

# European Girls' Mathematical Olympiad

## an unofficial UK student report

Murray Edwards College, Cambridge

10<sup>th</sup>–16<sup>th</sup> April 2012

### Introduction

Once upon a time, in a galaxy far, far away, in Cambridge, the final frontier...

So, you've all heard about EGMO 2012, the inaugural Olympiad solely for those with a higher than average number of X-chromosomes, which took place in Murray Edwards College, Cambridge, the final frontier.

We are the Egmaids of UNK:



- Natalie Behague (like 'behave' with a 'G'), UNK 1
- Katya Richards (also on this year's IMO squad), UNK 4
- UNK 2, Lizzy Lee (who dislikes excessive commenting on her rather long hair, so we won't mention that here)

- UNK 3, Ella Mi (half of the twins Ella and Emma, although there are scurilous rumours of a third twin Enna Mi. Perhaps unsurprisingly, she is never talked about...), and last but not least...
- Emily Bain (who dislikes excessive commenting on her pink hair, so we won't mention that here either), the reserve.

Our leader was the lovely Alison Zhu, and our deputy leader the equally lovely Jo Harbour.

## Tuesday 10<sup>th</sup> April

The Egmonds arrived at Murray Edwards College in dribs and drabs on Tuesday afternoon. The pink-haired reserve arrived late, unfortunately delayed by a body on the line. She claims this had nothing to do with her.

Most of the afternoon was spent lonely and alone in the Dome. Teams were supposed to socialise here, but our sole companions were the muffins, who, incidentally, were very tasty. We were disappointed to discover that the EGMO rucksacks given to us on arrival were neither psychic, nor could open doors. However, they did contain a number of small gifts, the most exciting being the UKMT freebee Frisbee. This we used for sophisticated experiments on the nature of aerodynamics and gravity.

Eventually, we were joined in the dome by the Luxembourgeois, whom we taught to play cheat. In retrospect, we are not entirely certain whether this was the best idea. At around 6:15 all the other teams magically appeared, just in time for dinner.

After eating, we headed down to the games room where we were greeted by an awesome 1000-piece MC Escher jigsaw puzzle. Some bemoaned the lack of colour; others were put off by the high proportion of plain white pieces; and some disliked jigsaws altogether. But we are the Egmonds of UNK, and we are up for any challenge, and so an evening of ordering various grey pieces of cardboard began.

Natalie and the one with pink hair were the first to grow weary of this cardboard sorting, and joined a group of Poles and Luxembourgeois for a game of anarchic Jenga, otherwise known as Mikado, Morocco or pick-up-sticks. The term anarchic Jenga was coined by none other than James Cranch, who, to ensure that EGMO wasn't left a single night without first aid cover, rushed all the way from Sheffield to Cambridge at a moment's notice. Travelling by foot. Barefoot. In the rain. We appreciated his heroic efforts, and also his conversation, learning in the course of the evening that he is both UNK avuncular and has no friends, at least according to his lanyard.

## Wednesday 11<sup>th</sup> April

We were up bright and early Wednesday morning, resplendent in our rather fetching subtle pink T-shirts, ready for the opening ceremony. Whilst the T-shirts clashed horribly with both our green lanyards and the Union flag in our team photograph, the one thing they didn't clash with was the Polish leader, the Poles having adopted the convention of girls in blue, boys in pink. In fact, the two pinks went so well

together that we adopted the Polish leader, Michał Pilipczuk, into the UNK fold for the rest of the day.

After a blissfully short opening ceremony, we spent the afternoon participating in various sporting activities. This was more fun than it sounds and, after giggling our way through a blindfolded obstacle course, boules, rounders and ultimate frisbee, we felt we had fulfilled our sports quota for the entire year. Whilst enthusiastic, we must admit we were slightly lacking in skill, especially when compared to members of the Hungarian and Ukrainian teams who could hula-hoop and hula-hoop and just keep on hula-hooping – useful in everyday life, and invaluable in the obstacle course where precious seconds were deducted for every hoop revolution.

At some point between the ceremony and the sports, whilst playing cards in the walkway, the UNKs were approached by Ceri Fiddes, the competition organiser. She wished to know if any of us would be willing to join her at an interview for BBC Radio Cambridgeshire after the sports. Natalie, naïve excitement in her eyes, leapt at the chance. Suffice it to say that with questions such as ‘Is Maths geeky?’ and ‘Are you a clever-clogs?’, the interviewer was clearly no Mathematician.

## Thursday 12<sup>th</sup> April

Thursday’s second most important event, was, of course the first exam. It is tempting to follow the lead of a certain other student report, and skim over the questions very briefly:

Question 1 was a geometry problem, solved by only one UNK but a large number of other participants. Natalie surprised herself by actually finishing a geometry question, something never achieved in practise papers.

Question 2 concerned the possible number of rows of a table with  $n$  columns, such that the maximum difference between some two corresponding elements in different rows is exactly one. Every UNK claimed this question, but all bar Katya had, sadly, made one of a variety of fatal flaws.

Question 3 contained a fun equation. Not much to say here.

Question 4 was the first of three tricksy problems posed by the Romanian leader, Dan Schwarz (the others being 6 and 8). Only two contestants scored any marks on this question.

Katya decided to name the questions after rabbits fish: adorable, fluffy, hugable and sick-making, respectively. This bijection seems entirely appropriate given that “f’s look just like huggable dinosaurs!” according to Lizzy.

So, onto the most important event of Thursday: cake! Yes, today was Natalie’s eighteenth birthday and therefore there was an abundance of cake. Chocolate cake and cupcakes at lunchtime, and another birthday cake, of which more later. A chocolate bar with an appropriate UK Olympics wrapper was a gift from the guides; this was also given not so appropriately to Elise, the Belgian contestant whose birthday was on Thursday too.

Lunch was spent discussing all the exciting possibilities open to Natalie now that she is eighteen, such as getting a mortgage, buying a lawnmower, marriage – all suitable things to do in the middle of an Olympiad.

Our yearly quota of vitamin D was provided by an afternoon spent playing cards in the sunshine. Here is a brief step-by-step guide to Egmoid card games:

1. Work yourself up into a suitable hysterical state;

2. Take great glee in burning cards (games are accompanied by general pyromania and other insane tendencies);
3. Keep playing until Natalie loses. Jake, the college cat, made several attempts to sit on the cards, but was successfully distracted by an EGMO egg. These UNK mascots were prizes awarded in the quiz at the pre-EGMO (Pregmo) camp, and were priceless genuine polystyrene. Lizzy's egg made a great sacrifice and was left with telltale battle scars after Jake was through with him.

The only other vaguely notable event was an attempt by Ross Atkins, the semi-bearded Australian staff member, to interview us for the daily bulletin. As our answers were punctuated with shouts of 'cheat!', he felt, surprisingly, that another team would make better interviewees, and left to find one.

A while later, after dinner, the UNKs roamed the walkway, likened unto the 4 Egmonds of the Apocalypse: War, Famine, Pink and Cake. The cake in question was a large birthday cake, slightly squashed from a journey on the London Underground, and innocent passers-by were accosted and given an impossible choice: Cake? Or death?

When the supply of cake had run dry, a group of British (and an Australian) convened in the walkway, and talked late into the night. Or at least until about half past nine, as an early night was needed before the second exam.

## Friday 13<sup>th</sup> April

So, Friday dawned and brought the second exam with it. This time Lizzy named the questions: paper-waster, badly-worded, annoying and impossible. She evidently liked the paper.

5 was a number theory question that needed careful handling. Some UNK marks were picked up here. Question 6, concerning friendships on the famous social-networking site, Mugbook, prompted the wonderful comment from Katya, 'best friendship is like a directed graph.' Jo agreed that among the girls in the class she teaches, that is most definitely the case. Question 7 was more geometry and question 8 was indeed impossible.

In the afternoon it had been arranged for all of the students to enjoy the touristy delights of Cambridge. This began with an absolutely amazing mock courtroom scene in Cambridge's tourist information centre. The hi-tech animatronic puppets were incredibly lifelike and the whole experience was fascinating and not in the least bit patronising.

This was followed by a chauffeured punt trip down the river Cam. With bright, if cold, weather and supplies of chocolate, this was quite enjoyable, marred only slightly by our jaded punter. The contradictions between his stories and those of nearby punters raised his and our eyebrows on several occasions. The one thing that impressed him was us responding to 'some past students have put traffic cones on top of King's College Chapel' with 'yes, we know one of them!'

On arriving back at Murray Edwards, we were ushered into a talk by a woman from HP (the company, not the sauce or fictional wizard). She was enthusiastic and interesting, explaining algorithms for spotting patterns in data.

During dinner, James regaled us with stories of encounters with various dubious characters, while Jo chastised the UNKs for laughing - "You'll only encourage him."

We were also informed that whilst we were being pushed along a river, Andrew Carlotti had turned up at Murray Edwards, clearly having forgotten that he was no longer Andrea, the UK's emergency reserve.

The evening's entertainment was a high-energy Ceilidh, which left everyone feeling happy but thoroughly exhausted.

Heart-warming fact of the day: the beautiful flowers left in the public areas of Murray Edwards College were freshly picked every day by the gardeners for the benefit of EGMO. These flowers were as good as or better than any found in a professional arrangement.

## Saturday 14<sup>th</sup> April

On Saturday, we woke up at 7.30 to no food. The plan had been a lie-in followed by brunch, but unfortunately we skipped the first part. No matter, because today was Ross Atkins's birthday and he had come prepared for cake! Well, in truth, he had just been that morning to 'some strange supermarket where everything was organic and expensive' (i.e. M&S) and bought cake ingredients there, but that was preparation enough. We headed to our tiny student kitchen, pilfered some student kitchenware, and got baking. Well, microwaving.

Recipe for Cross Catkins Cake:

1. Find a suitable vessel or two.
2. Break eggs on (different) convenient surfaces and pour in.
3. Add flour, baking powder, sugar, cocoa powder, milk and oil (to bowl as well as worktop).
4. Observe the dollops of mixture on the floor.
5. Add more cocoa powder.
6. Remove bits of eggshell from mixture.
7. Add fingers to taste.
8. Stick in microwave for a while until nicely gooey.
9. Meanwhile, mix milk, sugar and cocoa powder to make icing. The consistency should be somewhere between gravy and custard. If you are not sure, add more cocoa powder.
10. Ice half the cake (for obvious reasons).
11. Et voila! Now go and feed people.

And feed people was what we did! Once more, (and not for the last time), we roamed the corridors giving people cake. People were slightly more suspicious of this cake, which closely resembled waterlogged soil, but all it took was one taste of the warm, chocolatey goodness for people to be converted. This was not just any cake. This was an M&S cake. (We apologise to all the people who ate the cake and, after reading the recipe above, are now regretting it.)

Whilst all this was happening, the pink haired one had been out in Cambridge with the Irish team, and, ignorant of the cooking going on, returned with another two cakes. These were carefully topped with melted chocolate and walnuts to create Ross's likeness, and proudly presented to him after brunch.

Today was also co-ordination day, and in an effort to prevent contestants working themselves up into a frenzy staring at the live results, we all headed off on a mathematical tour of Cambridge. Sally-Anne, the UNK guide (or GUNK), took the UNKs and the Irish, who were fast becoming the best of friends. One of the most interesting sights was actually on a slight detour from the prescribed route, to visit the zoology department and Sean Finnegan, the magnificent Finback whale skeleton.

And then back to Murray Edwards for more – you guessed it – cake! We seemed to be developing quite an obsession. Lemon drizzle cake this time, and a considerably less chaotic cooking style. We did, however, somehow manage to put it in the wrong part of the oven so it failed to cook. Realising our mistake an hour or so later, we transferred it to the right part and headed off to a talk.

The talk, by Romanian leader Dan Schwarz, was genuinely fascinating (as opposed to the *fascinating* courtroom show). He discussed two Olympiad problems: the infamous windmill problem from IMO 2011 and another combinatorial question of his own. Watching the windmill problem being solved, a good few months after first hearing it, was particularly satisfying.

After this brief interlude, we got back to our main occupation. The cake was rescued from the oven and the burnt bits removed, before it too was offered to the masses. Imre Leader, sighting the cake, gave Ross a ‘nice person stroke’ in a subtle attempt to obtain a slice. Lizzy suggested the introduction of the EMCSO (the European Maths, Cake and Singing Olympiad), a competition the UNKs would surely win, with all the practise they’d been getting.

Saturday ended with craft activities in the dome. The UNKs chose to use their time wisely and make origami dodecahedrons, items that turned out to be very difficult to safely transport back home. It was during this period that we received the happy news that Katya and Natalie were both EGMO bronze medallists. The Polish team won overall, beating the Romanians by a hair, and the UNKs managed their objective of beating a country!

## Sunday 15<sup>th</sup> April

We blearily pulled ourselves out of bed early Sunday morning, for this was the day of the great EGMO expedition to Bletchley Park. Unfortunately, Jo had to go home to prepare for the start of school on Monday, and Alison, understandably, felt her time would be better spent revising for her upcoming exams. The UNKs were just planning all the things we would get up to without adult supervision, when James stepped in with a sinister giggle (yes, such a thing does exist) and volunteered to be our replacement leader. Jo left us reluctantly with stern warnings not to laugh at James’s jokes (although we were free to laugh at him). This didn’t seem like it would be too hard when, after a cursory ‘UNK UNK UNK UNK UNK?’ to check we were all present and correct, James strode off and got on a completely different coach.

For those of you who don’t know, Bletchley is not some minor ailment (as in, ‘I wouldn’t if I were you, I’m feeling a bit Bletchley’) but the former home of British

code-breakers. Our tour guide for the section of the Park focused on the Second World War effort was less than satisfactory: he knew less about the workings of an Enigma machine than us, and what is more, was utterly dull. In complete contrast, the guide to the computer museum also on the site was enthusiastic and knowledgeable, giving us a whistle-stop tour of computing from Colossus to the present day.

The weather began to turn nasty, with some UNKs claiming it was even snowing. For this reason (and because we're lazy), we used the time after lunch not particularly productively, not even moving from the spot where we were sitting. Lizzy and Katya spent a good hour simply doodling.

Back at Murray Edwards, everyone spruced up for the Gala dinner and closing ceremony. Alison sneakily handed out UKMT thermos flasks to the other leaders from a box secreted under the table, and the UNKs presented Sally-Anne with a photo of us as a thank you gift and memento. The ceremony went smoothly, the only hitch coming at the very end when the time came for us to hand over the EGMO flag to the Luxembourgeois, who will be hosting next year. The UNKs came up to the stage and looked bemusedly around for the flag. It transpired that the flag was the piece of fabric with the EGMO logo on it, right in front of our noses.

It was at this point that Ella had to go home, as her parents were unable to collect her the next day. After a number of team photographs, we said a fond farewell, and went back to the party, which continued late into the night. So late, in fact, that the staff began clearing tables and turning lights on and off as subtle hints for us to leave. The Irish and the pink haired one took great delight in sprinkling James's hair with little sequin stars, but eventually tiredness won out over even such great amusement, and we retired to bed.



## Monday 16<sup>th</sup> April

The last day.

A mood of gloom hung over Murray Edwards as people began slowly to depart. This was relieved slightly by the giving of birthday cake to Sally-Anne (the second lemon drizzle cake made on Saturday). The remaining UNKs hung on as long as possible, not wanting to leave. We sat on the floor in the hallway, playing cards and giggling at amusing web pages until the arrival of parents or train reservations meant we could stay no longer.

We'd like to take this opportunity to thank everyone involved in EGMO: the organisers, and particularly Ceri Fiddes for dreaming it up; the coordinators; the

guides, including our GUNK Sally-Anne Bennett; Alison Zhu and Jo Harbour; and anyone else we've not mentioned. We all had a wonderful, wonderful week, filled with good cake, good maths, and lots of laughter. Long live EGMO!

*Written by Natalie Behague, with considerable input from Elizabeth Lee and Katya Richards.*

*Disclaimer: All efforts have been made to ensure that this EGMO report is completely factual. If reality does not match up to what is written here, reality has got it wrong.*