

51st Annual Meeting of the Australian Mathematical Society

Education Afternoon Program

La Trobe University, Melbourne, Wednesday 26 September

Sponsored by the International Centre of Excellence for Education in Mathematics



An Australian Government Initiative

ICE-EM is managed by:



AustMS Conference 26 September 2007

General information:

La Trobe University

Visit the conference web site for maps and transport information:
www.latrobe.edu.au/mathstats/math/conferences/AMS2007/

Parking will be in car park 2 only, campus map reference E6. Parking is free but delegates must park in the white bays (not the red or green bays).

Talks

These will be in the ELT 6 Lecture Theatre, campus map reference G4.

Registration

The registration desk will be located in ELT6, campus map reference G4. Please register between 1.30pm and 2.00pm.

Afternoon tea

There will be afternoon tea following the first three talks. You will be directed to the venue.

Reception

The Director of the International Centre of Excellence for Education in Mathematics, Professor Garth Gaudry, will host the Reception in the SEMS Meeting Room, level 2 Physical Sciences 1 Building, campus map reference F5.

Education Afternoon Program

A very warm welcome to all Education Afternoon participants.

The afternoon talks are a snapshot of the vibrant, dynamic world of modern mathematics. Professor Stephen Wright and Professor Mark Kisin are plenary speakers at the conference. We are particularly grateful that they have agreed to contribute to the Education Afternoon.

We are grateful also to Dr Melanie Bahlo from the Walter and Eliza Hall Institute of Medical Research who will be speaking about an exciting area of statistics in medical sciences. This is a cross-disciplinary area that offers many wonderful career opportunities for young people with an interest in mathematics and medicine.

Our thanks also to Dr Peter Milley who will be talking about geometric objects which cannot be physically constructed, or even properly drawn, but whose inherent elegance compels us to try anyway.

Dr Micheal Evans from the International Centre of Excellence for Education in Mathematics (ICE-EM) will provide a perspective on modern mathematics and the school mathematics classroom. He will describe the way in which ICE-EM is providing materials that equip students for a world that is even more dependent on mathematical skills.

The final talk will illustrate how important mathematical skills are in the modern business world. We are very grateful to Jetstar Chief Executive, Mr Alan Joyce, for his participation. He will describe some of the ways in which mathematics contributes to a successful airline operation.

The afternoon concludes with a Reception where you will have an opportunity to meet the speakers and other participants over a drink and snack.

The generosity, and willingness, of all the speakers to be part of this program is much appreciated by ICE-EM, AMSI and the Australian Mathematical Society.

Education Afternoon is sponsored by ICE-EM which is funded by the Australian Government through the Department of Education, Science and Training and managed by the Australian Mathematical Sciences Institute (AMSI).

Jan Thomas
Executive Officer, AMSI

Garth Gaudry
Director, ICE-EM

Geoff Prince
Conference Director

September 2007

Program overview

14:00	Stephen J. Wright: "Mathematics and Cancer Treatment"
14:30	Mark Kisin: "Elliptic curves and modular forms"
15:00	Melanie Bahlo: "Using statistics to find disease-causing genes"
15:30	Afternoon tea
16:00	Peter Milley: "Feet firmly planted in the clouds: hyperbolic geometry and hyperbolic manifold"
16:30	Michael Evans: "Mathematics and mathematics in the school mathematics classroom"
17:00	Mr Alan Joyce, Jetstar Chief Executive: "Flying with numbers!"
18:00	ICE-EM Reception

Education afternoon talks

Mathematics and Cancer Treatment

Stephen J. Wright

University of Wisconsin (Madison)

Abstract: Many types of cancer can be treated successfully by radiation therapy, and devices of increasing sophistication are available that deliver doses of radiation with great accuracy. Planning the treatment can be difficult, however, as radiation must be delivered to the tumors while sparing the surrounding tissues - especially vital organs located right next to the tumors. I will show how methods and formulations from numerical optimization are being used to plan treatments.

Stephen Wright is a professor of Computer Sciences and Industrial and Systems Engineering at the University of Wisconsin-Madison. A native of Mackay, he attended the University of Queensland where he received a B.Sc. (Hons.) in 1981 and a Ph.D. in 1984. He moved to the US in late 1984 and since that time has held positions at universities in Arizona, North Carolina, and Chicago. He spent 12 years at Argonne National Laboratory in suburban Chicago before taking up his present position in Wisconsin in 2001. His research interests include computational optimization and its many applications in science and engineering.

Elliptic curves and modular forms

Mark Kisin

University of Chicago

Abstract: Elliptic curves are one of the most fundamental and beautiful objects in modern number theory. I will discuss mod p points on elliptic curves and their link with modular forms. This connection has been the subject of a tremendous amount of work during the last 40 years and plays a central role in Wiles' proof of Fermat's last theorem.

Mark Kisin grew up in Melbourne, Victoria. He completed his graduate studies in Princeton, with Nicholas Katz. After holding positions at Sydney University and the University of Muenster, he moved to the University of Chicago, where he is currently a Professor of Mathematics.

Mark is the 2007 Mahler lecturer which is awarded every two years to a distinguished mathematician. Professor Kurt Mahler was one of the major characters of Australian mathematics from his arrival in this country in the 1960s, until his death in 1988. The Society was a beneficiary under the will of Professor Mahler. The money from this bequest has been used to set up a visiting lectureship in his honour.

Education afternoon talks

Using statistics to find disease-causing genes

Melanie Bahlo

Walter and Eliza Hall Institute of Medical Research

Abstract: Families affected by genetic diseases receive genetic counseling through services such as the Victorian clinical genetics health service. These families are often keen to know which gene of the 30,000 genes in the human genome is responsible for causing disease in their family. Statistical analysis of DNA data allows the identification of causal genes in these families. Such identification could lead to genetic tests and perhaps to future treatment of the disease. It helps improve our understanding of gene functions.

Recent technological developments for the generation of DNA data and the development of suitable statistical design and analysis have also allowed the identification of genes contributing to the disease risk of so called complex diseases such as diabetes and multiple sclerosis. These diseases have multiple genetic causes and are also influenced by environmental risk factors.

Melanie Bahlo is an NHMRC R D Wright Fellow who has her own laboratory in the Bioinformatics Division at The Walter and Eliza Hall Institute of Medical Research, located in Melbourne. In 1996 she graduated from Monash University with a PhD in statistics, specialising in population genetics. After a two year post doctoral position in the same field she moved to the Hall Institute to join Professor Terry Speed's group. She now works in statistical genetics and bioinformatics. Statistical genetics involves the statistical analysis of DNA data to identify genetic loci involved in disease. She collaborates closely with many medical scientists, working on diseases as diverse as epilepsy, multiple sclerosis and deafness. She particularly enjoys the immediate application of mathematics to biological problems, having had the pleasure of seeing her work translate to medical benefits for the public.

Feet firmly planted in the clouds: hyperbolic geometry and hyperbolic manifolds

Peter Milley

University of Melbourne

Abstract: The last few years have seen an explosion of significant results in the field of hyperbolic 3-manifolds, an evocative field of mathematics which unfortunately can present a high barrier to understanding. We are, after all, talking about geometric objects which can't be physically constructed or even properly drawn...but their inherent elegance compels us to try anyway. This talk will attempt to shed some light on the significance of recent results from an elementary perspective.

Peter Milley is a Canadian, but well-traveled as academics tend to be these days. He received his Ph.D. from Princeton University in 2003 and came to Australia last year to work as a researcher with Craig Hodgson at the University of Melbourne. At the University he studies hyperbolic manifolds and writes software to help study them.

Education afternoon talks

Mathematics and mathematics in the school mathematics classroom

Michael Evans

International Centre of Excellence for Education in Mathematics

Abstract: The following three quotations by Alfred North Whitehead provide a basis of discussion for directions in school mathematics:

- 'It is a profoundly erroneous truism, repeated by all copy books and by eminent people when they are making speeches, that we should cultivate the habit of thinking of what we are doing. The precise opposite is the case. Civilization advances by extending the number of important operations which we can perform without thinking about them.'
- 'It is a safe rule to apply that, when a mathematical or philosophical author writes with a misty profundity, he is talking nonsense.'
- 'Education is the acquisition of the art of the utilisation of knowledge.'

The International Centre of Excellence for Education in Mathematics has been working on a program for school mathematics. The aims of this program and the progress made over the past three years will be discussed.

Michael Evans has a PhD in mathematics from Monash University. He has taught at State and Independent schools in Melbourne and overseas. Until recently he was Head of Mathematics at Scotch College, Melbourne. He is currently Schools Project Manager at ICE-EM and collaborating with teachers around Australia in the ICE-EM Mathematics program. This is an innovative program of texts, professional development and other resources for Years 5-10. He is chief examiner for the Victorian Certificate of Education Mathematics Method course.

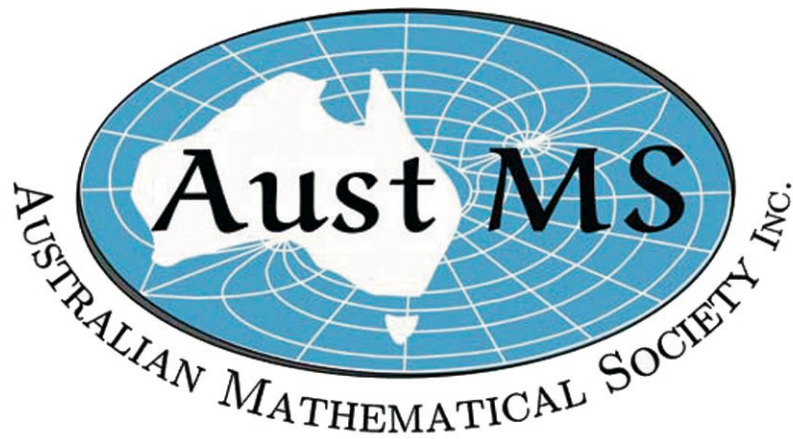
Special session

Flying with numbers!

Mr Alan Joyce

Jetstar Chief Executive

Mr Joyce was born in Ireland and holds a Master of Science degree from Trinity College, Dublin, with a double major in mathematics and physics. When facing complex issues, such as the number of no-shows on particular flights, he has found his mathematical skills to be more important to his aviation career than a pilot's licence.



AustMS Conference