IMO 2006 in Slovenia

United Kingdom Leader's Report

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The International Mathematical Olympiad is the world championship of secondary school mathematics. This annual competition has been held since 1959. Each nation may send up to six students. Competitors must be under 20 years of age and not in full-time tertiary education. The event is held in July, and the venue shifts from year to year. In 2006 the IMO was hosted by Slovenia, the nation with smallest population to attempt the task thus far, a fact which could not be deduced from the excellent quality of the hospitality and administration.

The United Kingdom has competed since 1967, when the event was still rather small, and only 13 teams took part. As years have gone by, the competition has prospered, and 90 teams participated in 2006. The modern format is that the IMO examination consists of two papers sat on consecutive days. Each paper contains three questions, and the candidates have four and a half hours to address it. The candidates may answer the questions in their own language, and may demand copies of the exam paper in up to two languages. Each question is marked out of 7 points. This is done according to an agreed marking scheme. Initially this is done by the leaders of the candidate in question, but then this mark has to be verified with question specialists called *co-ordinators* who act as marking police.

Each country has its own selection procedure designed to produce a strong team for the IMO. In the UK the two rounds of the British Mathematical Olympiad are the principal tools used to identify exceptional mathematical talent. We have a multi-stage national mentoring system (developed by Richard Atkins) which enables students at any UK school to have access to regular mathematics problem sheets and to advice concerning the solutions to problems. In recent years we have had team members from both selective and non-selective state schools, as well as the private sector. Once identified,

these strong students can attend various training camps and take practice examinations in an effort to make the IMO8 (team plus reserves) and finally the IMO6, the team itself.

The team representing the UK (UNK in IMO parlance) this year was as follows:

UNK1 Tom Eccles, St Paul's School
UNK2 Saul Glasman, Latymer School
UNK3 Jonathan Lee, Loughborough Grammar School
UNK4 Daniel Lightwing, York College
UNK5 Jack Shotton, Portsmouth Grammar School
UNK6 Lee Zhao, Nottingham High School

The reserves were Jos Gibbons of King Edward VI Camp Hill Boys' School, Birmingham, and Imdad Sardharwalla of King Edward VI Grammar School, Chelmsford. The team leader was Dr Geoff Smith of the University of Bath, the deputy leader was Dr Ceri Fiddes who is moving between Millfield School and Stowe School, and the observer with leader was Dr Joseph Myers, ex-Trinity College, Cambridge.

The questions of the 47th IMO were as follows.

1. Let ABC be a triangle with incentre I. A point P in the interior of the triangle satisfies

$$\angle PBA + \angle PCA = \angle PBC + \angle PCB.$$

Show that $AP \geq AI$, and that equality holds if and only if $P = I$.

2. Let P be a regular 2006-gon. A diagonal of P is called *good* if its endpoints divide the boundary of P into two parts, each composed of an odd number of sides of P. The sides of P are also called *good*.

Suppose P has been dissected into triangles by 2003 diagonals, no two of which have a common point in the interior of P. Find the maximum number of isosceles triangles having two good sides that could appear in such a configuration.

3. Determine the least real number M such that the inequality

$$\left| ab(a^2 - b^2) + bc(b^2 - c^2) + ca(c^2 - a^2) \right| \leq M\left(a^2 + b^2 + c^2\right)^2$$

holds for all real numbers a, b and c.

4. Determine all pairs (x, y) of integers such that

$$1 + 2^x + 2^{2x+1} = y^2.$$

5. Let $P(x)$ be a polynomial of degree $n > 1$ with integer coefficients and let k be a positive integer. Consider the polynomial

$$Q(x) = P(P(\ldots P(P(x))\ldots)),$$

where P occurs k times. Prove that there are at most n integers t such that $Q(t) = t$.

6. Assign to each side b of a convex polygon P the maximum area of a triangle that has b as a side and is contained in P. Show that the sum of the areas assigned to the sides of P is at least twice the area of P.

   The jury traditionally tries to make the questions harder on each day, and to make day two more taxing than day one. Each problem is marked out of 7, so the rare perfect score for a candidate is 42. The points on questions 1 and 4 are relatively easy to obtain, but strong students have to be on their guard against careless minor slips which might be punished with a deduction. On the tougher questions, minor slips are sometimes more easily forgiven, because the mathematical ideas needed to solve the problems are so hard to find.

   At most half (plus ε) the contestants receive a medal, and these are distributed in the ratio gold:silver:bronze = 1:2:3. Students who do not achieve a medal are awarded an honourable mention if they solve a single problem perfectly. Just as in the sporting Olympic Games, there is an unofficial table of national performance, with the ranking in terms of the sum of the scores achieved by each country's students. Nations with a large population and a highly developed system of mathematics education adapted to the IMO have a great advantage of course. This year the following marks were the minimum requirements for a medal: gold 28, silver 19 and bronze 15.

   The scores of the British students were as follows.

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Name              Q1  Q2  Q3  Q4  Q5  Q6   Total  Medal
Tom Eccles         7   6   0   6   3   0    22     Silver
Saul Glasman       7   1   0   6   2   0    16     Bronze
Jonathan Lee       7   7   0   7   1   0    22     Silver
Daniel Lightwing   7   7   0   6   1   0    21     Silver
Jack Shotton       7   0   1   7   7   0    22     Silver
Lee Zhao           7   1   0   5   1   0    14     Hon. Mention
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Three IMO contestants got perfect scores (42). They were Zhiyu Liu of the People's Republic of China, Iurie Boreico of Moldova and Alexander Magazinov of Russia. Note that at IMO 2005 in Mexico, Iurie Boreico also scored 42, but that time he also won a special prize, so his performance is clearly on a downward slide.

This year 90 nations participated in the IMO and the unofficial ranking of performances was as follows: 1 China (214), 2 Russia (174), 3 Korea (170), 4 Germany (157), 5 USA (154), 6 Romania (152), 7 Japan (146), 8 Iran (145), 9 Moldova (140), 10 Taiwan (136), 11 Poland (133), 12 Italy (132), 13 Viet Nam (131), 14 Hong Kong (129), 15 Canada (123), 15 Thailand (123), 17 Hungary (122), 18 Slovakia (118), 19 Turkey (117), 19 United Kingdom (117), 21 Bulgaria (116), 22 Ukraine (114), 23 Belarus (111), 24 Mexico (110), 25 Israel (109), 26 Australia (108), 27 Singapore (100), 28 France (99), 29 Brazil (96), 30 Argentina (95), 30 Kazakhstan (95), 30 Switzerland (95), 33 Georgia (94), 33 Lithuania (94), 35 India (92), 36 Armenia (90), 36 Slovenia (90), 38 Serbia (88), 39 Finland (86), 40 Peru (85), 41 Bosnia and Herzegovina (84), 42 Austria (83), 43 Sweden (82), 44 Estonia (80), 44 Mongolia (80), 44 Spain (80), 47 Portugal (78), 48 Azerbaijan (77), 48 Czech Republic (77), 50 Albania (76), 50 Colombia (76), 52 Belgium (75), 52 Latvia (75), 54 Croatia (72), 55 Sri Lanka (71), 56 Greece (69), 57 Uzbekistan (68), 58 New Zealand (66), 59 Iceland (63), 59 Macau (63), 61 Turkmenistan (59), 62 Former Yugoslav Republic of Macedonia (57), 62 Netherlands (57), 62 South Africa (57), 65 Morocco (55), 66 Norway (52), 67 Ireland (49), 68 Paraguay (47), 69 Denmark (45), 70 Ecuador (40), 70 Malaysia (40), 72 Tajikistan (35), 73 Trinidad and Tobago (34), 73 Venezuela (34), 75 Panama (33), 76 Pakistan (32), 77 Kyrgyzstan (31), 78 Costa Rica (27), 78 El Salvador (27), 80 Bangladesh (22), 81 Cyprus (19), 82 Luxembourg (12), 82 Uruguay (12), 84 Nigeria (11), 84 Puerto Rico (11), 86 Bolivia (5), 86 Kuwait (5), 88 Saudi Arabia (3), 89 Liechtenstein (2), 90 Mozambique (0).

Nations doing particularly well this year include Korea, Germany, Moldova,

Italy, Poland and Thailand. From the narrow perspective of the UK, this was our fourth consecutive top 20 performance. We came 2nd in the Commonwealth behind Canada. Germany topped the EU with a most impressive showing. As often happens, Luxembourg was the leading Grand Duchy. Hong Kong was the leading team without the letter A in its name. The bitter regional rivalry between Trinidad and Tobago and Venezuela is set to resume next year after the issue was unresolved in 2006.

The number of people who now support the UK IMO effort is completely out of control, and so, if you will forgive me, I thank them in categories rather than by name. There are the students who participate in our competitions, their parents and teachers, the people who mark the exams, the people who set mentoring papers and the people who mentor. There are trainers at camps, setters of exams, the people who write, illustrate and edit our training books and other materials, administrators in the Leeds UKMT office, those who serve on the various subtrusts of UKMT and UKMT's Council. There are people who give us practical or financial support. These include the Actuarial Profession, the microelectronics group ARM, Trinity College Cambridge, the University of Bath and the publishing house Springer. This year we also thank the Slovenian IMO team and their trainers for hospitality before the IMO. Finally, we must acknowledge the reliable continuing support of our largest single supporter, the Department for Education and Skills of the UK Government.

It is traditional to supply a UK leader's diary to share the flavour of events. Sometimes the diary is opinionated, and since it is apparently read quite widely on the internet, there is a temptation to tone it down so as to cause little offence. On balance, I think that this should be resisted. This IMO was a great success, but like all events of this complexity, a few things went wrong and a few silly decisions were made. It makes no sense to pretend that this didn't happen. A mistake is simply an opportunity to learn, and a diary is an opportunity to exact revenge.

United Kingdom Leader's Diary 2006

A little preamble about a filming project is in order. In 2002 the UK IMO effort was filmed as part of a pair of programmes *In Search of Genius*. These went out on BBC2 in May 2004 and later on cable channels from time to time. In fact the IMO component of these programmes was rather restricted. We

were filmed again with a view to a Channel 4 documentary on IMO 2005, but that project was cancelled just prior to Mexico (so they missed the dramatic hurricane story).

This year it came as no surprise to be approached once again, this time by film makers from a company called Blast! Films. It must be said that this group of people have been fine colleagues, and have been extremely considerate and helpful. The original plan was for their IMO television programme to form part of a series which looked at various unusual international competitions. However, somewhere along the way the maths documentary became detached from the rest, and it is now planned to be a free-standing item to be broadcast on BBC2 in 2007. Morgan Matthews, David Brindley and Charlotte Rodrigues are the crew. They followed us around for the six months leading to the IMO, but were forever dipping in and out as their other filming commitments dictated. They also filmed the Chinese IMO team's preparations in Beijing. I know that they were very grateful to the Chinese team, and particularly to their leader Shenghong Li and other trainers for making this possible.

April 2006 As usual, the UK IMO Easter training camp was at Trinity College Cambridge. We have arranged to have a pre-IMO camp with the Slovenians in July so it was appropriate to invite their IMO leader Irena Majcen to Trinity as a guest trainer this year.

We finish the camp with a couple of selection tests. Traditionally the shortlist of candidate questions for the previous IMO is kept secret for one year so that the contents can be used for selection purposes. This sensible system has been undermined by the internet, human folly and the ever increasing size of the IMO. It is bad enough relying on 90 other leaders to be discreet. Now as soon as a selection test is sat somewhere in the world, some candidates are driven by a technophilic compulsion to put the paper on the internet within three minutes of leaving the exam hall. Unless candidates are confined to lead-lined wi-fi-proof chambers (an attractive idea) there seems no way to stop this incontinence. Once a question appears on a couple of selection tests, then it doesn't take the students long to work out that it was on the IMO shortlist last year, and to prepare a model answer in case their leader is sufficiently unworldly as to trust the security of the shortlist.

The selection tests throw up a problem. The geometry is a disaster. Also Daniel Lightwing, who sometimes performs very well, has crashed badly. Daniel's variable performances are a real nuisance. We decide that we cannot justify giving Daniel a place in the IMO8 because he is simply too far down

the rank order. However, two of the IMO8 have attractive offers of definite places in science olympiad teams, and ask to be released. This gives us new and interesting opportunities. The young Imdad Sardharwalla did brilliantly on the easier questions of the Trinity selection tests, so we adopt him as a reserve with an eye to the future. That leaves one more place. Happily the "near miss" students are scheduled to take part in the Balkan Olympiad in Cyprus in May, so we can hope that someone will shine.

Naturally the film crew were very interested in the selection process. I was interrogated on the difficulty of selecting the IMO8 (there wasn't any) but was clearly providing completely inadequate and wooden footage (a persistent problem). In exasperation the director Morgan Matthews explained that one had to emote to camera. Of course the suggestion was repellent, but I thought refreshingly honest. I did my best to express my inner turmoil, such as it is.

Happily we have a place in the IMO8 for Jos Gibbons who has been knocking on the door for some time. It is not clear that he will make the side, but he does have the feature that he can do hard combinatorics problems.

We address the geometry issue by making everyone work through every exercise of Bradley and Gardiner's *Plane Euclidean Geometry.* This will turn out to have been an exceptionally good ploy, and the team's geometry will be transformed. This excellent text is available on-line from UKMT, as is its recent companion volume (two books in one) *Introductions to Number Theory and Inequalities* by Christopher Bradley.

May 2006 Richard Atkins (Oundle School) and Ian Jackson (Tonbridge School) lead a UK team to the Balkans. This is our second consecutive trip to this competition as a guest nation, and we are very grateful for the opportunity it gives us to widen participation in international events, and to blood some youngsters. The good news is that our performance was no worse than last time, and most importantly, we have a clear star. Daniel Lightwing has delivered on his potential, and is quickly seconded to the IMO8.

The next event is the selection camp in Oundle. We have to choose the IMO6. This is often the worst part of being team leader, but fortunately the test results were clear. There was a large gap separating the top six students from the other two, so no hard decisions were necessary. It was tough on Imdad and Jos, but they both have another chance.

June 2006 Final preparations are made. The team uniform will be extended to include Panama hats for the next few years. We have some IMOs in sunny countries coming up. Our outfitter has promised lightweight jackets but lets

us down at the last minute.

The UNK (United Kingdom in IMO speak) leadership is new. My deputy is Dr Ceri Fiddes who should have come to Mexico but had to pull out because she had a profound disagreement with a horse. She still limps a year later. We also have a terrifying intellectual weapon in the form of two-time IMO gold medallist Joseph Myers who has many remarkable skills and credits. He administers the IMO register on the internet, and is the fastest marker of extended 10 page combinatorics essays that I have ever seen, and indeed ever wish to see. Joseph will attend as observer with leader.

July 1 We are off to Slovenia for the annual pre-IMO camp. This time it will be held in Tito's summer capital, Bled. England are scheduled to play Portugal in the soccer World Cup starting some 35 minutes after our flight is supposed to land, and a large screen is waiting for us in a Bled hotel. Instead of the usual Heathrow start, we find ourselves in Stansted airport among the package tourists. We have arranged to meet outside the shop W. H. Smith's. Two team members, Messrs Lee and Shotton, are absent. We check, and yes there is a second WHS but they are not there. It transpires that they have checked-in by themselves in order to get to a third WHS which is on the far side of immigration control. Don Collins our treasurer has come to see us off. He looks worried at this pathetic start, and I don't blame him.

Easyjet takes us to Ljubljana's Brnik airport without incident. Our excellent Slovenian hosts are using our early arrival in Slovenia to test their airport welcoming drill. It works perfectly, but happens in the middle of a sudden rainstorm. The poor Slovenian official kindly suggests that we should wait for the rain to pass before boarding the bus. Mindful of the impending events in Germany, we say no, soccer comes first, and send the poor bloke out into the rain to get the bus. We soon arrive in Bled where the Slovenian IMO team have been at their camp for some time. We drag them over to the hotel to watch the second half of the England–Portugal game. This is a strange experience, because the commentary is in Slovenian, and events have to pass by without English explanation. Young Rooney is sent off for no reason that we can see. We ask our hosts what the commentators think has happened. It turns out that they are equally bemused. Only later we discover that Rooney was deemed to have deliberately trodden on the generative zone of one of the players trying to haul him off the ball. No sense of malign purpose was evident to us.

July 2 Irena Majcen is the Slovenian team leader, and she is in charge of this Bled camp. Irena is a pleasure to deal with, ever enthusiastic and helpful.

With the Slovenian deputy Jernej I scour the local shops for supplies of crisps and slabs of A4.

We are all staying at the Plemelj house. Josip Plemelj was a complex analyst who bequeathed his house to maths enrichment. It has lots of bedrooms, a kitchen, and downstairs a lecture room. There is also a tranquil garden in which red squirrel nutkins happily scamper.

A few yards down the road there is a bust of Plemelj, decorated by a couple of choice contour integral formulas. As Sinatra repeatedly put it, this is my kind of town. We are in the mountainous north-west of Slovenia, and we have more or less everything you could want: a lake, a summer bobsleigh run, a castle perched atop a dramatic cliff which drops down to the lake, an island with an ancient chapel, a casino, a mathematical tourism opportunity, squirrels and so on.

The team are getting on with one another very well, and are mixing socially with the Slovenian side. We quickly organize the first practice IMO exam under proper 4 hour 30 minute conditions. The teams enjoy it, and it becomes the first of many. This gives me the chance to slip away with Jernej and pick up a bottle of local culture. It is a plum brandy called Slivovka. I risk a sip. This yields a pleasant burning sensation and a slight numbing of the face. This will do nicely.

July 3-4 The Canadians, Luxembourgers and Swedes (CLS) are arriving today. The Canadians have sent e-mail describing their appearance so that IMO spotters can track them down at Brnik airport. Given the size of Brnik International, half a dozen Canadians in bright red shirts plastered with maple leaves should be hard to miss.

Deputy Ceri and Observer Joseph arrive today, but before we can be properly reinforced, the Slovenians quickly invite us to play a soccer game. My heart sinks at the thought of our collection of pasty and bookish scholars up against the virile and sporty Slovenians. We have no choice but to accept the challenge, though I can't help feeling we might be better placed if the game were bridge or Mao. As we prepare to depart for the match, things get worse when the Slovenians suddenly produce proper sports shoes and almost start doing press-ups.

In desperation I am conscripted into the team, but thankfully am put in goal. We are resigned to our fate. Then a small miracle happens. Several UK players turn out to have good ball skills and co-operate well: Jack, Tom, Lee, and Jonathan are all more rounded human beings than I had hitherto supposed. Now it is true that my main concern was the other two team

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members. There is some surprise in discovering that mild mannered and superficially gormless Daniel Lightwing has a small fragment of pit bull terrier DNA which can be activated by sliding a pass through towards our goal. Also Saul Glasman's patsy days are long gone, and he lunges aggressively at opposing forwards.

At half-time we were winning 4-0. I will make light of my own contribution in goal, but thoughts inevitably turn to comparison with performances of Banks and Yashin. In the second half we found it hard to maintain form, and clung on for a most unlikely 6-5 victory. If only the match had been played after the arrival of Ceri and Joseph, we could have used their skills to devastating effect. I imagine that Dr Myers would have taken on a roving midfield role more like Beckenbauer than Moore, and that Dr Fiddes would have taken a dive and feigned injury in the manner of Jürgen Klinsman.

July 5 We have an excursion. The idea is to meet up with the CLS who have set up camp in a nearby town, and have adventures. The coach takes us through glorious scenery, and eventually we are given the opportunity to make a huge climb to view a waterfall. Ceri and I make a gesture by climbing the first bit, but then Joseph agrees to look after the team so Ceri and I settle on a bench for a chat. My gammy knee and Ceri's horse-mangled frame will not stand much more. After half an hour, the teams descend and we rejoin the bus in search of lunch. This turns out to be on top of a mountain, with access by precipitous cable car. We ascend almost a kilometre, and with popping ears we clamber out to enjoy the panorama. We are standing on a metal grille, through which we can see ample quantities of empty space. It turns out that Lee Zhao has fear of heights. The team mock him unmercifully; careers in counselling do not seem to be an option. Later on Lee Zhao falls off a rock next to a sign warning you not to fall off the rocks. Happily this is far from the edge, but is clearly time to reduce Lee's gravitational potential in a controlled fashion.

We return to the CLS site for soccer and gossip. Charles Leytem (the Luxembourg leader) is a mountaineer, and when frustrated by living with a near stationary z-co-ordinate, he is is prone to taking completely unnecessary extended walks, often at night. Even with his trip up a mountain today, I can see that he his getting frisky, and might set off at any moment.

July 6-9 Joseph, Irena and I depart to join the jury, leaving the team in the hands of Ceri and Jernej. Our journey involves a car ride back to the airport, where we are ushered into an upstairs room full of leaders, observers and their luggage. We learn that the jury will sit in Portorož, the southernmost resort

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on the short Slovenian coast. The bus ride is uneventful, but we do see how much of Slovenia is covered in trees, decorated very occasionally by bauxite mines. The coast of Slovenia, and indeed the north part of the Croatian coast too, has a lot of Italian speakers. The signage in Portorož is in both Slovenian and Italian. This bodes well for the quality of the coffee, and my spirits are lifted.

It is perhaps time to mention how well Slovenia has done since the break-up of Yugoslavia. I was lucky enough to pass through Slovenia hitch-hiking to a Group Theory conference in Crete in 1983 I think. The place is transformed, and seems to be enjoying the most rapid economic progress of any former communist state. This is all evident looking at the neat towns and villages, the beautifully surfaced roads, and the spring in the steps of the people. One or two vestiges of the old ways remain: hotels love to take your passports and make little lists, and we all had to have our passport names on our IMO badges which was a bit of a shock for some of us. No-one has called me Geoffrey for 40 years except my mother in deep reproach.

We arrive to find a complex of linked 4 star hotels very close to the beach. My hotel is joined to the conference centre which will form the jury site. Initially it seems perfect. However, there is an irritant in the form of a late evening discotheque which pours out noise pollution just when I am donning my nightshirt, sipping cocoa and Observer Joseph is reading me a suitable story involving billy goats and trolls. My room is on the side of the hotel rather than the rear, which unfortunate. Attempts to shift rooms are rebuffed.

I find all this mysterious. In every other country I can think of, the vast economic power of these 4 star hotels would have found a way of dealing with an annoying discotheque in a matter of days. In some countries a noise abatement order would be obtained from the courts, in others the discotheque would be simply purchased and closed. In most countries the police, fire department or health and safety inspectors would be bribed to close it down. In the most brutal societies the disco owner would simply disappear. All these are perfectly good ways to close down a discotheque. How come none of them work in Slovenia?

Apart from this, the hotels are very good. The facilities are also being used by members of the public with whom we share a dining room, and this leads to an ongoing comedy. We IMO folk seem to have identical dining rights to everyone else, but someone on the hotel staff decides that we must on no account mix with normal human beings. A code is developed, and we

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are supposed only to sit at tables decorated with napkins of a certain colour. This is rather like trying to herd cats. Indeed it reminds me of IMO 2003 in Japan when the nice people running a leaders' bus tour tried to get us to board coaches alphabetically. There is a gulf of incomprehension between societies where people do as they are told, and those where instructions are there to be ignored. The Swedish leader Paul Vaderlind is a persistent trouble maker, and seeks to reorganize the priorities of the wine waiter to our collective benefit.

Many old friends are present. I usually enjoy a bantering relationship with the Irish leader (which is definitely an office rather than a person, since the person changes every year). This time it is Rachel Quinlan who will do nicely. Now the business can begin.

The IMO shortlist arrives and looks particularly attractive. In recent times there has been a shortage of high quality easy questions, but this year we are spoilt for choice. Observer Joseph scurries off to his room with the questions (without solutions at this stage) and proceeds to make mincemeat of the combinatorics questions before turning his forensic attention to the other categories. He leaves geometry to me, since he feigns weakness in this area (just as I feign strength).

A problem looms straight away, and there seems no way to avoid it. The jury traditionally loves geometry. There are usually two geometry problems on the papers. There are many countries (often with small populations) which sometimes get low scores, and their leaders may be tempted to vote for one, or possibly two exceptionally straightforward questions in the hope that their students will score well. This is a natural human reaction, but the IMO jury needs to be protected from itself. Question G1 is going to be unstoppable. It is a simple twist on a standard configuration. I know that every United Kingdom student will solve this problem, and with a sensible marking regime we will sweep up full marks. The trouble is that many other students will do this too, so that the question will be inconsequential. Indeed all this will come to pass, and G1 will become IMO Problem 1, and it will generate a harvest of marks; the average score on this problem will be over 5 marks out of 7. Moreover, this problem will squeeze out one of several excellent and novel relatively easy questions which were much more exciting alternatives. There is a burden of responsibility here: in my view the Problem Selection Committee should never have let the jury have sight of G1. The PSC have the time, the experience and the duty to protect the jury from itself.

After a day or so we receive the official solutions to the shortlist and the proper jury sessions begin with Gregor Dolinar in the chair. Gregor sets a slightly authoritarian tone which goes down well. He will clearly keep us under control, and it should be easy to conduct business. Indeed, after IMO 2006 there seemed to be a wide consensus among leaders that Gregor had been an exemplary chair. We are seated on an alphabetical basis by country. I have the same neighbours every year, the Ukraine on one side and the United States on the other, led by Valentyn Leyfura and Zuming Feng respectively. Old friendships are renewed, and we go to business.

Before long we have the 'beauty contest' vote, where all leaders rate each question in terms of both how hard it is, and how attractive it would be as an IMO question. Traditionally the jury tries to construct papers containing one easy question (easy here is a strictly relative term of course), one medium and one hard (a monster). The beauty contest informs this construction. Actually if the jury does its job too well, this can lead to difficulties with the marks being compressed. If two questions are too easy, and two are too hard, the battle ground for many students will be on just the two medium questions, and this is unfortunate. This has happened a few times in recent years; whenever the bronze boundary is about 14 and the gold boundary is about 28, this may well have happened. In my view the jury should rather look for six questions of different levels of difficulty. This would stretch out the marks and lead to a more just and accurate discrimination of the candidates.

The question selection process proceeds very slowly. We decide to select the harder questions first since there is at least one excellent (relatively) easy question in every category (algebra, combinatorics, geometry and number theory). Thus we will not be painting ourselves into a corner no matter which choice of harder questions we select. We choose an inequality (which was very brave given the events of IMO 2005) and a combinatorial geometry question. The latter will become Problem 6, and will be found extremely hard. In fact though I understand the solution line by line, I find myself in the troubling position that I cannot imagine how you would think of it. The method of selection is that various leaders propose pairs of hard problems until we are spoilt for choice. Then we vote again and again, eliminating the least popular pair on each round. It has the feel of building a consensus, and seems a very popular way to proceed.

At the next stage we select Problems which will become numbers 1 and 4. In by view the best choices are A1 with either G2 or G3. However, G1

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is going to triumph as I indicated earlier. It gets selected along with N1. Finally we pick the so-called medium problems. These are C2 and N4.

Now we have the English language committee. This is a subcommittee of the jury which I have chaired for the past 5 years. The committee is open to all, and has the task of constructing the official English version. When the ELC reaches a consensus, the full jury meets, and I present the ELC's recommendations. At this stage many issues are revisited, but with luck the ELC will have weighed the options and have sound reasons for its choices.

We have a problem with the wording of Problem 2, the combinatorics question set in geometric language. We must strike the right balance between precision and brevity. It turns out that there is a wide consensus that we need an adjective to describe certain kinds of diagonal, and in the end *good* will be the word selected. However, this choice was made only after much agony and debate. I was confronted by an unholy alliance of the leaders of France and Italy, Claude Deschamps and Roberto Dvornicich. They were adamant that it would be natural to colour the diagonals, and suggested the term *blue*. It took about half a second to see through that ploy – it was the day of the World Cup Final, and the leaders with soccer teams known as *les bleus* and the *azzuri* were making an appropriate proposal. If the relevant IMO paper were to have been sat on the day of the World Cup Final, this little jest would have made sense. The jury does understand that this question is going to attract essay style solutions, and that co-ordinating the scripts will be hard.

The translations into other official languages are a little more tricky than usual, and some problems arise in casting the paper in German. Nonetheless, we get there in the end. Then the Iranian Observer Mohammad Razvan discovers a way to solve Problem 3 by using Lagrange multipliers (not directly, but after a simple algebraic transformation). There are some members of the jury who would like to reopen the suitability of this question, but it quickly becomes apparent that turning this great ship at speed is not possible, and the jury prefers to put up with this unpleasantness, rather than reopen the design of the paper. We proceed to the final translation stage when the questions are put into all languages requested by the candidates.

July 11 Jury meetings are interrupted for the opening ceremony on the 11th, for on the 10th of July the 90 teams, and the Blast! film crew have descended upon Ljubljana. Everyone at the jury site is bussed to the capital to witness the opening ceremony. There can be no mixing with students since the IMO paper is known to the jurors, so Observer Joseph and I are confined

to the balcony. We quickly spot our team resplendent in their uniforms and Panama hats. There is some pretty stiff sartorial competition, and perhaps the Nigerians are the outright winners with their dazzling green and black outfits. The Saudi team look pretty good too, in Arab headgear and with flowing robes.

The ceremonial and political speeches are mercifully short, and we prepare for the main business, the parade of nations. Ceri is now in full air hostess attire; a vocation missed. The film crew (carefully screened for mathematical ignorance) have special dispensation to move between the jury and the students. Larry Gogoladze, the genial Georgian leader, kindly steps aside to make way for one of the film cameras trying to get good shots from the balcony. The Australian team set the tone by producing prodigious quantities of small koalas holding boomerangs and wearing coloured waistcoats, and flinging them at the student mass which heaves with appreciation. Later on (alphabetically and temporally) some teams hurl baseball caps into the crowd. At last it is the turn of the United Kingdom. Imagine the frenzy as six classy Graham Greene standard issue Panama hats climb on stage with a student under each one. The audience is baying for the hats to be flung into the pit, but mindful of the UKMT budget, our students wisely retain their headgear.

Joseph and I wave a fond farewell. There is a brief march to a fragment of Ljubljana University where we are taken to what looks like a courtroom fit for the trial of József Pelikán. Now that would make a good documentary. Anyway, after the shortest speech on record (thank you) we were fed, watered, and sent back to Portorož to continue with jury duties.

July 12 IMO Exam Day 1 The contest begins in Ljubljana. The idea is that for the first half hour of the exam, students may ask questions of clarification. These are transmitted to the jury site by fax or scan. The relevant leader considers the question, and proposes a response to the jury. This may lead to anything from tired nods through to heated debate, depending on the nature of the question. A popular reply is 'read the question again' and another favourite is 'no comment'. However, when a student needs a piece of standard notation explained, the jury is generally much more helpful. In recent years there have been a lot of questions flowing from the UK students. However, the team selection process has worked sufficiently well that this time we have six students who can read, and my morning coffee is not disturbed.

In the afternoon there is an excursion. Normally I would feign illness

or hide in the toilets, but I am presented with a opportunity to be airily pretentious, and of course grab it with both hands. The film crew are at a loose end and want to kill some time in Portorož in the afternoon. Therefore anyone foolish enough to ask if I will be coming on the leaders' excursion is given the line that unfortunately I am burdened with media duties – the heavy responsibilities of a mass communicator. The leaders depart to view a cave dwelling creature akin to a Mexican axlotl (actually I would rather like to have seen this but don't let on). The film crew turn up, and are suitably impressed by the fancy hotels and beach life, and immediately start working out how to spend more time at the jury site.

Morgan Matthews has me walking up and down a pier for about half and hour. It turns out that I don't walk very well, and have to do it many times. Perhaps this is going to feature as a "man of destiny" shot, the great leader is seen against a Mediterranean backdrop, like Alexander, Caesar and Napoleon before him. On the other hand the approach might be more like a consumer rights programme where an alleged scoundrel is revealed to be living in luxurious conditions while children struggle in a sweatshop. I can only hope that the accommodation at the students' site is not too bad.

The film crew have enough footage to tell any story they please, and I am aware that I have made contradictory statements to camera over the months. Life is like that, and your views change with time and mood. No wonder politicians resort to giving formulaic answers; if they rephrased their idea elegantly, reporters would simply claim that they were shifting position.

In the late afternoon the scripts arrive and the leaders dash to their rooms to peruse the scripts. In our case I have Observer Joseph Myers to help. He enters into a combinatorial trance and communes with the Problem 2 essays. I read Problem 1 and can find no errors. It looks like we have indeed slipped 42 marks in the pocket as expected. Problem 3 does not seem fertile ground.

July 13 IMO Exam Day 2 Once again we begin the day with questions from the exam. In a perfect world, we would then get in coaches and rush over to Ljubljana to see the teams leave the exam hall. Alas this is not the plan. Instead we have some IMO Advisory Board business. There are no definite proposals to host IMO 2010, but the IMOAB is very hopeful that there will be something concrete to announce at IMO 2007.

There is a presentation from Richard Rusczyk of the website and publishing house *Art of Problem Solving.* The site is offering to host an official IMO site with all sorts of attractive bells and whistles thrown in. I feel embarrassed. An appropriate model for the IMO jury is the UN General

Assembly but without the overriding sense of common purpose. There is no way that an IMO jury is going to throw in its lot with a private company. That is simply a fact of life, and someone should have explained this clearly to Richard before he wasted his money and time flying to Ljubljana with his pitch.

We also have some IMO Advisory Board elections. József Pelikán is returned as chair after a strong challenge from Nazar Agakhanov. There are also two vacancies to sit as elected members of the advisory board. There is a very big field of candidates, including me. I come third. C'est la vie. The leaders elected are Patricia Fauring of Argentina and Yongjin Song of the Republic of Korea and I am sure they will each do a great job.

We have been separated not only from the team, but also from our deputy Ceri Fiddes for quite some time. When the coaches roll in, I look on lists to find her hotel room, and am stunned to discover that she hasn't got one. We find Ceri, put her luggage in my room, and sit her down for debriefing on the news from the team. At this stage she has some notion of how they might have done on the second day (i.e. in the morning) but the scripts have yet to arrive. We have sent up flares to the organizers and without much delay Ceri has a room in an excellent hotel next to ours. All this turns out to be the fault of the film crew (never blame the host nation directly!). As you can imagine, people who gad all over the planet are prone to make arrangements and rearrangements of reservations as their plans change dynamically. It seems that somehow Ceri's name got involved in the resulting chaos, and some administrator has inadvertently cancelled Ceri's reservation. No harm done; it was all fixed very quickly. Conversation quickly turns to the marking and co-ordination phase, and when the second day scripts arrive, we are really in business. We have virtually nothing on Problems 3 and 6. Problem 1 looks like a perfect 42 and I will deal with that. Problem 2 will be the heartbreaker. Joseph has already digested the solutions and has firm views on what they are worth. Ceri is also a combinatorial specialist, so I leave her to do a detailed critique of Joseph's analysis, and set to work on the remaining papers.

July 14-15 It is time for co-ordination. Most years there is at least one problem which causes grief. This time there are two. In one case it is the jury's fault, and in another the co-ordinators will have to face their maker with heavy heart. First off, the jury made a really stupid decision concerning Problem 5. The result depends on a positive integer parameter k, and the reduction to the case $k \leq 2$ is in fact well-known. It appears as

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a solved exercise in the excellent Springer text "Problem Solving Strategies" by Arthur Engel. In an act of collective insanity, the jury has decided that reducing the problem to the case $k \leq 2$ (i.e. doing the known part) should be on the IMO paper. Of course it should have been removed, but don't worry, things go from bad to worse. The jury then decided that doing this known problem was worth 3 marks, but merely quoting the result, chapter and verse, from the literature was worth 0. However, quoting known results has always been legitimate mathematics, and introducing a special rule that on this occasion only, quotation is not allowed, was in my opinion unfair. How is a student supposed to know that the jury is changing the rules? My fingers are hitting the keys with some force at this point, for our student Lee Zhao will lose 2 marks for believing in the fairness of the IMO jury. It will cost him a bronze medal, and I am still hopping mad about this.

Now for a discussion of the co-ordination of Problem 2. This is a problem where there are a variety of solutions. It is going to be a brute to mark because it is not that hard to write down a saloon bar solution, by which I mean a "proof" of the following type. While it is not a full proof, the details which are omitted are sufficiently trivial that an intelligent reader will automatically mentally insert the required padding in her head as she reads. Problems which admit this type of proof outline are a recipe for trouble, unless the marking scheme does the sensible thing and awards a typical such solution 4 or 5 points.

The co-ordinators are not fools, and they know that they are in danger of being drawn into an ugly verbal brawl. There are a handful of leaders who are perfectly happy to argue that black is white all day in co-ordination. Almost all leaders will argue that very pale grey is white. What do co-ordinators do when this is about to happen? Well, one mistake they can make (and did make in Slovenia) is to become very bureaucratic and administrative (for readers of *The Hitchhiker's Guide to the Galaxy*, the co-ordinators switch into *Vogon* mode). Co-ordination turns into a cycle of conversations which go like this:

Co-ordinator: "This student has not checked the X configuration, so the proof is incorrect."

Leader: "In the method of proof used by this student, the X configuration cannot arise."

Co-ordinator: "How does the student know that?"

Leader: "The student has explicitly set up the argument in such a way that the X configuration cannot arise."

Co-ordinator: "Perhaps the student has set up the argument in such a way that the Y configuration will not arise, and is in fact completely unaware of the existence of the X configuration."

Leader: "Your argument is absurd. In a mathematical proof you do not have to mention all the things which need not be considered."

Co-ordinator: "You do have to mention them when their exclusion is central to the argument."

Leader: "No you don't, you just exclude them."

Co-ordinator "What mark are you asking for?"

Leader: "6."

Co-ordinator "It is worth 1."

I am afraid that some injustice was certainly done. I am aware of one case in my own team where the student Saul Glasman was given one mark, but the solution was worth (in my not so humble opinion) five. There were many similar cases in other teams. Perhaps the jury simply shouldn't set questions which will generate essay answers with lots of picky detail to discuss. However, we would lose some good combinatorics questions if we adopted that form of self-denial. Of course there are other ways of co-ordinating a question badly in addition to the Vogon technique. There is the *arbitrary exercise of power* which happens when a chief co-ordinator singles out some technical detail in a proof and makes out that this particular point is of over-riding importance, and unless the student mentions it in red ink, and decorates the script with bird of paradise feathers at that point, then the proof should be deemed virtually worthless. We had one of those in Greece 2004 and one in the United Kingdom 2002.

In Japan 2003 there was a number theory problem which admitted very

many different solutions, and the Hungarian Leader József Pelikán wisely suggested that we identify the fundamental taxonomy underlying the question, and award part marks for chopping up the question the right way. This worked very well. Unfortunately this 2006 combinatorics problem did not allow such an approach to assessment.

I think you have no option but to use the zero plus versus seven minus approach. A piece of logic not made explicit which could be fixed within a few seconds takes you down to 6, and two such offences down to 5 and three to 4. I think that this should be the minimum mark for any essentially correct solution even if it is put sloppily. Of course if a missing step contains a good idea or is not obvious, then the mark should collapse into the zero plus regime. Such schemes have their problems, but do have the merit that students who have more or less solved the problem get nearly seven marks. Perhaps it would be a good idea to hold a jury meeting after the first couple of hours of co-ordination to discuss if the processing of any particular question is going off the rails. If it is, then we can rethink that marking scheme and start again.

The experience of the United Kingdom's co-ordination phase was fairly typical I think. By and large the co-ordinators were very rational and had clearly read the scripts. We were often followed by the cameras, and we had significant disputes in only two problems. The cameras catch me having a rant after the co-ordination of Problem 2.

In the evening the jury meets to settle disputes and approve the medal borderlines. We have to stretch ε beyond the 50% rule for medals, including a tiny handful of extra students in the bronze zone. If we had not done so, I think only 38% of students would have got medals. The bronze cut off would have been 16 and the silver 22.

July 16 There is the general IMO excursion. For years I have kept relatively quiet about these things in print, but now the truth can be told, precisely because the Slovenian excursions were really quite good (mostly). This is not always the case.

As a general rule, IMOs and boats do not mix. There was an unpleasant incident on the paddle steamer Waverley in Scotland in 2002 when we huddled inboard sheltering from the rain, and an attempt was made to feed about 600 people using facilities appropriate for 50. That had a happy ending when the sun came out and we had a beautiful cruise in the late afternoon. However, nothing can capture the horror of the black hole on the Potomac in 2001. Then the leaders were rendered onto a floating discotheque in heavy

rain. When you staggered outside to escape the nauseating music you got drenched to the skin and attacked by waterproof mosquitos. The fourth of July fireworks displays amounted to flashes of light masked by mist and rain clouds.

In Japan I managed to hide and enjoy a sequence of baths while the IMO spent a day in Tokyo traffic on the pretext of visiting temples. Hiding is generally best, but I regretted it after IMO Greece when apparently the trip was excellent (including Hungarian deputy Sándor Dobos's celebrated ocarina concert in an ancient Greek amphitheatre). I understand that the rescheduled excursion in the path of hurricane Emily in 2005 was rather good. I don't know because I was busy scouring supermarkets for water, batteries and other supplies in case Emily ripped through the heart of Mérida (as forecast).

In Slovenia the excursion was mixed up with a transfer of the jury to Ljubljana, so there was no escape. The tour consisted of two events. The first was a visit to Bled. Those of you who have been concentrating will know that we already spent time there so this might have been pointless for the UK. However, Bled is lovely, and it turned out that we had not been introduced to all of Bled's temptations. This second visit gave a chance to address this oversight. Bled cake is a thick wad of custard and cream between a couple of ice-cream wafers, and is traditionally accompanied by a large beer. The fact that I am able to write this document is probably because of not having discovered this charming calorie-laden vice earlier. Anyway, Ceri and I used our mangled legs to get out of the castle climb, so all in all another completely successful visit to Bled was enjoyed.

My enthusiasm for the second stop was more muted. Lunch was held in a resort near the Austrian border. There was a dreadful oom-pah-pah band pumping out loud submusical twaddle, and the vegetarian food had run out before we arrived. Still, this was not too bad. After all, you could simply walk away from the "entertainment", the weather was excellent and the scenery stunning. The students had got there before the leaders, and this was the first chance that Ceri, Joseph and I had had to see the students since the results were settled. Lee Zhao must have been a bit depressed about missing a bronze medal, and Saul Glasman also had good cause to be annoyed at not getting a silver. However, the team is very close now. The silvers for Jack, Daniel, Jonathan and Tom are not being excessively celebrated. Daniel's hat has apparently disintegrated. Whether he actually ate it, or finally succeeded in tugging it so far down his head that he burst out through the top, is not

revealed.

We headed for the summer bobsleigh to get away from the ear abuse and took ski lifts to the top of the run, but alas time was short and the queue was long. Although the students were allowed extra time to complete their rides, the message was passed up that leaders had to return to base immediately. I joined the Russian leader Nazar Agakhanov on the ski lift back down. It was a very pleasant ten minutes, as we swapped family details and escaped the IMO bubble for a few minutes, soaring over the beautiful Slovenian countryside. Nazar told me that this diary is read in Russia so надеюсь, вы можете так же хорошо читать по-английски, как я писать по-русски, иначе у вас будут трудности с чтением этого дневника.

We arrive in Ljubljana in the evening, and drag our luggage out of the coaches and into the leaders' new hotel. Somewhat predictably we discover that once again Ceri has been erased from reality; she has no room reserved. The hotel gives her a room straight away because of her status as a non-existent person, but Joseph and I are sent to the other end of the building to a special check-in desk for people who do exist. The nightmare returns; a hundred leaders and observers are trying to check-in simultaneously. They certainly exist, and in most cases we must hope that they are unique. I queued for an IMO check-in for the last time in Mexico; never again. We head straight for an adjacent bar and relax until the swarm has dispersed.

July 17 We have the closing ceremony today. In the morning Ceri, Joseph and I decide to stroll through Ljubljana towards the students' site and to try to find our team. After we have walked a couple of hundred yards we bump into them. Now, the exquisitely beautiful Ljubljana is a small city, but even so this is remarkable. We celebrate with lemonade, and predictably the students object to the flavour of this drink because it contains lemons.

At the closing ceremony we have the European Commissioner for Science and Research Dr Janez Potočnik as main speaker. Now there is a man with a budget. He begins by making some very astute asides about how bored he was as a young man when he had to listen to official speeches. Guess what he did next? Anyway, it was splendid that the IMO had the attention of such a significant figure in the politics of science research.

Then came the medal ceremony. This was marked by the usual chaotic scenes as unrehearsed dignitaries and startled students failed to match up on the stage. Happily this gross incompetence merely serves to add gaiety to the festivities, and it is all very moving to see this grand celebration of the next generation of mathematicians come to a climax.

The last act of the closing ceremony was, as always, the passing of the IMO flag from this year's hosts to next year's organizers; in spirit passing the torch from Slovenia to Vietnam. The flag was hanging from a very high pole. Two dancers attempted to reach it without success. Eventually the boy picked up the girl and lifted her high in the air to try to reach the flag. Perhaps this was the intended climax, or perhaps not, it was impossible to be sure. The hook to release the flag was just too high to reach, as the couple tried again and again to get the flag free. This seemed to go on forever, to progressively more laughter from the audience, until jury chair Gregor Dolinar (or was it Charlie Chaplin?) removed the pole from its base, and gently lowered it so that the flag could be passed to Vietnamese safe keeping.

After a short walk we arrived at the banquet hall. This was a fine event and included the award of the celebrated *Microphone d'Or*. The garrulous leader who has made the most contributions to the IMO jury discussions is awarded the Golden Microphone, though it sounds more stylish in French. Rafael Sánchez, the leader of Venezuela, sits quietly at the back throughout the jury, taking note of who makes each speech during the full jury sessions (not the English language committee), and counts which leader has made the most. The announcement at the conference dinner is presented with much fanfare, in all IMO official languages and great ceremony. I assumed that the trophy would be won by Arash Rastegar, the leader of Iran, and a man not slow to his feet. I was aware that I had also been very active and first got an inkling that I might have won when the presentation party avoided looking at my table. By making 48 of the 252 speeches, I have at last won something. The trophy is made of the finest yellow plastic, and will sit in a position of pride in my office. Garnik Tonoyan, the leader of Armenia, presses upon me a supplementary award of Armenian brandy and I share it round. I will try to obtain an animated *Microphone d'Or* for my website, to pass on to future award winners.

July 18 The IMO ends today, but we were offered the opportunity to stay until the 19th in order to visit Venice. Notwithstanding my earlier well-merited criticism of various IMO excursion follies, most of the UK party decided to do this. Silver medallist Jonathan Lee and deputy Ceri Fiddes elected to depart today, perhaps wisely. The excursion began at 6:15am and we were issued with a packed lunch. This turned out to be the only scheduled food on offer during a trip which would go on until 11pm. What can I say?

The bus calls for the leaders first, and then goes on to the students' site where we pick up five members of the UK team and an interesting assortment

of other characters. Our students engage in endless card games involving exotic and ever changing rules. They are not seated in one place, but rather distributed haphazardly round the bus. This leads to much passing of cards.

The Irish deputy, Gordon Lessells had managed to leave his passport behind (everyone should know this). Using his much advertized Blarney feature he managed to talk his way into Italy using driving licence, a library card or maybe a bus pass or something similar.

Anyway, we made it as far as a comfort stop at a service station on the Italian side of the border when fire-engines started racing past in the direction of Venice. Now if I had been alone, I think I would have blessed my luck, and settled down for a long wait in the service station. Not so our determined bus driver. He ordered us all back on board, and raced out to join the traffic jam backed up behind the road smash. We were stationary in the Italian sun for 1 hour 45 minutes. Nice decision that.

Perhaps our tour guide deserves a mention. He had to improvise to fill the dead time created by the road accident. Tourist guides in Central and Eastern Europe do not use the same bland language as their counterparts elsewhere. Respect for the diverse opinions and cultures represented in an international gathering does not come easy to someone who has taken up being a tourist guide in order to express grievances to a wider audience. We were given a selected history of the area. One regional language was dismissed on the grounds that its users indulged in inbreeding. According to his version of events, Trieste has been made into an international science centre in order to help it overcome its twin problems that its population is (a) old and (b) fascist. There is a tourist guide in Budapest he should meet. During one of the UK-Hungary maths camps she gave us a tour of Budapest richly decorated with xenophobic asides. I think they would enjoy each others company.

The traffic delay (and the subsequent Neandertal political analysis) disrupted the schedule. Everything had to be rearranged at short notice, and in the circumstances, a reasonable fist was made of the programme. In the afternoon we were given a free hour in Venice after a gallop round the most significant tourist sites. Our team needed to be cooled off in an air-conditioned environment, and this we managed. Nazar told me that the hardy Russians ignored the heat and enjoyed a Gondola trip. Well done.

We then all took had a boat ride in the lagoon and visited a couple of Venetian islands to engage in pleasant strolling.

On the final day we seek out a proper pizza joint for lunch. They supply

the largest pizzas I have ever seen. Cryptically, Saul says that he has eaten here before, but whether he means last week, or on a family holiday in Ljubljana, or perhaps in another life, he does not make clear. Like the matter of Daniel's hat, it seems better not to press the issue.

Easyjet took us home on time and without problems. They are therefore awarded bonus points, and are not appended to my list of the world's worst airlines: Malev, British Airways, Olympic Airlines and Austrian Airlines. Actually Malev's offence is getting quite old now, and I will remove them from the list on the 20th anniversary of their disgraceful behaviour (2012). Unless, of course, new evidence of incompetence is forthcoming.

Thanks for a great IMO 2006. So farewell to Slovenia, and perhaps to the Tolar. Don't break up the printing blocks.

Geoff Smith UNK7
A forest in the Volshchansk region of Ukraine.
August 2006.
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P.S. The Hungarian deputy leader is now a father. Sándor's splendid wife Tímea gave birth to Jakab on July 30th. Please celebrate in your own way.