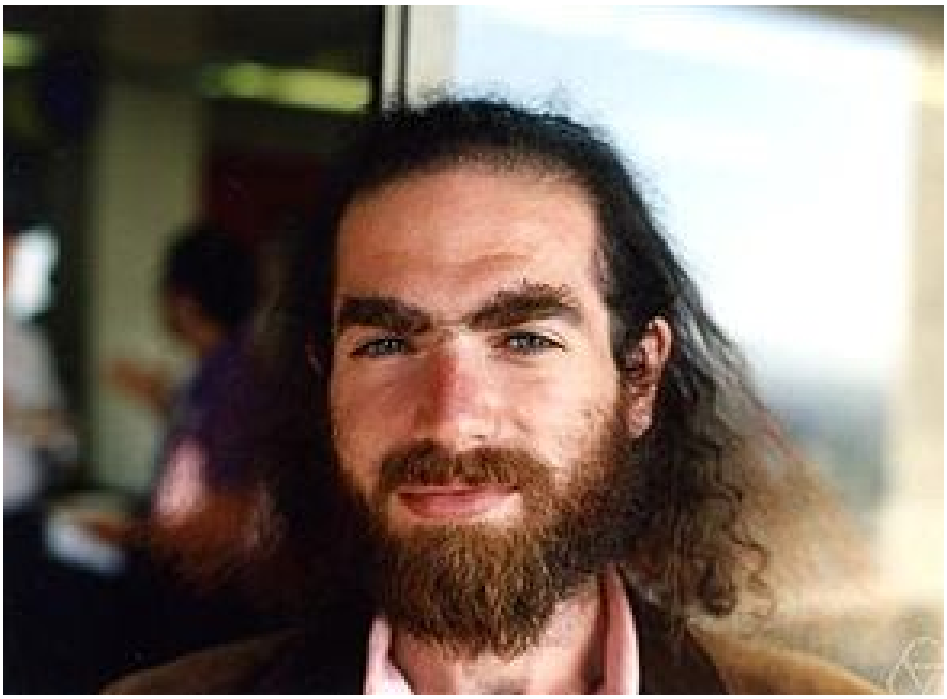


Issue 3, 2015

Paradox

THE MAGAZINE OF THE MELBOURNE UNIVERSITY MATHEMATICS AND STATISTICS SOCIETY

MUMS

PRESIDENT:	Tien Huynh tlhuynh at student.unimelb.edu.au
VICE-PRESIDENT:	Damian Pavlyshyn damian.pavlyshyn at gmail.com
SECRETARY:	Yuhe Gong ronziegong at gmail.com
TREASURER:	Aaron Chong awychong at hotmail.com
EDITOR OF Paradox:	Ben Hague paradox.editor at gmail.com
EDUCATION OFFICER:	Paul Nguyen paulpn14 at gmail.com
PUBLICITY OFFICER:	Michael Rixon mrixon at student.unimelb.edu.au
POST-GRAD REP:	Muhummad Adib Surani adib.surani at gmail.com
UNDER-GRAD REP:	Ben Hines bhines at student.unimelb.edu.au
UNDER-GRAD REP:	James F Boon jboon at student.unimelb.edu.au
UNDER-GRAD REP:	Britt Morison brittmorison at gmail.com
UNDER-GRAD REP:	Will Troiani william.a.troiani at gmail.com
UNDER-GRAD REP:	Daniel Johnston djlikesdjs at gmail.com
UNDER-GRAD REP:	Allan Pennings penningallan at gmail.com

MUMS WEBSITE:	www.mums.org.au
MUMS EMAIL:	mums@ms.unimelb.edu.au
MUMS PHONE:	(03) 8344 4021
MUMS TWITTER:	http://twitter.com/MelbUniMaths

In This Edition of Paradox

WEB PAGE: www.ms.unimelb.edu.au/∼mums/paradox
E-MAIL: paradox.editor@gmail.com
PRINTED: Monday, 27 July 2015
COVER: Grigori Perelman, the subject of this issue's biography by Ruwan Devasurendra

An infinite number of mathematicians walk into a bar. The bartender says: "What'll it be, boys?" The first mathematician: "I'll have one half of a beer." The second mathematician: "I'll have one quarter of a beer." The third mathematician: "I'll have one eight of a beer." The fourth mathematician: "I'll have one sixteenth of a" The bartender interrupts: "Know your limits, boys" as he pours out a single beer.

Words from the President

Hi MUMS, hope that you all had a good winter break and are ready to start a new semester with energy and passion!

The Annual School Maths Olympics (SMO) this year will be held on Sunday 16th of August. Letter entry forms have been sent out, the venue has been booked and M.U.M.S has received many replies from schools expressing their interest in joining the SMO. With questions being written, SMO will be big this year!

Currently, MUMS is working with STAMPS (Mathematics Postgraduate Student Society) to organize a Recent Graduate Seminar on Wednesday 17th September from 5:30 pm -7:30 pm. 3 recently graduated students from Masters to Post. Docs have been invited to share with us their journeys, their current employment and their tips for anyone who wish to find jobs after their degree. There will be great speakers, free food and alcohol, don't miss event out!

In mean time, if you would like to enhance your interest in Mathematics, making new friends and grabbing free junk food, come and join us at our weekly Friday Seminars!

— Tien Huynh

A newlywed husband is discouraged by his wife's obsession with mathematics. Afraid of being second fiddle to her profession, he finally confronts her: "Do you love math more than me?","Of course not, dear - I love you much more!" Happy, although sceptical, he challenges her: "Well, then prove it!" Pondering a bit, she responds: "Ok... Let epsilon be greater than zero..."

The Editor's Column

Welcome to Semester 2 to all the readers of this esteemed publication. Congratulations on making to Page 5. By now you would have enjoyed the words of our President Tien Huynh, whom I must apologise to for mis-spelling his name in the last issue[1].

In this issue, you will find an article detailing each of the members of the recently-elected MUMS Executive Committee. These are the people to talk to (as well as the Undergraduate and Post-Graduate Representatives) if you have any questions about MUMS, our events or anything.... Their email addresses are listed on Page 3, or you could find them at MUMS events or in the MUMS Room.

Also in this issue, Ruwan Devasurendra continues to keep Paradox in print with two more articles, continuing with the ongoing Interview and Biography series. This issue's interviewee is Alex Ghitza, a lecturer (amongst many other roles) from the Melbourne University School of Mathematics and Statistics. Paradox wishes to thank the School of Mathematics and Statistics, as without their assistance Paradox would not exist as a print publication.

This issue's biography is focused on the elusive but very talented mathematician Grigori Perelman, so far the only solver of a Millenium Problem, for his proof of the Poincaré conjecture.

Finally, another of Jinghan Xia's puzzles is provided for your entertainment.

Enjoy the issue and the coming semester.

— Ben Hague

So Descartes goes into a bar late one night for a beer. At closing time, the bartender makes Last Call and asks him, "Get you another?" Descartes replies, "I think not." And disappears.

[1] Another reason why it would be great to have someone help me with the editing of Paradox!

Interview with Dr Alex Ghitza: Mathematician and Champion of Open-Source Software

Dr. Alex Ghitza is a lecturer at the University of Melbourne who, among teaching and research, holds focused seminars and contributes to open-source mathematical software. He generously set aside some time to talk to me about his interests and his journey thus far.

What has been your journey in mathematics thus far?

I was an undergraduate student at McGill University in Montreal, and I started with a joint mathematics and computer science degree. As I was doing that, I realised that I was more interested in the mathematics, so I eventually finished my degree in that field. I then moved to Boston for my graduate studies, and then completed my Ph.D. at MIT before returning to McGill for a postdoc in number theory for three years. I was then Assistant Professor at Colby College in Maine, which is an undergraduate institution. Finally, I moved here in 2008!

What fascinated you the most about computer science and mathematics?

I guess this was mostly what I was exposed to and was studying before starting university. In fact, I was trying to decide between computer science, mathematics and physics. I was interested in all three, but I always had this problem with physics where we would always be ahead of the mathematics subjects. So you would do mechanics, but not have seen derivatives first. You

could start doing electricity and magnetism, and have to, say, calculate flux through a sphere without having any idea of multiple integrals, which is really what it is. So the physics was always ahead of the mathematics, and it was upsetting because they would hand your formulae for the flux through a sphere or a cone without actually explaining where they came from. Anyhow, doing all three of computer science, mathematics and physics proved to be too cumbersome, given the structure of the courses at the time, so I gave up physics.

In terms of mathematics and computer science, I was always interested in computers and programming, so it felt like a natural thing to look into. It also tends to make parents more relaxed when they know that you are doing a course that might lead to a job in the future! Most people don't start university thinking that they want to be a university professor!

As I went through my degree, I found that I really enjoyed the theoretical side of computer science, and eventually I took more and more mathematics subjects in my course. In my last year I realised that if I wanted to graduate with a double degree I would have to take five computer science subjects in my last semester. I looked at the list of the subjects and thought, 'I don't want to do any of those!' So in the last moment my course was decided to be a sole mathematics degree. Computers and computer science still play a big role in what I do; my research is in number theory, but there are aspects that are very computational.

On your website it says that you are an avid supporter of open-source software. Could you tell us more about your involvement?

Yes! I have been using Linux for a very long time as an OS, and I think what I like about it most is that you can tinker with it. When I started, you did mathematics the way you saw other people do it. You would see Mathematica and be enraptured by what it can do as you use it. However, there is something that you lose when you put all your hope in a product that is commercial. So Mathematica will never have the specialised stuff that I'm interested in, in number theory. They have great stuff for other things, and I know that Mathematica is used extensively in other fields, but for number theory, for the kind of things I do, it is difficult to use Mathematica, or even other packages such as Maple. Also, it is difficult to do any kind of pure mathematics in MATLAB.

So eventually I became aware that there was a number theory package called Pari that was available freely on the internet. It was started by a French man

in Bordeaux, and it had a lot of the things that I was interested in, so I used that quite a bit. It's been around for quite a long time, and it is still being developed actively, but they have a fairly small development team. Later on, I learnt of a mathematical software called Sage and back then it was something that you could use to do some really interesting number theory, but it wasn't so developed in other respects. This was during my postdoc, back when I had a little more time on my hands than I do now, so I got involved in this. It was great, because if something was not working or if you needed a new function, you could dive right in and create it. Sage had a lot of advantages over things that were there before, which made it much easier to just start doing stuff and start contributing to the existing body of work. One advantage is that the main language is Python, which is much simpler than C, which is what Pari is written in. With Python, you can just jump into it! It will take some time to learn how to do things properly, but at least you can start doing things.

The other thing is that Sage was started by William Stein and he had this idea that if he started from scratch, he would never reach where he wants to be. He was hoping to use this software to do his own research. He decided to not teach the computer, say, how to multiply arbitrary-length integers, but instead used pre-existing libraries that completed rudimentary operations and functions. Basically, he patched together these libraries and attempted to build on top of that. This introduces a whole lot of issues: you are on top of a pile of things and you are trying to keep your balance, but at least you are up there, as opposed to being at the bottom and trying to build up the whole foundation. Hence, I found it very useful and very interesting to contribute to Sage, whether it be by providing my own code, or by reviewing the code that others have written. I use it in my research and I use it when I teach, reasonably often when I need to show a graph of some sort to them.

Coming back to the idea of open-source software, I feel that it is important for research, particularly in mathematics because if I submit a paper and claim some theorems I need to write some proofs for those, and if I don't it's very likely that the referee will point out that I've forgotten something here! But if I do something that has a large computational side to it, instead of the traditional method of writing a small paragraph to describe my code, I can just make the code available. This assists researchers who may want to build on my own research, or take it in another direction; they need not start from scratch. A similar principle applies to data, especially in cases where it has taken a long time to collect it. Hence open source software aids diffusivity of results and accessibility of research for a large audience.

What was your doctoral research on?

It was on a problem that was in between number theory and algebraic geometry, and on mathematical objects called modular forms. These can be thought of in many ways. One way is to consider certain complex analytic functions with a transformation behaviour; another way is to think of them as functions defined on a geometric object or a certain curve. The problem that was suggested to me by my supervisor at MIT was to relate these modular forms to some algebraic objects that come more so from representation theory. There was some work done by Sayer that had done one level of this correspondence, and then the question was to try and build this up with more generality. I found it very interesting because I got to learn a whole lot of things from both sides.

In retrospect, I think my supervisor probably could have solved this problem very quickly, but once he noticed that the problem had an endpoint, he probably found that there were certain points along trying to find a solution that would serve a far more important teaching purpose for a student.

Apart from your subject lectures, you also conduct some seminars of your own. Could you please tell us more about these?

I find that seminars are a very good way to learn stuff. These are not so much the type of seminars where you have people coming in to visit and tell you about their latest research – you do learn things there, but not necessarily the details – but you can have working seminars where as a group we can decide that we want to learn about one particular thing. It's a little bit like lectures, but people take turns at the lectern, going through the text or journal article they are trying to read.

It's a very common method of learning very focused material that's used in Europe and in the US. If you want to learn something, presenting it to other people is a great way to do it, especially if there is that deadline of the next meeting pushing you to study and absorb information. Ultimately, you become critical in your readings, because your aim now aligns with the question of how you want to present this new concept to your peers.

These number theory seminars that Prof. Arun Ram and I have been running are either a way to learn some things, or we might present something that we are working on. My students have done this as well as they try to write up their thesis; oftentimes if they want to order their thoughts and gain the big

picture again, doing a talk can help.

The other thing is that we have Masters-level subjects, but we don't have anything beyond that. If there are three or four or five students interested in roughly the same kind of thing, then one thing you could do is go around and attend to these students individually, which can cause you to repeat the same pieces of information to many people on multiple occasions. Or, you could hold a seminar, which is an efficient way to pass on knowledge that is commonly sought.

Even for a MSc. thesis, you will have to go beyond the subjects that you take, and this is most definitely the case for a Ph.D. too. In some universities, they may have subjects dedicated for these areas, but we are trying to recreate that here with the seminars. They are much more flexible, as they are not in the handbook; we can put whatever we like in them, and vary the content as necessary.

Is there a problem in number theory that you are particularly interested in?

Ah…that is a good question! There are a couple of questions, but they are fairly ambitious…let me tell you anyhow!

One isn't a particular question, but it is a group of conjectures or some intuition that should lead to precise results – this collection is known as the Langlands Program, and I am interested in the number theory side of these things. On one side we have modular forms, on the other side we have certain actions of groups on vector spaces. More precisely, the groups we are interested in are Galois groups of extensions of the rational numbers: so take the rational numbers and throw in i. So throwing in i doesn't take me all the way to the complex numbers, but to a+bi, where a and b are rational. So this is a tiny little jump from Q to the Gaussian rational numbers.

Imagine throwing in i and the cube root of 2, which produces something more interesting. Try throwing in some other algebraic number, say, the fifth root of 17. So you can grow these extensions of the rational numbers, and what we're interested in is actions of the groups of transformations of these extensions of the Galois groups on vector spaces! This is the representation theory of these Galois groups.

Number theory, depending on how you count, is 2000 years old! It has spread so much, and into different areas of mathematics, and this is what I hope that my students can appreciate.

Were you always interested in teaching?

Yes! I mean, I didn't start out in front of 300 students; I worked my way up to that, otherwise it can be a little intimidating! But I enjoy teaching a lot, it's a lot of fun.

In some subjects it can be a little harder to do this, due to time restraints, but I try to have one lecture towards the end where I tell the students about something interesting, something that is beyond what they have seen, but not that far that it is unrecognisable. I haven't taught Real Analysis in a while, but when I was teaching that subject I would end by telling people about the Riemann Hypothesis. I do try to tell students about mathematical research and about the questions that mathematicians are thinking about, which are often not that far from what the students can see. So for me, research and teaching are fairly closely related. And even if you teach the same subject for a while, you keep learning new ways to do things and it keeps you entertained!

What advice would you give to students about studying mathematics, wanting to do research, or wanting to become a lecturer?

I would start with a disclaimer: when I was an undergraduate and when I went to do my Ph.D., the economy was doing well in Canada and the US. It's not necessarily at that point now. There are some practical considerations, as no one can predict what will happen in the next five years!

With that out of the way, doing an advanced degree in mathematics – or even in any field – requires very intensive work. So if you're going to do it, do it in something that you like, otherwise it's really going to be painful. Even if your do it in a field that you like, there may be times where you may be doubting things, but if you are really interested in it, that helps you along. Remember: the analytical skills and tenacity you develop during your degree will be in demand in the real world!

— Ruwan Devasurendra

There are 10 types of people in this world. Those that know binary, and those that don't.

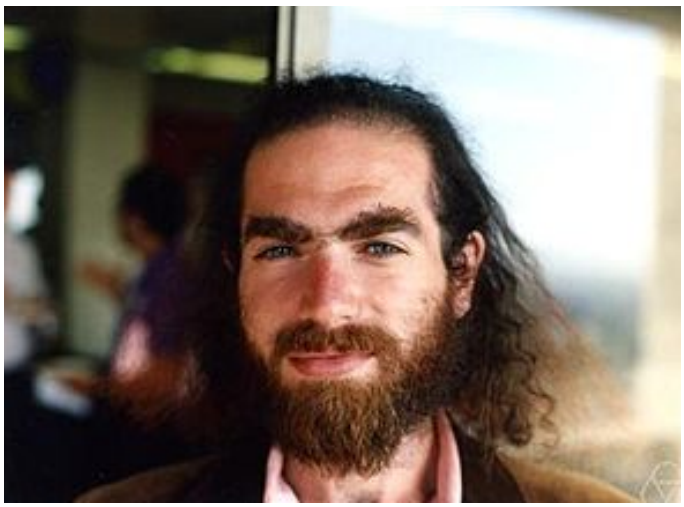
MUMS Puzzles

There are five owners who each have a dog. The dogs are a bit (just a bit) vicious and if left with a human that is not their beloved owner they will maul and kill the person, unless their owner is around to supervise them. The dogs are all brothers and will not maul each other. They are all on the same bank of a river where there is one boat that can only hold three (that is three creatures regardless of dog or human). The dogs will attack whether they are on the bank or in the boat. All the humans can row, luckily one of the owners has a dog that has been trained to row, but no one can swim. How can the owners and their dogs all cross the river (to attend a dog show of course!) without anyone being mauled?

(Solution is provided on Page 15.)

— Jinghan Xia

Biography: Grigori Perelman (1966–)



"I'm not interested in money or fame [...] I don't want to be on display like an animal in a zoo.

I'm not a hero of mathematics."[1]

[1]News.bbc.co.uk, (2015). BBC News - Russian maths genius Perelman urged to take $1m prize. [online] Available at: http://news.bbc.co.uk/2/hi/8585407.stm [Accessed 23 Jul. 2015].

Grigori Perelman is a reclusive Russian mathematician, whom is most well known for his proof of the Poincaré conjecture, which is the sole Millennium Problem that has been solved out of the original seven questions set by the Clay Mathematics Institute. Despite his landmark achievement, Perelman refused many of the subsequent accolades and now appears to have gradually withdrawn from mathematics altogether.

The shaping of a mathematician

Perelman's mother, Lubov, was offered a graduate study position in mathematics by Prof. Garold Natanson in the 1960s, which was significant at the time given anti-Semitic and anti-feminist sentiment during the post-war climate of the Soviet Union. Lubov politely declined Natanson's offer, explaining that "she had recently married and planned to start a family, and with that she accepted a job teaching mathematics at a trade school[2]".

Just over a decade later, she returned to Natanson and informed him that her son, Grigori, now a schoolboy, had excelled at a district maths competition, realising that "in the timeless scheme of Russian mathematics, he was ready to take up where his mother left off[3]". Natanson placed the young Perelman under the tutelage of Sergei Rukshin, the head of an intensive mathematics club. Interestingly, Rukshin was only nineteen years-old at the time, and had not previously led a club, but he did have an "outsize ambition and a fear of failure to match"; though Rukshin was still an undergraduate, "two afternoons a week, he put on a suit and tie and impersonated an adult math-club coach[4]". This ability to outperform one's age was not restricted to Rukshin, for by the time Perelman was a university student himself, he was able to sift through thousands of mathematical problems and select appropriate ones for club training – all at a fraction of the time it took Rukshin.

In 1982 the coach of the Soviet IMO [International Mathematics Olympiad] team approached Rukshin to submit his two best students for the competition. Perelman was Rukshin's first choice, and when he competed, he went on to achieve a perfect score and win a gold medal for his endeavours.

[2]Gessen, M. (2009). Perfect Rigour: A Genius and the Mathematical Breakthrough of the Century. Boston / New York: Houghton Mifflin Harcourt, p.17.

[3]Ibid.

[4]Ibid. p.22.

The Poincaré conjecture

The problem is stated thus:

1. In 1904 the French mathematician Henri Poincaré asked if the three dimensional sphere is characterized as the unique simply connected three manifold. [5]

2. If we stretch a rubber band around the surface of an apple, then we can shrink it down to a point by moving it slowly, without tearing it and without allowing it to leave the surface. On the other hand, if we imagine that the same rubber band has somehow been stretched in the appropriate direction around a doughnut, then there is no way of shrinking it to a point without breaking either the rubber band or the doughnut. We say the surface of the apple is "simply connected," but that the surface of the doughnut is not.

Poincaré, almost a hundred years ago, knew that a two dimensional sphere is essentially characterized by this property of simple connectivity, and asked the corresponding question for the three dimensional sphere (the set of points in four dimensional space at unit distance from the origin)[6].

Freedman (1982) had covered the case of the four dimensional sphere, and Smale (1961) tended to spheres of dimension greater than five; given that the case of dimension one was trivial, and that the case of dimension two was a known, classical example, the case of dimension three was the niche that conjecture aimed to fill.

Perelman's proof and aftermath

His initial proof was submitted as a series of online papers in November 2002 , in which he uses Ricci flow with surgery to systematically excise the singularities that arose from Richard Hamilton's prior attempt at using Ricci flow on the problem. Perelman's proof attracted much online attention, and by 2003 he was invited to speak at universities such as MIT and Princeton.

Three years later, his proof had been independently verified. He was awarded the Fields Medal in 2006, but he declined this award and stated, 'Everybody

[5]Claymath.org, (2015). Millennium Problems — Clay Mathematics Institute. [online] Available at: http://www.claymath.org/millennium-problems [Accessed 23 Jul. 2015].

[6]Claymath.org, (2015). Poincar Conjecture — Clay Mathematics Institute. [online] Available at: http://www.claymath.org/millennium-problems/poincar%C3%A9-conjecture [Accessed 23 Jul. 2015].

understood that if the proof is correct, then no other recognition is needed'. Perelman was awarded the Millennium Prize in 2010, but he refused this award (including the $1 million prize money) citing that the Clay Institute's decision to not share the award with Richard Hamilton was 'unjust'.

Perelman has since been absent from public mathematics. He no longer lectures, and he has not submitted any research papers since the Poincaré conjecture. His current status is a mystery: some contend that he is wearied by the lack of integrity by certain individuals in mathematics, others believe that he may be in self-imposed exile, working diligently on a whole new problem.

— Ruwan Devasurendra

MUMS Puzzles Solutions

Aa Cc Dd Ee || > Bb ||
Aa Cc Dd Ee || < B || b
A B C D Ee || > acd || b
A B C D Ee || < a || bcd
Aa Ee || > BCD || bcd
Aa Ee || < Bb ||Cc Dd
Bb Ee || > Aa || Cc Dd
Bb Ee || < Cc || Aa Dd
bce || > BCE || Aa Dd
bce || < a || A B C Dd E
b || > ace || A B C Dd E
b || < B || Aa Cc Dd Ee
|| ¿ Bb || Aa Cc Dd Ee
Where A is the owner of the first dog, a (which can row) B is the owner of the second dog, b, etc.

Getting to Know the New Committee

As has been tradition for the last few years, I have asked the Executive Committee (and myself) to write a little about themselves. Due to the early election called by previous President Mel Chen the new committee has had a bit more of a chance to be on the committee before writing this article. I hope you enjoy learning a bit about the current MUMS committee.

Tien Huynh – President

Hello MUMS, my name is Tien Huynh and I am currently a 3rd-year Science Student, majoring in Statistics and Stochastic Processes and Pure Mathematics.

Before transferring to do Mathematics, I did Biomedicine for 2 years. It was a big decision for me to transfer from Biomedicine to do Science - Mathematics especially because I am an international student. It was pretty scary at the time, because I knew that studying Mathematics would put me at risk of having to go back to Vietnam. But I don't regret the decision a bit now. Studying maths have been giving more energy to live life because maths is what I am passionate about.

I love working with other passionate friends on a maths problem, it is the thrill of working on a challenging maths assignment one or two days before it is due that make like worth living. . . haha.

Beside my passion for mathematics, I choose to run for MUMS president because I want to inspire other international students like me to look up. Due to lack of English command and the financial burden from international student fees, most of my international student don't believe that they can achieve big, I would like to show them that they can. If I can be ambitious, a high achiever despite being an international student, so can they!

In conclusion, I would like to say thank you to all MUMS committee and other active members for their contribution in organizing events. They make MUMS possible! I look forward to see what MUMS can achieve in the 2nd semester!

Damian Pavlyshyn – Vice-President

Last year, as the MUMS Education Officer, I had a great experience working with the Maths Department and MUMS members organising the weekly seminars and other events, so I've stayed with the committee in order to continue that work as the Vice-President.

I spent my undergraduate contriving ways to stave off the decision of whether to specialise in probability or pure maths. After one semester of my Master's, I'm happy to say that my love for both fields is undiminished and that my research in coupling methods for point processes has allowed me to maintain this wilful indecisiveness.

When I'm not doing maths (or attending the many excellent MUMS events!), you might find me hiking through Australia's wide expanses or sitting, crammed into the audience of Melbourne's tiny theatres.

One way or another, though, I hope to see many of you during this coming year!

Aaron Chong – Treasurer

I'm currently studying a Master's specialising in Statistics and Stochastic Processes. I've always been a maths person, so I've been involved in MUMS and its activities ever since I entered the university, and can be seen at a variety of events (including the seminars as well as the major events). I am also a frequent user of the MUMS room, and can be found there hanging out or using the computers.

As the Treasurer I manage the society's finances, including applying for union grants and sponsorship for major events (SMO, UMO, Puzzle Hunt). Actually, I've been in the committee before a few years ago, as the secretary - my most notable achievement then was maintaining the Problem of the Week (since neglected). I decided to take on the role of Treasurer because I wanted to become involved in the society once more before I graduated, and because being Secretary is a pain.

Yuhe Gong – Secretary

My name is Yuhe and I am currently in my third year of a Pure Maths major with a Concurrent Diploma in Informatics. I am passionate about mathematics and hence joined the committee of MUMS to hopefully spread the love of maths around. Aside from maths, I have a vast range of interests including visual arts, photography, history, literature and travel. Hopefully I will be able to combine mathematics and one of my more creative interests in my future career!

Paul Nguyen – Education Officer

Hi ! I'm Paul, the new education officer for the MUMS committee of 2015-2016. I like math! I am very excited to be part of the new committee and about what I can offer MUMS. I got involved with MUMS due to my love of math! And because of the friendly environment that the MUMS club offered.

I ran for committee so that I could contribute and be apart of something that was much bigger than I was, MUMS was about math and math is something I care about. In addition, being part of MUMS has also assisted me in doing better at university and has provided me with heaps of help as to what I could achieve with my degree in mathematics.

I am currently in my second year studying a Bachelor of Science majoring in Mathematics. My interests are guitar, indie music, soccer and applied mathematics.

Michael Rixon – Publicity Officer

Hello Paradoxies, I am a 2nd-year Science Student from the realm of Melbourne University and I look to one day level up to the coveted Master's rank of the Maths and Stochastic Processes.

In the set of the maths field, there is neither an upper bound nor supremum to its awesomeness. However once I have axed through its axioms and hyper thought out its hypotheses, there is a remainder of time left, which one diverges into

a harmonic series of activities including guitar, tennis and eating chocolate.

In conclusion, don't be irrational or obtuse; rather coordinate your undivided attention to mapping through each and every element of this Paradoxedition. The product of combining exponentially powerful and complementary ideas cannot be denoted in words.

Enjoy!

Ben Hague – Paradox Editor

Hi, having been Editor of Paradox for the last year you have probably become all too accustomed to reading my editorial waffle and musings. For those who are new to Paradox, or skip over the Editor's Column each issue, I am an Atmosphere and Ocean Sciences student in my Fourth Year of Undergrad, having spent some extra time completing the Concurrent Diploma of Mathematical Sciences, specialising in Statistics and Stochastic Processes.

Over the last year, I appear to have, with a few others, taken over the (unofficial but enjoyable) role of 'Quizmaster' for the Trivia Nights. I have also kept berating people to write more articles for Paradox, which I will continue to do for as long as my reign persists, or people suddenly flood me with articles, whichever happens first...

Over the next year I will continue to provide you with Paradoxen and hopefully write some more trivia questions.

— The 2015-6 MUMS Executive and Ben Hague

Did you hear about the man who got cooled to absolute zero?
Hes 0K now.

Paradox **wants you!**

Want to share your interest in maths and stats with others?
Paradox is always on the look-out for contributors. Whether it is an article on an area or application of maths and stats that interests you, an interesting maths-related film or book you enjoyed that you would like to review, or a summary of your own or others' research, Paradox would love to hear from you. Paradox is also recruiting editors to join our editorial team, to help proof-read and typeset articles. No experience required – just a keen eye for detail and enthusiasm. Experience in LaTex desirable for typesetting roles but some brief training could be provided.
Email: `paradox.editor@gmail.com` for more information or to express your interest.

A stats professor plans to travel to a conference by plane. When he passes the security check, they discover a bomb in his carry-on-baggage. Of course, he is hauled off immediately for interrogation. "I don't understand it!" the interrogating officer exclaims. "You're an accomplished professional, and now you want to destroy that all by blowing up an airplane!" "Sorry", the professor interrupts him. "I had never intended to blow up the plane." "So, for what reason else did you try to bring a bomb on board?!" "Let me explain. Statistics shows that the probability of a bomb being on an airplane is 1/1000. That's quite high if you think about it - so high that I wouldn't have any peace of mind on a flight." "And what does this have to do with you bringing a bomb on board of a plane?" "You see, since the probability of one bomb being on my plane is 1/1000, the chance that there are two bombs is 1/1000000. If I already bring one, the chance of another bomb being around is actually 1/1000000, and I am much safer..."

Paradox would like to thank Ruwan Devasurendra, Tien Huyng, Damian Pavlyshyn, Aaron Chong, Yuhe Gong, Paul Nguyen, Michael Rixon and Jinghan Xia for their contributions.