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THE IRON WARRIOR

THE NEWSPAPER OF THE UNIVERSITY OF WATERLOO ENGINEERING SOCIETY

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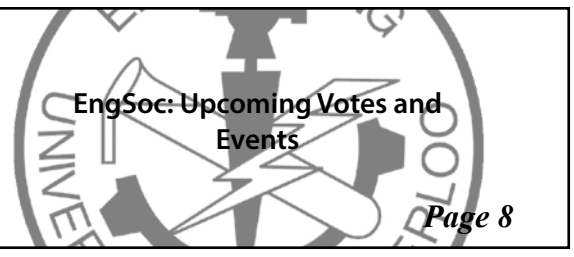
Supreme Court Rules in Favour of Doctor-Assisted Suicide

Page 3

#BellLetsTalk: The Pros and Cons

Page 4



EngSoc: Upcoming Votes and Events

Page 8

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Everyone Loves Waterloo

"People's Choice" among 9 podium finishes for Waterloo at GNCTR 2015

University of Waterloo Concrete Toboggan Team

The award-winning toboggan team in Kelowna, BC.

University of Waterloo Concrete Toboggan Team

The award-winning firefighter-themed toboggan.

University of Waterloo Concrete Toboggan Team

The toboggan's braking mechanism.

SCOTT KLINGER & JARED MURPHY
TEAM CO-CAPTAINS

At 3:00 am on January 21, 26 students from the University of Waterloo were awake en-route to the airport to represent Waterloo at the Great Northern Concrete Toboggan Race (GNCTR) in Kelowna, BC. This competition, which lasted 5 days, is one of the longest standing engineering traditions and requires teams of undergraduate engineering students from across the continent to design, build, and race a concrete toboggan. The toboggan must weigh less than 300 pounds, hold five people, have a concrete running surface (only concrete can touch the snow), fully functional steering and braking mechanisms, and have a protective roll cage! This year GNCTR had 18 competing universities with over 430 students.

This year's competing team consisted of civil, mechanical, and mechatronics students in their 2nd to 4th years. As the core team members had previously attended GNCTR (a first for Waterloo) the design was largely based off past experience. The team designed a wide aluminum-framed toboggan for greater stability. The two skis utilized a complex composite section, involving low-density concrete, rigid foam, GFRP-reinforcing mesh, and CFRP post-strengthening which acted in composite with the aluminum frame. A light weight frictional steering system was activated by the rear rider. Braking involved a massive bear-trap-like steel plate dropping at the rear of the toboggan when engaged by the brakemen.

Design work began last summer along with hundreds of hours spent batching and testing new concrete mixes. During the fall term design was concluded and a final concrete mix was selected. Construction of the ski formwork was done using 100% recycled wood material from past concrete canoe formwork. The skis were poured in late November, with the toboggan being assembled during December and the first week of January. The toboggan was then shipped in a crate, with the team flying out to meet it two weeks later.

This year, the University of British Columbia Okanagan (UBCO) played host in Kelowna, BC. Teams were judged on the toboggan design, technical report, technical presentation, performance on race day, and team spirit. Each day, teams could be heard yelling their school's cheers or the competition chants, all while wearing their themed costumes! Waterloo went as the University of Waterloo Fire Department (UWFD), wearing firefighter outfits for the week, even on competitor interaction day skiing at Big White! The team's technical exhibit was also built around this theme with all of the technical posters, product samples, and report being themed around a fire hall.

This year, Waterloo performed quite admirably gaining awards in technical and spirit categories. First place trophies were awarded to Waterloo for Concrete Reinforcement, Most Sustainable Team, and People's Choice (everyone loves Waterloo!). Waterloo also came home with six other podium finishes. University of Calgary came away as the winners of GNCTR 2015.

The team had an incredibly memorable time in BC and in Waterloo designing and building the toboggan! A large contingent of the team is graduating this year and the younger students on the team are eager to carry on Waterloo's successes. If you are interested in joining this fantastic and award winning team, please contact the team captains at *uwaterlooconcrete@gmail.com*. The team is always open to new members! Those aiming to compete at GNCTR 2016 will be travelling to Ottawa to represent the University of Waterloo.

EngSoc Election Results

ANDREW DAVIDSON
ELECTIONS COMMISSIONER

The people have spoken, and the results are in! I'd like to give a warm welcome to the next set of Engineering Society Executives: Hannah Gautreau as President, Anson Chen as VP Education, Kieran Broekhoven as VP External, Don Tu as VP Finance, and Teresa Lumini as VP Internal. I'm also very pleased to announce that the new WEEF Director will be Wesley Sak.

We had 713 students vote in this election, a turnout of about 18%. Even though 5 out of the 6 positions had only one candidate running, it is still important that people took the time to vote. The unopposed candidates still had to receive the approval of the engineering students to actually be elected. Your vote ensured that you had a say in choosing the people responsible for matters such as events and services, representing you to external groups and the KW community, academic issues, finances, and the governance of the engineering society as a whole.

Overall, I'm quite happy with the campaigns the candidates ran as a whole. They were all great to work with, and have put a lot of work into their campaigns. The winners will now certainly have their work cut out for them over their 16 month term. This is Andrew Davidson signing off as CRO, and thanks for voting!

Letter from the Editor

In Praise of IRS Pranks

NANCY HUI
EDITIOR-IN-CHIEF

It's been an eventful few days. The not-a-snow-day, upcoming midterms, and the Iron Ring ceremony! But despite it all, including a very unfortunately placed production weekend, we've finished the second issue of the Iron Warrior this term. The first draft actually went out for review at 9PM Sunday - a personal record (admittedly with only two data points...)

We have a lot of articles this issue, including Ashlyn's interview of Dr. Chandramouli R. Madhuranthakam (if you have a prof you'd like to see featured, shoot me an email at *iwarrior@uwaterloo.ca*!) and Joanna's recap of her time at the First Year Integration Conference. Kathy has also put together a killer, seasonally-appropriate crossword for this issue. There are also a lot of things going down with the Engineering Society right now: check out the EngSoc exec reports on pages 8-9 and keep an ear out for any news about Infosilem scheduling software and the upcoming E7 Referendum! And a big ol' CONGRATULATIONS to the Concrete Toboggan team and their MaC1VE TROPHIE5 on the front cover.

My two personal favourite articles of the issue are probably Meagan and Devika's articles on the effectiveness of Bell's #Let'sTalk campaign to "raise awareness" for mental health. Is it helpful, just a publicity stunt, or possibly both? Check it out on page 5!

I'd like to thank Nina for coming in and helping with the last bits of copyediting. Also thanks to Jacob Terry for fixing fine formatting issues despite having retired from EIC duties in 2012.

Thanks to Elizabeth and Emmanuel for coming in to copyedit, and Bryan for learning layout and taking care of a tricky page in the Science & Technology section (his page is the one with the picture of an egg!) Also kudos for putting together the Iron Inquisition. The original question was supposed to be "Tell us about your first time on Facebook!" in recognition of Facebook's tenth anniversary of existence, but it turns out that nobody actually remembers their first time on Facebook. I guess I don't really either, ha. I joined it in high school to keep up with Debate Team news, and I remember the outrage at all the layout changes, intermittent fits of frustration in which I removed all my Facebook friends and added them all back, cryptic adolescent Facebook Notes alluding to romances that weren't meant to be... can't say I miss the Facebook of my youth, actually.

So, what's that about pranks?

Friday was very festive, if you get my meaning. Did the hallways seem more decorated than normal? Did the lecture halls appear... obstructed? Did legions of strangely clad hooligans make the rounds to prod and provoke your professors?

That would be the Engineering Class of 2015.

Traditionally, before the Iron Ring Ceremony, the graduating class sets up pranks and parades around the engineering buildings. I'm not sure why, except out of tradition. Don't worry, the profs are consulted before their classes are invaded, and the pranks taken down so that future cohorts can make their own playful (and temporary) mark on the face of campus.

Detractors say that missing class is unhealthy, tradition isn't a good enough reason to do anything, and that some traditions really should be put down, and that the pranks are dangerous, inconvenient, messy, and altogether unnecessary.

I'm sure these people also say that Edcom is a psychological safety hazard.

First of all, missing class is definitely detrimental to one's academic career, but frankly if one has made it to 4B, skiving off on class isn't going to bring 30 months of education screeching to a halt. It's a much bigger deal in first year where sleeping in one lecture might lead to skipping all of one's morning classes. One assumes that 4B one can tell the difference between three skipped classes and thirty.

As for tradition: the Iron Ring itself is a tradition. Getting obligated during the ceremony is neither an indication nor a prerequisite to one's ability to practice as a licenced engineer. If one dispensed with all traditions - well, that leaves one without fireworks on Canada Day, without presents on Christmas, and without FLAMING CAKE on your birthday.

Certainly, not all traditions are worth observing. But I'd say that IRS pranks are some of the less harmful ones. Please refer to Caitlin's article this issue entitled "More Disgusting Things People Have Done in History" for a frame of reference. IRS pranks may be annoying but cause no irreversible damage, and only happen once a year. In fact my favourite prank this year was when all the chairs and tables in CPH-3607 were turned sideways - incomparably elegant and nondestructive, but so, so annoying.

Finally, to the point that the IRS pranks just aren't necessary: You know what else is dangerous, inconvenient, messy, and unnecessary from a physiological point of view? Golden retriever puppies (most dog bites are from "family-friendly" breeds like retrievers and labs.) Road trips (a.k.a. operation of a two-ton death machine by a sixteen-year-old.) Chocolate fondue (major safety hazard!) Friends. Love.

All of this is even more important in engineering, where there otherwise isn't so much to look forward to, except the turning of the world, the endless cycle of school and co-op and school and co-op, where school offers you nothing but an unending stream of assignments and labs, and you've landed a co-op placement that you're somehow not absolutely stoked for despite claiming during the interview that you would love nothing more than to work in X field on Y project.

Sorry, I'm exaggerating a bit there. Waterloo offers possibly the best undergraduate engineering education in Canada, and the prestige of its co-op program is unparalleled.

But, y'know, it's probably not healthy to just look forward to work and school. Co-op ends, people graduate. You gotta make your source of fun-generation self-sufficient. And sometimes it's not enough to wait for fun times to fall into your hands, to wait for your friends to make plans for you or without you.

It's important for each person to set goals for oneself - not just career goals, or school goals, but goals for things you actually enjoy. Try really hard to remember the things you enjoyed before coming to engineering. Book a solo kayak trip on the Grand River. Hell, get your passport renewed and start putting together a graduation trip (I'm going to New Zealand to fulfill my LotR-oriented childhood dreams, by the way. L> fellow travellers?) Book a piano room in the SLC and play covers of crappy pop songs by ear. Plan things beyond your midterm homework and study schedule. Plan things that really make you feel happy rather than just passing the time away. Plan things to look forwards to when you leave the University of Waterloo behind in the dust and you're wondering where to go next. Plan things that make you feel hopeful that the future is more than death and taxes.

Including planning IRS pranks. It would be a shame if engineering students weren't allow to joyfully and methodically showcase their cooperation and school spirit in erecting temporary monuments to academic excellence.

Also, we take them down ourselves afterwards.

So, current third years - I beseech you take up the crown of your predecessors and plan pranks so innocently elegant and nondestructive yet so annoying they bewitch the mind and ensnare the senses. Everybody else, remember to look forward to things that are more than work and school.

Like the next issue of the Iron Warrior.

Until next time--

Nancy Hui

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Death with Dignity

LEAH KRISTUFEK
3T CHEMICAL

On February 6, the Supreme Court of Canada voted in favour of allowing people with grievous and irremediable medical conditions to request the assistance of medical professionals in ending their lives. This decision will take effect in just 1 year leaving provinces and territories scrambling to come up with legislation narrowing this broad scope to something that will still protect vulnerable citizens.

Assisted suicide has long been a controversial issue. The decision for a person dying of an incurable illness to take their life with the assistance of a physician has a profound effect on all involved parties. For the patient it saves them the pain of a degenerating body and disintegrating quality of life which in many diseases follows a predictable timeline. Although Palliative care can lessen the symptoms there remains many diseases which do not have cures. By choosing to end one's life prior to reaching the extreme stages of the disease being suffered, patients aim to lessen the suffering of their loved ones. Physicians, on the other hand, spend much of their careers preserving life at all costs. Purposefully ending a life, even when it may prevent untold pain and suffering, can seriously affect physicians' mental health and the medical community has not unanimously gotten on board with the idea of assisted suicide.

There is a great deal of grey area in allowing people with grievous and irremediable medical conditions to request the assistance of medical professionals in ending their lives. Ensuring that the patient is giving informed consent is perhaps one of the most important issues. A sick person may go through cycles of depression. When in a depressed state that person may ask for doctor assisted suicide while later realizing that their pain is bearable for a little more time with their family and friends. This second chance would be unrealized if suicide was allowed.

The group most benefitted by this Supreme Court ruling is people with degenerative conditions such as ALS, MS and Huntington's disease. In many cases sufferers have a very defined way that their body will begin to decline. First you might lose speech, then mobility, then your very knowledge of self. For the dying person the pain of their terminal illness is increased by watching those around them suffer with the inevitable loss. However, we must question what constitutes a reasonable request. Is 'being a burden to your family' enough of a reason for suicide when faced with a degenerative disease?

The rules for doctor assisted death need to be more defined to ensure that an individual retains their 'right to life' without limiting them with a 'duty for life'. In the cases of mental illness, physical trauma like paraplegia and cancers and many others the boundaries for when assisted suicide is acceptable are indistinct. While we can all agree that minimizing suffering in a person's final days is important it is equally important to ensure that people are not taken advantage of.

This upcoming year will be incredibly important for the successful implementation of doctor assisted suicide. A great deal of debate and thought will have to be put into creating a law that will allow all people to die with dignity when their time has come.

A Dam'ed Failure

The Mount Polley Tailings Dam failure investigation

JESSICA KEUNG
2N CIVIL

On August 4, 2014, the Mount Polley copper and gold mine tailings pond, in the Cariboo region of British Columbia, breached. This tailings dam is owned by Imperial Metals. The Mount Polley tailings storage facility released 10 million cubic metres of water and 4.5 million cubic metres of mining waste into the Polley Lake. This tailings slurry eroded river banks, tore down trees and flowed out of the Polley Lake into the nearby Quesnel Lake. This spill greatly affected the natural landscape of the surrounding area by causing the Polley Lake to rise by 1.5 metres and the nearby Hazeltine Creek to transform from a 2 metre wide stream into a 50 metre across "wasteland". By the end of the fourth day, the tailings pond was virtually empty and the slurry of tailings had poured into the once pristine Quesnel Lake. Immediately after the tailings pond was breached, the Cariboo Regional District declared a local state of emergency over concerns of the quality of the drinking water. The tourism businesses in the surrounding areas remained open inspite of the tailings spill. On August 5 and 6, it was found that even with the tailings slurry in the Quesnel Lake, the water was not toxic to the rainbow trout. After the tailings dam failure, the water, sediment and fish were sampled and tested by the BC government. The government officials found that the fish contained elevated levels of selenium that exceeded levels safe for human consumption. The sampling also revealed elevated levels of arsenic and cooper in the fish, but not enough to be considered a threat to human health. The testing of the sediment revealed elevated concentrations of copper, iron, manganese, arsenic, silver, selenium, and vanadium, but these levels were already elevated before the dam breach.

On January 30, 2015, the Mount Polley Independent Expert Engineering Investigation and Review Panel delivered a final report detailing the findings of this independent investigation. This report was delivered to the Ministry of Energy and Mines, the T'exelc First Nation (Williams Lake Indian Band) and the Xat'sull First Nation (Soda Creek Indian Band).

The report states that there are three contiguous embankments that confine the Mount Polley tailings storage facility and that the perimeter embankment, where the breach occurred, was on the northern flank of the tailings pond. This report breaks down possible failure modes into four categories: Human intervention, overtopping, piping and cracking, and foundation failure. The investigation concluded that the Mount Polley TSF breach was due to the foundation failure of the embankment which showed visual evidence of bodily outward displacement and rotation of the embankment remnants that was consistent with foundation failure. One of the layers found in this investigation is especially weak and was not accounted for in the design of the TSF. Another is the presence of a brittle stratum that loses strength as it comes under load and becomes too weak to support the embankment and dam. Another possibillity is the presence of a layer that is compressible under the load and develops a high pore pressure, weakening an otherwise much stronger material.

Through surface investigations, subsurface investigations, and laboratory testing, the Panel concluded that the main reason for this dam failure is due to the design. The design did not take into account the complexity of the sub-glacial and pre-glacial geological environment. The foudnation investigations and associated site characterizations failed to identify the continuous GLU (glaciolacustrine layer) in the area surrounding the breach. This GLU layer is recognized to be susceptible to undrained failure when subjected to the stresses associated with the embankment. The Panel also reviewed the roles and responsibilities of all involved and found no regulatory oversight and that all the regulatory staff were well qualified. The panel found that TSF inspections would not have prevented the failure.

The conclusion of the report is that the safety of any dam, water or tailings, relies on multiple levels of defense. At the time of design of the Mount Polley TSF, the engineers were not able to design around this weakness in foundation which could have failed earlier due to overtopping of tailings in the pond or erosion. The Panel recommends that rather than following the prescribed Canadian Dam Association's factors of safety, that there should be more individual requirements for site investigation, failure mode recognition, selection of design properties, and specification of factors of safety. Many dams in British Columbia have been functioning well, and similar failures have no occurred at other mine sites. Even though the probability of a tailings dam failing is small, the implications are not.

Solitary Confinement Challenged by Human Rights Group

CAITLIN MCLAREN
3A CHEMICAL

British Columbia's Civil Liberties Association and the John Howard Society of Canada have filed a petition to the Supreme Court, arguing that Canada's use of solitary confinement in prisons is unconstitutional.

The UN Special Rapporteur on Torture considers solitary confinement of longer than 15 days to be torture. The average length of a period of solitary confinement in Canada is 40 days.

In 2007, 19-year old Ashley Smith committed suicide after spending more than 1000 days total in solitary confinement. The coroner in her case recommended that "administrative segregation" be limited to 15 days. This suggestion was ignored. Currently, Canada has no limit.

Smith's case was not unique - on average, there are around 10 suicides per year by prisoners in solitary confinement. One quarter of Canadian prisoners spend some time in solitary confinement, but tellingly, over half of prisoners who commit suicide were segregated.

Canada doesn't seem to be learning, either - over the past five years, Canada's use of solitary confinement has increased by 6%.

We should really know better.

Long weekend at the First Year Integration Conference

JOANNA LIU
1B CHEMICAL

A five-hour car ride, bag full of 'business casual' to 'semi-formal' clothes and arriving at the hotel to discover all other delegates were running late; these were the deceptively bumpy beginnings of FYIC 2015.

FYIC stands for 'First Year Integration Conference.' It is hosted by ESSCO (Engineering Student Societies' Council of Ontario) consisting of 15 Ontario University Engineering Societies. Started in 1987, ESSCO became a means for all Engineering societies in Ontario to collectively represent all undergraduate engineering students.

This year's FYIC was hosted by Laurentian University, and hence, delegates and speakers were to meet in Sudbury. Each University bought their own number of delegates (ranging from one to eleven, based on available funding from the respective Universities).

Waterloo was a relatively large group, totaling ten delegates including our VPs.

The first evening (Friday, January 30), the delegation mingled at Wacky Wings. Among wood tables, pitchers of soft drinks, and a buffet of salad, wings and fries, delegates from different school met and chatted.

In this one and a half day conference (not including travel time), everyone, knowing their time with each other would be short, were soon exchanging contacts. The resounding notion was us delegates would be meeting one another again in one setting or another in the future.

The evening closed with icebreakers at the hotel, followed by free mingling. Many chose to stay past midnight, maximizing the time there was to socialize.

Saturday, January 31 began bright and early. Delegates were up before 7 AM to get dressed in business-casual clothes and be ready for breakfast. The day was spent at Laurentian University, where executives from ESSCO, CFES (Canadian Federation of Engineering Students), and PEO (Professional Engineers of Ontario) gave slideshows and talks about involvement with the respective organizations, and each organization's tasks and stories.

Throughout the day, there were also talks by VP Externals from different Universities on topics including "Professionalism and Networking," "Dinner Etiquette," "Pre-interview Preparation," "Elevator Speeches," "How to Conference," and "Do's and Don'ts of Public Speaking."

After lunch, VPs left for their plenary session, where they voted on new legislations affecting Ontario engineering students. Delegates sat on for more presentations followed by "Mock elections." These were two minute "elevator" speeches where volunteers would propose a position (real or imaginary) they were running for, and attempt to convince the audience they were the most suitable candidate.

The afternoon ended with delegates return-

Continued on LONG on page 8

Prof Personalities

Dr. Chandramouli R. Madhuranthakam

ASHLYN LOW
1B NANOTECHNOLOGY

PROF PERSONALITIES

Dr. Chandramouli Madhuranthakam is a well-known and well-respected professor from the Chemical Engineering department, loved by his students for his evident enthusiasm for his course material and passion for teaching. Completing his Bachelor and Master's degrees in India, he soon moved to Canada to pursue his PhD degree and research career at the University of Waterloo.

This month, the Iron Warrior took some time to chat with this awesome professor.

Here's what he had to say:

Which courses are you teaching this semester?

This semester, I am teaching two courses in Chemical Engineering. One is Process Data Analysis, a 2A course, and the other is a 3B course called Heat and Mass Transfer.

Why did you choose to pursue a career in Chemical Engineering and become a professor?

After high school, I wanted to pursue Electronics Engineering, but I would have had to move out from my hometown to do that. My parents insisted that I stay in my hometown, so I attended Sri Venkateswara University. The options I had were chemical, mechanical and civil engineering. At that time, out of those three, chemical was an emerging field, so I thought there would be a promising career in that, and I ended up taking chemical engineering. I did a good job in my undergrad, and after I graduated, immediately there was an opening in the same department, as a junior faculty member. Most of the professors who taught me, they know me, and then they offered me that position. So for one year, I was teaching undergraduates immediately after my graduation. I used to get very good applause when I used to teach, and I enjoyed it. Then, when I was deciding whether to continue this or not, my colleagues, who used to be my professors, advised me to pursue a research career, after which I could always come back and teach. I then completed my Masters at the Indian Institute of Science, which is a premier institute in India. There I got exposed to research experience and I enjoyed it. Then I quickly realized if I chose to pursue a career in academics, I could have the privilege of teaching and also doing research. Further, if you want to settle in academics, you have to do a PhD, so that's what drove me to do a PhD here in Waterloo.

Why did you come to Canada to pursue your graduate studies?

I had a couple of friends here in Waterloo who did their PhD and told me about an industrial project which was an application of what I learned, and which I was interested in. So when I got the offer from the University of Waterloo, I accepted it.

What are your research interests?

My research focuses on designing microreactors and static mixers to make advanced materials. So what usually happens is that the properties of most materials depend on their structure, or morphology. You can actually control the structure when you make them in tiny reactors because you will have minimum diffusion limitations, or minimum heat transfer limitations. For example, the systems that I am working with are polymeric materials. Depending on whether the polymer chains are linear or cross-linked, you can have different properties of the material. In my research I design microreactors which are at a scale of 50 to 100 microns that can facilitate the polymer molecules to grow in one direction, uniformly and efficiently. My focus is also on using them for making value-added products such as biocomposites and advanced materials in drug delivery systems. Within this research area, I also work on the feasibility studies, hydrodynamics of multiphase flows in static mixers and microreactors, control and optimization with respect to operating procedures.

With my expertise in modeling and simulations, right now I mostly create simulations, but wherever possible I will verify it with experimental data when I have a lab. To explain you further, there could be many different structures or geometries, let's say you want to design a specific structure for the microreactor, so how you actually do it is you make a 3D geometry of that structure, using AutoCAD. Then import this AutoCAD structure into a CFD software such as COMSOL, solve the multiphysics models which are nothing but heat, momentum and mass balances and postprocess the results. So that's about my research in a nutshell.

What has been the most memorable experience so far in your career?

The most memorable event in my career was the offer I got from the University of Waterloo, not for a PhD, but the offer to be a faculty member. That was the most memorable event, to have the offer to teach and do scholarly work.

What do you like about being a lecturer?

I like to interact with the students. I love to explain things, especially when you see them feel happy when they understand something, and you see a glow on their face. I really like that.

Have your students taught you anything during your time as a lecturer?

It has taught me a lot. I am open to learn from anyone, and that's what I tell students, that you have to be eternal learners. You should be ready to learn from anyone, because some things you might know better than me; it's not always about the subject material. So you have to be open minded and open ended. I always learn a lot from students. For example, I might think that a certain way of explaining a concept would be the best, but from the questions they ask, or from the doubts that arise during the class, that will actually convince me that I should probably do it in a different way, a way that they want.

Do you have any advice for your students about how to be successful in their university career?

Overall, what I can say is that during this part of your life, you have a huge reservoir of energy, and you need to focus this for learning, gaining experience and acquiring knowledge. That should be your first priority, and it will help you down the road for the rest of your journey in life. Other than that, what I can suggest to students is the importance of planning and perseverance. Once you set your objective I think what you need to do is plan it accordingly, plan your time, and persevere for it. You have to throw yourself into whatever you do and you have to do it wholeheartedly. Otherwise, if you do it half-heartedly it will actually leave you with bitterness everywhere. You will get nothing out of it.

Another important thing I want to tell you from my experience, is that good and bad, they never come separately; they always come together. It's up to you to choose and identify what is good, and the results depend on your decision. Even when you work in a co-op or in an industry or anywhere, good and bad, they will be together everywhere. These are some practical things that life will teach you, no university offers a course on this! As you move on in your career, you have to always keep this in mind that they come together, but you have to always choose 'good'. Momentarily you might face some difficulties but overall you will be the winner.

The University of Waterloo
Dr. Chandramouli Madhuranthakam

What were some challenges you faced as a university student?

As an undergraduate student, I was tutoring math and physics to high school students. So at some point it became a challenge to manage my time, because I had to spend time tutoring, and at the same time I had to study for my coursework. That's the only challenge I can remember. Other than that I enjoyed my undergraduate studies experience. I persevered a lot, and I did a very good job.

Another challenge I faced was getting admission at the Indian Institute of Science where I did my Master's. Like I said before, this is a premier institute, and you have to go through an entrance exam and a personal interview with a panel of faculty members. The interview was a very scary thing because you basically had to know 32 courses worth of material from your undergrad for this interview, and they can ask you anything. So that was really challenging, but it went well.

What do you like to do in your spare time?

I listen to a lot of music. During summer I play badminton. I also enjoy chatting with friends, spending time with colleagues, and calling home to India.

#BellLetsTalk

About Mental Illness or Bell?

DEVIKA KHOSLA
1B CHEMICAL

If you were on social media on January 28, you probably would've noticed it was Bell Let's Talk day. For each phone call or text on the Bell network, as well as each share and tweet with #bellletstalk, Bell promised to donate 5 cents to mental health initiatives in Canada. This year, they raised a total of $6,107,538.60. The donations are all part of a campaign by Bell, started in 2011. Along with Let's Talk day, the campaign includes donating to current mental health organizations, investing in research, incorporating a standard for psychological health in the workplace for their own employees, and providing grants to new mental health initiatives. Overall, the campaign aims to reduce the stigma associated with mental health by encouraging national conversation about it and to improve the services dedicated to the mentally ill through donations.

The question is, do they actually achieve that?

Critics of Bell Let's Talk Day say that the day is less about mental health and more about Bell, citing the use of Bell's brand in the hashtag (#bellletstalk), as well as the use of news networks they own (such as CTV) to promote their campaign. According to Bell, on Wednesday, there were 122,150,772 overall interactions about mental health. Though, a good portion of those may have been just general positive statements about the campaign, or people spamming the hashtag to increase the donations. While it was done with good intentions, it misses the point of the campaign – to start a conversation about mental health. Even our Prime Minister tweeted on Bell Let's Talk day, in support of mental health; though as a blogger on Huffington post pointed out, he has done little to actually improve the issue in his time as prime minister, even when he had the opportunity. Political issues aside, it raises the question of whether people are actually learning anything when they support the campaign.

That said, reducing stigma and educating people is not something that will happen quickly or easily. Bell does at least increase exposure to an issue that was once in the dark. According to the CEO of CMHA (Canadian Mental Health Association), Peter Coleridge (talking to Marketing magazine), "Let's Talk – in combination with other programs – has had a discernible impact on raising both public and government awareness of a problem that causes as many as 500,000 Canadians to miss work on any given day and costs the Canadian economy an estimated $50 billion a year in lost productivity." If you look at the Bell Let's Talk website, there are several resources listed there that provide information and help for people with mental illnesses. Finally, the money is being spread out all over Canada to support various initiatives. For example, even right here in Waterloo, Bell donated money to the regional suicide prevention council last year.

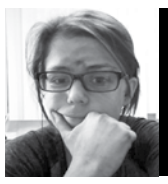
In effect, the campaign has accomplished some of what it set out to do. The shares on social media have the power to show people that they are neither alone nor without support if they suffer from mental illness (a sentiment that is expressed many times on Twitter and Tumblr if you search). Plus, over the five years that Bell has run the campaign, they have raised $73.6 million to support mental health programs all over Canada. Undoubtedly, there is still a long way to go to end the stigma around mental illness and put in the necessary support systems to prevent and treat it. What's really important now is that Canadians continue the conversation and start to educate themselves about mental illness outside of Let's Talk day.

As a start, here are some organizations that provide help and information every day:

- CMHA (*cmha.ca*, or in Waterloo - *wwd.cmha.ca*)
- Kids Help Phone (*kidshelpphone.ca*)
- Centre for Addiction and Mental Health (*camh.ca*)
- *Here247.ca* for addictions, mental health and crisis services
- Mental health helpline in Waterloo : *mentalhealthhelpline.ca/Directory/Organization/1819*
- University of Waterloo Health Services: (*uwaterloo.ca/health-services/mental-health-services*)

They have workshops too: *uwaterloo.ca/counselling-services/workshops*

#LetsTalk about Ice Buckets and BOOBIES!



MEAGAN CARDNO
2T NANOTECHNOLOGY

When it comes to marketing and promotion, be it advertising for a product or service, or raising awareness for a particular issue, it doesn't seem like there is such a thing as too much exposure. Yet, a few particular cases come to mind in which I can't describe the attempts at promotion as anything else— a promotion that works so well that the very purpose that it seeks to spotlight becomes overshadowed by the campaign itself, becoming an undeniable example of a tree obscured by its own forest.

Perhaps the most recent and discussable example of this is the annual #BellLetsTalk campaign that swept Twitter off its feet, with each tweet of the hashtag turning into five cents towards mental health initiatives within Canada, all while aiming to tackle one of the largest issues surrounding the treatment of mental illness— the societal stigma and discrimination that continues to affect those with mental health problems. With well over $6 million raised, it is no question that the first goal of the campaign was a crushing success.

But what of the second half? It is much trickier to analyze the change in mannerisms and opinions of the general population, but I would argue that this side of the matter was left grossly neglected. Not by Bell itself— the company made sure to continue articulating this objective throughout the campaign— but by the Twitter users who took up the hashtag and accepting Bell's challenge to raise as much money as possible within a twenty-four hour window of time. The majority of tweets containing #BellLetsTalk were simple explanations of the "five cents per tweet" matter, and excited encouragement for other people to tweet with the hashtag as much as possible. In turn, tweets describing school lunch menus and complaining about a lack of sleep were slapped with #BellLetsTalk before sent into void of the internet, meaning that any sort of search of the hashtag itself yielded more mundane tweets about lazy cats and cold coffee than actual discussion about the issues surrounding public views on mental illness.

This should sound quite familiar to another viral attempt at fundraising that took the world by storm— the Ice Bucket Challenge of last year, aimed to promote awareness and raise funds for the research of Lou Gehrig's disease (amyotrophic lateral sclerosis, also known as ALS). While the success of the campaign's fund raising cannot be denied by the nearly $80 million raised, once again the less tangible goals fell quickly into neglect as the challenge became more of a publicity stunt for celebrities to participate in, allowing to easily boost their image as being 'involved' and 'generous'.

Social media isn't the only offender in this regard— much controversy has surrounded the advertising associated with breast cancer awareness, with slogans such as 'save the boobies!' or 'save second base!' plastered onto t-shirts and plastic bracelets. Aside from the obvious reality that mastectomies are not uncommon in order to remove malignant tumours, the campaign also strikes an odd chord in the fact that it is focused on saving a body part more than the human itself. If the promotion was aimed to do anything aside from profiting on the merchandise (say, bring awareness into the reality of living with breast cancer), it certainly didn't do a good job of it.

So what's the deal? Why does it seem that every attempt of marketing a worthy cause ends up more farce than force? If I had to blame any single cause, I would point towards the great shift that we've seen in successful advertising in the past few years. Advertisements gone viral spread like a disease through social media, but to the point that the product it is advertising becomes drowned by whatever joke or gimmick afforded such attention (the Old Spice commercials featuring half-naked men with diamonds on horses is a poster boy for this). Our own consumption of media blinds us from the message intended by the creators, choosing instead to focus on the aspects we find amusing.

It seems as though advertisers are beginning to understand this. Advertisements are quickly becoming more and more estranged from the product or service that they are attempting to sell, resorting to bizarre skits and quirky catch-phrases in a desperate attempt to catch even a brief hold of the internet's small attention span. With some great luck, they might succeed, get their day or week in the spotlight, fade back into obscurity, and return to the drawing board to try to win the lottery a second time. Money is made, but the longterm impact is minimal at best.

Is there a definitive remedy for this issue of campaigns losing their message in their own virulence? Of course there are steps that can be made in the right direction— for example, if there is little message to be delivered in the first place, such as the 'Save the Boobies!' style of promotion, there is no hope in the audience ever taking it the right way.

Beyond that, though, it largely falls into our own hands to make sure that we don't strip away the morals for our own short-lived amusement. Next time there is a surge of interest in a particular issue or cause, try to participate in legitimate conversation about it. Educate yourself and others about the matter, especially if it interests you. Most importantly, though, try to do something that will elicit genuine change— volunteer your time, donate resources, or even just try to inform your peers on what they might not know. Maybe it's not much, but if no lasting improvements are made while a campaign has the limelight, it can hardly be called a campaign at all.

That said, be sure to look before you leap aboard the bandwagon. #Kony2012

Leafy Thoughts

Ontario bans breeding, sale, and acquisition of killer whales and (some) friends

NINA FENG
3B ENVIRONMENTAL
LEAFY THOUGHTS

In a recent report for the Ontario Ministry of Community Safety and Correctional Services, it was determined that the conditions in which marine mammals in captivity are kept are oftentimes insufficient for ensuring their well-being. The Ontario Society for the Prevention of Cruelty to Animals (OSPCA) led the inquiries, which include unannounced inspections as part of the process. The report, summarizing the findings and recommendations of an investigative work group, forms the basis upon which new standards for the responsible care of these animals are to be made. In it, different environmental stressors are explored for the animals, as well as their life histories, and the physiological, psychological, and behavioural damage that may occur.

Community Safety Minister Yasir Naqvi announced Tuesday, January 27, that changes will be underway, with the advisory group presenting their final suggestions and timeline estimation in the summer. With this overhaul, Ontario becomes the first province to impose standards of this nature. These rules will include guidelines for water quality, bacteria concentration, pool size, and dictate veterinary programs and practices for their proper handling.

The standards are meant for theme parks, zoos, and aquariums, of which Ontario has 60. While they are intended to protect a wide range of animals, including whales, dolphins, porpoises, sea lions, seals, and walruses, orcas in particular were singled out for bans. The rest will at least have their living conditions improved. This is due to the 'uniqueness' and intelligence or the orcas, which one might argue is shared with at least the bottle-nosed dolphins in captivity. Orcas are dolphins, after all. Currently, there is only one killer whale left in Ontario. Kiska, a 38-year-old female, still remains in Marineland, along with several belugas, and various other marine mammals.

In response to the announcement by the Ontario Government, Marineland released a statement welcoming the changes, assuring the public of their prioritization of animals' welfare, affirming that they "have always, and will always live up to the highest, achievable, science-based standards in the world." They also pointed out that they employ approximately 700 people, the majority of whom are students and seniors. Should economic damage result from these new regulations, a number of people may become unemployed. They are currently conducting million-dollar lawsuits against several whistleblowers, including former trainers that have blamed poor water quality and short staffing for illness and death in animals.

It's a fantastic and long-awaited step for those concerned with the health of captive marine mammals, setting precedence for other provinces, and some stated to look into similar regulations. There is still some distance to go, however, but perhaps more stringent bans in the future will free all captive animals in similarly poor conditions.

Lack of Female Profs Stems From Far Greater Issue

ELIZABETH SALSBERG
2T NANOTECHNOLOGY

Most of us can count the number of female professors we've had on the fingers of one hand. This seems to be well known and even accepted; you probably don't need another long, propaganda-like article promoting "awareness" and "diversity" and "inclusivity." Though of course these things are important (and are not as trivial as they sound), I'm not going to discuss them here as I think we all agree that it serves little, arguably no, purpose. What I want to do with this article is take a look at data from a recent study and some other related data, and come full circle with what has caused this problem and how we can work towards a solution.

Following the release of Google's diversity report, which (unsurprisingly) found a severe lack of female representation among its ranks, Michael Kuzmin, Arik Motskin and Zack Gallinger, founders of the 10 and 3 blog and analytics fans, thought it would be interesting to conduct a similar study regarding female faculty members in Mathematics, Computer Science and Electrical and Computer Engineering departments at Canada's leading research universities. They published their findings on the 10 and 3 blog on January 29, 2015.

Though the findings would hardly be shocking for students in these faculties, they are still alarming. For math and computer science, all but 2 universities in the study had less than 25% female representation with a few hovering around the 10% mark. In Electrical and Computer Engineering departments, the average looks to be in the 11.5%-12% range.

UW's ECE department fared well compared to others with a whopping 12.0%, ranking 6th overall. This may be "good" compared to other schools, but allow me to put this in perspective for you: If you Google "number of faculty, uwaterloo ece department," it will tell you that there are 86 full-time faculty members. The 10 and 3 study cited above includes only "full-time" faculty members in their numbers, excluding Visiting professors, Adjunct, Retired/Emeritus Instructors, Lecturers, and Professors of Teaching. I should also note that the study excludes cross-appointed faculty, who work primarily out of another department. Basically, it only covers faculty members who research and teach for a living primarily in the department of interest. Assuming the 86 full-time faculty members on UW ECE's website figure coincides with the studies' criteria, that means we have exactly 10.32 female faculty members in our ECE department. Yikes.

As a (Loyal? Devoted?) student in UW's ECE department (I'm fairly sure nano is technically part of ECE in some way, shape or form), I'm not here to drop bombs on these figures. That being said, this is still really sad. So the next question to ask is, Why?

The answer is frankly no more complicated than this: There are not very many women in engineering and mathematics/computer science related fields to begin with. Of that limited pool of people, a subset will pursue graduate studies, and out of those, it is likely that only some will try for faculty positions.

The problem starts at the bottom. Fewer women are choosing these fields and therefore inevitably, there is limited representation at higher ranks. So again, why? Because of deeply rooted societal stereotypes and biases. Now you might think, this is the 21st century, how are issues from the dark ages still around? Well, they are. These are so ingrained in our culture that often we are unconsciously unaware that they could be affecting our judgement.

For example, take the implicit association test. Many psychological studies on bias have been conducted from results of this test. In this test, there are two categories, each placed on the left and right side of your screen. A word appears in the middle of the screen and you must quickly decide in which category it belongs. A particularly famous example has the following categories: "Male and Science" and "Female and Liberal Arts." The same participants were then put through the test with the categories flipped around, i.e.: "Female and Science" and "Male and Liberal Arts." On the second run, respondents were significantly slower in classifying the words that appeared on the screen. They had to "think" more, as it was not "intuitive" for words like "Physics" to be associated with "Female" (and "Science"). Think you're different? I encourage you to try the test yourself by Googling "implicit association test"—I guarantee you will be surprised at the results.

So now we know we have a problem and even where it comes from. But how do we fix it? Obviously, we need to encourage more women to go into these fields. In our "enlightened" society, one would think this would be second nature. Yet in countries around the world where women are often not as treated as nearly as well as they are here, far more pursue studies in mathematics, computer science and engineering-related fields. In fact, Canadian engineering graduate programs are known to have a significantly higher proportion of international students than domestic ones. The overlap of these dynamics does not bode well for Canada's competitiveness in these key disciplines, which will undoubtedly be the source of future economic growth worldwide.

The same way little girls should not be forced into pink dresses complete with tutus and boys should not have to wear Buzz Lightyear or Spider Man gear (unless by choice), we should not attempt to influence academic interests based on gender. Everyone should be able to make informed decisions, particularly when choosing a career. Furthermore, young people should be encouraged to pursue their interests

Continued on LACK on page 11

Impacts of New Anti-terror Legislation on Students

FILZAH NASIR & SEPEHR MOHADDES
3B ENVIRONMENTAL &
PH.D MECHANICAL ENGINEERING

In the great 1997 movie, *Good Will Hunting*, the main character, Will Hunting (Matt Damon) – the self-taught super-mathematician – ends up in an interview for the National Security Agency (NSA). At one point, the director says to him "the way I see it, the questions isn't why should you work for the NSA. The question is why shouldn't you?" Will's answer to this question, a moving monologue, does not concern us in this piece. It is the question, or rather asking the question, that we shall dwell upon.

On January 30 Prime Minister Stephen Harper introduced Bill C-51: the Security of Canada Information Sharing Act and the Secure Air Travel Act. The Act is introduced as a reaction to the shooting of a military officer in Ottawa last fall and is intended to safeguard Canada from such attacks. The Act amends the Criminal Code, the Canadian Security Intelligence Service Act, the Immigration and Refugee Protection Act in order to prevent "home-grown terror attacks."

Like any legislation meant to "increase national security" Bill C-51 is a blatant attack on civil liberties in Canada. A few changes that the Act makes: security officials will be allowed to gather and share information about passport holders in Canada; sharing a video of a terrorist attack online could be a criminal offence; anyone deemed to be a threat to national security will be prohibited from boarding a plane; the bill also makes it easier for security officials to detain anyone suspected of terrorism without charging them. The bill also does not include any sort of parliamentary oversight so there is no attempt to ensure that these powers are not abused.

But perhaps the most troubling aspects of Bill C-51 are the powers it provides to the Canadian Security Intelligence Service (CSIS). While CSIS is considered an intelligence gathering organization the new bill gives CSIS the freedom to take a variety of actions against an individual they perceive to be a threat to national security. And the definition of threat to national security does not simply include "terrorism" but also anyone who is perceived to be a threat to the economic stability of Canada, critical infrastructure, or a perceived threat to other states. Considering that the bill is being proposed by a government which has previously referred to environmental activists as "foreign radicals" one can imagine the various interpretations of "threat to national security" that can be made under this broad definition. Bill C-51 effectively transforms CSIS from an intelligence gathering agency to another police force, which is extremely troubling when one considers the individual about whom CSIS has been gathering information – which includes students.

There are two types of experiences with CSIS that a UW student may have had. On their FAQ page, CSIS acknowledges that they recruit students to spy on their colleagues on campus is a tactic. And while details on this type of spying is difficult to obtain, most sources seem to believe that despite claiming otherwise CSIS tends to target Muslim students. Without sounding hyperbolic, given the commonality of these tactics, there is no reason to believe why UW may be exempted from this type of intelligence gathering.

But if you aren't one of those unfortunate students who has been exposed to CSIS through their attempts at intelligence gathering, you may have been exposed to them through a co-op job opportunity. CSIS, under the name of Public Safety Canada (the government department under which CSIS exists) regularly hires co-op students from UW. This means that the same agency which is recruiting students to spy on their colleagues is recruiting students to become current and future employees for them. Can we see the problem with this picture? Let's go back to the question we posed at the start of the article "the way I see it, the questions isn't why should you work for the NSA. The question is why shouldn't you?"

Perhaps some of the information we've provided above regarding CSIS's activities have given you some insight into this question. But perhaps you can't see the bigger picture of why this means you shouldn't take a great job if it's offered to you. After all what's one co-op in the grand scheme of things?

We think the answer is found in the definition of what an engineer is meant to do in society. Quite simply, they are meant to solve problems. So we ask you, is CSIS solving society's problems?

It is completely understandable, though not very agreeable, that some engineers would be fine or even enthusiastic about working for employers such as CSIS. What is not acceptable, however, is engineers working for CSIS, or anyone for that matter, without asking what

Continued on TERROR on page 11

Point Vs. Counterpoint

Should formula sheets, if required, be provided by the professor?

POINT

ELIZABETH SALSBERG
2T NANOTECHNOLOGY

Midterms are upon us. Material needs to be quickly reviewed, understood, and in some cases, *gasp* memorized. Symbols and equations swarm our fuzzy brains as the stress of hell week sets in.

It's the class before the midterm. A classmate inevitably puts up their hand and asks, "Will this [formula] be given on the exam?" Followed by, "Which formulas will be given on the exam?" Collective anxiety builds in those of us who don't have a photographic memory. At this point, the professor responds with something to the effect of one of the following: "The formula sheet provided will have all of the formulas that you need," or "The formula sheet provided will have most of the formulas you need, but this particular formula is fundamental and should be in your bones," or, "That's up to you—you're responsible for your own formula sheet: One 8.5 by 11 inch sheet of paper, single sided."

The first response is the best option. Sit back and (relax?), all that you need will be given to you—now you just need to know when to use what. Everyone has the same tools at their disposal. No need to worry about memorizing any questions. No need to stress about what needs to go on the formula sheet, no worrying about running out of room as you squeeze in every last possible equation and example; to the point where there is so much overwhelming detail that the writing is so very teensy weensy that you can barely read it.

These arguments may seem somewhat small, or perhaps even trivial at first glance, however they do translate into what can be a significant difference.

It is fair if everyone is provided with the same formulas. This avoids the scenario in which more than half the class forgets to put the most ridiculously obscure, random, seemingly useless formula that you learned in the very first or last class, or maybe the class on what was supposed to have been a snow day and nobody made it except the prof and possibly some nargals that were living in that lecture hall anyway. Furthermore, it is frankly silly for perfectly intelligent people (with no photographic memory) to be unable to complete a question simply because they didn't include that particular formula on their formula sheet.

This goes against the point of the exam: To assess the students' understanding of the course material. Forgetting to include a formula on the formula sheet, thereby making it impossible to answer a question, is in absolutely now way indicative of understanding.

This is particularly important as many of the questions we see on exams are more complex and yes, as painful as it is to borrow this expression, "multi-step." Chances are that you will need one formula to find a particular quantity and suddenly realize, "Crap, they didn't give me this other thing that I now need to get what they're asking for." You get the idea. And then you suddenly realize, "Crap, I don't have that formula!" so you try to B.S. up an explanation saying you would do this, that or the other thing to solve the problem. Alternatively, you move to the next question with an air of despair, thinking, "How could I be so stupid!" Regardless, you know you understand but are essentially unable to demonstrate it.

The second key advantage with professor-provided formula sheets is that you can focus on understanding the fundamental concepts rather than worrying about which equations need to be on your formula sheet. Suppose that while you are studying, you find that you're struggling with a particular problem. Finally you get the answer, and you say, "Great, I can put this example on my formula sheet, this was really tough and will be on the exam for sure." You don't focus on understanding how to solve the problem properly because you're either falsely convinced that you do understand the problem after seeing the solution, or are under the impression that having the solution to a similar problem on your formula sheet will get you through the exam. Which, again, goes against the entire point of the exam.

Studying for the exam is when you learn most of the material. Band-aid solutions as described above that "get you through" the exam do not teach you anything. Not only will you be unable to apply the concept in question to problems in the future, you also miss out on the opportunity to improve your ability to problem-solve, work under pressure and most importantly, think outside the box.

All of this aside, bringing your own formula sheet can actually help you understand the material when done properly. Reviewing the material systematically will help you formulate a good formula sheet (pun intended). That being said, a similar process should be followed regardless of the "format" of the formula sheet. If you need the motivation of making your own formula sheet to review the material in meticulous detail, then you are missing out on learning the material properly in courses where this is not an option.

It is therefore evident that professor-provided formula sheets are better than making your own. When everyone gets the same formula sheet, there is no chance of students being unable to answer a question for the sole reason of not having a particular formula. Better still, it forces students to focus on understanding the concepts rather than worry about which specific formulas they will need. Finally, it encourages the application of a strong studying approach across all courses.

So what does this all mean? The next time your professor asks if you'd like to make your own formula sheet, think twice—and let them do the dirty work.

COUNTERPOINT

SHERWIN KWAN
4B MECHANICAL

Engineering is a subject which stands midway between scientific and mathematical theory on one side, and directly-applicable techniques (such as taught in trades schools) on the other. So usually, in an engineering course, students will be expected to have some theoretical knowledge (say, differential equations), but the focus is on being able to apply such knowledge correctly to problems which may be commonly encountered (e.g. heat conduction). Therefore, many professors will allow students to have a reference of some type during an exam - what is being tested is not the ability of a student to recall an equation or basic principle in the absence of any resources, but the ability of a student to solve a problem given the appropriate resources.

Assuming that allowing an entire textbook as a reference is not desired, professors choose one of two models: a) a prof-created reference sheet, which contains a number of equations, generally without explanation, supplied to every student at an exam, or b) entitle every student to bring one reference sheet of their own making. It is my belief that a student-made reference sheet is more favourable to the student trying to get a good mark.

A professor-created reference sheet, I will not deny, has several benefits. First of all, you just have to show up at the exam and voila! There it is. You need not waste time trying to craft a reference sheet, and can focus exclusively on practice problems if you wish. Second, unless you have a sadistic professor, you will have all the formulas you need for the exam. Third, there will not be any errors, and if there does happen to be an error, then one of the proctors at the exam will normally write a correction on the chalkboard.

However, I believe these are outweighed by the benefits of being able to make and bring your own reference sheet. Every student learns differently. Perhaps you're strong at optics, but a dynamics problem will leave you scratching your head. Meanwhile, your friend Jane is great at anything with moving parts and forces, but if you give her an optics problem she'll just stare at the exam paper as though it were the mirror described in the problem. If you can make your own reference sheet, you get to tailor it to your own strengths and weaknesses, using more space on the equations and concepts from the topics you need help on.

Also, prof-supplied reference sheets often don't explain what all the funky symbols mean in their formulas. Many a student has duly written the appropriate formula down, only to blow the question because the "d" they thought was a diameter of an orifice was actually the distance between two orifices. And who isn't intimidated by an equation with eight symbols, five of them Greek? With a reference sheet you make yourself, you are entitled to write, not only the equations, but also explanations for any confusing symbols to assuage your worries.

To the objection that making a reference sheet is a waste of time, I would say that it is actually a great study method. During the process of making a reference sheet, you need to look through all the topics being covered and extract the most important information. By doing so, you will become at least passingly familiar with all the content you need to know. Perhaps you'll end up writing down too much - equations and concepts you don't end up having to use. But the same is true for a prof-supplied reference sheet: they often have extraneous equations scattered between the ones you actually have to use. Anecdotally, I've even made "reference sheets" for courses which didn't allow one, just to familiarize myself with all the important information for the course.

Now some students might not have much confidence in their abilities to create a reference sheet. Not to worry, though. Your entire class is making reference sheets, and you can help each other out with less familiar topics. Unlike on a real exam, it's not an offence to get ideas from other people and use them on your own reference sheet.

Now prof-supplied reference sheets can be very useful, and I don't mean to discourage anyone currently studying for a midterm which uses one. And they might even be better if you have a large number of exams crunched together, not leaving you enough time to make a good reference sheet (usually Waterloo Engineering is pretty good with spacing them out though). But given enough time, I would definitely prefer making and bringing my own reference sheet. I know what I need help with the most, and I can tailor my sheet accordingly, and as a bonus it's a great motivation to get studying.

The Term of Endless Voting

EngSoc Election Results, the Feds Election, and the E7 Referendum

ALLYSON FRANCIS
PRESIDENT

Hello again Waterloo Engineering. These past two weeks I've been very busy once again with issues surrounding the Infosilem scheduling software. A highly polarized topic, this software may impact the way that some engineering departments schedule their cohort times and locations. At this time, I am looking for any students who are interested in becoming more involved in the discussion surrounding how this new software compares to the old system and what issues may present themselves with a cohort-based program to send me their name and contact info at *president.b@engsoc.uwaterloo.ca*. Although there is no deadline to reach out to me to become involved in this cause, I expect to begin regularly sending emails to the interested students during reading week and through to the end of the term, so please help to advertise this opportunity to any students who may be interested!

In other news, my successor has been ratified! Hannah Gautreau is a 2017 Management Engineering student who has some big plans for the next 16 months as the incoming Engineering Society President. If you haven't had a chance to say hi to her during her campaign, you should look out for her on campus between now and the end of the term to chat about what you want to see from EngSoc over the next year or so. I'm sure she'd be happy to hear from you!

Also, speaking of new leadership, make sure that you remember to vote in the Feds election next week, from 10am February 10th to 10pm on the 12th. The list of candidates can be found at feds.ca/elections, so please look up what they are promising you, the students, and become informed in your own vote. The successful candidates are put in charge of millions of dollars in student fees, as well as critical academic decisions, and so having accurate representation of student priorities through voter turnout is very important!

Finally, before I conclude my update, I want to briefly mention the Engineering 7 referendum that is happening this term as well. On A-Society in Fall 2014, the students voted in favour of the establishment of an optional $25 termly donation to go towards a $1M student contribution to the building of E7, beginning once the building is open. This same referendum is being run on B-Society this term, and if the students once again vote in favour, the referendum will be passed. Currently, we are looking for nominees for the Yes and No committees, which are tasked with promoting their respective stance to the students. For more information or to get involved, please contact the CRO Jennifer Coldwell at *cro.b@engsoc.uwaterloo.ca*. Also, keep an eye out for the campaigning and polling periods after the break.

That's it for this update. As always, I can be found in the CPH foyer at 12:30 on Fridays, and can also be reached at *president.b@engsoc.uwaterloo.ca* anytime. I'd also encourage any interested students to come out to the next Engineering Society Council meeting, which is on March 4 at 5:30pm in the E5 LiveLink Room (3101). All are welcome, and I hope to see you there!

VP-EX Update

First-Year Integration Conference and the Ontario Engineering Competition

SARAH-ROSE LANCASTER
VP-EXTERNAL

The start of February has been a busy time in the world of the VP-External. Two major events have happened: the First-Year Integration Conference and the Ontario Engineering Competition. The two events are significantly different from each other, however both help develop leadership qualities, teamwork qualities and ingenuity in Waterloo's Engineering students.

The First-Year Integration conference happened from January 30 to February 1, and was hosted by Laurentian University in Sudbury. The Engineering Society "A" VP-External, Heather Smith, and myself drove nine delegates during the five hour ride to Sudbury. Despite lengthy travels, the First-Year students arrived excited and ready to take away new leadership skills from the conference. Several development sessions took place, including how to tackle interviews, how to manage extracurriculars with school, and how to create a great LinkedIn Profile. The first-year delegates also had the opportunity to network with students from across Ontario, an experience that was beneficial to them. The mini-tool also made an appearance at the conference, being worn by two first-year delegates. I would like to add that during my term as VP-External I have brought the mini-tool to two conferences and have not lost it. All-in-all, upon returning to Waterloo I feel we have nine first-year students who have acquired new skills they can contribute to the Engineering Society.

The Ontario Engineering Competition took place from February 6 to 8, and was hosted by Ryerson University in Toronto. In total,Waterloo Engineering Society "A" and "B" combined sent forty-five competitors to seven different competitions. The competition categories were: Junior Design, Senior Design, Innovative Design, Consulting, Technical Speaking, Debate, and Programming. Having competed at the Ontario Engineering Competition before I can personally say that it is an amazing experience. Every competition offers something challenging that truly tests and engineer's skill set. It, like the First-Year Integration Conference, is also a fantastic opportunity to meet students from other Engineering Schools in Ontario. Waterloo sent several professors as judges for the competition. On another note, Waterloo will be hosting the Ontario Engineering Competition next year, in 2016.

All-in-all, February has been a fantastic month for conferences and competitions where Waterloo can showcase its talent provincially. If you are interested in learning more about the First-Year Integration Conference or the Ontario Engineering Competition, please email me at *vpexternal.b@engsoc.uwaterloo.ca*.

Long Weekend at FYIC

Continued from LONG on page 3

ing to the hotel to get changed for the evening's semi-formal dinner held at Science North, Sudbury's Science Museum. Here, delegates practiced proper dinner etiquette in a three-course meal and Waterloo also showed off our mini tool in various photos.

Saturday evening ended similarly to the night before, where delegates mingled far past sleeping hours (gambling on the extra hours of sleep they would recover during the return trip on Sunday).

After breakfast on Sunday, remaining presentations were delivered in the hotel meeting room, as delegates trickled out to catch their coaches. Farewells and "see you later" were bid, and remaining contacts exchanged.

Although cold and tired by the time we returned to Waterloo, we were all very excited for news from the conference to progressively stream in to social media sites, and to hear news from new friends about their post-conference experiences.

The greatest take-away from the conference was the number of ways to get involved – including directing EngSoc events, volunteering for O-week, and running for executive positions on EngSoc, ESSCO and CFES. These opportunities are accessible to all, so if you are interested, sign up now before applications close in the very near-future!

VP-WINternal update

MATHIEU TREMBLEY
VP INTERNAL

Hello friends, I hope hell week is treating everyone that has it alright this week! There are a few cool things coming up in the next little while, these include Romantic Pictures with the Tool, READING WEEK, Puppies in POETS, and TalEng.

Congrats to all the 4th years who now have their Iron Rings; if you'd like to get your picture taken with The Tool in a romantic setting, have I got an event for you! Come out to POETS on Thursday Feb 12th for this, and those of you who have Iron Rings will be able to take pictures with our favourite 60" Ridgid pipe wrench!

Has exam stress got you down? Do you enjoy puppies? If you answered 'yes' to any of these questions, come out to Puppies in POETS on Monday Feb 23 and hang out with some National Service Dogs to relieve stress!

Do you have a talent? If so, would you be interested in showcasing that talent at a fun talent show? On Tuesday March 3 we will be hosting TalEng, an engineering talent show where you can see all the cool things your friends/classmates can do! There will be a signup sheet on the Orifice door (CPH 1327) where you can sign up your act the week before the event, so if you or anyone you know has some neat talents, be sure to sign up!

I hope everyone enjoys their week off next week, cheers until next time!

Upcoming Events Calendar

Wednesday February 11	**Thursday February 12** Romantic Pictures with the Tool 12:00-14:00, POETS	**Friday February 13** Weekly Charity Grilled Cheese and Hot Chocolate 11:30-12:30, CPH Foyer Weekly Exec Hangout 12:30-1:30	**Saturday February 14 to Sunday February 22** Reading Week!		**Monday February 23** Puppies in POETS 11:30-13:30, POETS	**Tuesday February 24** Weekly Charity Grilled Cheese and Hot Chocolate 11:30-12:30, CPH Foyer Iron Warrior Meeting 18:00-19:00, E2 2347	**Check out up-to-the-day event postings on the EngSoc website at engsoc.uwaterloo.ca**
Wednesday February 25	**Thursday February 26**	**Friday February 27** Weekly Charity Grilled Cheese and Hot Chocolate 11:30-12:30, CPH Foyer Weekly Exec Hangout 12:30-1:30	**Saturday February 28** First Year Mentoring Movie Night 19:00-22:00, POETS	**Sunday March 1** NEM Rube Goldberg Day 1 11:00-15:30	**Monday March 2** Lego Day 18:00-20:00	**Tuesday March 3** Weekly Charity Grilled Cheese and Hot Chocolate 11:30-12:30, CPH Foyer Iron Warrior Meeting 18:00-19:00, E2 2347 WiE Self Defence Workshop 18:00-20:00 TalEng 20:00-23:00	

VP-Finance Update

Budget Approvals and SLEF

MELISSA FERGUSON
VP FINANCE

Hello Engineering Students!

I hope that everyone has had a great term so far! I know that there will be many fun events after reading week to look forward to, so keep getting excited about all things EngSoc!

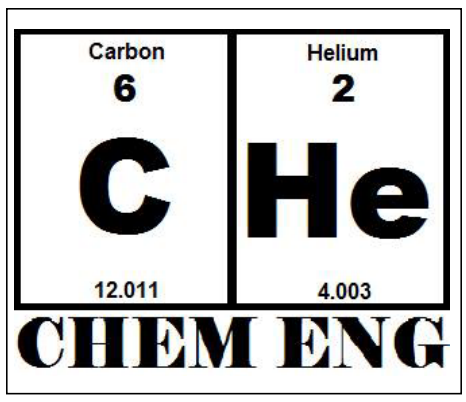
The past two weeks have been particularly eventful as far as finances for EngSoc go. The EngSoc budget was approved at the 2nd meeting of the term, and some great discussion took place as to where the surplus funds should go. For those of you who are not familiar with how EngSoc operates financially, every term you are charged an EngSoc fee as a part of your tuition (this term was $15.45) and this money is used to fund different events throughout the term, as well as cover operating expenses for the society (such as EngSoc office front desk staff, C&D expenses, Sponsorship, and ECIF). Event directors then submit budget proposals for the events they want to run.

This term was an interesting case where EngSoc had more money to allocate than was requested by directors, which is a problem since we are a non-profit organization (we can't have a positive number on our budget). I had originally allocated this surplus funds to existing directorships to allow for larger scale events since both Sponsorship and ECIF are set to certain amounts based on our Policy Manual. However, at the 2nd meeting when we discussed the budget a member motion was made to ignore the policy manual sponsorship cap of $6500 and reallocate all excess fees to Sponsorship, since Council felt that this would benefit more students. If you are interested to see where money was reallocated to I have included the approved budget along with what was requested from each directorship and what was originally proposed as a part of my update, you should check it out!

I'm sure most of you are very aware of the huge snowstorm that happened on Monday. Unfortunately Monday was scheduled to be coverall day, and although the school was open many students chose to not come to campus, and as such coverall sales were affected. However I plan to keep the sample coverall sizes in the EngSoc office until Friday February 13th, so if you are interested in purchasing your own pair of covies send me an email at *vpfinance.b@engsoc.uwaterloo.ca* to set up a time when we can meet and order your coveralls! The covies cost $90, which includes the "ENGINEERING" silk screening down the left leg, the silk screened EngSoc logo on the back, and 2 lines of embroidery on the upper right arm. Also, for an extra $10 I will give you $15 worth of patches from Novelties, and you get to pick which ones you want!

I will be sending a proposal to the Student Life Endowment Fund later this term to request for new benches to be installed on the POETS patio, since every year we have to replace rotting wood slats on the existing ones. If you have any other ideas for capital purchases that are on a large scale please send me an email and I will listen to your ideas! Also, proposals are now being accepted for the Engineering Capital Improvement Fund, so small scale capital purchases can be submitted as well!

Finally I am super happy to announce that one of the Novelties Directors for this term has come up with a new department patch design! Chemical Engineering will be getting their very own patch in Novelties within the coming months! The design has been included in this update too. If you have any feedback on the design send me an email, I would love to hear your thoughts. (P.S. I have some neat concepts for Geo, Civil, Biomed, and Systems, but I'm not good at graphic design. If you or someone you know is skilled with photoshop send me an email, I would love to get more of these patches made this term!).



Let's Talk Ring

PERMEG KENTH
VP EDUCATION

Hey!

I am going to start of by congratulating all the fourth years on getting their Iron Rings over the weekend. The five-year struggle has finally paid off. In the spirit of all the iron ring celebrations I would like to shed light on what the ring symbolizes and where it all began.

Canadian engineers wear the Iron Ring as a symbol of the obligations and ethics towards their professional duty. It however does not symbolize the qualification of an engineer (this is done via a licensing board/body). The concept of the Iron Ring originated in 1922. A group of Montreal engineers proposed that seven of Canada's most prominent engineers, know today as the Seven Wardens, be the center of an organization which would provide cohesiveness to all Canadian engineers.

The rings are given at the ceremony known as The Ritual of the Calling of an Engineer. This is a private ritual written by an English poet Rudyard Kipling. The ceremonies are held at individual universities each assigned one of the twenty-six camps of the corporation of the seven wardens.

The Iron Ring is made from either wrought iron or stainless steel. Most Canadian universities only offer stainless steel rings because iron is not the most suitable material to be worn. When in contact with the skin, it is known to make the finger blackish and slowly deteriorate, making the ring loose. This ring is worn on the pinky finger of your working hand.

Congratulations again to all the forth years on this great achievement. Let the ring symbolize the pride which engineers have while reminding us of our humility towards the profession.

If you have and questions feel free to contact me via email on *vpeducation.b@engsoc.uwaterloo.ca*.

EngSoc B Winter 2015 Budget Proposal

Income			
Item	**Requested**	**Proposal**	**Approved**
Student Fees			
Estimated Student Fees	$ 56,607.85	$ 56,607.85	$ 56,607.85
Orifice			
Estimated Orifice Sales	$ 1,400.00	$ 1,400.00	$ 1,400.00
Total Income	**$ 58,007.85**	**$ 58,007.85**	**$ 58,007.85**

Expenses			
Item	**Requested**	**Proposal**	**Approved**
Fixed Costs			
Photocopies	$ 2,500.00	$ 2,500.00	$ 2,500.00
Telephone	$ 420.00	$ 420.00	$ 420.00
Postage	$ 460.00	$ 460.00	$ 460.00
Supplies	$ 2,000.00	$ 2,000.00	$ 2,000.00
Cable	$ 75.00	$ 75.00	$ 75.00
Casual Payroll	$ 5,730.00	$ 5,730.00	$ 5,730.00
Monthly Payroll	$ 13,000.00	$ 13,000.00	$ 13,000.00
Bar Services	$ 500.00	$ 500.00	$ 500.00
Mailchimp	$ 100.00	$ 100.00	$ 100.00
Iron Warrior - 1% of Student Fees	$ 566.08	$ 566.08	$ 566.08
ECIF - 5% of Student Fees	$ 2,830.39	$ 2,830.39	$ 2,830.39
Total Fixed Costs	**$ 28,181.47**	**$ 28,181.47**	**$ 28,181.47**
Executive			
Exec Discretionary	$ 1,000.00	$ 1,000.00	$ 1,000.00
President	$ 1,000.00	$ 1,000.00	$ 1,000.00
VP Education	$ 500.00	$ 500.00	$ 500.00
VP External	$ 500.00	$ 500.00	$ 500.00
VP Finance	$ 500.00	$ 500.00	$ 500.00
VP Internal	$ 500.00	$ 500.00	$ 500.00
CRO	$ 200.00	$ 200.00	$ 200.00
Candidate Campaigns	$ 500.00	$ 500.00	$ 500.00
Total Executive Costs	**$ 4,700.00**	**$ 4,700.00**	**$ 4,700.00**
Directorships			
Academic Rep Advisor	$ 206.00	$ 206.00	$ 206.00
Alumni Speaker Director	$ -	$ 300.00	$ 300.00
Arts	$ 205.00	$ 205.00	$ 205.00
Athletics	$ 304.98	$ 304.00	$ 304.00
AutoCAD	$ 26.70	$ 50.70	$ 26.70
AutoDesk Inventor	$ 26.70	$ 50.70	$ 26.70
Board Games	$ 300.00	$ 300.00	$ 300.00
Bus Push	$ 1,425.00	$ 1,475.00	$ 1,475.00
CANstruction	$ 150.00	$ 190.00	$ 190.00
Charities	$ 150.00	$ 150.00	$ 150.00
Course Critiques	$ 12.00	$ 12.00	$ 12.00
Directorship Appreciation	$ 2,000.00	$ 2,000.00	$ 800.00
EngHockey	$ 130.00	$ 130.00	$ 130.00
Enginuity	$ 140.00	$ 140.00	$ 140.00
EngPlay	$ 1,303.75	$ 1,303.75	$ 1,303.75
Exam Bank	$ 100.00	$ 100.00	$ 100.00
Food Director	$ 2,218.35	$ 2,218.35	$ 2,218.35
Frosh Mentoring	$ 85.00	$ 85.00	$ 85.00
Genius Bowl	$ 292.00	$ 362.00	$ 292.00
Hackathon	$ 522.00	$ 522.00	$ 522.00
Jazz Band Director	$ 675.00	$ 675.00	$ 675.00
LAN Parties	$ 300.00	$ 500.00	$ 500.00
LaTeX	$ 2.00	$ 2.00	$ 2.00
MAC Eng Musical	$ 500.00	$ 500.00	$ 500.00
Marketing	$ 30.00	$ 30.00	$ 30.00
Music	$ 428.40	$ 428.40	$ 428.40
NEM - Rube goldberg	$ 180.00	$ 180.00	$ 180.00
P**5	$ 15.00	$ 965.00	$ 965.00
Pi Day	$ 194.50	$ 389.00	$ 194.00
POETS Managers	$ 600.00	$ 850.00	$ 850.00
Resume Critiques and Interview Skills	$ -	$ -	$ -
Semi Formal	$ 300.00	$ 300.00	$ 300.00
Ski Trip	$ 651.75	$ 651.75	$ 651.75
Sleepover in POETS	$ 35.60	$ 35.60	$ 35.60
Solidworks	$ 1,451.10	$ 1,452.10	$ 504.60
Special Events	$ 106.35	$ 106.35	$ 106.35
TalEng	$ 201.80	$ 202.00	$ 202.00
WiE	$ 600.00	$ 600.00	$ 600.00
Year Spirit 2015	$ 2,893.90	$ 190.00	$ 250.00
Year Spirit 2016	$ 200.00	$ 200.00	$ 200.00
Year Spirit 2017	$ 106.00	$ 106.00	$ 200.00
Year Spirit 2018	$ 200.00	$ 200.00	$ 200.00
Year Spirit 2019	$ 230.00	$ 228.48	$ 228.48
Total Directorship Costs	**$ 19,498.88**	**$ 18,896.18**	**$ 16,589.68**
Total Expenses	**$ 52,380.35**	**$ 51,777.65**	**$ 49,471.15**

Sponsorship			
Sponsorship Meeting	$ 6,500.00	$ 6,500.00	$ 8,806.50
Net	**-$ 872.50**	**-$ 269.80**	**-$ 269.80**

On the Shoulders of Giants

René Just Haüy

SHERWIN KWAN
4B MECHANICAL

ON THE SHOULDERS OF GIANTS

The Iron Ring Ceremony being upon us again, this OTSOG column will cover a man who made his name in mineralogy. His discoveries on how crystals worked would later allow us to develop theories about crystal structures, dislocations, and slip, letting us predict the ductility of metals and find appropriate alloying elements.

René Just Haüy (1743-1822) was born in the village of St.-Just-en-Chaussée, France, to a family of weavers. In pre-revolutionary France, working class people didn't have a lot of opportunities to advance in society. But luckily for René, as a kid he was very musical, which attracted the attention of a local monk and allowed him to receive an education at the monastery. He impressed his teachers, to the point where he was awarded a scholarship to the University of Paris. Even then, he didn't have enough money to pay his student fees, so just as students today look to co-op for their income, Haüy had to interrupt his studies, spending some time playing violin and singing in a choir to make ends meet. But he did graduate and earned "arts" (which, at the time, included the natural sciences) and theology degrees. In 1770, he received ordination as a Catholic priest, and a teaching post at the University of Paris.

Haüy was originally asked to teach Latin courses. But he had his own hobbies too – one area of interest was botany, and he spent a lot of time in a garden at the university, cataloguing the different types of flowers which grew there. He was impressed with the regularity with which flowers grew petals; for example, roses always have exactly five petals. He soon became friends with Louis Daubenton, who studied minerals. At first, he was disappointed that crystals seemed to follow no regular pattern – calcite crystals, for example, came in many different shapes, some that did not resemble any regular geometric solid.

Supposedly, one fateful day, at the home of a fellow professor, his colleague handed him a piece of calcite … but he dropped it. While cleaning up the pieces, he noticed suddenly that all of the pieces had rhombohedral shapes. What were the chances of that? Although it is a nice story, it could just as easily be a legend like Newton's apple falling on his head. More likely, Haüy simply heard about the research of the Swedish chemists Torbern Bergman and Johan Gahn, who had hypothesized that all calcite crystals were made up of rhombohedrons a few years earlier.

Haüy started acquiring samples of minerals for an experiment. He gathered a few calcite crystals of various shapes, and smashed a hammer into each one. He discovered that no matter what the original shape of the crystal, when broken up into pieces they were always rhombohedrons. When he tried the experiment with pyrite, all the pieces were cubes. When he smashed barite, all the pieces were rectangular prisms. He came to the conclusion that all minerals only have one basic crystal structure, and all the other crystal shapes which are observed are simply combinations of the basic building block superimposed on each other at various angles.

Haüy further discovered that the length, width, and height of the building blocks, the basic crystal or lattice structures, could always be expressed as rational number multiples of each other (1:1, 3:2, 2:1, etc). This became known as Haüy's Law of Rational Intercepts.

When his discoveries were published, Haüy was named to the Académie des Sciences. But he soon ran into political difficulties. In 1792, the King and Queen of France were removed from power by revolution. As the Catholic Church had ties to the old regime, Father Haüy was arrested as a suspected counter-revolutionary. He took his jail time in stride – after all, he was already used to being stuck in his room alone doing research. After fellow scientists offered pleas on his behalf to the new regime, he was released and given his tenure back. He was also named to a committee to establish a new system of units, which would eventually become the SI system we all know and love. By the time of his death, Haüy's books had become the standard text for materials science in France.

Like many other brilliant scientists, Haüy had an unfortunate tendency not to give his predecessors their due, and was reluctant to admit his own mistakes. But he definitely went beyond Bergman and Gahn, generalizing their research to arrive at a universal law of crystallography, and he did pave the way for later researchers. In the nineteenth century, William Miller proposed vector symbols like (111) for lattice planes; based on Haüy's discovery that the ratio between the dimensions of a crystal would be a rational number ratio, all lattice planes could be symbolized with three numbers. The modern classification of crystal systems (e.g. diamond cubic, hexagonal close-packed) is ultimately based on the work of Haüy.

René Just Haüy , as painted by Ambroise Tardieu

Recent discoveries have called into question whether Haüy's theories are really universal. In 2011, Dan Shechtman was awarded the Nobel Prize in Chemistry, for showing that structures could have order without being periodic repetitions of the same basic building block. These he labelled "quasicrystals", because they cannot be broken down into a single crystal structure. But this just shows us how science works: as new research happens, older theories sometimes are found wanting. But this is no knock on Haüy – he has simply become one of the giants that today's researchers are standing on.

Graphene

Cheaper, better, faster, stronger

BRYAN MAILLOUX
1B MECHATRONICS

Regardless of the engineering discipline you're in, you've probably heard of the incredibly versatile material known as graphene. Made of a sheet of carbon atoms only one atom thick, it just happens to be the best electrical and heat conductor discovered, as well as the strongest compound known. The unique properties of the material would open up a whole range of engineering applications, including carbon nanotubes, supercapacitors, and perhaps even foldable electronic devices. That is, if the cost to produce it weren't so high.

For a long time, the problem in creating graphene was isolating the carbon sheets that compose the material. In 2004, researchers Andre Geim and Kostya Novoselov from the University of Manchester stumbled upon a very low-tech method to obtain graphene: they noticed that they were able to remove a small layer of carbon from a chunk of readily-available graphite (the stuff in pencil leads) using a piece of tape. Repeating the process several times on the piece of tape created a layer of carbon atoms only one layer thick: graphene. The discovery earned the researchers the 2010 Nobel Prize in Physics. Despite not needing any sort of special equipment to create the material, however, actually implementing it in industry turned out to be quite difficult, as sheets of graphene of a size suitable for practical application were far more difficult to produce.

A new method for creating graphene, however, could reduce the cost of the material thousandfold. Shou-En Zhu, a researcher at the Delft University of Technology in the Netherlands, has devised a deposition process involving a mix of gases, including methane, circulating over a copper sheet heated to a thousand degrees Celsius. The copper strips the carbon atoms from the methane molecules, leaving hydrogen gas and a thin sheet of carbon on the copper plate. Zhu's method could be the key to bringing graphene out of the lab and out into industry.

While graphene does indeed seem to be a wonder material, some say that its properties are greatly overstated and the publicity surrounding it is excessive. One of the most promising applications of graphene in electronics, its potential use in super-fast logic chips, has already been shot down: the fact that graphene comes in a continuous sheet of atoms makes it useless as a semiconductor, and thus it cannot be used in transistors. Scientists are already observing the properties of graphene-related materials, such as silicene and phosphorene (single sheets of silicone and phosphorous), as possible semiconductor alternatives. These materials, however, face their own problems, notably their degradation in a matter of minutes in the presence of oxygen.

Perhaps, with some more technological advances, these graphene-like materials will become the new "wonder materials" of the near future.

Raspberry Pi 2 Boasts Souped-Up Specs, for the Same Price as the Model B+

NINA FENG
3B ENVIRONMENTAL

The new Raspberry Pi, designated as the Raspberry Pi 2 Model B, is out (though it's not that easy getting your hands on one right now) and it looks pretty darn fantastic. For the same $35 as the Model B+ of the original Raspberry Pis, it packs in some significant upgrades, superseding its predecessors completely.

Most notably, it now has a 900MHz quad-core ARM Cortex-A7 CPU, which, based on benchmarking test runs, increases processing speeds by up to 6x, depending on the application. Compare this with the 700MHz single-core CPU of the first generation of Models. It also comes with 1 GB RAM, doubling that of its precursors.

The new and improved processor means that it can now run the complete range of ARM GNU/Linux operating systems. Not only that, but it also supports Windows 10, which users will get free of charge.

In terms of design and hardware, its form factor is about identical to the B+, with the 4 USB 2.0 ports, 40 GPIO pins, and better alignment of ports. It also offers more power, at 4.5 watts, compared to the 2.5-3.5 of older versions. It's completely backwards-compatible with the Raspberry Pi 1, though older Raspberry Pi 1 Models such as the A+, B, and B+ will still continue to be sold, especially for industrial consumers not needing the change.

Following the launch, the company has been asking users and hobbyists to assist in benchmarking their new devices, with both qualitative and quantitative results steadily flowing in to establish just how much better it is. It has been tentatively determined, for example, that a Minecraft server can be more than comfortably run on these new computers, and creating new worlds takes about half the time that it does on the B+. When booting the computers, the efficiency was also about double. Some other processes saw an even greater difference, resulting in the "up to 6x faster" claim.

One thing to note though: some users have determined that the computer is a bit "camera-shy." When taking photos of their devices with flash, they tended to respond by freezing, then rebooting. This applies specifically to Xenon flash bulbs; LEDs seem to be okay. Just a thing to think about if you're Instagramming it, as it seems like the chip is light-sensitive.

This is a fantastic device that does a remarkable job showing what small, cheap, single-board computers can be capable of. It will be a welcome upgrade for hobbyists, also opening doors for users in developing countries. With a diverse and varied developing community, some pretty awesome things are sure to be done with this computer.

Cofounders

EyeCheck

NACHIKET SHERLEKAR
3N NANOTECHNOLOGY

COFOUNDERS

In this column, I interview co-founders of recently formed start-ups that have come out of the University of Waterloo. With the presence of programs such as Velocity Science, Garage and Foundry, as well as other organizations in KW such as Communitech and the Accelerator Centre, the opportunities available for entrepreneurs to implement their ideas are boundless. In this issue I interview Ashutosh Syal, who started EyeCheck along with co-founder Daxal Desai in 2014. EyeCheck develops cheap and portable solutions for the diagnosis of vision impairments, to be implemented in developing countries.

Ashutosh Syal (a.k.a Ashu) meets me at the SLC, and we decide to conduct the interview on the main floor in M3, as this seems to be the quietest spot in the vicinity. Ashu informs me that Daxal is unable to make it since he is currently in India carrying out field tests in addition to getting a general feel of the way things work there. Through our conversation, I recognize the enthusiasm that Ashu maintains when talking about his company and the motivation behind their technology, as well as his sincerity when it comes to achieving EyeCheck's goal of fast and inexpensive vision impairment diagnoses.

EyeCheck started out as an idea for a Fourth Year Design Project in 2013, when Ashu and Daxal were in their third year of Systems Design Engineering. Through collaborations with the School of Optometry, the team was able to design a proof of concept system that could detect patterns in reflected light corresponding to visual deficits in artificial eyes. The push to form a start-up came on the day of their design symposium. Ashu elaborates, "Mike Kirkup [Director at Velocity] came by and asked us if we had thought of applying to Velocity. Daxal and I hadn't at the time, but decided to look into it. We applied, and the rest is history. Since then we've expanded to include Communitech and GreenHouse as our mentors, and things have started to move much more quickly".

Their motivation to build an affordable system to detect vision problems is inspiring: "While researching for our project, we were seeing numbers like a quarter of children not being able to see the chalkboard in their classroom, and decided we needed to do something to close this gap. We also wanted to solve what is essentially a preventable problem; many cases of blindness can be solved with vision

Continued on COFOUNDERS on page 13

Texiobactin

The new antibiotic on the block

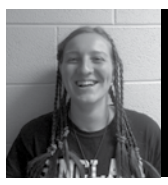
DONOVAN MAUDSLEY
2A MECHANICAL

A lot can happen in 53 years. Man has stood on the moon, the cold war ended and more wars began, the internet came into existence and almost immediately began serving as a platform for animal videos. Medical techniques and antibiotics have become increasingly strong, but so have the bacterial infections that they fight. The term "super-bug", now commonly used to describe an antibiotic resistant bacterial infection, did not exist in 1962; they were still focusing on normal bugs. When isolating new classes of antibiotics researchers typically turned to the soil to find bacteria which produce antimicrobial compounds that are non-toxic to humans. This method produced many antibiotics in the early years of research – twenty classes before 1960, but only two since then. The deliberate holding back of various strains of antibiotics has allowed medical professionals to remain one step ahead, but the stock is quickly running out. We're fighting a losing battle.

Enter teixobactin, a new antibiotic observed by a team of researchers at Northeastern University in Boston led by Kim Lewis. Teixobactin is able to kill bacteria by preventing them from building cell membranes. It has been successfully tested on antibiotic-resistant infections in mice, and when researchers tried over several weeks to evolve strains of bacteria that could resist teixobactin, they were unable to. Teixobactin seems to be immune to resistance. The drug works by blocking bacterial cells access to the compounds Lipid II, which is needed to create cell membranes and walls, and Lipid III, which preserves existing walls and membranes. This two pronged attack is likely why teixobactin is so hard to adapt to. An existing antibiotic, vancomycin, also works by withholding Lipid II. Vancomycin was used for around 30 years before bacteria were able to evolve and resist it. Lewis hopes that it will take even longer for bacteria to adapt to teixobactin.

Teixobactin was discovered using a different method than most previous antibiotics. The team used a device known as the iChip to discover the drug, and are very optimistic about the potential of the tool. Bacteria are constantly fighting each other, providing a tremendous source of potential antibiotics, but 99 percent of these bacteria won't grow in lab conditions. The iChip can bring the natural environment of the bacteria in to the lab. Really it is just a small board that can separate cultures of bacteria, and keep them in their natural environment at the same time. By separating the bacteria cultures which are already growing, each can be studied independently. This allows researchers access to things they've never seen before. The discovery of teixobactin is momentous on its own, but the iChip and its potential may be the more important part of this discovery. Teach a person to fish and you'll feed them for life.

Unboiling an Egg



CAITLIN MCLAREN
3A CHEMICAL

Everybody hears it as an example in thermodynamics: "You can't unbreak a glass. You can't unboil an egg."

Now, that example has been proven wrong.

Eggs are full of proteins, which are complex molecules that need to be folded in a particular way in order to work. Heat, changes in pH, and other stresses can change the shape of a protein, rendering it unable to perform its biological task. This is called "denaturing" the protein. In the case of eggs, it makes them delicious. In the case of proteins used in cancer research, it makes them useless.

Professor Gregory Weiss of the University of California, Irvine had this problem. However, when he visited Flinders University in Australia and saw that they had a powerful vortex fluid device, he had an idea.

The vortex device generates strong forces that can pull a protein apart - not into pieces, but more like an elastic. Weiss boiled an egg until it was extremely hard, dissolved the whites in a urea solution, and vortexed the mixture.

What came out was, for all intents and purposes, egg white. The enzymes were able to regain about 85% of their effectiveness, although the urea guaranteed that they wouldn't taste very good.

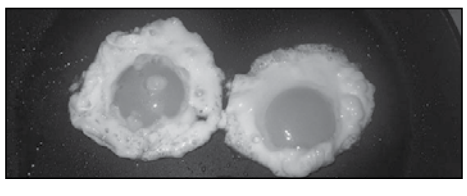
For Weiss, this is only a proof of concept. The process might be very valuable in the future for analyzing cancer-related proteins. Ultimately, this process could save lives.

Lack of Female Profs

Continued from LACK on page 6

by their family and by their peers, and (insofar as possible) not be swayed by social and societal dynamics at play in their field of choice.

It will be a very long time (if ever) before we are able to purge biases and stereotypes from our thinking. What we can do however is be aware of these, step back, and actively justify to ourselves why we are making a particular choice. Following this way of thinking will help us fight internal biases, and over time, work towards a truly enlightened society.



flayist on Flickr

A pair of fried eggs.

Terror Legislation

Continued from IMPACTS on page 6

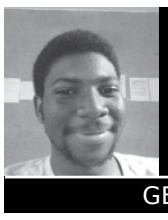
they do and why they do it, etc.

Some might see financial need, aspiration, or similar incentives enough for accepting any offer. It is critical to realize the distinction between being a good "engineer" and an average technician, just getting the job done. A good engineer does not sell their expertise in return for monetary compensation only. Good engineers to approach life, including their job, as an engineering problem, applying their critical thinking and engineering judgment.

In the end, we do not wish to preach about whom to work for (or not), because, if nothing else, nobody is going to listen to our sermon. But we would like to remind everybody of the distinction between good and average engineers, and those simple questions that make the difference while considering a job.

Watch that movie: *Good Will Hunting*.

Geek Culture: The war of the Renaissance fathers



EMMANUEL UTUAMA
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GEEK CULTURE

Hi, folks, and welcome to Geek culture. It is a new column that focuses on all your geek needs from comic books, super heroes, movie reviews, TV shows and much more. If you have any content suggestions, submit your request to the Iron Warrior, or even better, write an article about it for the Iron Warrior!

To kick off this first issue of Geek Culture, I will be reviewing a comic I have recently read which I found awe-inspiring and fascinating. Words can't express how much I think this comic is amazing. It is called *S.H.I.E.L.D.: Architects of Forever,* written by Jonathan Hickman and illustrated by Dustin Weaver. Yup, it is the same secret spy organization – S.H.I.E.L.D. - that we have all grown to love in the past years thanks to Marvel movies and TV shows. However, the comic doesn't feature the adventures of Agent Phil Coulson and good Old Nick Fury but instead explores the secret history behind S.H.I.E.L.D. and the world.

Here is a synopsis of the book. Since the dawn of civilization, humanity has been threatened with the end of the world but the brotherhood of the S.H.I.E.L.D. has always protected us from danger. Great historical minds, such as Leonardo DaVinci, Zhang Heng, Galileo, Sir Isaac Newton, Nikola Tesla and many more, were agents of S.H.I.E.L.D. The story is set in the 1960's and follows a war of ideas between these great historical minds, as some of them believe in following fate and others in free will. It is basically like assembling the League of Extraordinary Gentlemen with the greatest historical scientist and engineers as members and letting them wage war against each other throughout time. Mind-blowing.

I would say the most captivating part of the comic is how Jonathan Hickman and Dustin Weaver masterfully bend sci-fi and history together by using the classic great things of the Renaissance era. For those of you who aren't familiar with the Renaissance era, it was the time that followed after the Dark Ages (in which there was little or no intellectual development) after the the fall of the Roman Empire in Western Europe. The Renaissance era is the link between the Middle Ages and the Modern age where there was a revival of art, science and literature under the influence of classical learning. It is historically seen as the rebirth of human intellect and discovery. This theme of curiosity, invention and desire for knowledge is echoed throughout the book as you get to a feel of how the people of the Renaissance thought of problems and solutions. Apart from the cast of star-studded historical polymaths (multi-disciplined experts), there are some familiar Marvel characters such as Celestials, Nathaniel Richards (Reed Richards/Mr Fanatics' dad), and Howard Stark (Tony Stark/Ironman's dad) in the book. Nathaniel and Howard's relationship in the comic feels like a throwback to Agent K and Agent J in Men in Black, but a little more nerdy. As you guessed it, they are both agents of S.H.I.E.L.D. working for the brotherhood.

My favourite parts of the comics are as follows: Leonardo DaVinci traveling through time with what looks a like a Medieval armor guilder. Another one is seeing Galileo Galilee take down Galactus with a ray gun powered by the collective consciousness of the brotherhood's members. Lastly, Newton accidentally corrupts a Celestial using a mathematical solution for the Theory of Everything. Although the comic is a really fun read, Jonathan Hickman starts the book right in the middle of the story; this makes it a little difficult to understand what is going on for the first few chapters. The first volume of *S.H.I.E.L.D: Architects of Forever* leaves you with a lot more

Continued on GEEK on page 13

Take Five: Lumos!

NANCY HUI
4B CIVIL

TAKE FIVE

Out of all my fandoms, I think I enjoy the Harry Potter fandom the most. Based on the books by J.K. Rowling which have sold nearly half a billion copies worldwide, it chronicles the coming-of-age of a young wizard who comes to realize that he must make the choice between what is easy and what is right.

The first book was published in 1997, and the first movie hit the screen in 2001.

I enjoy the books more than the movies due to the depth of the worldbuilding within it and the extensive framework it serves for transformative fanworks, but the movies have the ability to compensate for any weaknesses in Rowling's writing through adaptation into another medium. Because of the extensive changes made to the pacing and plot in later books, they are impressive in their own right.

Harry Potter and the Sorceror's Stone (2001)

I used to like this movie a lot more than I do now, but as time wore on I realized that Chris Columbus' vision of the first book was a slavish effort to mirror every cue. And without trying to add anything new, the result was inevitably lesser than the original. I wonder what direction the film franchise would have taken if Terry Gilliam of Monty Python's Flying Circus had directed instead.

But, eh, Sorceror's Stone was good enough to usher me into the fandom at an age where the novel lengths were a major deterrent in actually reading the book, so points for enchanting my eight-year-old self.

Harry Potter and the Chamber of Secrets (2002)

I enjoyed Chris Columbus' second stab at the series more than the first but this was caused by improvement of the source material. Chamber of Secrets is one of the best books in the series because it is tight and hits you with a mystery from the get-go. Columbus benefitted from this and an obvious increase in his special effects budget, so I'm reluctant to say that Harry Potter and the Chamber of Secrets, as a film, demonstrates an improvement over its predecessor.

Harry Potter and the Prisoner of Azkaban (2004)

Why does Alfonso Cuaron end the movie with a cheesy freeze-frame? Why is John William's score suddenly so sappy? Why does Harry only get his broom after everything, basically killing the quidditch subplot? And what is the purpose of the shrunken heads?

At least Hermione (Emma Watson) punches Draco (Tom Felton).

Harry Potter and the Goblet of Fire (2005)

The Goblet of Fire, as a book, is enjoyably structured in that the Triwizard Tournament lends a sense of tension to the proceedings, even if it's just a high school competition. However there's way too much stuff happening in the movie and Harry's adolescent dating woes feel trivial after the excitement of the Iron Ring Ceremony, the Chamber of Secrets, and your Azkaban-mad godfather popping up in a shack.

The movie could have compensated for this weakness with more brooding, more shadows, and more hints that something is weird in the neighbourhood but instead favours a raving Michael Gambon as Dumbledore and a dance between Rupert Grint and the venerable Maggie Smith. You can't have a farcical rom com through the first two thirds of the movie and then a showdown with the resurrected Dark Lord in the last third. Not impressed.

Harry Potter and the Order of the Phoenix (2007)

At this point you KNOW that Rowling's editors just threw up their hands and let her write whatever the hell she damn pleased. So David Yate's editorial team tackled the Herculean task, wrangling the series' longest book into the shortest movie by focussing on Harry Potter's struggle against the forces both within and outside of Hogwarts.

This is also the point where Daniel Radcliffe begins to bring his acting chops around the table, rather than getting buffeted around by a host of the most accomplished British actors in business, including Imelda Staunton's Professor Umbridge, Ralph Fienne's Lord Voldemort, and the incomparable Helena Bonham Carter as Bellatrix Lestrange, Manic Pixie Nightmare Girl extraordinaire. He can't really stand up to them, but he does his best.

Harry Potter and the Half-Blood Prince (2009)

The Half-Blood Prince opens with a waitress who flirts with Harry in a cafe, but he must away with Dumbledore . It is always difficult for the movies to balance Harry's destiny as the chosen one and his identity as a schoolboy thrust into the midst of things he isn't allowed to fully understand.

Anyways, Harry reacts to this by developing the ability to sass, snark, and swagger, sometimes without the influence of luck potion, but all the while remaining the steadfast hero. This is a very good development.

Continued on TAKE on page 14

Love You Like a Love Song

ALEX TOTH
4B CHEMICAL

ALBUM OF THE WEEK

This week, instead of writing about one specific album, I decided to combine three things I really enjoy: music, lists, and cheesy romantic gestures. Since Valentine's Day is approaching and my girlfriend suggested I write an article in honour of it, I thought it would be a good time to discuss the love song. The theme of love, in some form, is probably the most common theme in music now and forever. However, not all songs containing the theme of love can be considered love songs. There are songs that deal with the absence of love, searching for love, and falling out of love; but none of these songs are love songs in the purest sense. A true love song is one that is able to project a feeling of emotional attachment onto the listener; a sense of happiness that can only come from being fully in love. It's a song that makes you feel giddy, and leaves a warm glow even after it's finished. So without further preamble, I've chosen five songs, all released in the last 5 years, which I believe best capture that feeling.

Beyoncé – 1+1

In concert, Beyoncé performs this song alone on stage, in a sparkly blue jumpsuit. Halfway through the song, a cable lifts her off the ground and carries her to a separate stage, where she finishes the song lying on top of a grand piano. If the performance were to be described in one word, "grandiose" seems fitting. However, the performance pales in comparison to the actual song. Freshly married to Jay-Z and using that emotional milestone as a springboard, Beyoncé extolls the virtues of monogamy over flowing synths and keyboards. She may not know much about algebra, but she certainly knows how to craft a stunning love song.

Miguel – Adorn

"Adorn" is seduction under the guise of music. Miguel's take on airy RnB is in its purest form in this song, which finds Miguel lovestruck and confident at the prospect of new love. Each line could double as a wedding vow, a statement of absolute trust: "Baby these fists/ will always protect you/And this mind/will never neglect you." The joy of "Adorn" is palpable and infectious, and will leave you smiling for a long time.

Disclosure ft. Sam Smith – Latch

"Latch" has to be a contender for hugest song ever, right? Sam Smith does a wonderful job alternating between crooned verses and absolutely massive, blow-off-the-rafters choruses while discussing the wild-eyed feeling of finding someone so perfect you never want to leave their side. Musically, Disclosure streamlines their modern house sound to craft a timeless pop song. Plus, "Latch" is a frontrunner for chorus you know you can't sing but do anyway, which is icing on the cake of this perfect song.

Rhye – Open

Rhye is a duo made up of two men, one instrumentalist and one vocalist. But upon listening to "Open," you'd be forgiven if you didn't believe that was the case. "Open" is awash in lovely androgyny, with singer Milosh's voice fluttering in a genderless alto region. But hidden behind the breezy vocals is true emotional heft. Milosh is concise with his lyrics, but each one reads like a riddle at which we can only guess at an answer: "I wanna make this play/Oh I know you're faded/But stay, don't close your hands." "Open" is a gentle whisper in your ear from someone who you can't bear to let go.

Calvin Harris ft. Rihanna – We Found Love

"We Found Love" is all about the feeling that results when a song is sung with such conviction that it doesn't really matter what the lyrics say. Calvin Harris provides a backdrop of stabbing synths and swirling builds for Rihanna to just belt overtop of. And belt she does, using only a select few lyrics to convey maximum emotion. This is action-movie romance in song form, with the hero overcoming incredible odds and still managing to get the girl (or boy). It's overwhelming, sure, but isn't that what love's supposed to feel like?

Perspectives

The Importance of Words and Perspective in Journalism

DAVID ROUSSO
1B NANOTECHNOLOGY

PERSPECTIVES

What is the difference between a king and a dictator? How about a freedom fighter and a terrorist? A revolutionary and a traitor? In terms of definitions, absolutely nothing. Think about it. King: (n) ruler of an independent state, especially one who inherits the position by right of birth. Dictator: (n) a ruler with total power over a country, typically one who has obtained power by force. Typically a line of kings started with one king that took power by force, and typically dictators that survive their reign pass on their power hereditarily, so in essence there really isn't much of a difference. However, despite them being almost exactly the same thing, there is one huge difference: kings are typically heroes and dictators are typically villains. Why? Because it depends on your perspective. (Political Science Students: Yes, I do realize that there is a more precise difference, but bear with me here.)

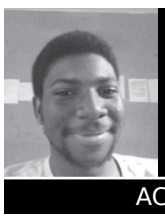
Now you might be wondering why I'm pointing out dramatically different ways of saying the same thing. The reason is because this is incredibly important in journalism. In journalism, you are basically trying to write a story, and good stories need a protagonist and an antagonist. Most stories already come with two sides, so the most media outlets typically pick a side that is more aligned with the views of their viewers and makes that side the protagonist, and the other side the antagonist. This is partly why Western and Eastern media can sometimes be incredibly different. In Western media, you never hear "The Sovereign of North Korea Has Decided to Enter the Space Race", you hear "Tyrant Dictator to Begin Testing of Nuclear Weapon Rockets". You don't hear "The Islamic State Revolutionaries Fight Back American Forces Annexing Iraq", you hear "American Forces Fighting Back Islamic Terrorists". You don't hear "Sovereign of Egypt Overthrown by Treasonous Traitors", you hear "Victory for Democracy over Tyrant Dictator". Why? Because you see a different protagonist. If you lived in North Korea, I'm pretty sure Western news might seem just as ridiculous as those headlines to you, simply because you see a different protagonist. But when you think about it, there really isn't any inherent "good" or "evil" in anything. The universe is indifferent to morals. In human civilization, there are just actions beneficial to our kind, and actions that are not beneficial to our kind.

But why stories? Well the fact is, facts are boring and stories are interesting. Nobody would read an article if the entire thing was "Plane crashed into sea at 0900 hours, nothing is known, search efforts are underway, company records have released an advisory a few months ago that there is a chance that a specific engine valve might fail." They want to read "a plane has crashed into the sea killing everybody in a terrifyingly violent plunge. We suspect that terrorists or an evil careless pilot purposefully downed the plane in an attempt to strike fear into the hearts of the democracy-loving world and that investigations are under way to bring them to justice. *Insert emotional stories of family members here*". People need protagonists, antagonists, emotion, and suspense. The media never goes ham on reporting a plane crash when they were sure that the plane was downed by natural causes. They need to hold somebody accountable. They need an antagonist for their story. But what happens if there isn't enough information to choose a side? What quite a few media outlets do (CNN is a remarkable example) is bring in tons of experts to speculate and come up with interesting possible stories, trying to make up interesting antagonists and present those made up stories as news.

But why is this important? Is this a problem? Well, it depends how you think about it. Your brain tends to take in the information from the world and use it as a lens to view new incoming information. For example, if you were discriminated against constantly, you would be more inclined to interpret neutral actions as a potential act of discrimination against you. This is particularly important when it comes to the media, since that's how most people get information about the world these days. Being bombarded with negative stories and certain views, you would become inclined to view the world that way rather than being more objective. Well, I guess you could say that there are pros and cons to this, and that there isn't much that the media could or should change. But should we really stop trying to view things objectively? Well then again, what do I know? I'm just a sleep-deprived first-year engineering student, not a journalist.

Actual Advice

Dealing with the Winter Heat



EMMANUEL UTUAMA
2A ELECTRICAL

ACTUAL ADVICE

Hi Warriors, it's that time of the term where there are a lot of project deadlines to meet, job interviews to ace, it feels like the number of deliverables per class have doubled, and hell week is creeping up very slowly. The days feel longer and the nights even shorter. With all this work in a short amount of time to deliver, it is important not to let the stress get the better of you. Dealing with all this heat – stress – is just as important as accomplishing our set out work because stress determines how well you can perform and focus on achieving a goal. So, it here is four tips on how to shake off the stress.

First, try to get organized. Making study schedules and deliverable lists can drastically improve your productivity and help you stay focused. Taking note of key dates throughout the school calendar, such as midterm dates, project/assignment due date, final exams and interview dates, helps you find a way to proactively work ahead or keep working at a good pace. Scheduling has the added advantage of helping you at time management. For example, allocating a certain amount of time on performing a particular task, gives you a way to check your progress during that time and your efficiency at dealing with the task. In a way, it's like checking the "runtime" of your own processor (mind) and algorithm (strategy) of dealing with a problem. As a result you can adopt various strategies to help you improve your runtime (rate of work) when working towards a goal. However, sometimes it is not easy to follow a schedule; life is not a static list of goals, but you should always strive to follow the schedule you created. It helps in the long run.

Second, engage in an extra-curricular activity to take your mind off school work. Playing sports or going to gym is amazing way to de-stress as well as help develop both the mental and physical stamina needed to stay focus. Apart from sports, there are a lot of extracurricular activities you can engage in such as joining a design team, learning a new programming language, reading, event planning and many more. Extracurriculars help you develop essential skills you need to succeed while giving you a chance meet people, challenge yourself, and explore different possibilities apart from academic work. A final bonus of engaging in an extracurricular activity is that it allows you to stand out during job interviews and can even land you an interview. It's like killing two birds with one stone.

Third, one of my favourite ways, is meditation. Meditation is an amazing way dealing with anxiety and stress. It could be as simple as taking a 5-10 minute breather or coming for 30 minute a meditation session. The purpose of meditation is to allow you be aware of the present situation and allowing you to take control of it. One of my favourite quotes from the television show Legend of Korra that I feel describes the essence of meditation is, "Let go of your earthly tether. Enter the void. Empty, and become wind." This simple quote explains the mechanism and the purpose of mediation. My interpretation of this saying is as follows. Letting go of your earthly tether is simply removing all your worries and anxiety from your mind. Entering the void and being empty can be viewed as being in a state of calmness and balance with yourself. Finally, becoming wind is achieving the goal you set out to do and being the person you want to be. Off course don't become an anarchist while mediating. That's a little tease for you LoK fans.

Finally, understanding your strengths and weaknesses are essential to getting around any stressful situation and in doing so you can structure ways of handling your problems. For example, I am a very slow while working on projects and assignments. So one strategy I use to work around this is to start my projects very early and breakdown the work over a long period of time. This often works for me, as I don't feel too stressed when my deadline is approaching. But most of all, don't forget you are in engineering because you are warrior – an academic warrior of course. This means you believe you are capable of handling all the heat and pressure of your chosen profession and delivering quality results regardless of the situation.

Geek Culture

Continued from GEEK on page 12

questions than answers, and the grand scheme of the story isn't explained until you start reading the second volume. Thus, you will need to be invested in the story to fully understand the book. Sadly, this brings up another problem with the comic series: it is not done yet. The final issues have not been published since 2011. This is due to Jonathan Hickman and Dustin Weaver taking a hiatus from the project.

Finally, as an engineering student reading the story, it was refreshing to be reminded that the engineering designs, mathematical equations describing physical principle developed by historical engineers, mathematicians and scientist still resonate and shape our thinking in the present. As mortal men, we cannot live forever, but as engineers we are called to make designs and solutions to help build the future; we are called to be the architects of forever.

Cofounders: EyeCheck

Continued from COFOUNDERS on page 11

correction."

Initially, the plan was to make EyeCheck a non-profit rather than incorporate and monetize their product. However, after interacting with their peers and mentors, they realized the non-profit route was quite difficult a path to follow. "We did some research and found that our customers don't really care whether we're a non-profit or not, as long as we have transparency built into our pricing. In addition, there's a social impact benefit when we compete as a commercial company against others."

EyeCheck's technology consists of two parts. The first is a smartphone application-based triage tool used to quickly filter out people with cases of visual impairment from a large group. This helps to increase throughput and allows resources to be focused better. The second step involves using a stand-alone camera to capture information about a patient's eye in order to give them a prescription. In this step, infra-red light is used instead of visible light to detect vision defects. "When you shine infra-red light into your eye, your pupil stays nice and big, allowing it to pass right through, and we can see the patterns clearly", explains Ashu.

Currently, EyeCheck is in contact with several organizations in India that are helping them deploy their technology in certain areas in the state of West Bengal. "The reason we chose India is that there are logistical starting points we can springboard off of, including mature distribution channels for optometry care in rural areas. However this is definitely a global problem, for which we are currently developing a global strategy."

Ashu describes his experience as a part of the Velocity Foundry: "It's great to have people from companies that have tackled the problems we are currently facing, provide us with inspiration, mentorship as well as criticism. Focused criticism is especially important." Last fall, EyeCheck participated in the Velocity Fund Finals competition, and walked away with the top prize of $25k as well as an additional $10k for being the top hardware team. "Winning the competition was overwhelming, but it was also a signal for us to get to work and continue what was expected of us."

The presence of organizations like Communitech and St. Paul's GreenHouse have resulted in the formation of a vibrant community of entrepreneurs in KW. While each of these organizations have different contributions to offer, they have collectively sped up the pace of idea formation and the translation of ideas into reality.

EyeCheck's dream of creating a cheap and quick means of diagnosing vision impairment seems very close to becoming a reality, and it is hoped that in the coming years they will be able to expand their technology to a global level.

More Disgusting Things People Have Done In History

CAITLIN MCLAREN
3A CHEMICAL

TOO MUCH INFORMATION

Every culture has ideas of what is and is not acceptable, because nobody likes a creep. Unfortunately, the ideas of what is okay and what is sick and wrong tend to change from time to time and place to place. Here are some things your ancestors have done that are just.... wrong.

The Irish had a thing for (men's) nipples

Babies breastfeeding from their mothers is cool. Everyone's done it. However, the ancient Celts in Ireland decided to take things a step further. Ordinary Irish guys sometimes expressed loyalty and submission to their king by sucking on his nipples. The logic behind this has been lost in the mists of time, if it ever existed.

Furthermore, what if some dude wanted to be king, but couldn't cut it? A guy who tried to become king (probably by overthrowing the old one) might be in danger of having his nipples cut off before execution, to symbolically show that he could never become king.

Of course, the ancient Irish were a pretty fierce bunch anyway, what with their constant wars and human sacrifices and all. Of course, they weren't alone…

The Aztecs had fake wars, just to obtain human sacrifices

Everyone's seen those movies where some creepy priest would rip a dude's heart out on top of a pyramid. It's pretty common knowledge that the Aztecs were hardcore. However, did you ever wonder where they got those dudes from?

The Aztecs would sacrifice thousands of people on festival days, and they ran out of victims pretty quickly. Every Aztec man was obliged to be either a priest or a warrior, and most warriors ended up getting sacrificed.

You see, every time they needed more sacrifices, they would start a war with a neighbouring city-state in order to capture some warriors. When they became an empire, they started to run out of enemies they could fight. What was the solution to the problem? The warriors would divide into two teams, who would then fight each other. The captured guys were sacrificed, and according to their beliefs, then had access to the best afterlife.

The priests didn't have it too easy either, as they were forbidden to wash or cut their hair. That doesn't sound too bad, until you realize that they ritually smeared themselves with soot, and got covered in blood by the nature of their work. Their hair would be so matted and filthy that fungi would start to grow in it. After many years of priesthood, the hair could be so heavy that it was hard for them to walk.

Oh, yeah. Some historians say that Aztec priests were only supposed to sleep with… each other.

The Greeks believed that the ideal romance was between a teenaged boy... and an old man.

The Greeks had some odd beliefs about sex. For one thing, they considered the active partner to be superior, and the passive partner to be inferior. Of course, this was mainly good old-fashioned sexism. They also disapproved of gay men, because of course two social equals couldn't have sex! The scandal!

Of course, since a young teenager wasn't a full citizen yet, he was a social inferior and was therefore perfectly fair game. The Greeks thought that the perfect relationship was between and older man and a boy. The man would teach and mentor the kid, while also screwing him. Harvard would disapprove.

When the boy reached adulthood, the relationship would have to stop. This may or may not have been a relief. On the one hand, handsome boys were constantly given gifts and fought over by their (creepy) suitors, and this would stop. On the other hand… these couples are depicted thousands of times in Greek artwork, and the boy is never, even once, pictured as enjoying himself.

The Babylonians believed in sacred prostitution

That doesn't sound so creepy. After all, prostitution is the world's oldest profession, and everyone involved is a consenting adult. However, according to Herodotus, Babylonian sacred prostitution was pretty strange.

Every woman was religiously obliged, at least once in her life, to sell her body for the sake of the goddess Mullissu. The women would go to the temple and wait for the first man to offer her money in the name of the goddess. She then had to sleep with him and take the money, or it would be a sin. After that, she was free to go home and did not have to prostitute herself again.

When the women lined up in front of the temple, men would walk up and down and choose them. A woman couldn't leave until someone had picked them, and so some women would have to wait a very long time. The customers could cheap out, too - whatever money they offered, the women had to take, as it was considered sacred.

You have to wonder about the guy who invented this religion.

Prophet: "I have a message from the goddess: Every woman has to sleep with the first man who offers her a coin!"

Everyone else: "SEEMS LEGIT."

Mesoamericans pierced their genitals, because reasons

The Aztecs sacrificed people. I may have mentioned that before. However, horrifying shit wasn't limited to the Aztecs - all of Mesoamerica had some pretty messed-up religious practices.

Blood sacrifice was a pretty big deal, and a lot of it was self-sacrifice. Worshippers might pierce their ears or their tongue to get a bit of blood. No biggie, right?

And then they did things like this:

WARNING: If you are squeamish, STOP READING NOW. You will not be able to forget this.

Mayan men performed a ceremony where they pierced a hole in their genitals. They would then pull a string through the hole. A large group would do this at the same time, and they would tie themselves together with the string and anoint a statue of the god with their blood.

Why? It was a fertility ritual. Because, clearly, that will improve your fertility.

And women? They did it by pulling a rope through their tongues. And their rope had sharp spines woven into it.

Superbowl XLIX: Gridiron Glory!

DONOVAN MAUDSLEY
2A MECHANICAL

One Sunday every year, America sits down for its favorite holiday: Superbowl Sunday. A day full of greasy food, the greatest game in the country and more beer than any one nation should drink in a day. Every year it comes down to two teams, the AFC champion versus their counterpart from the NFC.

This year the teams were undeniably the very best in the league: the Seattle Seahawks and the New England Patriots. The Best in the West faced the Beast from the East. On defense, New England brought Vince Wilfork, defensive lineman and superhero, who two weeks prior rescued a woman from her overturned car, and Darrell Revis, a veteran defensive back who is hailed as one of the greatest in the game. Seattle matched with the Legion of Boom, led by their ringmaster Richard Sherman. The Seahawks also boasted quarterback Russell Wilson, a third year sensation who can beat defenses with his arm as well as his feet, and Beast-Mode himself, Marshawn Lynch, one of the most dangerous and destructive running backs in the game. The man driving the Patriot's offense needs no introduction: Tom Brady, three time Superbowl champion, two time MVP. Even the sidelines this year were legendary, featuring the genius head coach Bill Belichick in New England, and his counterpart Pete Carrol, a defensive mastermind.

Neither team really came out swinging in the first quarter, both failing to cross mid field on their first possessions. Then Brady did what Brady does and drove slowly down the field to the Seattle 10 and things were looking up. He threw to Danny Amendola on the goal line but the Legion of Boom struck first: Jeremy Lane intercepted the throw and ran it to the sideline before being brutally hit by Julian Edelman, injuring his wrist. He wouldn't return to the game, and the momentum gained by his interception quickly disappeared in his absence. Seattle punted it away a minute into the second quarter.

Lane was replaced by Tharold Simon. This created mismatch opportunities on the outside for the Pats offense. Simon got beat four minutes and ten seconds later for the first touchdown of the game, putting the Pats up by 7.

Wilson tossed one deep to Chris Matthews who came up HUGE. Who's Chris Matthews? An undrafted rookie who was working in a Footlocker a few months before the game and had to leave work early to make his flight to Seattle to the tryout. Imagine explaining that to your boss. A few plays later Lynch crashed in to the end zone to tie it at 7. Then Brady did it again, tossing one to Gronk, who spiked the ball to the center of the Earth.

The score was 14-7 Pats with thirty seconds left, but the Hawks tied it with a 11 yard pass to Matthews (the undrafted rookie) with two seconds left.

During halftime, Katy Perry was pretty sick. Lenny Kravitz came up for about 30 seconds, Left Shark was a hero. Even Missy Elliot showed up.

In the second half, Seattle starts off with a field goal, putting the Hawks up by 3. The Pats score a touchdown through veteran receiver Doug Baldwin. Baldwin dances a little bit too much and gets penalized for excessive celebration. Really? This is one of the largest games on the planet. Is there a way to celebrate TOO MUCH when you're winning? Okay, ref. Pats are down by 10, the quarter expires, and the Patriots get the ball back. There are twelve minutes left.

Two hundred million people are watching the best Superbowl in recent memory and it's still anyone's game. Brady gets sacked for 8 yards and the West Coast roars. Things aren't looking good for the Brady Bunch, especially when Sherman gets called for unnecessary roughness, until Amendola is able to sneak through coverage and grab a perfect pass for the touchdown. The Hawks are up by 3.

The end draws close and this is it. Brady knows it's his last chance. Tom, Bill and Josh McDaniels, the Pats offensive coordinator, have a pow-wow at their sideline, and draw up the plan. LaGarrette Blount smashes up the middle for 2 yards, and from the Seattle 3 on the next play. Brady gets even with the Legion of Boom for his first pick, hitting Edelman on almost the same play he was picked off on in the 1st quarter.

With two minutes left, the Hawks are down by 4, with 80 yards to the end zone. All or nothing. This is the two minute drill in action. Lynch catches a pass deep before being brought down. Two incomplete passes. Short pass to Ricardo Lockette, who picks up 11 yards. 1st and 10, Wilson airs it out to Jermaine Kearse. The ball is contested in the air, and both the receiver and defensive back fall down. The ball wobbles, bounces off both of Kearse's thighs as he lands on his back, one after the other, before popping out over his chest where he grabs it effortlessly. Personally I think the whole thing was planned. New England remembers when David Tyree caught Eli Manning's against his helmet (the infamous Helmet Catch) almost 7 years ago on the same field.

Seattle is now at the New England 5 yard line with one minute left. The entire population of Boston is holding their breath. They know what's coming: a rumbling Lynch TD to finish the game off. They appear to be right on the first play from 5, as Lynch blasts forward 2 yards. Seattle runs the clock, trying to avoid last second heroics by Brady. This is it; they're down at the line with the best player on the field, Marshawn Lynch, in the backfield. The Seahawks are going to win.

Wilson gets the snap, but doesn't give it to Lynch. He passes to Lockette on the goal line. A New England linebacker jumps in front of the ball, and catches it before falling down at the 2 yard line. His name is Malcolm Butler, an undrafted rookie, and he has just won Superbowl XLIX for the Patriots. Another Lombardi Trophy will sit forever in Foxborough, enshrined to the glory that was the end of the 2014 NFL season. And Tom Brady, the man behind it all, wins his third Superbowl MVP award.

Take Five: Lumos!

Continued from TAKE on page 12

I could stand a stronger appearance from the titular "Half-Blood Prince" but the combination of teenage romance and Dumbledore's literal trips down memory lane lent a bittersweet tinge to the former while lending emotional breaks to the latter.

Harry Potter and the Deathly Hallows - Part 1 (2010)

Well, the good parts first. Emma Watson has begun to tone down her eyebrow tic. The *deus ex Dobby* was very moving. And Helena Bonham Carter playing Hermione pretending to be Bellatrix was brilliant.

However, the camping parts of Deathly Hallows were incredibly boring and translate equally drearily to the screen. It is not inspiring to watch Harry, Ron, and Hermione trapaise around England in what amounts to a wild goose plot chase.

Harry Potter and the Deathly Hallows - Part 2 (2011)

At this point in the plot, Harry and co. have grown some backbone and take charge of the action by robbing Gringotts. This goes over really well with You-Know-Who. The fighting would seem dark and pointless if not for the return of the Love-as-the-power-the-Dark-Lord-knows-not theme, as presented by Snape. Because it's presented by the perpetually dour Snape, it's actually touching- unlike when when Dumbledore first introduced it to Harry and the audience interpreted it as the ravings of a senile, sentimental wizard past his prime.

Deathly Hallows - Part 2 began the unfortunate trend of splitting up the last installments in film franchises into two movies (I'm looking at you, Mockingjay) but it handles this gift of additional screentime well. In fact, Deathly Hallows - Part 2 is my favourite movie of the series, as it should be. All is finally well with the franchise.

Until somebody reboots it.

Knock on wood.

"IF YOU ASK ANY TEACHER IN THIS SCHOOL IF THEY'VE SMOKED POT, AND THEY SAY NO, THEY'RE LYING."
-MY HIGH SCHOOL HEALTH CLASS TEACHER

RANDOM THOUGHTS

I DON'T GET WHY PEOPLE SAY TIME TRAVEL IS SUCH A BIG DEAL. I MEAN WE'RE ALL DOING IT RIGHT NOW!

THE SPONTANEOUS LOW TEMPERATURE ORGANIC SUBLIMATION PHENOMENON

SPONTANEOUS LOW TEMPERATURE ORGANIC SUBLIMATION IS A WELL-KNOWN AND WIDELY PRESENT PHENOMENON WHERE TASTY FOOD, AND WHEN LEFT OUT UNATTENDED, CAN SPONTANEOUSLY SUBLIMATE. THIS UNUSUAL PHENOMENON HAS YET TO BE STUDIED CAREFULLY AS, FOR SOME REASON DESPITE THE TEDIOUS RESEARCH CONDUCTED IN OUR LAB OVER THE PAST 2 YEARS, THE COOKIES USED FOR THE EXPERIMENT EITHER SEEMED TO REFUSE TO SPONTANEOUSLY SUBLIMATE WHEN THE CAMERAS WERE ON, OR SOMEHOW QUICKLY DID SO DURING THE TRANSPORTATION FROM THE OVEN TO THE SETUP DURING THE OTHER INVESTIGATORS' BREAKS. SO DESPITE TH.....OM NOM NOM..... AHEM, WE REQUEST AN EXTRA GRANT.....MMMM THESE ARE GOOD!!.....FOR THIS HIGHLY IMPORTANT.....UH STEVE DID IT!!!!!

WHAT DO YOU CALL A JOKE THAT HAS LOST ITS PUNCHLINE?

CLASSICAL PHYSICS: IF I THROW THIS BALL AT YOUR FACE, YOU ARE ABLE TO ACCURATELY ESTIMATE ITS STARTING POSITION AND MOMENTUM AND THEREFORE CALCULATE ITS TRAJECTORY IN ORDER TO MOVE YOUR ARMS TO DEFLECT IT.

QUANTUM PHYSICS: IF I MONKEY PANTS GENERAL STATUS CALCULATOR

I DON'T UNDERSTAND. WHY DO ALL BUSINESS PEOPLE WEAR FANCY NOOSES AROUND THEIR NECKS AND CALL THEM TIES??

BACK IN HIGH SCHOOL:

TEACHER: "OK, I NEED YOU TO WRITE ME AN ESSAY ON WHY CENSORSHIP IN CHINA IS BAD."

ALL ONLINE RESOURCES CENSORED BY THE SCHOOL BOARD

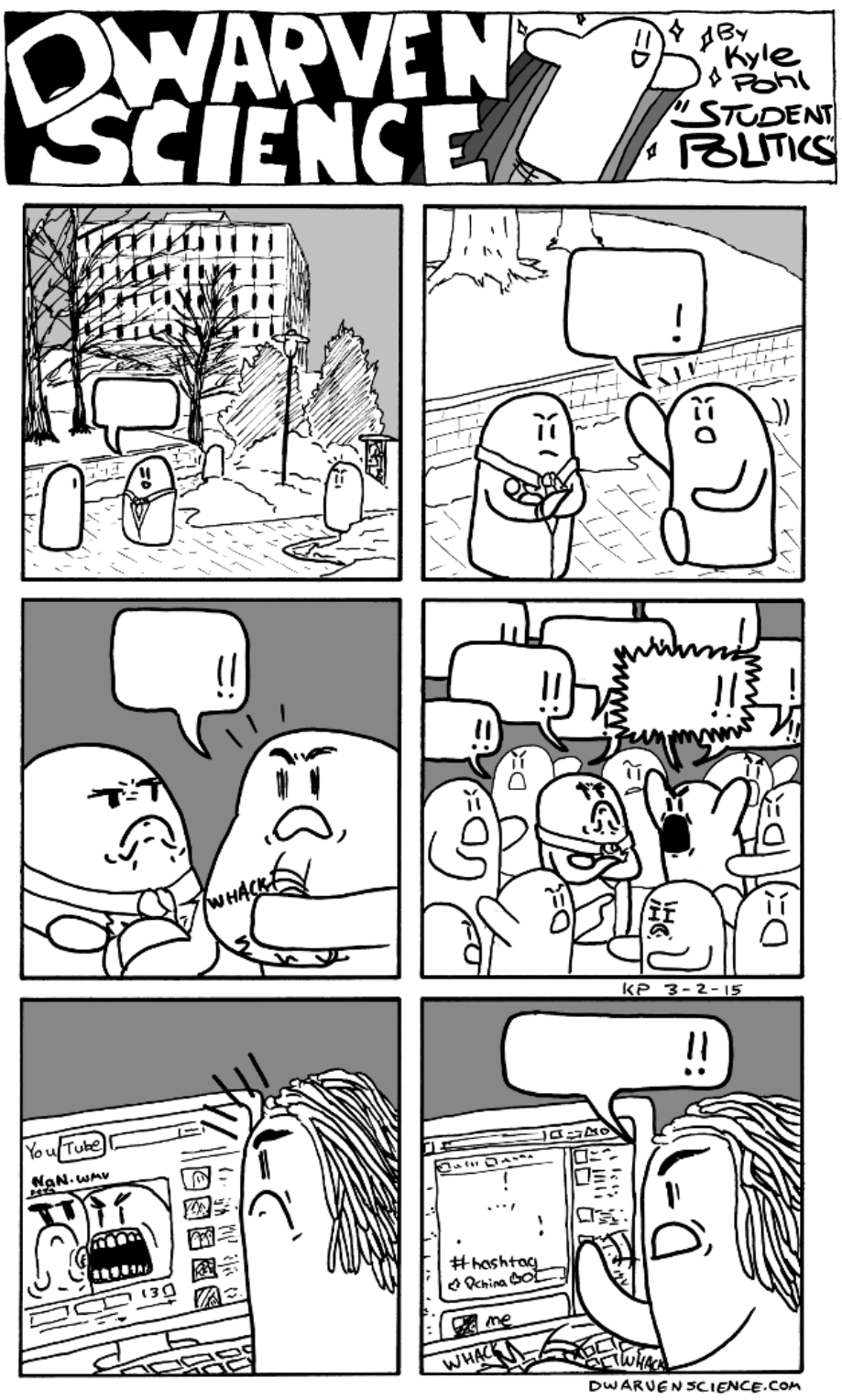
"I DON'T WANT TO GO OUT WITH ANYONE WHO IS CRAZY ENOUGH TO WANT TO GO OUT WITH ME." -DAD

Chemistry 1 for Engineers: Midterm

10. If you have 10mL of an unlabelled vial of chemical X and you mix it 40 mL 3M NaOH and you get a pH of 8 once the phenolphthalein changes colour, what is chemical X?

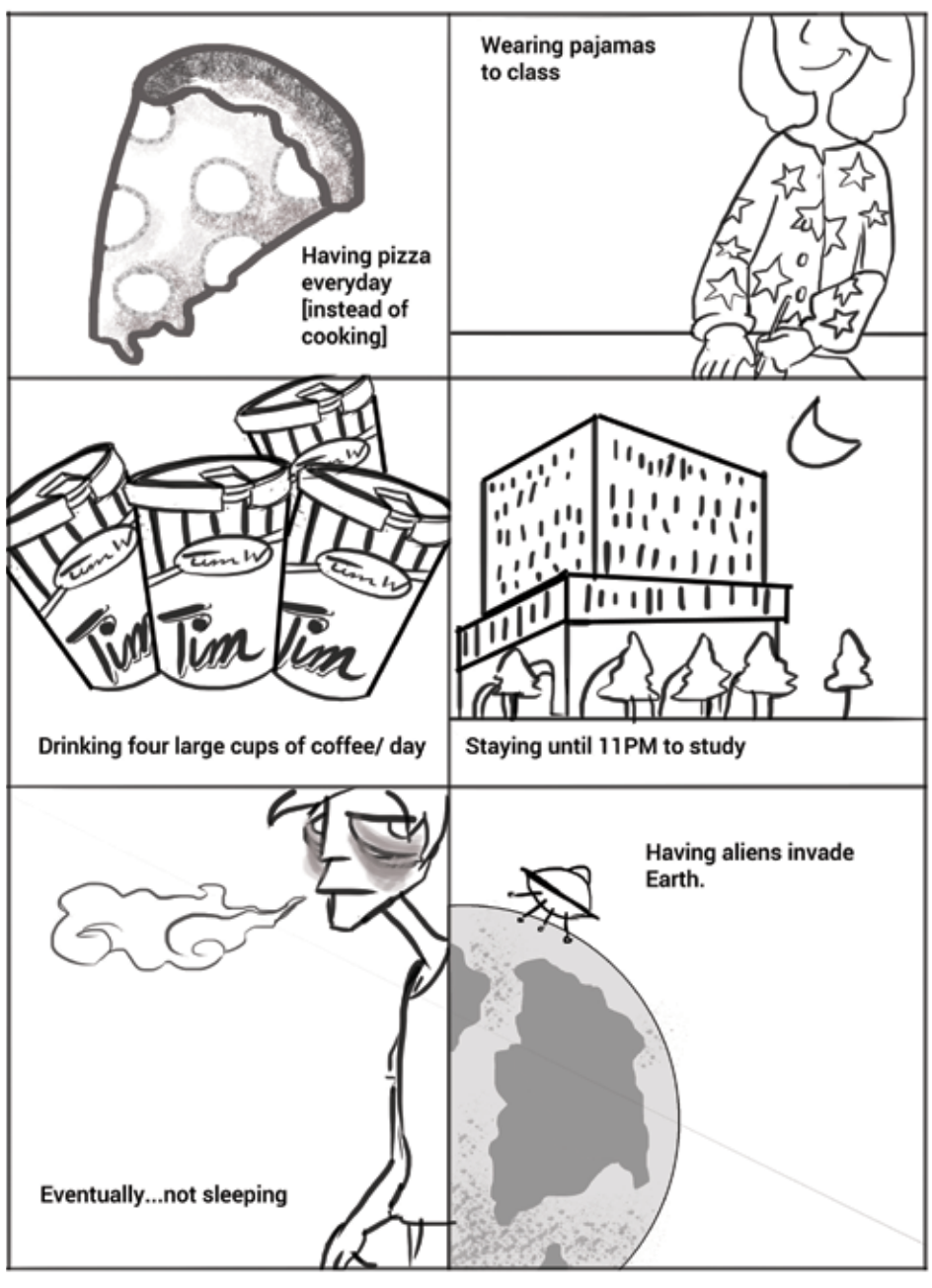
YOU SHOULD NOT BE DOING REACTIONS WITH UNKNOWN CHEMICALS AS IT IS UNSAFE AND VIOLATES WORKPLACE SAFETY REGULATIONS. WE WILL NOW REVOKE YOUR PEO LICENSE.

by David Rousso, 1B Nanotechnology



Things we eventually stop caring about

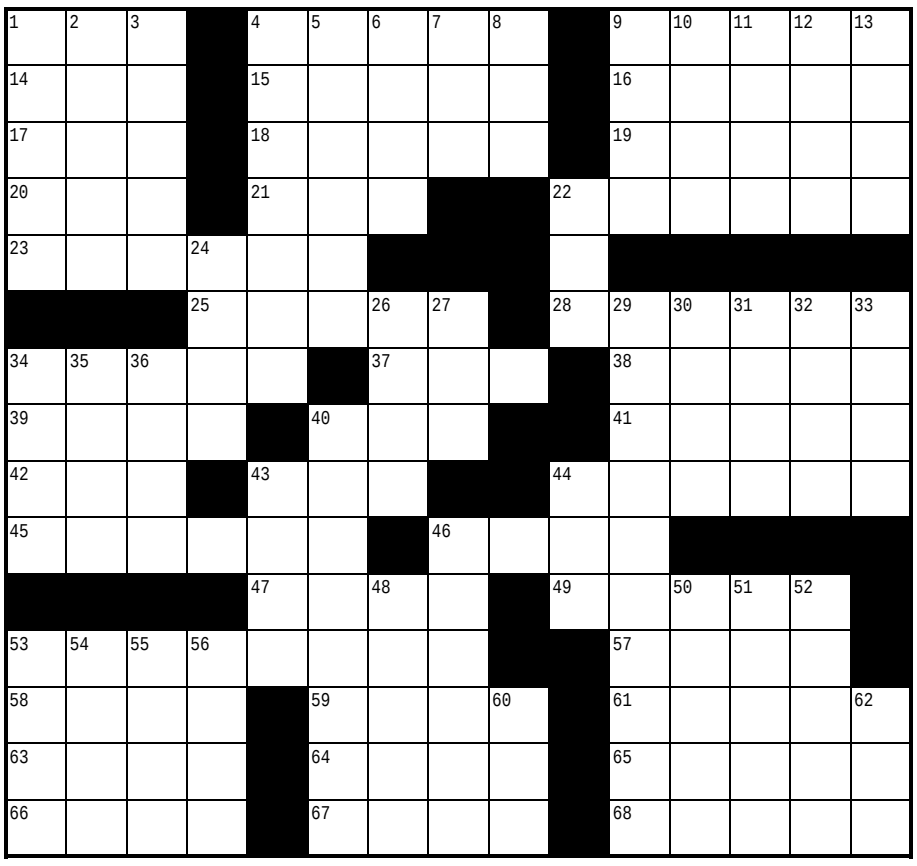
by Joanna Liu, 1B Chemical



The Iron Crossword

The Ringed Life

KATHY HUI
4B ENVIRONMENTAL



ACROSS
1. Finger candy
4. Social class
9. Band of ships
14. Stadium chant
15. Not tenors
16. Enthusiastic
17. Keep them with you
18. Andean mammal
19. Royalty's bling
20. Mendes or Green
21. Carry
22. Iron Ring supervisor
23. Passed on
25. Asleep?
28. UW's taps
34. Sharp end
37. Understanding sigh
38. Appropriate drink at these times (Fr.)
39. Weight
40. Primal cousin
41. Not buy
42. Popular on Reddit
43. In-class position
44. TWO
45. Hookups or love?
46. Take a drink
47. A common question
49. Decamole (abbr.)
53. SIX
57. Soy
58. Shepherd
59. "Yeah right" (2 wds)
61. Lead in
63. Tapioca dessert
64. "That's sick yo"
65. Alternate
66. Etc. (2 wds)
67. Emit
68. We all have them

DOWN
1. Rings from LOTR
2. Green or black
3. Plant's aesthetic
4. FOUR
5. Refer to
6. Post IRC
7. Cat or boy
8. NASA's rival
9. Salad cheese
10. Den
11. Greek exclamation
12. Blind eerie
13. Chris Brown's girlfriend
22. Net
24. "Say it ____ so"
26. Overly attentive
27. ONE
29. Said before the Iron Ring
30. Scrambled time
31. Boyfriend
32. Zeus' daughter
33. Fishing action
34. Plaza eats that rhymes
35. Culinary rat
36. FIVE
40. Chewy candy
43. Hemmed
44. Eliminate
46. Can be magnetic
48. Fable guy
50. ____ Carlo
51. THREE
52. Seduced
53. Plan B word
54. Cool
55. A Lady
56. Fox's talent hunt
60. Not that many
62. Other options?

Last Issue's Crossword Solution

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

Sudoku

#2015-02

NINA FENG
3B ENVIRONMENTAL

Fresh Frosh

	3	5			1	7		9
						1		5
2				5		4	3	
5			2	7	4			
			3	6	8			2
	5	1		3				4
9		4						
8		3	7			5	1	

Second-Year Slump

	3	5			1	7		9
						1		5
2				5		4	3	
5			2	7	4			
			3	6	8			2
	5	1		3				4
9		4						
8		3	7			5	1	

4YDP

	3	5			1	7		9
						1		5
2				5		4	3	
5			2	7	4			
			3	6	8			2
	5	1		3				4
9		4						
8		3	7			5	1	

Issue 3 Deadline:
Friday, February 27 at 6:00 p.m.
Send your submissions to:
iwarrior@uwaterloo.ca

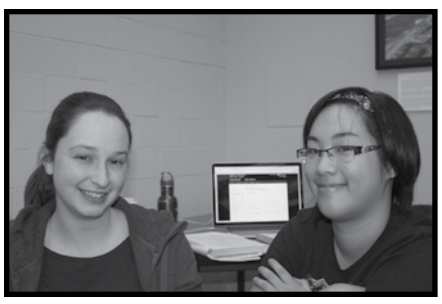
THE IRON INQUISITION
Bryan Mailloux, 1B Mechatronics

"Why did you join Facebook?"

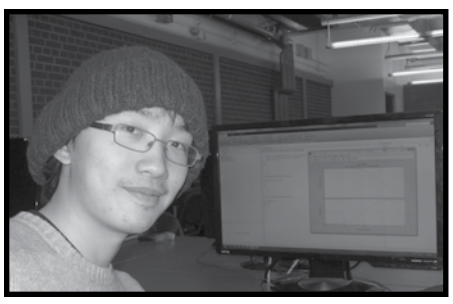
"A lot of girls had it."
Clutch, 1B Tron

"My mom told me all the cool kids had it."
Matt Cherry, 1B Mgmt

"It became the only way to communicate, and it was a big deal if you didn't have it."
Keshav Iyengar, 3A Mech



"All my rehearsal schedules were on Facebook."
"Peer pressure... and poking."
Teresa Lumini and Katie Chin, 3A Mech



"I thought the web design was interesting."
Yupeng Zhao, 4th year ECE Exchange

"To get info on assignments on my class group."
Kevin Mohamed, 3A Mech