2012/13

The 2012 AMSI Winter School

Geometric Partial Differential Equations

The University of Queensland 2 - 13 July 2012

AMSI
AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

Australian National University

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Pacific Institute for the Mathematical Sciences

BICMR

INTRODUCTION

Strengthening Australian research

The Winter School is designed for post-graduate students and postdoctoral fellows. This year's School focused on recent progress in non-linear partial differential equations and their applications. In particular, the program emphasised three interlocking themes:

- Nonlinear elliptic equations and their applications to geometry and optimal transportation;
- Geometric flows and applications;
- Harmonic maps and applications

The first week comprised introductory lecture courses by Professors Min- Chun Hong, Ben Andrews and Neil Trudinger, and the second week focused on key topics in recent research and contemporary applications.

These lectures were presented by world leaders in the area of Geometric Partial Differential Equations - Professors:

- Robert McCann (Toronto, Canada)
- Neil Trudinger (ANU, Australia)
- Xu-Jia Wang (ANU, Australia)
- Richard Schoen (Stanford, USA)
- Gang Tian (Princeton, USA and Beijing, China)
- James Sethian (Berkeley, USA)
- Tristan Rivière (ETH-Zurich, Switzerland),
- Michael Struwe (ETH-Zurich, Switzerland)

The Winter School is part of the AMSI Vacation Schools and Scholarships project which comprises vacation schools (Summer School, Winter School and BioInfoSummer), Vacation Research Scholarships and the AMSI intern program. The annual AMSI vacation schools and scholarships are funded jointly by the Department of Industry, Innovation, Science, Research and Tertiary Education and the Australian Mathematical Sciences Institute. The 2012 Winter School is also supported by the Australian National University, the University of Queensland, the Beijing International Center for Mathematics Research and the Pacific Institute for the Mathematical Sciences.

COMMITTEES

The 2012 AMSI/ANU/UQ Winter School wishes to acknowledge the generous donation of time and scientific advice of the following committees, without their contribution this event would not be a success.

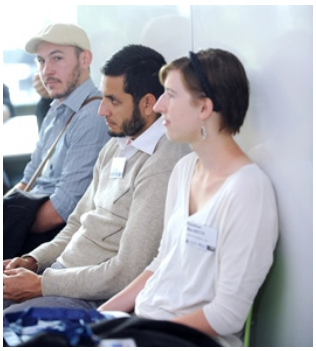
Scientific Committee

- Alan Carey - The Australian National University, Canberra, Australia
- Nassif Ghoussoub - The University of British Columbia, British Columbia, Canada
- Robert McCann - University of Toronto, Toronto, Canada
- Min-Chun Hong - The University of Queensland, Brisbane, Australia
- Gang Tian - Princeton University, Princeton, USA
- Neil Trudinger, (Chair) - The Australian National University, Canberra, Australia
- Cedric Villani - Institut Henri Poincaré in Paris, Paris, France

Organising Committee

- Alan Carey - The Australian National University, Canberra, Australia
- Neil Trudinger (Chair) - The Australian National University, Canberra, Australia
- Joseph Grotowski (Director) - The University of Queensland, Brisbane, Australia
- Min-Chun Hong (Local coordinator) - The University of Queensland, Brisbane, Australia
- Geoff Prince (Director) - The Australian Mathematical Sciences Institute (AMSI), Melbourne, Australia
- Andree Phillips (Administration) - The University of Queensland, Brisbane, Australia

PROGRAM



NONLINEAR ELLIPTIC EQUATIONS, OPTIMAL TRANSPORTATION AND GEOMETRIC APPLICATIONS

Advanced Lectures were given by:

- Robert McCann (University of Toronto, Canada)
- Neil Trudinger (The Australian National University, Australia)
- Xu-Jia Wang (The Australian National University, Australia)

Instructional Course for one week was given by

- Neil Trudinger (The Australian National University, Australia)

RICCI AND MEAN CURVATURE FLOW AND THEIR APPLICATIONS

Advanced Lectures were given by:

- Gang Tian, (Princeton University, USA)
- James Sethian (University of California, USA)

MINIMAL SURFACES AND EXTREMAL EIGENVALUES PROBLEMS

Advanced Lectures were given by:

- Richard Schoen (Stanford University, USA)

Instructional Course for one week was given by:

- Ben Andrews (The Australian National University, Australia)

HARMONIC MAPS AND APPLICATIONS

Advanced Lectures were given by:

- Tristan Rivière (Eidgenössische Technische Hochschule Zürich, Switzerland)
- Michael Struwe (Eidgenössische Technische Hochschule Zürich, Switzerland)

Instructional Course for one week was given by:

- Min-Chun Hong (The University of Queensland, Australia)

ENROLMENTS

BREAKDOWN BY ENROLMENT STATUS

This data reflects registered participants, and does not include speakers, staff or winter school organisers

Figure 1a. Enrolments by Status: Australian Participants

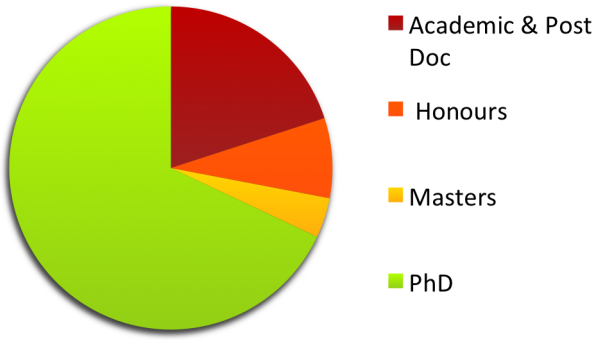
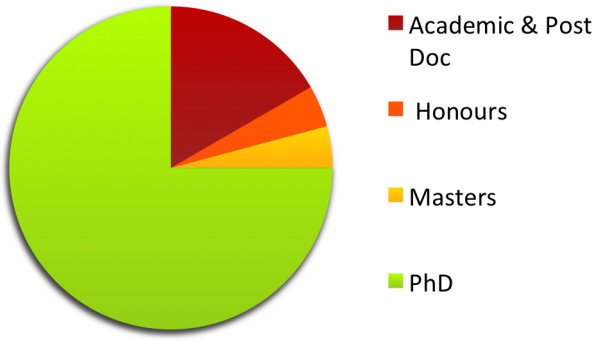


Figure 1b. Enrolments by Status: International Participants

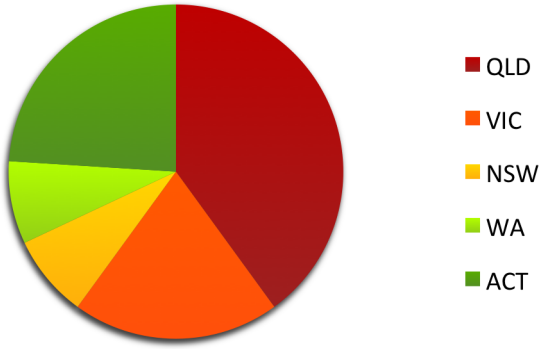


BREAKDOWN BY UNIVERSITY

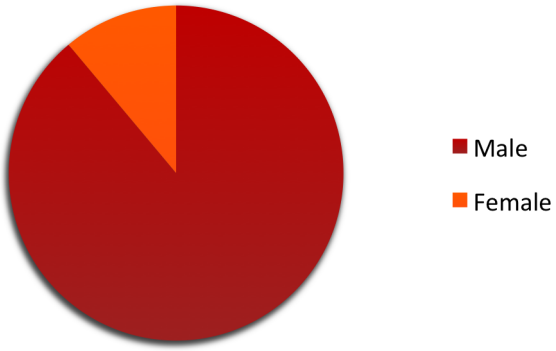
Queensland University of Technology	2
The University of Queensland	8
Monash University	5
Australian National University	6
University of Wollongong	1
The University of Sydney	1
The University of Western Australia	2
Total	**25**

Table 1. Enrolments by Institution

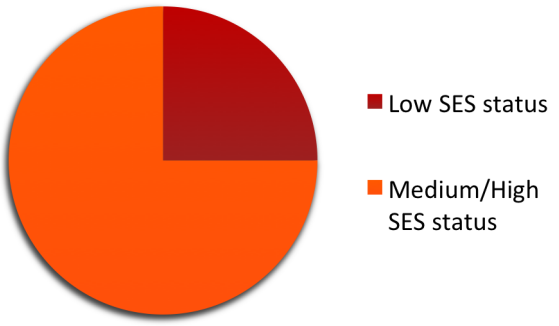
BREAKDOWN BY STATE



BREAKDOWN BY GENDER



BREAKDOWN BY SES STATUS



ABORIGINAL AND TORRES STRAIGHT ISLANDER PARTICIPATION

No participants identified themselves as having Aboriginal or Torres Islander heritage.

EVENT HIGHLIGHTS

OPENING

The Opening Ceremony for the Winter School was held in the Science Learning Centre on Monday morning. The Queensland Chief Scientist Dr Geoff Garrett was our key speaker. Dr Garrett gave a very relevant talk about Science, in particular mathematics and the increased role it plays in society and business today. Other guests included the Dean of the Faculty of Science Stephen Walker and Professors from QUT and Griffiths University.

The morning lectures started at 9am and were either one hour or one and a half hours in duration. We broke for a coffee break and then resumed again for another hour or hour and a half till the lunch break. The afternoon sessions followed the same time plan.

We had one afternoon on the Wednesday of the second week as a tutorial from 2- 4pm.

WELCOME BBQ

A Welcome BBQ was held at Emmanuel College on the evening before the conference started. This was an opportunity to register the participants, hand out information bags including program timetables and for everyone to meet each other.

SOCIAL DINNER

On the Friday night, a Social Dinner was held at the Mongolian BBQ restaurant. This was a very relaxed way for all the participants to socialise with each other. Drinks and food were provided.

CONFERENCE DINNER

The Conference Dinner was held on Thursday night July 12th at The Ship Inn at Southbank. We had a guest speaker from BIARRI who spoke of the significance of mathematics in the work place.

DIRECTORS REPORT

This year's AMSI Graduate Winter School took a slightly different direction from previous years by inviting international PhD and Postdoctoral participants to attend the Graduate school as well. Further, significant funding was secured from a number of sources in addition to AMSI: ANU, UQ, PIMS, BICMR, as well as continued support from local external sponsors Biarri and QCIF. BICMR directly sponsored 10 Chinese PhD Students, and PIMS sponsored 5 Canadian students and postdocs. Furthermore, we had a contingent of other international PhD and Academic staff attend from Universities around the world, including Korea, Taiwan, USA and Italy. The increase in attention and attendance was driven by the pool of world class professors who gave lectures on this year's theme, **Geometric Partial Differential Equations**. In all there were 9 Professors who participated in the program, three from Australia and 6 International. The first week was scheduled to give preliminary lectures as an introduction for the second week of more advanced lectures.

We had a full contingent of participants: fact our quota was filled very early in the year. The overwhelming feedback that we received is that everyone enjoyed this larger contingent of participants and the breadth and variety of the lecturers.

Joseph Grotowski , Director

FEEDBACK

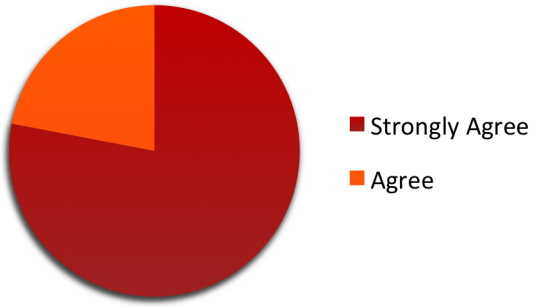
What was the best thing about the winter school?

"Speakers and the organisation"

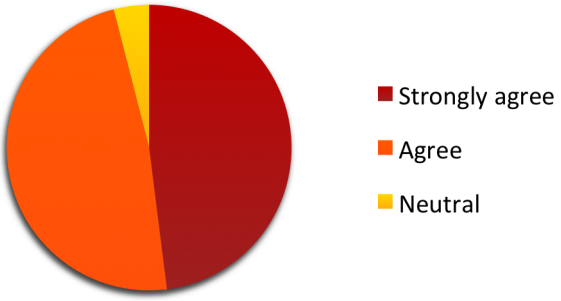
"High calibre of the speakers and their lectures"

"It gives students a good opportunity to meet leading mathematicians and peers"

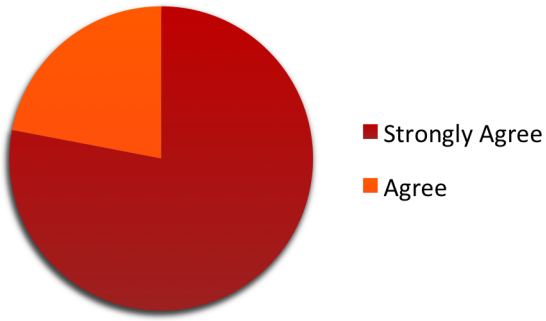
THE COURSES WERE WELL ORGANISED AND THE LECTURERS KNEW THE CONTENT WELL



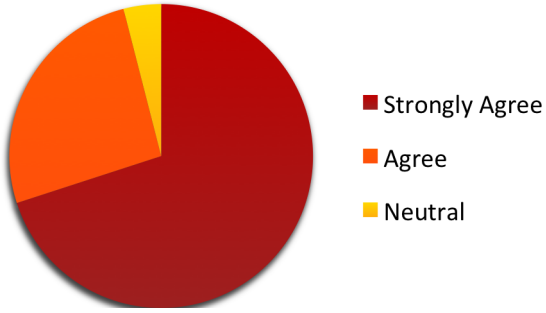
THE SCHOOL ALLOWED ME TO DEVELOP NETWORKS WITH MY PEERS



IT IS IMPORTANT TO BE AWARE OF OTHER RESEARCH BEING UNDERTAKEN IN MY FIELD



THE SCHOOL INCREASED MY KNOWLEDGE OF OTHER RESEARCH BEING UNDERTAKEN IN MY FIELD



CONCLUSION

The expanded format and multiple funding sources provided a significant challenge to the organisers: but in the end, the 2012 AMSI/ANU/UQ Winter School was a great success.

The School provided a unique opportunity for participants to learn from so many world-leaders giving a lecture series at one event. It was a tremendous opportunity for the Australian PhD students to benchmark themselves against internationals students, and many realized the breadth of knowledge many of the overseas students gather in their program.

The Winter School has always been important for students to network and form potential future collaborations. The hope was that the international participants would heighten this benefit. There are a number of early indicators that this was successful: for example, attendance at the follow-on one-day workshop Transport, Flows and Applications at ANU; registration among student participants of the Winter School for this year's conference is quite high.

Australian Mathematical Sciences Institute

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