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# Impressions of ICME-9

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**Report on ICME-9 - the ninth meeting of the International Congress of Mathematical Education, 31 July - 6 August 2000 in Tokyo, Japan**

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Held every four years, ICME is a large international conference embracing all levels of mathematical education. Some 2000 participants attended, presented and "workshopped" through various sessions in and around the reclaimed swamp which is now the international conference centre at Makuhari just outside Tokyo - a sort of NEC by the Sea.

There were five plenary sessions delivered with the aid of simultaneous translations between Japanese and English. From my perspective the first lecture by Mogens Niss - "Key Issues and Trends in research on Mathematical Education" - was by far and away the most useful and stimulating. Within the constraints of 50 minutes this was an excellent summary and I recommend all who can to get hold of a copy and read it. [At present there is no version on the ICME-9 website - <http://www.ma.kagu.sut.ac.jp/~icme-9/index.html> - but the proceedings will be in conventional form in the near future.] Of course it was selective but the selections seemed to be reasonable and representative of the major developments in the history of this relatively youthful discipline. Among the other plenaries, Prof Fujita of the host nation offered in contrasting style a thoughtful analysis of the issues that may be thought to be of special relevance to applied mathematics.

Some 55 regular lectures offered, in parallel sessions, a rich and exciting list of topics. I let my own interests guide me here to, for example, Ed Dubinsky's description of a "Theory of Learning Advanced Mathematical Concepts". This consisted of an outline of the so-called APOS [Actions, Processes, Objects, Schema] theory as applied to the problems of teaching more abstract concepts in pure mathematics. For example, in this presentation, Prof Dubinsky looked at the problems of learning about cosets and quotients in group theory. [More information about this approach may be found at <http://www.cs.gsu.edu/~rumecl/index.htm> ]

The rest of the time was given over largely to Working Groups for Action [WGAs] and Topic Study Groups [TSGs]. WGA5 focussed on university level mathematics and provided the real working environment of the meeting. My overall impression is of thoughtful - at times, provocative - presentations leading to well-informed and lively discussion. WGAs according to the

conference prospectus are sessions where "hot and controversial topics" are discussed among experts and general participants with an interest in the theme. Thus for example in two consecutive talks quite contrasting theses were presented on whether mathematics represented the ultimate triumph of reason over emotion [not that this was a title either used by either of these speakers]. The only slightly bizarre aspect of this enthralling afternoon was that all three of us had journeyed half way round the world from the same institution for the experience.

Topic Study Groups have as a remit "presentation and exchange" of results. From my observation there is little to distinguish WSGs from TSGs. My chosen TSG concerned itself with Proof and Proving in Mathematics Education". [Although rather frowned upon by the organisers, I also swapped to catch the flavour of "Problem Solving in Mathematics Education".] This

TSG included a thought provoking presentation from Yasuhiro Sekiguchi concerning the problems of adopting an "adversarial" approach to the discovery of proof in a society where the cultural background has been to discourage dispute and seek consensus.

There were few disappointing aspects. One might regret that the "West meets East" opportunity did not really work, at least for me [with the notable

exception of Sekiguchi's talk mentioned above.] There were the usual disappointments involved in negotiating classing presentations. But these are relatively small matters; overall the conference was a rewarding and stimulating experience.

For me as an individual and as a representative of the Maths, Stats & OR Network, the enduring words of the Congress came from the opening Plenary:-

"The very existence of a gap [between researchers and practitioners] is neither surprising nor worrying. The cause for concern lies in the fact that it is widening. ...for the health and welfare of our field we have to do our utmost to reduce the gap as much as possible. If we are unsuccessful in this, research in mathematical education runs the risk of becoming barren dry swimming, while the practice of teaching runs the risk of becoming more naive, narrow-minded and inefficient than is necessary or desirable." [Mogens Niss, Roskilde University]

