Storm, Origin PC, and Falcon Northwest. There are an infinite number of ways to make your computer truly yours, from specific components to custom paint jobs.

If you're ready to take the plunge and invest in your unique PC, you'll first want to take a look at the price. It might give you a mini heart attack. These prices rival those of even Apple, and you'll wonder why these computers are so expensive. When you're paying professionals with 20 years of experience to personally build you a custom gaming monster, you can easily configure a computer to prices upwards of five grand. Buyer beware; you will be getting a high quality system with incredible customer service and warranty at the cost of an arm and a leg. As for me, someday... I'll get enough cash to buy a boutique PC. For now, I'll stick with my 6 year old Macbook Pro.

guptashark

*prof*QUOTES

Stuffed into a corner because we needed filler

Professor: [*Concerning the midterm exam.*] "I'll adjust the grade depending on how I feel about the class."

Student: "...did I mention your haircut looks great?" [*Class laughs.*]

Professor: "I did it myself, with a beard trimmer. That's how I know you're lying."

New, MATH 247

"For those of you who haven't seen this before, just assume it's magic."

Nelson, MATH 239

How to get out of the friendzone

Not too long ago, I became friends with this really great person and, almost immediately, I knew that I wanted to go “further”, as they say. If you’re in the situation that I was facing, these are some quick easy steps to set yourself apart and help you bypass the dreaded “friendzone”:

1. Be polite and outgoing
2. Bathe and groom yourself more often
3. Get in shape
4. Pick up a new skill or hobby that they are interested in
5. Learn to pronounce “rød grød med fløde”

Some of these things seem obvious as to why they work. What is somewhat less obvious is why they don’t. While these methods are certainly worthwhile improvements, it turns out people like to cheat and take shortcuts. A lot of people on the path to improvement start out fine, but the lack of a solid strategy and a bit of confirmation bias decays these efforts to the point where they erode away entirely. There’s a lot that can be said about effective goal setting, but that’s not the point of this article.

What’s usually even less obvious to people is not why their attempts fail, but that their understanding of the “friendzone” is fundamentally flawed.

The “friendzone” is the idea that while you might be this attractive, nice, and brilliant person—or you’ve recently put in a lot of effort to become on—the person you pine for doesn’t see you in that way, and you will only ever be a friend to them. However, you put in all this effort and you’re clearly a good match for them, so why doesn’t it work out? Maybe you were too nice of a person?

If you thought this article was going to help you win over your crush, I apologize for the deception. There are no easy steps to “success”. Instead, I want to establish how the above line of thinking is just terrible. I aim to completely break down the concept of the friendzone and offer a perhaps more realistic way to cope with the situation.

There are two key aspects that I find particularly bad about the friendzone:

1. Having a friend is not good enough
2. Performing certain actions or being a certain way creates an obligation

When someone declares they have been friendzoned, it’s often presented as something negative.

For someone who has historically had a rough time making friends, being able to have a new friend is great. Having someone that you can rely on, spend time with, and with whom you can enjoy the company is a great thing to have. The friendzone devalues the whole idea of friendship.

The second and more reprehensible aspect of the friendzone is that certain actions and innate character traits should make someone like you; if I’m really nice to this person, they must like me. After all, inputs should generate outputs. This logic may work in a mathematical formula or game, but when it comes to relationships, this belief, above all else, must be discarded. People’s emotions simply do not work that way. While you may take steps to influence things in your favour, you cannot actively force someone to like you. It’s like the equally terrible notion that $\text{dinner} + \text{movies} = \text{sex on a date}$. No matter what you do for someone and whatever your intentions are, the motivation should never be to create an obligation for them to reciprocate.

Furthermore, thinking this way generates a disingenuous basis to why you are doing something. Are you being nice because that is the right thing to do, or only because you want to get on the good side of this person?

Instead, do good things and improve yourself because they are worthwhile undertakings in and of themselves. It’s OK to use your crush as an initial trigger to get you rolling (it was a huge motivator for me), but by developing an intrinsic motivation to be kinder, more physically fit, or familiar with Danish desserts, you will obtain a personal fulfilment even if things don’t work out. You will still have a friend and maintain an inner drive to continue admirable actions and goals.

This is where I ended up. Having been a past subscriber of the friendzone philosophy and feeling frustrated about relationships many times before, I wanted things to be different this time. This person sparked a personal renaissance, prompting me to find ways to build confidence, become more healthy, and become more sociable. I realized that it wasn’t their fault for not liking me, but I was unhappy with myself and that I needed to change. Things didn’t end up working out and it definitely sucked. However, once I had gotten over the initial blow of rejection, I was pleased with the progress in my goals. It wasn’t a failure to get this person to like me, but a chance to channel my feelings into something that would have been productive even if things didn’t pan out. The best way to get out of the friendzone is to acknowledge that it doesn’t exist.

zsygy

profQUOTES

Now more lacking than ever before!

"In this module you will very often have to bet your house and your belongings, and you will most likely lose."

Fischmeister, ECE 455

"Try and explain your answer to your neighbour. When he laughs, get him to explain."

Hill, PHYS 234

"I'll tell you what's really impressive, it's only 8:40 in the morning and you're all fully engaged in answering questions about quantum mechanics."

Hill, PHYS 234

"There's a bit of a tradition for oral history in mathematics, so I ask you, please don't write down what I'm about to say . . ."

Lee Dickey, PMATH 360

Inane Ramblings: Hopf Algebras

Put simply, a Hopf algebra is an object which is simultaneously an algebra and a coalgebra, and possesses a sufficiently nice “inversion” map. More explicitly, we begin with a vector space A over a field F , and equip it with a multiplication map $m : A \otimes A \rightarrow A$, a unit $u : F \rightarrow A$, a comultiplication¹ map $k : A \rightarrow A \otimes A$, a counit $z : A \rightarrow F$, and require that the following conditions are satisfied:

$$\begin{aligned} [(I \otimes m) \circ m &= (m \otimes I) \circ m] \\ [k \circ (I \otimes k) &= k \circ (k \otimes I)] \\ [m \circ k &= (k \otimes k) \circ (I \otimes r \otimes I) \circ (m \otimes m)] \end{aligned}$$

where I denotes the identity on A , and r is the canonical reversal of tensor products, $r(a \otimes b) = b \otimes a$. Finally, we add a linear map $p : A \rightarrow A$ such that:

$$[m \circ (I \otimes p) \circ k = m \circ (p \otimes I) \circ k = u \circ z]$$

Why do we care about Hopf Algebras? One of the earliest motivation comes from Lie Theory: the cohomology algebra of certain Lie groups is a Hopf Algebra. Some later applications stem from concepts in combinatorics such as Young Tableaus and representations of symmetric functions.

Problem of the Fortnight: Given measure spaces (X, μ) , (Y, ν) . Let $L^1(X, \mu)$ denote the space of absolutely integrable functions $f : X \rightarrow \mathbf{R}$ with respect to μ . For $t \in X \otimes Y$, let

$$\|t\|_\gamma = \inf \left\{ \sum_{i=1}^n \|x_i\| \|y_i\| : x_i \in X, y_i \in Y, t = \sum_{i=1}^n x_i \otimes y_i \right\}$$

and let $X \otimes^\gamma Y$ denote the completion with respect to this metric. Show that $L^1(X, \mu) \otimes L^1(Y, \nu) \cong L^1(X \times Y, \mu \times \nu)$, where $\mu \times \nu$ is the product measure.

DT

^[1] For a rigorous exposition of what it means to put \circ in front of a word, see Category Theory

Last Week's *gridWORD* Solution:

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

Pros and Cons of Sunscreen

Pros:

- Prevents sunburn
- Prevents DNA damage from sun
- Slows down the onset of wrinkles
- Protects you from getting skin cancer

Cons:

- Hinders tans
- Something else to remember to do
- It's cold when you first put it on your skin
- Having to reapply it after sweating or swimming
- Shopping for brands
- White streaks on your skin
- Sometimes smells funny

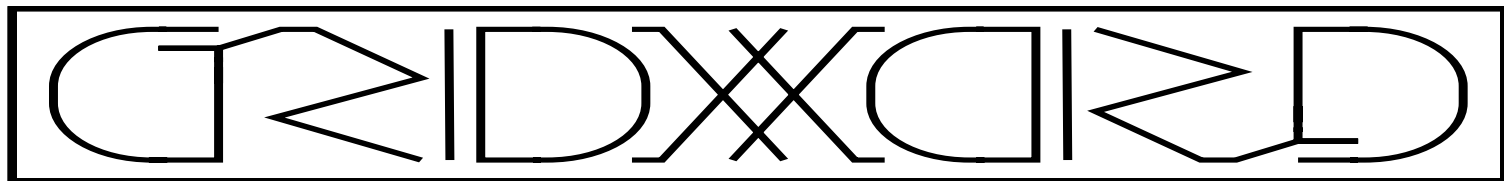
Most of the cons seem pretty trivial compared to skin cancer. Wear sunscreen.

Yours and burnt,
yourlocalWHETHERgirl

**Submit your Hopf Algebra and
gridWORD solutions to the
BLACK BOX!**



Fig 2. Lady Phi and the ordinary generating dragon



gridCOMMENTS

Squid pro quo

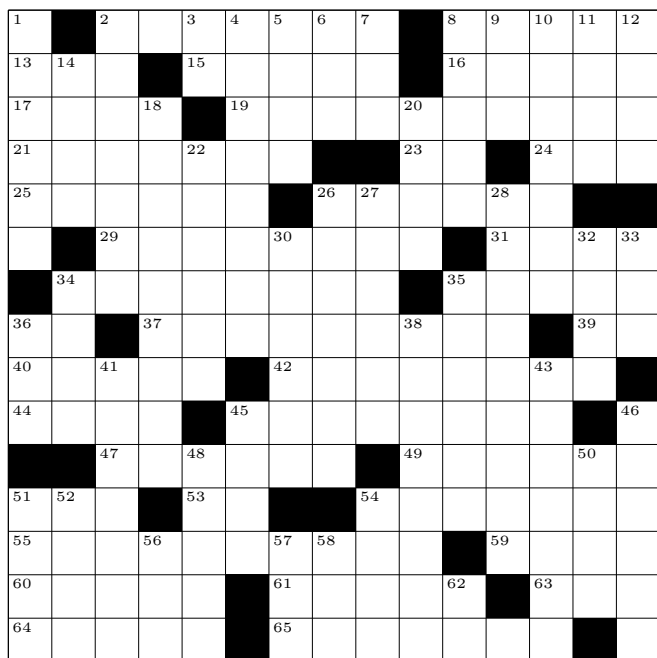
I've been feeling under the weather ever since I went to the aquarium, so I put in a few fish and a few two-letter words.

All nine submissions were perfect. Am I making these too easy? Only two answers to last issue's **gridQUESTION**, "Why does the lamplight flicker?" had anything to do with spookiness. Rob tried to pull another "nothing is certain in science", and Kevin parried with "Why are there ants in my lamp?". Abraham confessed he's "not pedalling the bicycle powering the lamp fast enough", and Reila gave two answers: one about fluorescent bulbs and another about my parents. And Michael, sorry, but I've never played A Machine for Pigs. The Messiest Writing Award goes to Travis ("whenever I rub my kitty's belly when she sleeps she always purrs"). To Jinny with her Landon quote ("An apt quotation is like a lamp which flings its light over the whole sentence") Maugham would say "she had a pretty gift for quotation". So we're down to Ramesh's "street's haunted, yo" and Richard's "the lamp only flickers when you look at it". I like the second one more, so congratulations, Richard! You may pick up your prize at MathSoc.

Submit your grids to the **BLACK BOX** (by the Comfy Lounge on MC 3rd floor) by 18:30 on Monday June 23rd. Include your name and your answer to this issue's **gridQUESTION**—the funniest answer decides the winner (of a \$5 C&D gift card) in the event of a tie: "If the egg fountain hatched, what would come out?"

Cheers,
unit

This Week's Grid:



gridWORD Clues

Across:

2. Woods, hard and soft
8. Orbital extremum
13. Indication of joyful pleasure
15. "It is silent"
16. Mother-of-pearl
17. Great Barrier _____
19. My favourite dessert
21. Sandy Mediterranean wind
23. N/m²
24. Acid
25. Nipple neighbourhood
26. Few and far between
29. Caviar source
31. Not twice
34. Kite-shaped fish
35. Depressing
36. Thou and thou
37. Eight-armed cephalopods
39. Not out
40. Gaia
42. Of whales
44. Succulent plant
45. Boons
47. Basketwork willows
49. Flaring, turning up
51. Make a selection
53. Virginia, briefly
54. Misery (redundant)
55. Made amazing
59. Pluck
60. German pistol
61. Redbreast
63. Compass point
64. Abrasive black sand
65. Shackle

Down:

1. Poland's capital
2. Feminine given name
3. Short mountain
4. Card game
5. Heartbroken by 38D?
6. Rough, wild
7. Postal suite?
8. (Get) close
9. Campus gym
10. Most triangles
11. Galls
12. Unit of reproduction
14. Next in line
18. Page-bottom embellishments
20. Width of a human hand
22. Flat handbag
26. Neptune's quills
27. Wile E., e.g.
28. Tightlacing
30. Bulk seller of food
32. Eve's firstborn
33. Sea eagle
34. Noms
35. One of nine dividers
36. Archaic affirmative
38. Jonquil
41. More important than leafage
43. Sprinkle with slander
45. Ursid
46. Bivalve mollusc
48. Treasured, also tickled
50. Ψ Ψ Ψ
51. Amorously eye
52. Pitted and purple
54. Arachnid's traps
56. French "sea"
57. Wrath
58. Daughter's brother
62. Not applicable

Doodle space