Australia wins the International Young Physicists' Tournament

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Three years ago I wrote an article for Australian Physics about the International Young Physicists' Tournament. At that time, the 2004 tournament had just taken place in Brisbane with Poland emerging as the winners and the two Australian teams achieving eleventh and nineteenth.

To the delight of all involved, the 2007 Australian team of Kathryn Zealand and Antonia Morris from Brisbane Girls Grammar School, Christopher Bentley and Mitchell Stevens from All Saints Anglican School and Thomas Milburn from Brisbane Grammar School won the 20th tournament recently held in South Korea. Team leaders were Mr Phil O'Neill and Ms Noel Chan from BGS and the team was accompanied by Dr Antoine Durandet from All Saints who acted as an independent juror during the tournament, and Mr Alan Allinson from BGGS, a member of the International Organising Committee.

The Australian mascot, Schrodiger, a metre high blow up kangaroo rounded out the party. His name had meant to be Schrödinger but the Koreans could not spell that!

The IYPT is a competition designed for senior high school students. Teams consist of up to five students, with a minimum of three. Each team receives the list of seventeen problems for the tournament about six months before the event. They then spend all of their spare time, and one suspects some of their core time, theorising and experimenting to prepare solutions.

The tournament consists of five preliminary rounds and a final. Each contest or physics "fight" takes place between three teams who take on the roles of Reporter, Opponent and Reviewer in turn. A fight commences with the Opponent challenging the Reporter to present their solution to a particular problem. The Reporter can accept or decline. During the preliminary rounds, a team can decline a maximum of a total of three times before penalties are invoked. A team cannot report on the same problem more than once.

Once the team reporting has accepted a challenge, they have a fixed time to prepare their presentation which is given by a single member of the team, again within a fixed time. It is then the Opponent's turn. During their time allowance, they are able to ask clarifying questions followed by one member delivering a critique of the report. This is followed by a "discussion" between the representative of the Reporter and that of the Opponent. Some of the discussions were vigorous to say the least!

It is then the Reviewer's turn to ask clarifying questions of the Reporter and the Opponent before presenting a critical review of their performance and the physics. The presenter from the Reporter has the last say with a two-minute wrap up.

Each fight is judged by a panel of physicists, teachers and the odd engineer. At the conclusion of the fight, panel members are able to ask questions of the participants. Then they allocate a mark out of ten to each. The highest and lowest scores are discarded and the remaining averaged. The score for the reporter is weighted by three (unless penalties for too many refusals have been invoked) and the Opponent's mark by two. The maximum score a team can receive from a fight is sixty.

Fig 1. Winning Australian team following presentation of trophy and medals: from left Schrodiger, Christopher Bentley, Thomas Milburn, Kathryn Zealand, Mitchell Stevens, and Antonia Morris

Why did this Australian team win against mainly older competition from twenty countries from six continents? Like all good scientists, this team built on the experience of previous Australian teams over the past thirteen years under experienced leadership. But more than just this, those of us who have been involved in this event for many years, physicists and teachers, all agreed that the final of the national competition between teams from these three schools, was the highest standard yet, and worthy of an IYPT final. Finally, team captain, Kathryn Zealand, was a member of the 2006 team as a Year 10 student and brought outstanding talent, experience and leadership to the rest of this excellent team.

While the Tournament has yet to achieve the profile of the Olympiad competition in Australia, overseas it attracts significant attention. In Korea, the Tournament had intense national media coverage, including all three main Korean Television channels (SBS, MBC and YTN) that filmed the opening ceremony, closing ceremony and the Final. Also during the competition a documentary was filmed about IYPT which will be broadcast on the Korean Education Network. The tournament had logistic support from the Government, University and Industries in excess of US$1,200,000. As a country, Korea has shown a tremendous interest and commitment in

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Fig 2. Australian team in front of the venue: from left Thomas Milburn, Kathryn Zealand, Antonia Morris, Mitchell Stevens, Schrodiger and Christopher Bentley

developing young physicists via this competition.

The draw for the Australian team was:
Round 1Germany, Hungary, Australia
Round 2Australia, Austria, Czech Republic
Round 3Bulgaria, Australia, Korea 2, Korea 1
Round 4Kenya, Australia, Switzerland, Croatia
Round 5USA, Australia, UK

The first round saw Australia meet Germany, a perennial finalist, and gave the team the opportunity to be challenged from the start; the third round involved meeting both Korean teams, the fourth round included last year's champions Croatia, and a fifth round against two English speaking nations in the United Kingdom and the USA.

The problems reported by the Australian team in the preliminary rounds were: Condensation, Rheology, Fluid Lens, Slinky and Water Jets. Details of these and the other problems can be found at *www.iyptaustralia.org.*

Australia finished the preliminary rounds in first place with Korea 2 in second and New Zealand third. In the final, staged before a large audience of around 700 including the Ministers for Education, and telecast live by the three main Korean networks, Kathryn again presented Water Jets, Tom opposed New Zealand's Blowpipe and Mitch reviewed Korea 2's Steam Boat.

It is necessary to correct the notion that Kathryn just repeated her presentation from round 5. In the intervening time, she undertook new experiments, devised a new mathematical model and revised her power points. And it was all worth it with Australia scoring 50.4 to Korea 2 and New Zealand tied on 49.7.

I asked Kathryn to provide me with some quotable quotes for the article. This was her response:

"I was asked to give some 'quotable quotes' for an article on IYPT, but good quotes tend to follow the same pattern: they have a beginning – to catch your attention, a middle – to set up a story, and a punch line – some unexpected, witty, thought-provoking final statement.

But, I find physics isn't like that. IYPT problems might begin that way: you observe a phenomenon for the first time and go "wow!" And it certainly is a catchy start. You get that desperate urge to find out why. Why it does that particularly interesting thing, and why it keeps giving unexpected results?

There is also a comparable 'middle' – the research – reading papers, thinking about the physics, experimenting and trying different things and trying to develop a possible solution or explanation. This is the bit I enjoy most. Sitting down with a pen and paper and trying to write down the physics. Good basic physics. And the freedom to take it where ever you want, often one particular aspect of a problem will be particular appealing, or particularly elusive, and I get such delight from finally graphing the result of some horrible theoretical function, and having it actually look something like the experimental data!

Fig 3. Captain of the winning Australian team, Kathryn Zealand, with 2007 IYPT trophy

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Fig 4. Winning Australian team following presentation of trophy and medals: from left Kathryn Zealand (captain), Mitchell Stevens, Thomas Milburn, Christopher Bentley, Antonia Morris, Noel Chan (leader) and Phil O'Neill (leader)

The main reason I think an experience like IYPT is completely unquotable is the lack of punch line. The IYPT experience never ends, the physics research doesn't conclude, and the solutions are never complete."

The Teacher/Leaders form a vital part of the team. Their role is probably most vividly relayed in the following description from one of the Australian leaders at IYPT 2007 of the scene deep into the preliminary rounds.

"At this stage of the competition, the teachers are surviving on less than 6 hours of sleep each night (or even dreaming of solutions to problems!) and copious amounts of coffee. Whilst the students are working on their presentations, we are guiding them along with encouraging words, re-reading their presentations, checking the maths in the derivations or actually telling them to stop working because it is getting too late. For me, this is by far the most physically demanding and rewarding part of the trip. It is great to witness a student's grasp of difficult physics concepts, their growing ability to explain it and their passion for the Physics itself! It is a big step for students to accept that their solution is by no-means a perfect solution (unlike most high school physics) in terms of describing all aspects of the phenomenon but it is a part of their continual process of discovery."

To win this tournament is a wonderful achievement. Put in context, most of the competitors from Europe and North America are on average a year older than the Australians. There were a number of Olympiad gold medallists in other teams. In some countries, team members receive intensive training in a university department with staff and resources made available to assist them in their problem solving.

The vision for the IYPT in Australia is for it to become a truly national activity. Teams would prepare and compete in each State or Territory, with the winning teams from each coming together in a national selection final. There has been some interest from schools outside Queensland but efforts for them to attend the selection tournament have foundered due to lack of financial support.

A sponsor, or sponsors, for a national competition are needed for the vision to become reality. Any suggestions? In the meantime, we can bask in the glory of Australia's latest international champions: the 2007 IYPT team.