Workshop on Geometric Quantisation

University of Adelaide

27–31 July 2015

Mathai Varghese*, **Peter Hochs**, **Anthony Licata and Hang Wang**

Geometric quantisation has been an increasingly active area since before the 1980s, with links to physics, symplectic geometry, representation theory, index theory, and differential geometry and geometric analysis in general. In addition to its relevance as a field on its own, it acts as a focal point for the interaction between all of these areas, which has yielded far-reaching and powerful results. At this workshop, a large number of world-leading international speakers will come together. This exceptional concentration of expertise in geometry and analysis is a great opportunity for anyone working in these areas to exchange ideas with some of the top mathematicians in the world.

Organising Committee

- Mathai Varghese (University of Adelaide)
- Peter Hochs (University of Adelaide)
- Anthony Licata (Australian National University)
- Hang Wang (University of Adelaide)

Group photo

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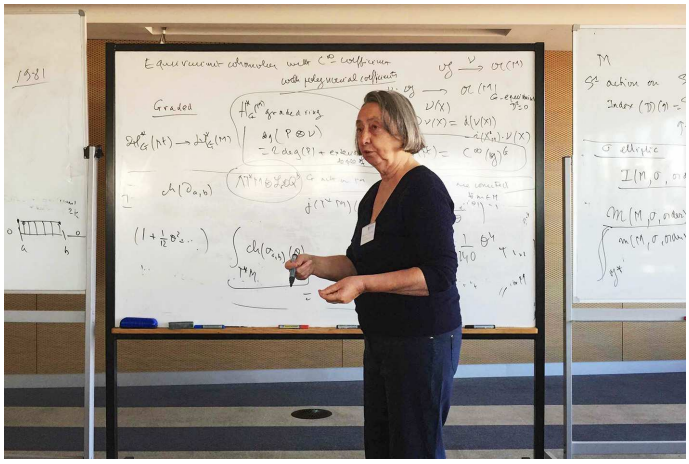


Michèle Vergne

Special presenters

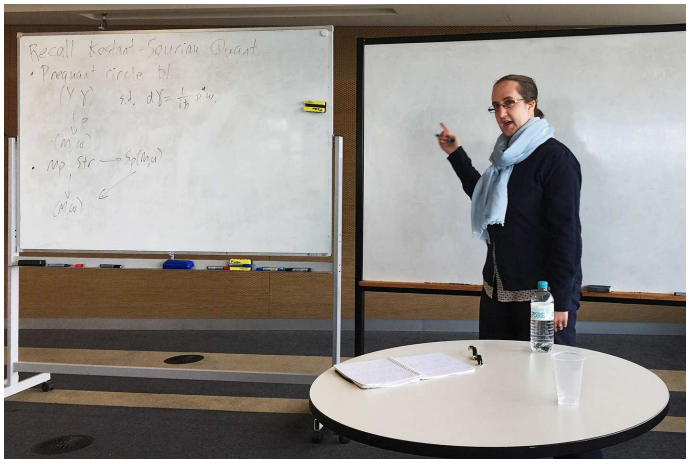
- Professor Maxim Braverman (Northeastern University)
- Professor Nigel Higson (Pennsylvania State University)
- Professor Eckhard Meinrenken (University of Toronto)
- Professor Paul-Émile Paradan (Université Montpellier 2)
- Professor Michèle Vergne (Institut de Mathématiques de Jussieu)
- Professor Siye Wu (University of Hong Kong)
- Professor Weiping Zhang (Chern Institute of Mathematics)

Report

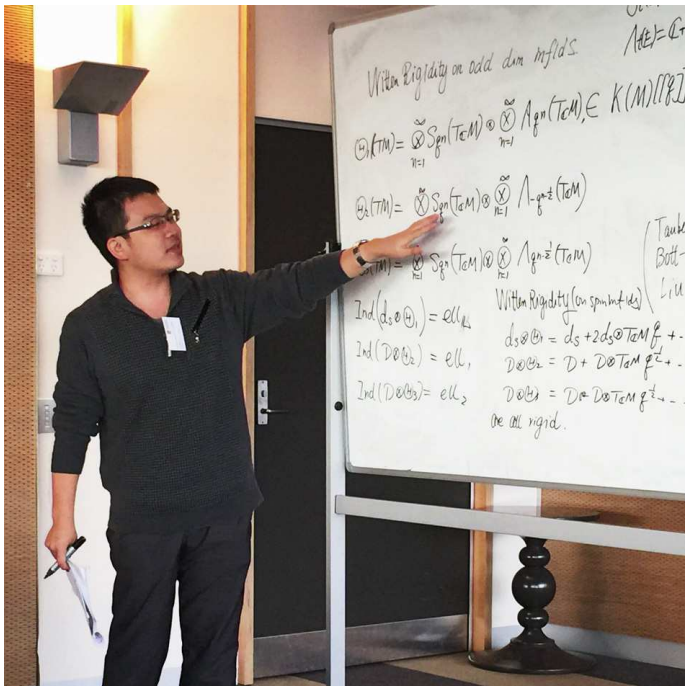
Since the *quantisation commutes with reduction* conjecture of Guillemin and Sternberg was solved by Meinrenken and Sjamaar in the late 1990s, geometric quantisation has evolved in many new directions. Work has been done on group-valued moment maps and loop group actions, noncompact groups and manifolds, the link with operator algebras, and recently on Spin^c-manifolds. In addition, various fundamentally different techniques have been developed and applied, including geometric, topological, analytic and Lie theoretic methods. New insights into the relations between all of these research directions and techniques have increased our understanding of all of them, and of the many related areas in mathematics.

A large number of the researchers leading these developments were present at this workshop. As the organisers had hoped, there was a great deal of interaction between these experts, and also between the senior and junior participants. The opportunity to ask advice from people like Michèle Vergne, Weiping Zhang, Eckhard Meinrenken and Nigel Higson was a rare and valuable privilege, and has led to many new research ideas.

The presentations by the bigger names allowed the participants to learn about new directions from the source. There were also talks by graduate students and early career researchers, who were able to get feedback from the experts in this way. The program was kept relatively light, with four talks on most days, and two on the Wednesday. During the breaks and after the talks, there were usually



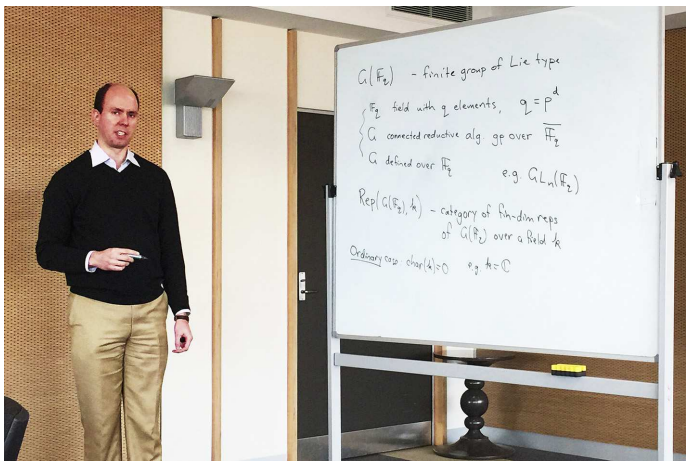
Jennifer Vaughan



Fei Han

discussions in front of the white boards and the coffee area. It was very satisfying to the organisers to see there was no lack of the two components of a successful conference: inspiring talks and lively discussions.

The topics discussed ranged from those directly motivated by physics (such as Jennifer Vaughan's presentation) to more fundamentally mathematical (such as the talks by Maxim Braverman, Anthony Henderson, Nigel Higson and Weiping Zhang). This is typical for geometric quantisation, which is related to many areas



Anthony Henderson

Nigel Higson

in mathematics, and also to physics. The common theme of geometric quantisation helped to focus the presentations into a coherent workshop, and meant people from different areas were able to learn from each other's talks.

It was a pleasure to have this combination of world-famous experts and promising young researchers in a room for four days. We had high expectations, and they were more than met.

With 17 overseas participants, many of whom are leading in their areas, we are extremely pleased with the international attendance of the workshop. For several reasons, the event was planned in the first week of teaching for many Australian universities. Despite this, the high-level international speakers drew 23 participants from five Australian institutions. Overall, we are very happy with the attendance numbers (and quality). Indeed, if there had been more participants, we would have had to look for a larger conference room.

The IGA hosted a workshop dinner for the speakers and participants, where the DVCR of University of Adelaide was the guest of honour.

Funding sources for the workshop were AustMS, AMSI and IGA.

Organisers' opinion of success

When we first talked about organising this workshop, we did not dare to hope that so many world-class researchers would attend. It was a real privilege to be in the same room as people like Braverman, Higson, Meinrenken, Paradan, Vergne and Zhang. The program was kept reasonably sparse to allow for as much discussion as possible. This worked, and there were discussions between various people during most breaks and after each day's talks. We could see junior participants getting advice from their senior colleagues, and the senior participants combining their expertise to find new research directions. Many participants left the workshop with new ideas and projects. This is the most important outcome of any workshop, and in that sense we think it was a complete success.

It was pointed out to the organisers that some talks seemed to be aimed more at the experts than at a broader audience. This is a fair point, and was possibly to be expected with such a large number of experts attending. Nevertheless, on a future occasion it could be worth trying to schedule more introductory lectures as well. (The introductory lecture series held in Adelaide in the months before the workshop obviously was not accessible to non-local participants.)

Possibly the most prominent attendant was Michèle Vergne, one of the most famous female mathematicians of our time. She has served as an example to many female mathematicians in her area. There was another female speaker, Jennifer Vaughan, and a female organiser Hang Wang. At the women in mathematics networking event on the first day of the workshop, there were lively discussions about the role of women in mathematics. Overall, while a larger number of female participants would have been ideal, we believe we made more than the appropriate effort to increase female attendance.