

Mathematics Enrichment Camp 2005

by
Elaine Liew

To most, it was just another Tuesday, but an exciting day lay ahead of the participants of the Mathematics Enrichment Camp 2005. Organized by the NUS Department of Mathematics, and held on the 13th of December 2005 from 8.00am to 5.00pm, it was specially tailored for SM2 students, as well as students from junior colleges and NUS High School.

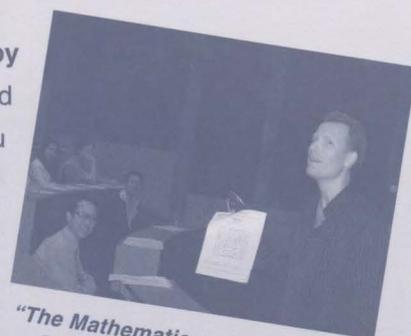


Welcome address by Prof Lee Seng Luan

Here are the highlights of the day's programme:

Following a heartwarming **Welcome Address by Professor Lee Seng Luan**, Head of the Department of Mathematics, **Associate Professor Goh Say Song** gave a **Brief Introduction to the Department of Mathematics**.

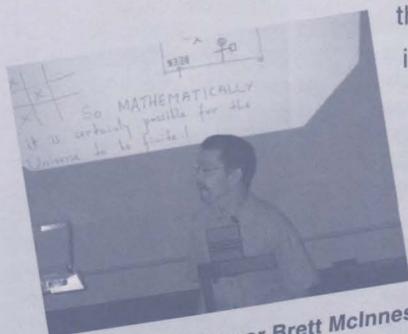
Our first lecture was on "**The Mathematics of Sudoku**" by **Associate Professor Helmer Aslaksen**, who was awarded the University's Outstanding Educator Award in 2004. Sudoku is a logic puzzle where you are given a 9x9 grid made up of nine 3x3 blocks. The goal is to place the numbers 1 through 9 into the cells in such a way that each row, column and box contains each number exactly once. While this does not require any Arithmetic, solving the puzzle certainly involves Logical Reasoning - an important branch of Mathematics.



"The Mathematics of Sudoku" by Associate Professor Helmer Aslaksen,

After a refreshing break at 10am, **Associate Professor Brett McInnes** intrigued us all with his Lecture on "**The Shape of the Universe**". One of

the great questions in science is this: is the Universe finite or infinite? The professor explained how a flat space can be finite, and why there are theoretical reasons to believe that our Universe is finite, even if it is extremely large. We also had a great bit of fun watching demonstrations of Torus and Klein Bottle games (find them at <http://www.geometrygames.org/TorusGames/>) For more information, visit the professor's website at <http://www.math.nus.edu.sg/~matmcinn/>



Associate Professor Brett McInnes intrigued us all with his Lecture on "The Shape of the Universe".

Next, **Professor Zhu Chengbo** presented us with some mind-boggling Mathematical Prize Problems in his Lecture on “**Famous Problems in Mathematics**”. These are some of the most fascinating and difficult problems that have captivated Mathematicians for centuries...

- Continuum Hypothesis,
 - Fermat’s Last Theorem,
 - The Poincare conjecture,
 - The Riemann Hypothesis
- (the last of which is my personal favourite)*

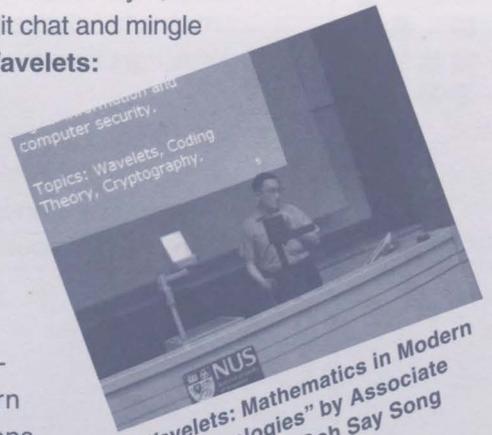


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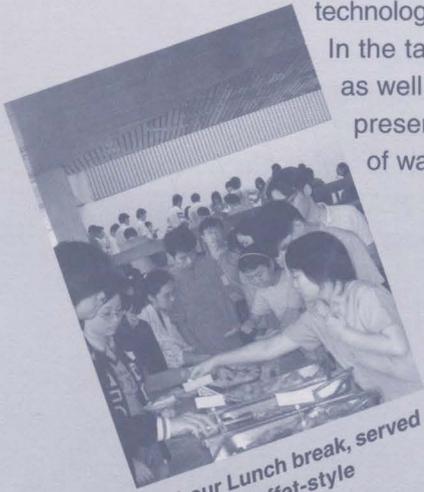
Prize problems share some common features: besides appearing easy but being very difficult to solve, they involve important branches of Mathematics - such that, even if the problem is unsolved at the end of the day, great Mathematics and powerful tools are generated along the way.

We had a much-needed 1-hour Lunch break, served buffet-style, at half past noon- a time for the students and professors to chit chat and mingle around. Pepped up, we returned for a Lecture on “**Wavelets: Mathematics in Modern Technologies**” by Associate Professor **Goh Say Song** - placed on the University’s Honour Roll in 2004, in addition to being the current Assistant Head of the Department and the Deputy Director of the Centre for Wavelets, Approximation and Information Processing (CWAIP).

This was, for me, a whole new perspective- understanding the role of Mathematics in modern technology. Wavelets are new mathematical functions with numerous applications in science and engineering. The CWAIP in the Department of Mathematics has developed wavelet-based image and video compression technologies that perform better than existing software in the current market. In the talk, the concept of efficient data representation for compression, as well as an idea of how the wavelet transform helps to achieve it, was presented, along with the construction of some elementary examples of wavelets.



“Wavelets: Mathematics in Modern Technologies” by Associate Professor Goh Say Song



1-hour Lunch break, served buffet-style



Our last lecture was on "**Graph Colouring & Its Applications**" by **Professor Koh Khee Meng**. Motivated by the Four Colour Map Problem, the

concepts of a graph, its colouring and chromatic number (the minimum number of colours needed to colour a graph so that no two adjacent regions have the same colour) are introduced, along with its applications to the time-tabling problem and traffic phasing problem. Interested? Get your hands on a copy of the books he co-authored: Principles and Techniques in Combinatorics, College Mathematics Volumes 1 & 2, Counting, and Chromatic Polynomials and Chromaticity of Graphs.



*"Graph Colouring & Its Applications"
by Professor Koh Khee Meng.*

Energized and invigorated by yet another Tea Break, here comes the highlight of the day... **Singapore's first ever** (according to A/P Helmer Aslaksen) **Sudoku Competition!** A gentle warning though... if a single mistake is made, the only means to salvage the situation is to... start all over again. Yes, right from the very beginning.

After 50 minutes of furious scribbling, heaps of eraser dust, deep intense concentration, and exasperating dead ends... here are the results!



Sudoku Competition!



*Winner: Tan Zek Gian from
Raffles Girls School (Secondary)*

Position	Prizewinner	School
1.	Tan Zek Gian	Raffles Girls School (Secondary)
2.	Jiang Yan Wen	SM2
3.	Tang Pan	SM2
4.	Liu Qianlan	SM2
5.	Shi Zhiming	Hwa Chong Junior College
6.	Hang Hao Chuien	Hwa Chong Institution
7.	Eng Wee Min	Catholic Junior College
8.	Elaine Liew	Raffles Girls School (Secondary)
9.	Tan Kian Hwee	Republic Polytechnic
10.	Fiona Lee	Hwa Chong Junior College

Note: the puzzle was ranked "hard", but not yet "fiendish" or "diabolical"... Many thanks to the Dept of Mathematics, NUS, for organizing this day camp. It was truly a delightful experience, an eye-opener that allowed us a fresh take on the mysteries and applications of Mathematics.