Trilateral Meeting 2012

3rd December to 7th December 2012

Australia - Italy - Taiwan

Partial Differential Equations and Related Topics

University of Wollongong, Australia

UNIVERSITY OF WOLLONGONG AUSTRALIA

AMSI AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

Centre for Mathematics and its Applications
Australian National University

Trilateral Meeting 2012

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Welcome

Dear Delegates,

Welcome to the 5th Trilateral meeting on "Partial Differential Equations and Related Topics", to be held in Wollongong 3rd to 7th December 2012. This series of meetings are designed to foster collaborative research links in the Mathematical Sciences between Australia, Taiwan and Italy.

The meeting will highlight over twenty experts in the field, chosen from all three countries. We expect that the meeting will foster new research collaborations between our three countries, as well as provide an opportunity to renew existing research links and old friendships.

We wish to thank the University of Wollongong, the Australian National University and the Australian Mathematical Sciences Institute for their financial support, without which this meeting would not be possible.

We hope you have an enjoyable week!

The Organising Committee,

Prof Tim Marchant,
Dr James McCoy
Ms Joell Murray
Prof Graham Williams

UNIVERSITY OF WOLLONGONG AUSTRALIA

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Trilateral Meeting 2012

SUNDAY 2nd DECEMBER 2012
Venue: Marketview Accommodation, Conference Room

6.00 pm – 7.30 pm	**Welcome to Wollongong event** Finger food, Wine and Beer for all delegates to meet in a social environment.

Trilateral Meeting 2012

MONDAY 3rd DECEMBER 2012

Venue: UOW Building 6 (SMART) Room 105

9.00 am – 9.30 am	**OFFICIAL OPENING** **Prof Judy Raper** Deputy Vice-Chancellor (Research) **Prof Oscar Moze** Science Attache' Embassy of Italy
9.30 am – 10.30 am	**Prof Tai-Ping Liu,** Academia Sinica ***Title:*** *Kinetic theory and gas dynamics*
10.30 am – 10.50 am	**MORNING TEA**
10.50 am – 11.50 am	**Prof Aldo Pratelli,** University of Erlangen ***Title:*** *New results for the isoperimetric problem in a space with low regularity density*
11.50 am – 12.15 pm	**Dr Glen Wheeler,** University of Wollongong ***Title:*** *Oscillation of curvature and the curve diffusion flow*
12.15 pm – 12.40 pm	**Dr Dmitry Demskoy,** Charles Sturt University ***Title:*** *Algebraic entropy for differential-difference equations*
12.40 pm – 1.40 pm	**LUNCH**
1.40 pm – 2.40 pm	**Prof Chi-Kun Lin,** National Chiao Tung University ***Title:*** *Zero-dispersion limit of the Klein-Gordon equation in electromagnetic fields*
2.40 pm – 3.40 pm	**Prof Yihong Du,** University of New England ***Title:*** *Regularity and long-time behavior of nonlinear free boundary problems*
3.40 pm – 4.00 pm	**AFTERNOON TEA**
4.00 pm – 5.00 pm	**Prof Shih-Hsien Yu,** National University of Singapore ***Title:*** *On hyperbolic system in half space*
5.00 pm – 5.25 pm	**Mr Lashi Bandara,** Australian National University ***Title:*** *L^{∞} coefficient differential operators and nonsmooth Riemannian metrics*

Trilateral Meeting 2012

TUESDAY 4th DECEMBER 2012

Venue: UOW Building 20 Lecture Theatre 4

8.00 am – 9.00 am	**Prof Chao-Nien Chen,** National Changhua University of Education ***Title:*** *Standing pulse solutions to FitzHugh-Nagumo equations*
9.00 am – 10.00 am	**Prof Stefano Bianchini,** SISSA, Trieste ***Title:*** *Continuous solutions to scalar balance laws*
10.00 am – 10.20 am	**MORNING TEA**
10.20 am – 11.20 am	**Prof Dong-Ho Tsai,** National Tsing Hua University ***Title:*** *Contracting convex immersed closed plane curves with slow speed of curvature*
11.20 am – 12.20 pm	**Prof Thierry Coulhon,** Australian National University ***Title:*** *Heat kernel estimates, Sobolev-type inequalities and Riesz transform on non-compact Riemannian manifolds*
	EXCURSION
12.20 pm – 1.20 pm	**Coach travel to Illawarra Fly**
1.20 pm – 2.00 pm	**Illawarra Fly** **Feathers and Gills Lunch - Chicken Kiev or Fish and Chips**
2.00 pm – 2.45 pm	**Guided Treetops Tour**
2.45 pm – 3.30 pm	**Coach travel to Nan Tien Temple**
3.30 pm – 4.30 pm	**Nan Tien Temple – self guided tour**
4.30 pm – 5.00 pm	**Coach travel to Marketview Accommodation and UOW**

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WEDNESDAY 5th DECEMBER 2012

Venue: UOW Building 6 (SMART) Room 105

8.30 am	**Coffee and Tea**
8.30 am – 9.30 am	**Dr Huy Nguyen,** University of Queensland ***Title:*** *Geometric rigidity of surfaces of bounded curvature*
9.30 am – 10.30 am	**Prof Jenn-Nan Wang,** National Taiwan University ***Title:*** *A size estimate problem in the shallow shell equations*
10.30 am – 10.50 am	**MORNING TEA**
10.50 am – 11.50 am	**Prof Nicola Fusco,** Universita di Napoli Federico II ***Title:*** *On the stability of Almgren's isoperimetric inequality*
11.50 am – 12.50 pm	**Prof Norman Dancer,** University of Sydney ***Title:*** *Stationary solutions of large interaction problems*
12.50 pm – 1.50 pm	**LUNCH**
1.50 pm – 2.50 pm	**Prof Luigi De Pascale,** University of Pisa ***Title:*** *Optimal transportation problems and electronic density functional theory*
2.50 pm – 3.50 pm	**Dr Artem Pulemotov,** The University of Queensland ***Title:*** *Boundary-value problems for the prescribed Ricci curvature equation on cohomogeneity one manifolds*
3.50 pm – 4.15 pm	**Mr Nicholas Fewster-Young,** University of New South Wales ***Title:*** *Deceptive solutions to singular boundary value problems*
6.30 pm	**CONFERENCE DINNER** **Ha Long Bay** 52 Crown St (Corner Corrimal St) Wollongong NSW 2500

Trilateral Meeting 2012

THURSDAY 6th DECEMBER 2012
Venue: UOW Building 6 (SMART) Room 105

8.30 am	**Coffee and Tea**
8.30 am – 9.30 am	**Dr Valentina-Mira Wheeler,** University of Wollongong ***Title:*** *Mean curvature flow supported on a hyperplane*
9.30 am – 10.30 am	**Prof Chiun-Chuan Chen,** National Taiwan University ***Title:*** *Wave solutions of reaction-diffusion equations and variational method*
10.30 am – 10.50 am	**MORNING TEA**
10.50 am – 11.50 am	**Prof Alessio Porretta,** Universita' di Roma Tor Vergata ***Title:*** *Long time average of mean field games*
11.50 am – 12.50 pm	**Prof Markus Hegland,** Australian National University ***Title:*** *Solving partial differential equations with exascale computers*
12.45 pm – 1.45 pm	**LUNCH**
1.45 pm – 2.45 pm	**Prof Shuenn-Jyi Sheu,** National Central University ***Title:*** *On Hamilton-Jacobi-Bellman equations for some investment problems*
2.45 pm – 3.45 pm	**Prof Massimiliano Morini,** University of Parma ***Title:*** *Minimality via second variation for a nonlocal isoperimetric problem*
3.45 pm –4.05 pm	**AFTERNOON TEA**
4.05 pm – 5.05 pm	**Prof Tony Roberts,** University of Adelaide ***Title:*** *Novel support for slowly varying and thin layer PDE models*
5.05 pm – 5.30 pm	**Mr David Hartley,** Australian National University ***Title:*** *Volume preserving mean curvature flow near cylinders*

Trilateral Meeting 2012

FRIDAY 7th DECEMBER 2012
Venue: UOW Building 6 (SMART) Room 105

8.30 am – 9.30 am	**Prof Andrea Malchiodi,** SISSA, Trieste ***Title****: Improved Moser-Trudinger inequalities via angular moments*
9.30 am – 10.30 am	**Prof Ben Goldys,** University of Sydney ***Title:*** *Stochastic Landau-Lifschitz-Gilbert equation*
10.30 am – 10.50 am	**MORNING TEA**
10.50 am – 11.50 am	**Prof Kuo-Chang Chen,** National Tsing Hua University ***Title:*** *Keplerian action functional, convexity, and n-body problems with boundary constraints*
11.50 am – 12.50 pm	**Prof Giuseppe Mingione,** University of Parma ***Title:*** *Update on nonlinear potential theory*
12.50 pm – 1.50 pm	**Dr Marianito Rodrigo,** University of Wollongong ***Title:*** *Valuation of American options with general payoffs*
1.50 pm – 2.00 pm	**Closing Remarks**

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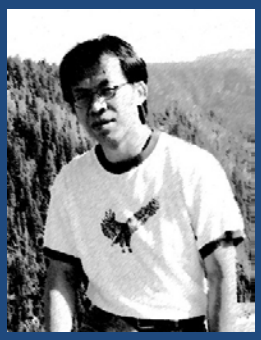
Invited Speakers

Prof Stefano Bianchini
SISSE, Trieste
Continuous solutions to scalar balance laws
C. Dafermos proved that a continuous solution to a balance law with continuous source is differentiable along the characteristics, if the nonlinear flux is convex. We extend this result to general fluxes and with discontinuous source terms.



Prof Kuo-Chang Chen
National Tsing Hua University
Keplerian action functional, convexity, and n-body problems with boundary constraints
Variational methods have been applied to construct various types of solutions for the n-body problem, under various types of symmetry constraints. However, there were not much success with similar approaches for n-body problems without symmetry and equal-mass constraints, especially when n>3. In this talk we will briefly describe how the convexity of the Keplerian action functional allows us to obtain sharp estimates for the action functional of the n-body problem, and how such estimates allow us to prove the existence of several classes of relative periodic solutions for the 4-body problem with only boundary constraints and with a wide range of masses.

Prof Chiun-Chuan Chen
National Taiwan University
Wave solutions of reaction-diffusion equations and variational method
To find travelling wave solutions and determine their wave speeds is one of the key issues in reaction-diffusion equations. We will review some variational methods and propose new approaches to study this problem for several types of equations.

Prof Thierry Coulhon,
Australian National University
Heat kernel estimates, Sobolev-type inequalities and Riesz transform on non-compact Riemannian manifolds
Let M be a complete non-compact Riemannian manifold or more generally a metric measure space endowed with a heat kernel and satisfying the volume doubling property. We will explain the connection between various heat kernel estimates and Sobolev inequalities, give some sufficient conditions in terms of heat kernel gradient estimates for the L^p-boundedness of the Riesz transform, and finally, in the polynomial growth setting, show the connection between the boundedness of the Riesz transform and a new Sobolev-type inequality.

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Prof Norman Dancer
University of Sydney
Stationary solutions of large interaction problems
We obtain a limit problem and discuss the converse problem of which solutions of the limit problem yield solutions of the system when the interaction is large

Prof Luigi De Pascale
University of Pisa
Optimal transportation problems and electronic density functional theory
Electronic structure calculations are at the very heart of predictive material science, chemistry and biochemistry. Their goal is to solve, in a reliable and computationally affordable way, the many-electron problem, a complex combination of quantum-mechanical and many-body effects. We have recently observed that multimarginals optimal transportation problems may be successfully applied to obtain very good results. I will present an overview of the problem and then I will focus on the mathematical chalenges presented by the optimal transportation problems of interest.

Prof Yihong Du
University of New England
Regularity and long-time behavior of nonlinear free boundary problems
In this talk I'll discuss recent results obtained jointly with Hiroshi Matano (Univ of Tokyo) and Kelei Wang (Wuhan Inst Phys and Math) on nonlinear free boundary problems. The problem arises from the investigation of ecological invasion and is also of significant mathematical interest. We'll focus on the regularity of the free boundary and the long-time behavior of both the free boundary and the solution.

Prof Nicola Fusco
Universita di Napoli Federico II
On the stability of Almgren's isoperimetric inequality
In 1986 F. Almgren proved a deep and beautiful version of the classical isoperimetric inequality for the higher co-dimensional case. We shall discuss a recent result obtained in collaboration with V. Boegelein and F. Duzaar that extends to this more general inequality the stability estimates known in the classical case.

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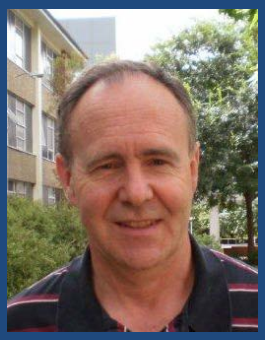
Prof Ben Goldys
The University of Sydney
Stochastic Landau-Lifschitz-Gilbert equation
The Landau-Lifschitz-Gilbert (LLG) equation describes the evolution of spins in ferromagnetic materials. The necessity of including random terms into this equation has been well known to physicists since the 1940's. In this talk we will introduce a stochastic version of the LLG equation. We will show the existence of weak solutions in three dimensions and will discuss some results on stability and transitions between equilibria in the one-dimensional case of magnetic wire.



Prof Markus Hegland
Australian National University
Solving partial differential equations with exascale computers
In 10 years we expect to solve our computational problems with computers which are 1000 times as fast as today's fastest computers. This will enable us to numerically solve substantially more complex problems including multidimensional problems. Such problems occur, for example in the kinetic description of plasmas, in computational finance, in computational chemistry and molecular biology. In the computers, parallelism is the main driver of performance. Highly parallel computers are challenged by high energy costs and the occurrence of faults. Here I will talk about numerical techniques and in particular mathematical approaches to deal with these new challenges. It is based on joint work with colleagues at the ANU, the Technical University of Munich and Fujitsu Laboratories of Europe. Funding is provided by the ARC, the IAS of the TU Munich and Fujitsu OPL initiative.

Prof Chi-Kun Lin
National Chiao Tung University
Zero-dispersion limit of the Klein-Gordon equation in electromagnetic fields
This paper deals with the zero-dispersion limit of the modulated nonlinear Klein-Gordon equation in electromagnetic fields. First, we derive the hydrodynamical structure of the modulated nonlinear Klein-Gordon equation with divergence free magnetic potential and prove the convergence of the modulated nonlinear Klein-Gordon equation with divergence free magnetic potential to the anelastic system. Second, we investigate the singular limit, indeed the nonrelativistic-semiclassical limit, of the modulated nonlinear Klein-Gordon equation with Ginzburg-Landau type potential directly the wave map equation (with or without magnetic potential) is recovered as a nonrelativistic-semiclassical limit. The magnetic effect depends on the relation between the scaled Planck's constant and the scaled light speed.

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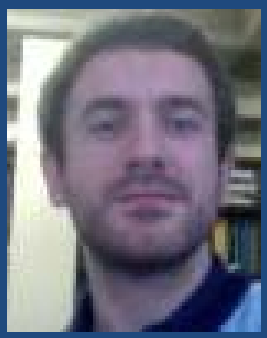
Prof Tai-Ping Liu
Academia Sinica
Kinetic theory and gas dynamics
We will discuss the recent progresses on the quantitative properties for the Boltzmann equation in the kinetic theory and the Euler equations in the gas dynamics and the relation between the two subjects. Explicit examples on the boundary layers and shock reflections will be given to illustrate the physical phenomena and the analytical richness of the recent studies. Possible future research directions will also be mentioned.

Prof Andrea Malchiodi
SISSA, Trieste
Improved Moser-Trudinger inequalities via angular moments
We consider singular Liouville equations on compact surfaces, motivated by the prescription of metrics with given Gaussian curvature and conical singularities, and from the study of some abelian Chern-Simons models. We tackle the problem of existence variationally, though some new - scaling invariant - improved Moser-Trudinger inequalities, jointly with topological methods.

Prof Giuseppe Rosario Mingione
Universita di Parma
Update on nonlinear potential theory
I will give a survey of potential estimates for nonlinear degenerate elliptic and parabolic equations, with special emphasis on those that can be given via the use of linear and nonlinear potentials, according to the line established a few years ago by Kilpelainen-Maly and Trudinger-Wang. In particular, I will present a few recent estimates allowing to give pointwise estimates for the gradient of solutions to degenerate equations via Riesz potentials. In the elliptic case these recast the usual estimates via convolution with fundamental solution while in the parabolic one they recast estimates via heat kernels.



Prof Morini Massimiliano
Universita di Parma
Minimality via second variation for a nonlocal isoperimetric problem
We discuss the local minimality of certain configurations for a nonlocal isoperimetric problem used to model microphase separation in diblock copolymer melts. We show that critical configurations with positive second variation are local minimizers of the nonlocal area functional and, in fact, satisfy a quantitative isoperimetric inequality with respect to sets that are L^1-close. The link with local minimizers for the diffuse-interface Ohta-Kawasaki energy is also discussed. As a byproduct of the quantitative estimate, we get new results concerning periodic local minimizers of the area functional and a proof, via second variation, of the sharp quantitative isoperimetric inequality in the standard Euclidean case. As a further application, we address the global and local minimality of certain lamellar configurations.

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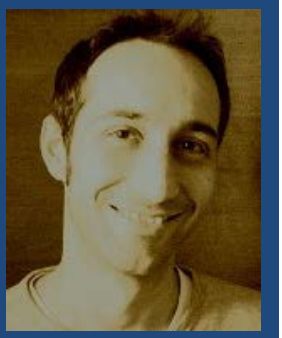
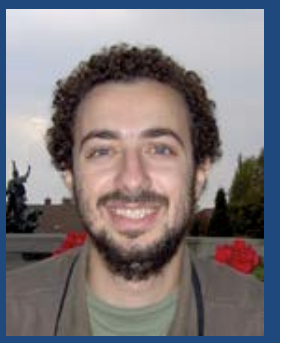
Dr Huy Nguyen
University of Queensland
Geometric rigidity of surfaces of bounded curvature
We consider surfaces conformally immersed in R^3 with L^2 bounds on the norm of the second fundamental form, in particular we will study the Liouville equation for such surfaces. Exploiting the immersion, we use that the Gaussian curvature has compensation properties and hence belongs to the Hardy space. We will classify certain limit cases of these bounds, for example we will suitably generalise Osserman's classification of complete non-compact minimal surfaces with total curvature equal to 8π to the case of complete non-compact surfaces with total bounded curvature.



Prof Alessio Porretta
Universita' di Roma Tor Vergata
Keplerian action functional, convexity, and n-body problems with boundary constraints
Variational methods have been applied to construct various types of solutions for the n-body problem, under various types of symmetry constraints. However, there were not much success with similar approaches for n-body problems without symmetry and equal-mass constraints, especially when n>3. In this talk we will briefly describe how the convexity of the Keplerian action functional allows us to obtain sharp estimates for the action functional of the n-body problem, and how such estimates allow us to prove the existence of several classes of relative periodic solutions for the 4-body problem with only boundary constraints and with a wide range of masses.



Prof Aldo Pratelli
University of Erlangen
New results for the isoperimetric problem in a space with low regularity density
We consider the space R^N endowed with a positive and l.s.c. density, which weights both volume and perimeter of sets, and we consider the isoperimetric problem. In this full generality, one would like to study the existence of isoperimetric sets and, if any, their boundedness property and regularity; actually, the a-priori boundedness is not only interesting by itself, but also of primary importance to show the existence. If the density is regular enough, then there are many general existence and regularity results, but if the density is not at least Lipschitz all of them fail. We study then the case when the density is only Hölder, or even only continuous; our main result is that isoperimetric sets are bounded whenever the density is bounded from above and below and just Hölder continuous, or even merely continuous. As a consequence, we will obtain some existence results thanks to some known theorems. Finally, we consider the question of the regularity of minimizers: we will see which regularity which comes directly from classical results about omega-minimizers of problems, and we will show that a stronger regularity theorem holds, at least in dimension 2 (joint work with E. Cinti).

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Dr Artem Pulemotov
The University of Queensland
Boundary-value problems for the prescribed Ricci curvature equation on cohomogeneity one manifolds
We will discuss the problem of finding a Riemannian metric on a manifold M with given Ricci curvature. This problem comes down to solving a weakly elliptic second-order partial differential equation for tensors. In the first part of the talk, we will review the relevant background and the history of the subject. After that, our focus will be on new results concerning the case where M is a bounded domain on a cohomogeneity one manifold. In this situation, the prescribed Ricci curvature equation reduces to a system of ordinary differential equations.

Prof Tony Roberts
University of Adelaide
Novel support for slowly varying and thin layer PDE models
The slowly varying or thin layer assumption empowers understanding of many physical processes from dispersion in pipes and rivers, including beams, shells, and the modulation of nonlinear waves, to homogenisation of micro-structures. Yet extant theoretical support is limited---especially when making forecasts and on finite domains. I introduce a new approach to theoretical support using perhaps the simplest example of slowly varying dynamics: we will explore the dynamics of an ideal heat exchanger. The approach proves the accuracy of mixed order local models, with a precisely quantified local error (in principle). The approach potentially caters for boundary conditions, nonlinear dynamics, and general cylindrical systems.

Dr Marianito Rodrigo
University of Wollongong
Valuation of American options with general payoffs
In this talk we consider the valuation of American options with general payoffs, which can be formulated as a free boundary problem for the Black-Scholes partial differential equation with time-varying parameters. We provide an analytical valuation formula, that is, an exact formula for the option price and an exact first-order ordinary differential equation for the optimal exercise boundary. As special cases, we give valuation formulas for the American put and call options. Although analytically intractable, the ordinary differential equation can easily be solved numerically. Numerical simulations yield excellent agreement with the results via the binomial method. Our approach makes use of the Mellin transform for the option price and the Laplace transform for the ordinary differential equation.

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Prof Shuenn-Jyi Sheu
National Central University
On Hamilton-Jacobi-Bellman equations for some investment problems
We review some recent mathematical results for the study of HJB equations derived from some investment problems in finance. We consider factor models with HARA utility functions. Under suitable conditions, the solutions of the HJB equations are smooth. The study of HJB equation suggests some interesting mathematical questions. They include: the existence of solutions, and the proof of the verification theorem. Two types of portfolio optimization problems are considered and some results are presented to show the development of different ideas to solve the equations. For the proof of the verification theorem, a crucial step is to obtain some suitable gradient estimates for the solutions. We use ideas from stochastic analysis and PDE argument to obtain such estimates.

Prof Dong-Ho Tsai
National Tsing Hua University
Contracting convex immersed closed plane curves with slow speed of curvature
We study the contraction of a convex immersed plane curve with speed $\frac{1}{\alpha}K^{\alpha}$*, where* $\alpha \in (0,1)$ *is a constant and show that, if the blow-up rate of the curvature is of type one, it will converge to a homothetic self-similar solution. We also discuss a special symmetric case of type two blow-up and show that it converges to a translational self-similar solution. In the case of curve shortening flow (i.e., when* α*=1), this translational self-similar solution is the familiar "Grim Reaper".*

Prof Jenn-Nan Wang
National Taiwan University
A size estimate problem in the shallow shell equations
In this talk I would like to discuss the inverse problem of estimating the size of an unknown inclusion embedded inside a shallow elastic shell. I will consider the cases where the media of the inclusion are given or not given. When the media of the inclusion is unknown, the method depends on some quantitative estimates for the shallow shell equations. On the other hand, if the media of the inclusion is known, we will use the method of the translation.

Prof Shih-Hsien Yu
National University of Singapore
On hyperbolic system in half space
In this talk, we will give a survey on recent development on hyperbolic system in a multi-D half space. The basic physics feature of surface wave propagation such as the Rayleigh wave will be discussed.

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Plenary Speakers

Mr Lashi Bandara
Australian National University
L^∞ coefficient differential operators and nonsmooth Riemannian metrics
The Kato square root problem on smooth Riemannian manifolds is the study of square roots of L^∞ coefficient uniformly elliptic divergence form operators. The stability given by the L^∞ coefficients enable us to reduce the study of such problems on non-smooth metrics to the smooth case by absorbing this lack of regularity in a corresponding equivalent operator on a smooth geometry. I will give a brief account of the solution to the smooth problem and current progress on non-smooth metrics and, in particular, possible connections to geometric flows.

Prof Chao-Nien Chen
National Changhua University of Education
Standing pulse solutions to FitzHugh-Nagumo equations
Reaction-diffusion systems serve as models for studying complex patterns in several fields of sciences. A localized pattern is a stable non- constant stationary solution usually located far away from neighborhoods of bifurcation induced by Turing's instability. In the study of FitzHugh-Nagumo equations, we look for a standing pulse with profile that is in close proximity to a trivial background state except for one localized spatial region where change is substantial. This amounts to seeking a homoclinic orbit for a corresponding Hamiltonian system and we utilize a variational formulation which involves a nonlocal term. The homoclinic orbit obtained here is a local minimizer extracted from a suitable topological class of admissible functions. In contrast with the known results for positive standing pulses in literature, new technique has been attempted in seeking standing pulse solution with sign change.

Dr Dmitry Demskoy
Charles Sturt University
Algebraic entropy for differential-difference equations
We extend the definition of algebraic entropy to differential-difference equations and demonstrate that its vanishing is a characteristic feature of integrability for this type of equations as well.

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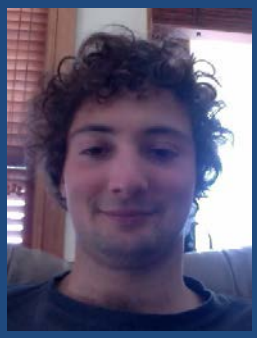

Mr Nick Fewster-Young
University of New South Wales
Deceptive solutions to singular boundary value problems
This talk will discuss singular nonlinear boundary value problems where the differential equation may not necessarily be continuous everywhere. There are numerous applications that motivate the study of such problems in the fields of heat and mass transfer, diffusion in a chemical catalytic converter and in boundary layer theory. The aim of this talk is to present results which yields existence of solutions to some of these problems.

Mr David Hartley
Monash University
Volume preserving mean curvature flow near cylinders
We will investigate the stability of finite cylinders under the volume preserving mean curvature flow. We will consider hypersurfaces that are graphs over a cylinder with boundary contained within two hyperplanes, such that the hypersurface meets these hyperplanes orthogonally. Under these conditions the stationary points of the flow are cylinders and unduloids. By analysing the center manifold of the linearised speed operator, we prove stability of cylinders of radius larger than a critical value. That is, hypersurfaces with sufficiently small height functions exist for all time and converge to a cylinder as time goes to infinity. This is the first known result proving the existence of non-rotationally symmetric surfaces converging to cylinders. A similar case where the initial surfaces are compact without boundary has previously been investigated by Escher and Simonett (1998).

Dr Glen Wheeler
University of Wollongong
Oscillation of curvature and the curve diffusion flow
In this talk we describe the recent invention of the "oscillation of curvature", and describe its application to the curve diffusion flow

Dr Valentina-Mira Wheeler
University of Wollongong
Mean curvature flow supported on a hyperplane
In this talk I will describe recent results on the mean curvature flow of graphs in Euclidean space which meet a hyperplane perpendicularly.

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Social Events

Welcome to Wollongong Event

Wine, Beer and Finger Foods

Sunday 2nd December 2012
Marketview Accommodation

6.00 pm – 7.30 pm

Excursion

Illawarra Tree Tops Fly and Nan Tien Temple
Tuesday 4th December 2012
12.20 pm – 5.00 pm

Ha Long Bay
Vietnamese Restaurant

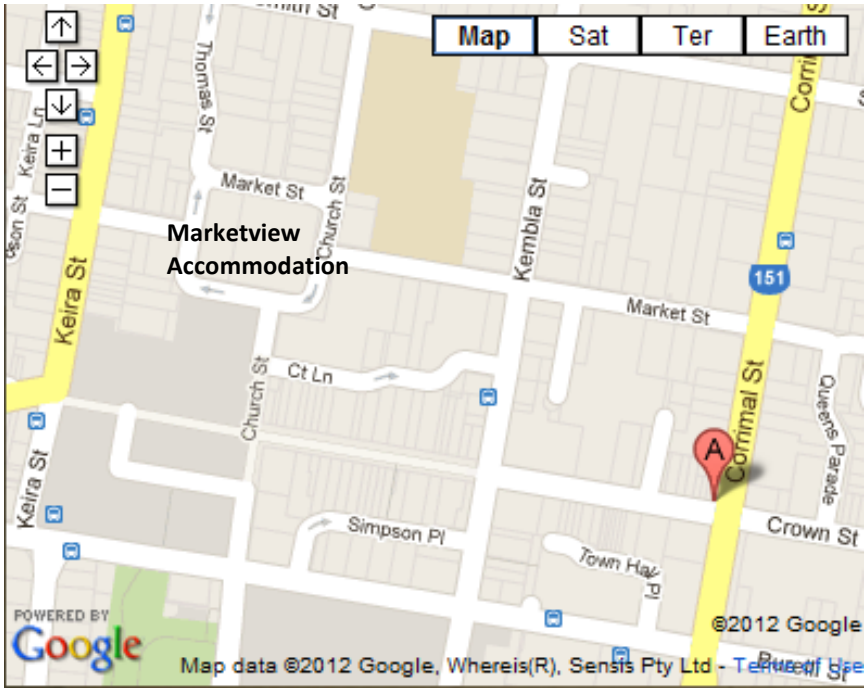
Trilateral Meeting Dinner

Wednesday 5th December 2012

6.30 pm

Ha Long Bay
52 Crown St,
Wollongong

Marked 'A' on map



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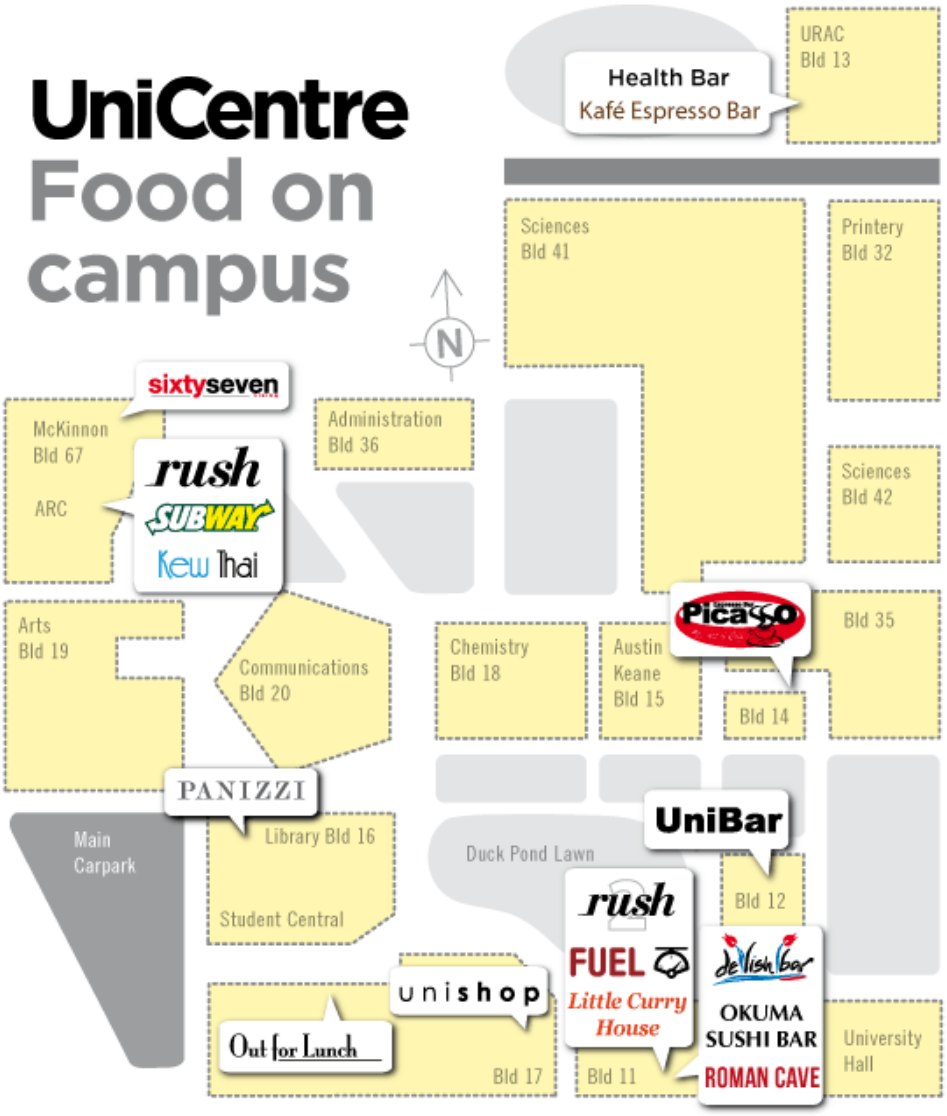
On Campus

Services

- Bank
- Unibar
- Post Office
- Travel Agent
- Hair Salon
- Doctor
- Dentist

URAC

- Pool
- Gym
- Fitness Classes
- Tennis courts
- Squash courts



Please note: Some food outlets have reduced hours during summer session

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