NeMeSiS News 2013

Newsletter of the

ANU-AAMT National Mathematics Summer School

Dynnargh dhis

Welcome to the 15th edition of NeMeSiS News! We hope that you enjoy reading it.

After 15 years of NeMeSiS News I think that it is time to reflect on where the newsletter has come from and where it should go. The aims of the newsletter have been: to allow NMSS alumni to stay in touch; to entertain; and to raise funds for NMSS.

So: what do you think? We would like to hear your views and ideas.

Technology has moved on since 1999 and there are possibly better electronic ways of keeping in touch. Would you prefer to receive this newsletter electronically? If so, please send me an email letting me know. Some NMSS year groups have set up Facebook pages. Should we set up something similar for all NMSS Alumni? If so, how do you envisage it working?

On the other hand, funding for NMSS has not changed since 1999. NMSS still receives no government or corporate funding, and is still looking for ways to raise money to allow it to continue. Do you know anyone (corporate or individual) who might be interested in supporting NMSS financially? Or do you have suggestions for how NMSS could obtain some sponsorship or funding?

The contents of this newsletter follow this reflective theme, with people reflecting on their experiences at NMSS and beyond. Thank you to everyone who contributed.

I am always looking for contributions for NeMeSiS News. I want it to be as relevant, enjoyable and entertaining as possible, so please email me with any feedback, ideas or submissions that you may have. I would love to hear from you, and I promise to reply to your email!

Merryn Horrocks (editor)

merryn.horrocks@gmail.com

NMSS students in Manning Clark Centre Theatre 1 during an afternoon lecture. Michael Smith

CAN YOU HELP?

As you are aware, NMSS needs all the support that you can give. The school only remains viable because of the donations of past students and their parents. I urge you to make a tax deductible donation if at all possible.

BSB: 082 902 (NAB)
Account: 674507553
Name: ANU General Account

Please put 'NMSS' and your full name in the reference. If you wish to receive an invoice for tax purposes please also email nmss@maths.usyd.edu.au with your name, address, the amount and date of the transaction.

Please contact the Director, Leon Poladian, at l.poladian@maths.usyd.edu.au for alternative methods of payment.

Thank you for your continued support of NMSS.

Puzzles

A school of 500 students has 500 lockers all in a row. Initially, all of the locker doors are shut. The first student comes by and opens all of the doors. Then the second student comes by and shuts every second door. Then the 3rd student comes by and toggles every 3rd door, and so on, until the 500th student who comes past and toggles only the last door. Now, which doors are open and which doors are shut?

(thanks to Garry Webb for this puzzle)

Consecutive fifth powers of positive integers are always relatively prime; that is,

for all $n > 0$, n^5 and $(n + 1)^5$ are relatively prime.

Are $n^5 + 5$ and $(n + 1)^5 + 5$ always relatively prime? If not, for what values of n do they have a common factor, and what is that factor?

(Sourced from http://www.qbyte.org/puzzles/puzzle06.html)

NMSS and Beyond ...

Back in January 1997 I was one very excited sixteen year old as I headed off to NMSS. Like most of you, I loved mathematics, and the chance to go to Canberra and do some more challenging and much cooler maths over my summer holidays thrilled me. (It's funny how the rest of the population would see this as a punishment).

It's been a little while since then and I'm still great friends with a couple of my fellow maths geeks from NMSS '97. Although I no longer get to do the cool, cool maths you see at NMSS, those couple of weeks inspired me through yr 12 and remain memorable to this day.

I completed a BSc in pure mathematics at Melbourne Uni. It had its ups and downs, with interesting subjects like: knot theory, metric spaces, number theory (my favourite) and integral transforms and asymptotes – which I 'enjoyed' so much I did it twice…

After I completed my degree, what else could I do but get a nice academic job? That's what you'd think, right? Well I decided to pursue some other interests: Gymnastics Coach; Landscape gardener; Door-to-door

Salesman. Oh yes, the world is your oyster when you have a Science Degree. But I thought it was about time I put that into practise and after many years of training I now find myself as a fully qualified JBAC (Joint Battlefield Airspace Controller) in the Royal Australian Air Force; more commonly known as an Air Traffic Controller.

As an Air traffic controller in the RAAF I do everything that a civilian controller does with some added fitness and weapon handling requirements. Recently I controlled out of a camouflaged tent in the middle of northern Queensland at a self-sustained airstrip. This was to facilitate the final stages of training for C-130 Hercules pilots before they deployed to the Middle East.

Judgement, priorities, the ability to look at a number of scenarios happening simultaneously, and thinking several steps in advance are what makes a good Air Traffic Controller. It's a career that is always challenging, with problem solving at the heart of every decision. It certainly wasn't a job I thought I'd be doing when I attended NMSS but it was a job opened up to me by my love of mathematics and my hunger for problem solving which was ignited way back - probably in a Terry Gagen lecture…

Flight Lieutenant Leigh Angus

It's been 12 years since I attended the maths camp that changed my life. Since then, I've changed courses and direction more times than I care to remember, but finally settled on economics and computer science.

After two years of full-time teaching economics at Melbourne Uni, I feel as though I've come home now that I am doing a Ph.D. in Mathematics. My research involves modelling human behaviour in emergency evacuations. I also work part-time for IBM Research in natural disaster management.

I may not know where life will take me next, but I certainly know the events which got me to where I am today; the most influential one being NMSS. I hope that all my fellow NMSS alumni are equally happy with where life has taken them.

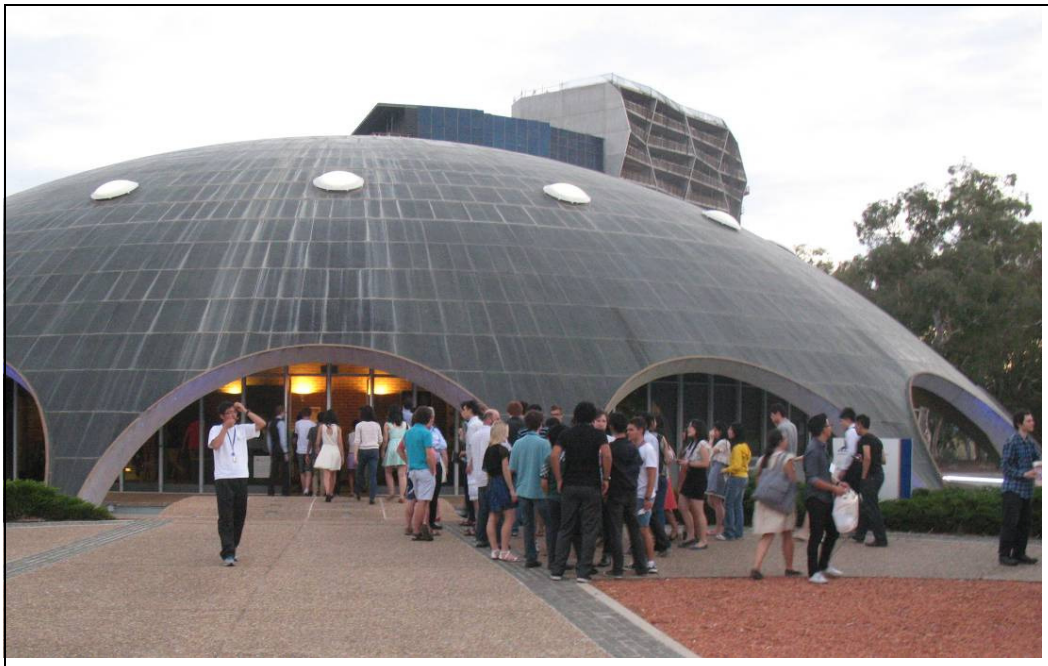
Felicia Eng

Matthew Fitzpatrick went to NMSS in 2004 and 2005. Later, he returned as a tutor for 2010-2012. He is currently researching part time towards a PhD. in Statistics at the University of Sydney, whilst working full time at Westpac. His research is on Mixture Models and Panel Data. Panel data is discrete observations for a large population, observed over time. Mixture Models are simply a mixture of models, each of which describes how the data moves or how the data is distributed (e.g. data about people's heights may be a mixture due to the distribution of boys' and girls' heights).

At Westpac, Matthew works in Risk Analytics. Here he develops models to assess the likelihood that a large company will not be able to pay back its loans. He works with other mathematicians to come up with creative ways of analysing the entire Institutional Bank portfolio to figure out which areas of the economy are the safest to lend money to.

In his spare time, Matthew is the CEO of a non-profit managed fund called Investing for Charity. This is an open source business, which shows all of its investment research and presentations to the public and invests donations before passing all the money on to Australian charities.

Matthew Fitzpatrick



Support for Bushfire Victims

Staff and students at NMSS 2013 supported bushfire victims in Western NSW.

Severe bushfires occurred in NSW in January 2013 and damaged the ANU's Siding Spring Observatory near Coonabarrabran. They also damaged and destroyed homes and properties in the area.

NMSS 2013 staff and students contributed $600 to the ANU's appeal to support ANU staff who lost their homes and possessions during the fire.

Teaching Mathematics

Robbie Gates said this year, while teaching the Number Theory course, that much of the motivation for doing Number Theory is simply because it is fun. I do maths and I teach maths at a high school, mostly because it is fun to do so. More fun than I actually could have ever imagined when I was a high school student myself.

The classrooms of today just look so radically different from the classrooms that I sat in, with their lone chalkboards. On some days, of course, they are essentially the same, but mostly, they are radically different. For clever students, who have always loved mathematics, I suspect it's all neither here nor there: if they are lectured en masse with chalk and still pictures, they inevitably understand it and love it anyway. But for many students, using technology to help them see things and play with ideas allows much more access to this abstract and baffling subject. And thinking about how to effectively use that technology is one of the really fun things about teaching.

There are interactive applets that let you take different shaped containers, virtually pour water into them and see how the height of the water in the container can be graphed. You can turn the tap more or less, pull a plug to let the water out, get people to dive into the water etc. Fun right? Back when I was at school, you had to just think about it and then draw the graph or the container.

I love that you can investigate reducible home loans on a calculator rather than having to trawl through pages of calculations (after pages of calculations it's easy to lose sight of the big picture!). I love that it's so easy to see areas bounded by graphs actually being rotated about an axis to form a solid of revolution, or to see a locus being traced out in front of you, or to see the shapes of the different conic sections as the eccentricity changes.

I love that there are videos on the internet, such as those from the Khan Academy, which students (and teachers) can learn from at home. I also love that it's so easy to create your own videos to go through a proof, or an example, or an exam paper, or a set of instructions, or an individual's homework. What's even more fun is then going back and looking at old technology, such as how slide rules were used to calculate 2*3 – it becomes so novel and so educational.

Being in the classroom, teaching mathematics and watching students engage with mathematics, is such a great way to spend the day. Moreover, thinking creatively about ways to get others engaged with this wonderful subject is a great way to fill your spare thoughts, and there's certainly no end of ideas to explore or fellow mathematics teachers to share in the exploration.

Thanom Shaw

Professor Jon Borwein gives the Academy of Science Lecture

Who has Michael Smith sketched?

Reflections on NMSS 2013

NMSS2013 was Leon Poladian's first year as director. Congratulations, Leon, on not only surviving the experience, but on making these two weeks such a success.

NMSS Staff and Students

This is the best schooling I have ever had. I have always loved maths and, everything I heard and saw at NMSS still made a very strong impact. The lectures were fun. Not only was the topic itself interesting, but the lecturers taught with such passion.

As a student who was raised under an Asian education system, this summer school brought me something far more than just fun and joy. I learned that maths is about understanding. I have spent a lot of years doing questions for the teachers to tick the boxes without having the opportunity to understand. I appreciate that people gave me time and allowed me to ask questions in this summer school so that I could really understand the maths.

I also learned that NMSS teaches about life. I am much more prepared to face the upcoming year. By using a university students' timetable, we learned a little bit more about college and about how things actually go in university. It also made me feel like I am unsure about the decisions I must make for my future life. However, as my tutor told me, seventeen is too young for a person to have a clear idea about what she wants in life.

One reason for this summer school being so awesome is that people share the same interests. When we were gathered, I felt that I belonged to the community. To me, this was a very strange but beautiful feeling; to no longer be the one who is always left out.. On the last day, I could not hold my self but burst into tears when I saw the bus carry away the dear friends I had made at this summer school. I have never had such an experience before: meeting a group of total strangers who, within two weeks, became dear friends who will remember me and whom I will remember.

There was one particular talk I would like to mention, given by one of the tutors. She was working in education research. I had always wondered, "Why does school have to be boring? Why can't people have fun and also learn something?" It turns out, there are many people wondering about this and they try very hard to improve the education system. This is something that I have never known, and I really appreciate them.

Yvette Su

My last two weeks spent at NMSS have been thoroughly enjoyable and informative. The lectures were interesting and well-structured and the associated problem sets were at the right level and so varied that we never got bored. Tutorials in small groups were fun and we could obtain more individualised help in the evening study when even the lecturers came along to guide us and discuss mathematics.

Before the camp, I never would have realised there were so many people like me in Australia. It was so easy to make friends and social time in the evening was one of the best things about the camp. We played pool, table tennis, board games and card games, and even completed a puzzle!

I am so pleased that my application was successful and would love to spend another two weeks of my holidays at NMSS. For anyone who enjoys extension in mathematics and problem solving, this is the best holiday activity ever and an opportunity not to be missed!

Andrew Haselgrove

My first experience of NMSS as a tutor was very different from my experience there as a student. I loved attending NMSS as a student: I made so many friends and learnt so much from so many outstanding people. When I learnt I was returning as a tutor I felt great excitement mixed with nervousness. However, my fears left almost as soon as I arrived. The two weeks of NMSS 2013 proved to be the most intellectually challenging, and the most enjoyable of my life.

The very best thing about being a tutor is being able to witness and encourage the minds of brilliant students. As a tutor, I got to see and hear about a large variety of fantastic ideas and perspectives that I hadn't even considered. It was really great to see the students thrive and develop in the NMSS environment.

Being a tutor gave me a much greater appreciation of the amount of work that goes into making sure the camp is the best it can be. So I'd like to say congratulations to Leon, Leanne and the rest of the team who put so much time and effort into NMSS.

Being a tutor was extraordinarily enjoyable and rewarding. I met another group of brilliant people, did a lot of maths and had more fun than I had dreamed of. I really feel so privileged to again be a part of NMSS.

Melissa Lee

Staff at NMSS 2013, from L to R: Garry Webb, David Harvey, Damjan Vukevic, Thanom Shaw, Sean Gardiner, Justin Koonin, Brendan McMonigal, Melissa Lee, Fiona Skerman, Leon Poladian, Olivia Smith, Ty Ghaswala, Michael Smith, Norm Do, Edwin Spark, Leanne Rylands, Robbie Gates