

# Observations on IMO 2012

Geoff Smith

James Cranch has given a full report on events in Argentina, so I will confine myself to matters disjoint from those which he has already covered.

I take a taxi to Luton Airport, due north of London. I have a lunchtime flight on easyJet to Madrid. I am travelling independently of the British student party, and am trying to be clever. From Madrid I have a ticket on Aerolíneas Argentinas, including a change of airport in Buenos Aires, but taking me through to the IMO 2012 site of Mar del Plata.

The reason I am doing this, rather than taking a more sensible London to Buenos Aires flight, is that I have been intimidated by tales of systematic overbooking of domestic flights in South and Central America, and hope that intercontinental passengers may get priority. It turns out that my overbooking fears are entirely misplaced, and that a direct flight on BA to BA would have been easier.

The flight to Madrid is uneventful, and over the Bay of Biscay I observe the first sunshine I have seen since March. In Madrid, in a prescient move, I change some euros into Argentinian pesos. Argentina operates a Soviet style money exchange system. Once inside the country, it is only possible to exchange hard currency for pesos in that direction, and at a special rate which is officially determined, and has no relation to the peso exchange rate available outside the country. Welcome to a Latin DDR. It takes me back to the Friedrichstraße crossing in Berlin during the Cold War.

The flight to Buenos Aires takes 12 hours, and I am seated next to a snorer. I had better not discuss my darker thoughts. On a happier note, Aerolíneas Argentinas have issued me with a voucher for a bus ticket. The plane lands later than it should have done, and I am torn between taking the official bus, or jumping into a random cab, which according to Wikipedia is the strategy favoured by those who wish to be robbed and murdered.

I decide to take the officially sanctioned Manuel Tienda Lexión bus, even though there is some risk that it will not quite make the connection in time.

In fact the driver makes good time, save for a pause at the central bus station where there is a lot of fuss made about luggage. We arrive 10 minutes ahead of schedule, and I rush to check-in my suitcase. That goes smoothly, and I am starting to meet friendly IMO travellers. In particular, the IMOAB secretary John Webb makes contact.

The short flight from Buenos Aires is scheduled to take just 40 minutes, and it seems that they operate a very friendly policy of waiting for connecting flights, so we tarry for some time while several groups of IMO passengers board the plane from various parts of the world. My anxiety about missing this connection was ill-founded. There are only two flights scheduled per day to Mar del Plata, so it would not be polite to leave people behind.

Mar del Plata airport terminal is comparable in scale to Iași, Romania, and to the old Kharkov, Ukraine effort (until it got redeveloped for Euro 2012) and the happily demolished Bath Bus Station of grotesque memory. The IMO organizers are there and efficiently transport John and myself to the leaders' residence, a sports complex due south of the city.

In his leader's report, James has alluded to the mysterious underfloor heating in the rooms. Mine had no off-switch, and since I prefer life on the cold side, I have to get it turned off by special appeal to the reception desk.

I have arrived in the middle of the question selection process, and I am astonished to learn that (a) the jury has not implemented my suggestion as to how to choose problems, as explained in my 2011 *Observations* and (b) the Problem Selection Committee has decided not to put the problem I submitted for IMO 2012 into the shortlist. I blame James Cranch for not completely reorganizing jury problem selection protocols according to my whim. As for the responsibility for not using my problem, it is less clear who is the guilty party.

On reflection, I now realise that my ploy of constructing culturally relevant problems might be viewed as a transparent ruse to avoid judgements about mathematical good taste, and to appeal instead to the jury's sentimental and craven desire to pander to the host nation. That was my plan anyway.

I tax Problem Selection Committee member Kós Géza as to why my question has been omitted. After he reassures me that it was left out because it was a boring question of no intellectual merit, I am happier. My fear had been that it was the intense eroticism of the question (which involves The Tango) which had caused it to be set aside.

Anyway, the problem is tailored to the Argentinian IMO, and since we

probably won't have another one for a generation, here it is. The original version came in various forms, so that you could tune the level of difficulty. This is the straightforward version of what I think of as *not Problem 4*.

## The Tango

Let  $n$  be a positive integer. A *tango* is a dance on the number line. Each dancer makes steps, each of which adds 1 to, or subtracts 1 from, their current position. Two people stand at 0 to begin. Each of them takes  $n$  steps in sequence. They keep in time with one another, so for all  $i$ , they both take their  $i$ -th step at the same moment. They must each conform to the three rules of tango:

- (i) Each dancer must finish at 0.
  - (ii) If, during the dance, they are in the same position, then they kiss (this does not include the start or the finish).
  - (iii) The steps of each dancer are scored as follows. Each right step scores the number of left steps that the dancer has already taken. Each left step scores the number of right steps that the dancer has already taken. Each dancer must dance so that the sum of the scores of his or her right steps is the sum of the scores of his or her left steps.
- (a) For which positive integers  $n$  is a tango possible?
  - (b) Show that each tango must include a kiss.

Last year, the usual Australian leader Angelo di Pasquale did not attend the IMO because he was getting married. This year, by way of compensation, Mrs Hellen di Pasquale accompanied Angelo, and was able to witness what a hard time we give him over breakfast. I personally felt a duty to lay it on thick.

There was quite a lot of IMOAB business to do. The Ethics Committee thinks that there should be a public affirmation of our commitment to honesty at the IMO, but time is at a premium. Various people help to construct an item to insert into the opening ceremony at short notice, for which many thanks. Next year we will have time to construct something a little more polished, possibly involving human sacrifice (I have some suggestions).

We heard strong presentations from Hong Kong SAR and Brazil concerning their bids to host future IMOs, and we later recommended to the jury that both generous and kind offers be accepted. The forthcoming schedule looks very attractive, but with so many IMO countries coming from Europe, I do wonder if some of the smaller ones will be able to afford so many long journeys. Of course, this is the usual problem for Asian and South American countries.

The IMOAB also had to construct the manual for the new *Ethics Committee*. Henceforth, the Ethics Committee will have all sorts of powers and responsibilities, including looking for marking anomalies in past scripts. From now on, if KLI7, the leader of The Klingon Empire, asserts in co-ordination that *tugh qoH nachDaj je chevu'ta'* means “and so, by the Combinatorial Nullstellensatz, we are done”, and later the Ethics Committee discovers that it actually says “soon a fool and his head will be separated”, then, in the words of Irving Berlin, *There may be trouble ahead . . .* Students of the Klingon Empire, please remind your leader of this new and troubling circumstance.

I was, as usual, delighted to see so many old friends in the jury. However, I had a most pleasant surprise when so many students greeted me with such enthusiasm. This seems to be connected to *The Windmill Problem*, IMO 2011/2. When walking through the student recreation room, or passing through an airport going to or from the IMO, groups of superficially friendly students would rush forward and ask to take photographs. I pretended not to know that they were actually looking for material to decorate their dartboards.

Towards the end of the IMO, Charles Leytem called a meeting for people interested in EGMO 2, the second European Girls' Mathematical Olympiad which will be held in Luxembourg next April. The inaugural competition was held last April in Murray Edwards College, Cambridge, in the UK. The EGMO room was completely full, and it seems that the number of European nations participating will be sharply up from the 16 countries which attended the Cambridge event. Charles has cleverly found some funding which will defray some accommodation and travel costs.

This year there were some major European nations which did not participate. Next year, it seems that there will be many fewer such countries. There is good reason to hope that that EGMO 3 will be held in Turkey, but we await final confirmation of this. Applications to host EGMO  $n$  for  $n \geq 4$  should be directed to the Provisional EGMO Advisory Board. The chair is

Birgit van Dalen of the Netherlands, on [bevandalen@gmail.com](mailto:bevandalen@gmail.com)

The journey home was another adventure. First we stood in the cold outside the students' hotel for an hour, until the news came through that Mar del Plata air-traffic control was taking industrial action. Why does an airport that takes two planes per day need air-traffic control? The people who have to make a sharp airport change in Buenos Aires are put on a bus to the capital. I have a leisurely change, so I elect to gamble on there being a flight at some point. People like me go by bus to Mar del Plata airport to do some serious waiting. There I run into the leaders of the highly successful Saudi IMO team who have travelled to the airport independently. One of them, Abdulaziz Al-Harthi, has to make a very rapid change in Buenos Aires, and his embassy has laid on a car for him. He offers me a lift, and I ponder the relative attractions of this new offer, and the worthy Manuel Tienda Lexión bus, and make a rather easy choice. Thank you Abdulaziz. The local flight takes off at lunchtime, and we cross Buenos Aires at pace.

I still have plenty of time left, and this time I am properly prepared for the journey north: shorts and lots of water, and of course piano wire in case they put me next to another snorer. In fact all is well, and I have a very pleasant flight back to Europe.

Now, some shameless advertizing: my *twitter* address is @GeoffBath. My UKMT book "A Mathematical Olympiad Primer" is now greatly extended, and includes an extra four years worth of problems. It is available at <http://www.mathcomp.leeds.ac.uk/publications/>, and since virtually all the 14–16 year olds of your country will no doubt wish to read it, note the UKMT bulk discount offer.