

The fourth
Early Career Workshop
of the Australian Mathematical Society

Novotel Forest Resort, Creswick, 22–23 September 2012



Research talks by:

Irina Dumitrescu (IBM Research)
Peter Kim (The University of Sydney)
Scott Morrison (Australian National University)

Advice talks by:

Sean Carmody (Westpac Banking Corporation)
Arun Ram (The University of Melbourne)
Jacqui Ramagge (University of Wollongong)

Organisers:

Guillermo Pineda-Villavicencio (University of Ballarat)
Natalie Thamwattana (University of Wollongong)
Stephan Tillmann (The University of Sydney)

Schedule of the fourth
Early Career Workshop
of the Australian Mathematical Society

Saturday, 22 September 2012

13:30	Arrival	
13:50	Welcome	
14:00	Scott Morrison (ANU)	<i>Higher categories, lower manifolds</i>
14:45	Afternoon tea	
15:15	Arun Ram (Melbourne)	<i>Selection Committee</i> <i>Pure Maths position 24 Sep 10:00</i>
15:45	Sean Carmody (Westpac)	<i>From mathematician to banker:</i> <i>an unplanned career path</i>
16:15	Q&A Session:	Career planning
18:00	Pre-dinner drinks (Cash Bar)	
19:00	Dinner	
20:30	Role-play:	The interview

Sunday, 23 September 2012

09:00	Irina Dumitrescu (IBM Research)	<i>The Research Choice: One Topic or Many?</i>
09:45	Jacqui Ramagge (Wollongong)	<i>What can you expect when looking for jobs</i> <i>and how can you prepare yourself?</i>
10:15	Q&A Session:	Balancing specialisation and breadth
10:45	Morning tea	
11:15	Peter Kim (Sydney)	<i>Bridging agent-based models and PDEs:</i> <i>A model of cell differentiation</i>
12:00	Final Q&A Session	
12:30	Lunch	

Research Talks:

Abstracts and Biographies of the Speakers

The Research Choice: One Topic or Many?

Irina Dumitrescu (IBM Research)

From Algebraic Geometry to Operations Research, from constrained shortest paths to production scheduling for open-pit mines, Irina's research has looked at many theoretical and real-life problems, and proposed a variety of solution techniques for them. She will talk about her research path, which took her through many topics and to many countries. She will also talk about advantages and disadvantages of her research choices, and how that type of choice can help or hinder a research career.



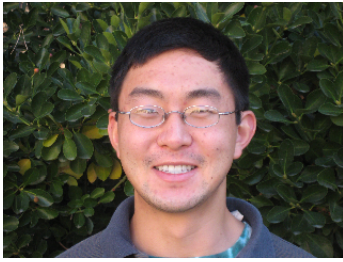
Irina graduated with a degree in Mathematics from the University of Bucharest in Romania. She worked for two years as a junior programmer in Bucharest and learned English, and then moved to Australia to do a Ph.D. in Operations Research at the University of Melbourne. At the end of her degree she moved to Germany to take up a Marie Curie Fellowship at the Technical University of Darmstadt, to look at integrating exact and heuristic methods. After two years in which she collaborated closely with the European Metaheuristics Network, she moved to Montreal, Canada, where she worked as a researcher with the

Research Centre on Transportation (CRT, now CIRRELT). At the end of her contract she returned to Australia and joined the University of New South Wales, where she worked on her first research project that had an industry partner. That was followed by a mild attempt at changing the world by working one year on understanding and promoting geothermal energy. While she still keeps that in the back of her mind, she now focuses on her work at the recently opened IBM Research Australia lab.

Bridging agent-based models and PDEs: A model of cell differentiation

Peter Kim (The University of Sydney)

Different modelling frameworks have been applied to cell differentiation, including partial differential equations (PDEs) and agent-based models (ABMs). ABMs simulate individual cell behaviour, while PDEs model spatial dynamics at a population level. Also, ABMs directly capture randomness and variability, but PDEs are faster to evaluate numerically and more conducive to mathematical analysis. Because of the advantages of each modelling strategy, it is valuable to form bridges between them. To begin building this connection, we present an ABM of blood cell differentiation and formulate a PDE model that reproduces the behaviour of the ABM.



I received my Ph.D. in mathematical biology at Stanford University in 2007. After that I went to a one-year postdoc at the Ecole Supérieure d'Electricité and the University of Paris VI. Then from 2008 to June 2011, I finished a three-year postdoc in the Department of Mathematics at the University of Utah in Salt Lake City, USA, and since July 2011, I have been a lecturer in the School of Mathematics and Statistics at the University of Sydney.

My current research interests lie in the field of mathematical biology. I develop mathematical models to help understand and explain the dynamics of biological systems. Some of my work involves trying to understand and improve the efficacy of medical treatments of diseases such as cancer or viral infections. As of less than a year ago, I have also begun investigating problems in life history evolution, such as why do humans live so long past the end of female fertility, and why do humans have such a long period of juvenile dependence compared to primates and other mammals.

Higher categories, lower manifolds

Scott Morrison (Australian National University)

I've been interested in the interplay between category theory and topology, especially through topological field theory. To tell manifolds apart, we want to compute invariants. Sometime, these invariants can be computed by cutting the manifold into smaller pieces, computing something "algebraic" associated to each piece, then assembling the pieces via some algebraic rules. The theory of higher categories is more or less the theory of possible ways to assemble algebraic data associated to small pieces of manifolds. I'll tell you about some of the aspects of this problem that I've worked on, and how I ended up working on them!



I'm an ARC Research Fellow and Senior Lecturer at the Mathematical Sciences Institute of the Australian National University. My research interests include Khovanov homology, derived topological quantum field theories (TQFTs), and small examples of subfactors and fusion categories. From 2009-2012, I was a Miller Fellow at the UC Berkeley mathematics department. During 2007-2009, I was a postdoc at Microsoft Station Q, at UC Santa Barbara. I did my undergraduate work at the University of New South Wales, then completed my Ph.D. in 2007 at the University of California, Berkeley, studying with Vaughan Jones.

Advice Talks:

Abstracts and Biographies of the Speakers

From mathematician to banker: an unplanned career path

Sean Carmody (Westpac Banking Corporation)

There are many different career paths that can follow mathematical training. Some take a determined, planned approach to their career, others, like me, follow something better described as a random walk (perhaps a bounded one). My own path falls clearly into the second category and I will reflect on this path, how mathematics has helped me along the way and what might be similar or different for mathematicians contemplating their career today.



Sean obtained a PhD in pure mathematics from Cambridge in 1995. He has since held leading positions at Deutsche Bank Australia (1995–1999), the specialist risk management consultancy Categorical Solutions (1999–2001), Westpac Banking Corporation (2001–2007), Barclays Global Investors Australia (2007–2009) and worked as an independent consultant (2010). Since 2011, he is the Head of Credit Risk at Westpac Banking Corporation.

Selection Committee, Pure Maths position 24 Sep 10:00

Arun Ram (The University of Melbourne)

Dear Selection Committee members, This is a reminder of the selection committee meeting for review of the applications for the position in Pure Maths Monday at 10am in Room 196883. If you requested printed copies of the applications hopefully you have already collected them (sometime ago) from Charlotte in the main office. Each member of the committee needs to come prepared with (a) a general ranking of each file (A top, B middle, C bottom) and (b) thorough merit/concern summaries for your top 5 candidates. In the discussions on Monday we will, as a group, need to find the best match for our department and make an ordered list for making offers. We'll begin by putting together the "top 5 lists" from each committee member and then discuss the strong points and red flags of each of these candidates. See you Monday. Regards, Max Honcho, Chair



I grew up in a smallish town in New Mexico—leaving to Boston to go university at MIT. After deciding that I needed a lifestyle which enabled me to travel and sit in coffee shops I found it best to get a PhD in Mathematics. After obtaining my PhD from University of California San Diego I was in a sequence of junior positions before landing at University of Wisconsin in 1999. In 2008 I moved to Melbourne where the mathematics, the weather, and the city suit me well. My passions are beauty, music, languages, cultures, and people.

Jobseeking in an employer's market

Jacqui Ramagge (University of Wollongong)

What can you expect when looking for jobs and how can you prepare yourself?



Jacqui was born in London and went to the University of Warwick where she did a PhD on Kac-Moody groups under the supervision of Roger Carter. She moved to Sydney and finished writing up her PhD while tutoring at UNSW. She moved to Newcastle, Australia in 1992. Everybody there was doing operator algebras, so she did some work on that and collaborated with electrical engineers on control theory. In 2007 she relocated a team of four to UOW, where she is now the Head of the School of Mathematics and Applied Statistics. She performs a number of services to the Mathematical Sciences, including working for AMSI, the Australian Mathematics Trust, and the ARC.

In particular, she is very relieved to be serving out the last months of a three-year term on the Engineering, Mathematics, and Informatics panel of the ARC College. Broadly speaking, her favourite work involves bridging geometry, algebra and analysis. This appears in the guise of topological groups, functional analysis on buildings, representations of Hecke algebras, or operator algebras from self-similar groups.

Name	Affiliation	Email Address	Field of Research
Syedeh Afzaly	ANU	narjess.afzaly@anu.edu.au	Combinatorics
Imam Tashdid ul Alam	ANU	ita105@physics.anu.edu.au	Statistical physics, Theoretical and Mathematical physics
Nicholas Bartlett	UQ	nicholas.bartlett@uqconnect.edu.au	Algebraic Combinatorics
Joseph Chan	Melbourne	jchan3@student.unimelb.edu.au	mathematical physics, geometry and topology
Yi Chen	Ballarat	yic@students.ballarat.edu.au	Geometry & mathematical optimisation, duality theory
Michael Coons	Newcastle	Michael.Coons@newcastle.edu.au	Number theory
Lito Cruz	Monash	lito.cruz@monash.edu	Geometry & computational logic, category theory and Model Theory
Norman Do	Monash	normdo@gmail.com	Geometry of moduli spaces, mathematical physics, combinatorics
Nick Fewster	UNSW	z3208562@unsw.edu.au	Differential equations: Qualitative aspects
Bao Ho	LaTrobe	nhan.ho@latrobe.edu.au	Combinatorics, game theory
Yi Huang	Melbourne	huay@ms.unimelb.edu.au	Geometry and topology
Kareem Elgindy	Monash	kareem.elgindy@monash.edu	Numerical analysis and optimal control theory
Han Liang Gan	Melbourne	h.gan5@pgrad.unimelb.edu.au	Probability, extreme value theory
Simon James	Deakin	sjames@deakin.edu.au	Aggregation functions, fuzzy sets, Consensus and Voting

Name	Affiliation	Email Address	Field of Research
Padraig Keane	UQ	p.oathain@uq.edu.au	Design theory
Kwok-Kun Kwong	Melbourne	kwok-kun.kwong@monash.edu	differential geometry, geometric analysis and mathematical relativity
Alexander Lee	Melbourne	a.lee19@student.unimelb.edu.au	Statistical mechanics
Angus McAndrew	Melbourne	a.mcandrew@student.unimelb.edu.au	Maeda's Conjecture, Number Theory
Stephen McCormick	Monash	stephen.mccormick@monash.edu	Geometric analysis, general relativity
Arun Mani	Melbourne	arun.mani@unimelb.edu.au	Combinatorics, graph theory, matroid theory, combinatorial algorithms and computational complexity
Daniel Mauricio Morales Silva	Ballarat	daniel.morales@hotmail.com	Global Optimization and Canonical Duality theory
Matthew Randall	ANU	matthew.randall@anu.edu.au	Differential geometry
Colin Reid	Newcastle	colinreid29@gmail.com	Group theory
David Robertson	UOW	david_robertson@uow.edu.au	Operator algebras, Noncommutative geometry
Ning Ruan	Ballarat	Nruan@staff.ballarat.edu.au	global optimization, operations research
Adam Sierakowski	UOW	asierako@uow.edu.au	Operator algebras, K-theory, Dynamical system
Tharatorn Supasiti	Melbourne	t.supasiti@student.unimelb.edu.au	Low-dimensional topology and geometric group theory
Sona Taheri	Ballarat	sonataheri@students.ballarat.edu.au	Bayesian Networks
TriThang Tran	Melbourne	t.tran17@student.unimelb.edu.au	Algebraic Topology

Name	Affiliation	Email Address	Field of Research
Timothy Trudgian	ANU	timothy.trudgian@anu.edu.au	Number theory
Maria Tsarenko	Melbourne	m.tsarenko@ms.unimelb.edu.au	Mathematical Physics (Integrable Lattice Models)
Samuel Webster	Wollongong	swebster@uow.edu.au	Operator Algebra
James Withers	Melbourne	j.withers2@student.unimelb.edu.au	Number Theory
Jon Xu	Melbourne	jonxu88@gmail.com	Representation theory
Ying Wan Yap	Melbourne	yingwan88@gmail.com	Fluid dynamics
Yinan Zhang	Sydney	y.zhang@sydney.edu.au	Computational number theory
Zongheng Zhou	Monash	zzhzhou@mail.ustc.edu.cn	Application of Monte Carlo method in statistical mechanics

Event Feedback Form for the Early Career Workshop 2012

Thank you for participating in the Workshop.

To assist us in improving future Workshops, we would be grateful if you would take a couple of minutes to provide some feedback.

Please tick as appropriate: Postgraduate student Post-PhD

How did you find out about this event? (please tick all that apply)

- | | |
|--|--|
| <input type="checkbox"/> AustMS Gazette | <input type="checkbox"/> Head of Department/Postgraduate Director |
| <input type="checkbox"/> AustMS mailing list | <input type="checkbox"/> Fellow students/colleagues or departmental news |
| <input type="checkbox"/> PhD supervisor | <input type="checkbox"/> Other |

What funding sources enabled you to attend? (please tick all that apply)

- | | |
|---|--|
| <input type="checkbox"/> Own research grant / travel account | <input type="checkbox"/> AustMS funding for Annual Meeting |
| <input type="checkbox"/> Supervisor's research grant / travel account | <input type="checkbox"/> Other external sources of funding |
| <input type="checkbox"/> Departmental travel funds | <input type="checkbox"/> Self-funded |

Please circle a number on the 1-5 scale below.

Research talks	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
(Dumitrescu, Kim, Morrison)					
The mathematics presented was interesting	1	2	3	4	5
The talks were understandable to a wide audience	1	2	3	4	5
Adequate opportunities for questions and discussion	1	2	3	4	5
Overall, I benefited from the research talks	1	2	3	4	5

Advice sessions

(Carmody, Ram, Ramagge)					
The information presented was useful for my career	1	2	3	4	5
There was a good range of topics	1	2	3	4	5
The information was covered in sufficient depth	1	2	3	4	5
Adequate opportunities for questions and discussion	1	2	3	4	5
Overall, I benefited from the advice talks	1	2	3	4	5

Comments:

Was there anything you thought was particularly interesting?

Are there any topics (particularly for the advice sessions) that you would like to see covered in future Early Career Workshops?

How do you think the Workshop could be improved?

How do you think other postgrads and postdocs could be encouraged to attend future Workshops?

Any other comments?

If you have any thoughts or suggestions in the coming weeks, or any requests from friends who could not attend this year, please feel free to contact Natalie Thamwattana or Stephan Tillmann.