The third International Conference on the Teaching of Mathematics (ICTM3) was held from June 30th to July 5th 2006 in Istanbul, Turkey. It followed two successful events, ICTM1 held on Samos in 1998 and ICTM2 on Crete in 2002. The conferences always coincide with the World Cup, adding a friendly rivalry to the proceedings, which unite rather than divide nations. ICTM3 brought together 520 delegates from 58 different countries to discuss the latest work on mathematics education at the undergraduate level. US delegates formed the largest contingent, followed by a solid block from the UK. Since there were usually six sessions running in parallel during the six days of the conference, it was only possible to attend a sample of the papers on topics ranging from fundamental pedagogical research through to the solution of specific mathematical problems and the use of technology. There follows my small sample of what went on:

McCallum (US) and Hadar (Israel) used the opening plenary to discuss the relationship between mathematics and mathematics education. According to McCallum: “Mathematics is inhuman. It typically involves just 40 other people around the world who understand each other’s work”. (Why 40? Is it 42 to one significant figure?) “The advancement of mathematics is fundamentally important and valuable work, but unintelligible to the rest of the world and most other mathematicians. Mathematics education is human and intelligible, but it involves silly, unimportant, useless, irrelevant, simplistic, unreal mathematics. How do we bridge this apparent gap?”

Fortunately the rest of the conference helped bridge the gap and answered some of the provocative questions posed about how mathematicians and mathematics educators can communicate.

Sessions did not always have a well-defined theme, but the first on reasoning and proof was an exception. Mejia-Ramos (UK, Warwick) argued that argumentation in
maths reasoning was different from formal deductive logic taught by mathematicians and proposed an alternative framework. Burch (UAR) discussed a framework for conjecturing as a classroom activity, identifying two key types: those related to solution of problems and those relating to generalisation of problems. Knapp (US) developed the notion of an active audience in proof writing, by getting maths students to evaluate each other’s proofs. Heady stuff indeed! Ambramovitz (Israel) talked about how proof writing by engineers could be improved, e.g. by piecing steps together as a puzzle, more like something I have tried!

Dagan (Israel), a retired lecturer, presented his comprehensive on-line courseware for algebra and calculus, http://www.MathAnimated.com, based on a physics course. He wasn’t the only one at the conference to assume that undergraduate physics is taught everywhere. One presenter even wanted maths teaching to be reordered to better suit the needs of physics. Polycarpou (US) attempted to identify the source of computer science difficulties in proof by induction. Craig (South Africa) described how reflective writing by 1st year maths students could be used, rather than symbolic algebra, to promote mathematics problem solving. Barbosa (Brazil) analysed the logic of student group discussions, and especially interruptions, in the learning of mathematical modelling. Robinson (UK, Sheffield Hallam) described how the focus could be moved away from “doing the sums” in maths modelling. His approach was illustrated by a spreadsheet, including macros, given to students for the PDE solution of Black Death propagation. Students were not expected to write it themselves. It could equally be said that there’s more to maths than “doing the algebra”, which CAS can eliminate.

Mackie (Napier) described how 1st year sports science students had used technology and blended, on-line learning to motivate their study of maths. Grieff (South Africa) discussed some numerical ODE solutions generated by CAS and a method for identifying when they might be breaking down.

A morning panel discussion on distance education was general and chatty. Kyle (UK, Birmingham) was more focused in his paper on computer algebra based CAA systems. Find f, given f ‘(1) was a simple, yet revealing, example of an open-ended question that he offered. There is plenty of scope for developing effective open-ended questions in the future and analysis of student answers can be revealing. Berezina (Israel) presented a less inspiring paper on how MCQs can be improved by analysing them.

Teeguarden (US) first showed some silly maths questions given to 1st year maths students. She talked about a wide range of examples, which helped to demonstrate the relevance of maths in the real world, from credit card debt to diets and triathlons. Presumably this assumes that students are in debt, on a diet or are swim-bike-run enthusiasts. Steyn (South Africa) talking about mathematical thinking skills, spent most of the time talking about Logo and seemed to be more inspired by the child-like pictures it could generate, which seemed rather a waste of mathematical thinking. Carrera (US) briefly mentioned the use of the TI-84 and its PC simulator, before dishing out promotional software and going into a sales pitch for the company.

McCabe and Heal (Portsmouth, UK) was one of only two papers to discuss the use of audience and classroom response systems. Melka (US) had a set of 20 wirelessly connected HP tablet PCs and demonstrated how they were used effectively in maths, physics and astronomy teaching for annotating lecture notes, marking and discussing student submitted work. The Math Journal software was particularly useful to him as a maths recognition tool. He also used a free product called Classroom Presenter, which had features comparable to our own Discourse software.

In a presentation – discussion session, Houston (Ulster, UK) looked at the induction and support for new maths lecturers, specifically describing an international survey of maths heads on EPD (early professional development) and CPD (continuing professional development). Despite the fact that only 16 out of 100 UK heads had responded, the UK does relatively well in this area. Nardi (UEA, UK) presented transcripts of numerous student teacher conversations as part of a six-university study on six wide-ranging themes, two on proof and reasoning, two on maths objects, one of communication through symbols and graphs and one on research collaboration. This heavy discussion paper was followed by a lighter one in which Konstantinou & Kalycioglu (US), two new teaching assistants, showed a set of video case studies for mathematics teacher training. Back of Book, Late Homework, Formula, Walking Demo were the titles of some clips, which aroused lively discussion. There was even a debate over whether students need to be able to “complete the square”!

In describing a European project for the reform of engineering mathematics teaching, De La Villa (Spain) drew the analogy between football clubs and universities. Given that the World Cup was on he could be forgiven, even though England had just been knocked out by Portugal. He described the development and tools for dMath, a European database of mathematical e-learning modules. His reference to “new and untried” technology seemed ominous, but who knows? Pitt (Sheffield Hallam, UK) talked about the use of spreadsheets for teaching genetic algorithms. Students did not have to write the spreadsheets or macros from scratch, but were able to focus on the problems. Use and modification of spreadsheet macros was seen as a valuable skill for employability.

Maerivoet (Belgium) discussed the use of Maple for problem solving and AIM computer algebra based e-assessment in an open learning context. It convinced me that Maple-TA is the better bet for the future, even if AIM is free.
Humour and Mathematics: Hamming it up at ICTM3

Pemberton (Australia) demonstrated some impressive Maple applications, which he had developed for visualising and exploring convergence in the trapezoidal and Simpson’s rule. Books always show nice curves, but what happens when you apply them to \( \frac{11}{10} \times (x + \sin(4x)) \) and other nastier functions? Pemberton showed what books do not reveal in an extremely effective way. Sugden (Australia) presented a paper on the peer reviewed e-Journal “Spreadsheets in Education”, which he set up.

Not all the discussion sessions provoked that much discussion. Zorn (US) talked about calculus calculations, concepts and analysis. The fact that the function \((x + \sin(x))\) does not have exactly the shape expected by most students aroused his interest, but not mine. Kwon (Korea) talked about inquiry-based learning of ODEs, but my lack of notes suggests that I was not that inquisitive. Vaz (Portugal) described some project work in multivariable calculus designed to improve communication skills and critical thinking, with the use of visualisation playing an important part. I didn’t find the examples presented that convincing, but maybe that was just sour grapes after England had just lost the World Cup to Portugal. Since Keith Hirst (Southampton, UK) is involved in this project, I should really be more positive.

Gretton, Challis et al (Sheffield Hallam, UK), brought the conference papers to a climax with their discussion of mathematics and humour. Improve the class alertness by getting them to stand up and “be \( y = x^2 \) with their arms or “be \( y = x^3 \) if you want to include some legwork. Really warm them up with rapid iterations of \( x^2 = y^2 \) and \( x = 0 \). Improve their backs with “\( y = e^x \)” or chests with “\( y = \sin(x) \)”. Get really carried away with some multivariable polynomials! Show them some Abbott and Costello video clips or Dilbert cartoons. Ask them to spot the deliberate mistake in an episode of The Simpsons, laugh at the Star Trek computer calculation of the final digit of \( \pi \). Get them to write down their own funny maths stories, jokes or cartoons and produce posters on the subject. Now there’s an idea for induction week to break the ice.

Feeling that mathematics might be rather fun after all, I wandered through to the closing plenary only to be returned to the depressing theme of inhuman mathematics. Lins (Brazil) compared maths with scary monsters, including a discussion of “monster theory” and semantics. In between serious mathematical examples of irrationality, complexity and infinity, he showed a film clip featuring a gorilla and a terrified little girl: “The gorilla is mathematics and the little girl is a student”, he explained! Maybe I should remember to shave before lectures in future.

These were just the papers that I attended and I might easily have missed some high quality contributions. The online administration of the conference was excellent, thanks to Doug Quinney (UK, Keele) and son. Paper submission, refereeing and approval of abstracts was an extremely efficient process for those of us persuaded to be on the programme committee.

So often, it is the extra-curricular activities that are memorable at conferences and ICTM3 lived up to this. The conference dinner was held at the Sabanci University overlooking the Bosphorus and delegates were allowed free admission to an exhibition of bronze sculptures by Rodin. It seemed highly appropriate to have a photo taken alongside Rodin’s “Thinker” with his elbows on his knees and head in his hands. Maybe there’s a connection between Rodin’s “Gates of Hell” and mathematics too?

One English woman, who made a significant contribution to mathematics and worked in Istanbul for several years, was not mentioned at the conference. Her name was Florence Nightingale. During the Crimean War she set up her military hospital at Selimiye Barracks on the Asian side of the city. Besides saving thousands of soldiers’ lives, she devised the first coloured pie charts or “coxcombs” to display the monthly mortality data clearly. Since her home and grave are in Hampshire and she founded the nursing home at St Thomas’ Hospital where our children were born, I was keen to visit the Florence Nightingale Museum. The Selimye Barracks are now a Turkish Army base, so special arrangements had to be made for access to this high security location. Although the museum exhibits include her lamp, desk, medicine bottles, and letters, there was no mention of her mathematics. Joe Kyle, Diana Mackie and I, the three of us who visited the museum, hope to rectify that omission in the near future.

Matthews has a great deal to do with inhumanity, monstrosity and war, but ICTM3 seemed to get over this remarkably well. There can be no doubt that ICTM4 will bring mathematics educators together again in 2010, but maybe the last word from ICTM3 should go to Neil Challis: “If I could be a stand-up comic, I wouldn’t be at this conference presenting a paper about mathematics and humour”. Nice one, Neil!