

# Curriculum Vitae of Dr Judy-anne Heather Osborn

## Personal Details

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Canberra, ACT 0200, Australia.

## Qualifications

- **2007 PhD in Mathematics**  
The University of Melbourne  
Thesis title: Combinatorics of Pavings and Paths  
Supervisor: Dr Richard Brak
- **2002 Bachelor of Science with First Class Honours**  
The University of Melbourne  
Thesis title: The Hadamard Maximal Determinant Problem

## Awards

- **2005 – MASCOS top-up Scholarship**  
ARC Centre of Excellence for Mathematics and Statistics of Complex Systems  
<http://www.complex.org.au>
- **2003 – Science Faculty Scholarship**  
The University of Melbourne

## Appointments

- **(2007 – 2010) Postdoctoral Fellow and Lecturer**  
Centre for Mathematics and its Applications  
Mathematical Sciences Institute  
Australian National University
- **(2011 – ) Research Associate**  
Priority Research Centre for Computer-Assisted Mathematics and Its Applications  
The University of Newcastle

## Research Interests

I am interested in combinatorial problems arising out of pure combinatorics and statistical mechanics. In my PhD I used geometric intuition to find bijections and involutions relating various paving and path problems, and collaborated with my PhD supervisor Dr Richard Brak in developing a new form of constant term method for lattice path enumeration. My recent work in collaboration with Dr Thomas Prellberg of Queen Mary, University of London, uses the kernel method, whose deep connections to other combinatorial methods I seek to further understand. In design theory, I am engaged in making a multi-pronged attack on the maximal determinant problem of Hadamard. In the cases of orders divisible by four I have found an intriguing connection to groups on graphs and possibly geometry of imbedded graphs. This problem relates algorithms, computation, graph theory and number theory. My collaborators in this area include Dr William Orrick of Indiana University, Dr Paul Zimmermann of INRIA, Nancy and Professor Richard Brent, of ANU. I am also interested in incorporating aspects of my mathematical research into my teaching.

## Publications

- **Published:**

- R Brak and J Osborn ‘*Chebyshev type lattice path weight polynomials by a constant term method*’ J. Phys. A: Math. Theor. **42** (2009)
- R Brak, J Essam, J Osborn, A L Owczarek and A Rechnitzer ‘*Lattice paths and the Constant Term*’, J. Phys.: Conf. Ser. **42** (2006)

- **Accepted:**

- Jennifer Badham and Judy-anne Osborn ‘*Zombies in the City: a NetLogo Model*’ Book chapter. Editor: Robert Smith? <http://www.mathstat.uottawa.ca/~rsmith/>  
Preprint available on my webpage: <http://wwwmaths.anu.edu.au/~osborn/>

- **Submitted:**

- J Osborn ‘*Bi-banded Dyck Paths and Narayana Numbers*’  
Preprint available on my webpage: <http://wwwmaths.anu.edu.au/~osborn/>

- **In Preparation:**

- J Osborn and T Prellberg, ‘*Forcing Adsorption of a Tethered Polymer by Pulling*’
- R P Brent, W P Orrick, J Osborn and P Zimmermann, ‘*The maximal  $\{-1, 1\}$ -determinant for matrices of orders 19 and 37*’
- R P Brent and J H Osborn, ‘*Minors of maximal determinant matrices*’

## Teaching Experience

### Course Coordination and Lecturing: MSI, ANU

- 2008: **Math1005:** Mathematical Modeling 2
- 2009: **Math1005:** Discrete Mathematical Models
- 2009-2010 summer: **MATH3349:** Graph Theory

### Tutoring: Department of Mathematics and Statistics, University of Melbourne

- 2001 - 2003 **620-141:** Mathematics A (Content: Calculus)

- 2001 - 2004 **620-142**: Mathematics B (Content: Linear Algebra and some Analysis)
- 2002 **620-151**: Introduction to Biomedical Mathematics
- 2005 **620-192**: Mathematics B (Content: Linear Algebra and some Discrete Mathematics)
- 2003 - 2005 **620-352**: Graph Theory

## Research Supervision

- 2010 - principal supervisor of an Honours student in the Mathematics Department of ANU, in co-supervision with Professor Brendan McKay of Computer Science, ANU.

## Professional Activities

- **Professional Memberships:**

- The Australian Mathematical Society
- Life Membership of the Combinatorial Mathematics Society of Australasia

- **Refereeing:**

- Journal of Physics A

- **Recent Talks:**

- Invited Colloquium at CARMA, University of Newcastle, 7th June 2010  
Title: Searching for Maximal Determinant Matrices
- Hadamard Maximal Determinant Workshop, CMA, MSI, ANU, May 2010  
Title: Visualizing Searches for Maximal Determinant Matrices
- Australian Statistical Mechanics Meeting, ANU, December 2009  
Title: Forcing Adsorption of a Tethered Polymer by Pulling
- Australian Mathematical Society Annual Meeting, Adelaide, 1 October 2009  
Title: Hadamard's Maximal Determinant Problem for non-Hadamard orders
- Invited seminar, INRIA, Nancy, France, April 2009  
Title: On Hadamard's Maximal Determinant Problem
- Invited Combinatorics Seminar, Queen Mary, University of London, March 2009  
Title: Visualizing Amicability
- 32ACCMCC, New Zealand, December 2008  
Title: Bi-banded Dyck Paths and Narayana Numbers
- Annual Australian Statistical Mechanics Meeting, Melbourne University 1-2 Dec 2008  
Title: Banded Lattice Paths
- Annual Australian Statistical Mechanics Meeting December 2007  
Title: Viennot Pavings, Determinants & Lattice Paths
- Australian Mathematical Society Conference 25-28 September 2007  
Title: Viennot and Laurent Pavings Count Lattice Paths
- Statistical Mechanics / Gordon Godfrey Workshop, ANU 11-12 December 2006  
Title: Weights on Walls and Combinatorial Calculations with Orthogonal Polynomials
- Invited seminar at Australian National University 9th October 2006  
Title: Extracting Coefficients from Generating Functions: application to Lattice Paths

- **Overseas travel for purposes of collaboration:**

- 2009 One week visiting Dr Nicolas Brisebarre and group, ENS, Lyon, France
- 2009 Three weeks visiting Dr Paul Zimmermann and group, INRIA, Nancy, France
- 2009 One week visiting the Computing Laboratory of the University of Oxford
- 2009 Six weeks visiting Dr Thomas Prellberg, Queen Mary, University of London
- 2002–2003 Three months visiting Dr Will Orrick and Associate Professor Bruce Solomon, Department of Mathematics, Indiana University, Bloomington, Indiana 47405, USA.

## Consulting

- June 2006, for ‘Ecological Dynamics’  
126 Amess Street, Carlton North, Victoria 3054

## Grants

- 2009 ANU Teaching Enhancement Grant  
Title: Student Organized Mathematics Film Showings  
Awarded to: Dr Judy-anne Osborn  
Amount: AUD1000

I have also been a junior team-member in a number of successful large grants. These include ‘Computational Research Infrastructure for the Mathematical Sciences’, a grant of funds from ANU’s Major Equipment Committee for the purchase of a new 224-processor computing cluster located in MSI; and successful renewal of both the French-funded INRIA-ANU Associate Team and the ARC Centre of Excellence MASCOS.