YOUNG RESEARCHERS IN MATHEMATICS 2015

WWW.YRM2015.CO.UK

University of Oxford, 17 - 20 August 2015

OXFORD BROOKES UNIVERSITY

UNIVERSITY OF OXFORD

We would like to thank all our generous sponsors.

Heilbronn Institute *for* Mathematical Research

GLOBAL INVESTMENT MANAGEMENT

Institute of mathematics & its applications

siam

OXFORD UNIVERSITY PRESS

LONDON MATHEMATICAL SOCIETY
150 YEARS

THINK TANK
THINKTANK MATHS LIMITED

Mathematical Institute

YRM 2015

Welcome

Welcome to *YRM 2015*! Thank you for coming to Oxford and being part of this student run event. Here you can meet other mathematicians and find out about research happening in your field and across mathematics. This is a great opportunity to meet new people and start interesting collaborative projects.

We hope that the conference is enjoyable with interesting keynote, plenary and track talks, and that this will be a friendly and relaxed environment for you to learn about other early-career mathematicians' research. Please do take the time to approach speakers with any questions you have, and we are sure they will be very happy to answer them for you.

And most importantly: have a great time here at YRM 2015!

Acknowledgments

There are many people who made this conference happen, not just those on the organising committee. We would like to pay special thanks to: Jo French, for getting YRM2015 off the ground; Sam Howison and Endre Süli for their support for the conference; Kobi Kremnitzer for his ready assistance; and Rob Calcroft for his much-appreciated hard work designing and maintaining our website. We would also like to thank our generous sponsors, without whom the conference would not be possible. Last but very much not least, we are deeply grateful to our speakers for the ideas, expertise and inspiration they bring to YRM2015.

Francesca Balestrieri, Mark Gilbert, Sam Kamperis,
Robert Kropholler, Eleanor McDonald, Simon Rydin Myerson,
Gonçalo Simões, Jamie Taylor, Tabea Tscherpel

Young Researchers in Mathematics 2015 Committee
www.yrm2015.co.uk

Information

If you have any questions, please ask one of the organisers. We will all be wearing Oxford Maths Department t-shirts, complete with Penrose tilings.

YRM 2015 is being held in the Andrew Wiles Building, which is the location of the Oxford Mathematical Institute. A map of the local area and a map of the Mezzanine level of the maths building can be found in the back of this booklet.

The registration will take place in the foyer of the Andrew Wiles Building and will commence on the morning of the 17th August. The conference officially begins at 12:30 with a welcome talk in L1. The front desk of the Andrew Wiles Building is manned from 9:00 to 18:00 and the building is open from 8:00 to 18:30, to enter the building outside of these hours you will need a university card.

Please make sure that you wear your conference badge at all times, especially during tea, coffee and lunch. This ensures that only conference participants are taking the food and drink.

Giving a talk

If you are giving a talk please find the person chairing your session and check that it is in a compatible format. All the rooms are equipped with rolling whiteboards, computers and digital projectors. If you are giving a computer slideshow, it would be easiest if you can transfer your slides using a USB stick, but it is possible to connect an external laptop to the projector system if need be.

All talks will be 20 minutes, with up to 5 minutes for questions at the end. In order to make sure that people have enough time to transfer between rooms between talks, people leading the sessions will be strict about cutting speakers off after their time is up.

G-research quantitative finance workshop

On Tuesday we will host a very exciting interactive workshop run by professional Quantitative Researchers from G-research. The workshop will be a discussion of some of the mathematical issues involved in portfolio construction. You will have the opportunity to consider one or more open-ended investment problems and come up with your own, mathematically based trading strategies. These will be run competitively against each other for the chance of a prize!

No prior knowledge of finance is necessary, but some familiarity with the very basic terminology of investment and risk management would be beneficial.

Meals

Breakfast: Breakfast is not included. There are many cafes in central Oxford which offer reasonably priced breakfasts, e.g. the Turl St Kitchen, Brown's Cafe (in the Covered Market) or Heroes. There are also branches of Tesco, Sainsbury's, Pret a Manger, McDonalds, etc.

Lunch is provided and will be served in the Mezzanine each day at 13:00 on Monday, Tuesday and Wednesday.

Tea and Coffee is provided twice daily and will be served in the Mezzanine at 10:30 and 15:00

Dinner is not provided except for the conference dinner, snacks will be provided at the wine receptions and there is a list of local restaurants in this booklet. The conference dinner will be held in Somerville College, marked on the map at the back of this booklet, the dinner will be at 19:15 on Wednesday 19th August.

Accommodation

Check-in: Please make your way to the Lincoln College Porters' Lodge on Turl Street (see map at back of booklet). The porters will give you your keys and directions to your room. The lodge is manned 24 hours a day - if you have any problems or questions about the accommodation the porters are extremely helpful and will be happy to assist you.

Check-out: Before you come to the conference on Thursday morning, please make your way to the Lincoln College Porters' Lodge on Turl Street to return your keys.

Left luggage: There will be a designated room for left luggage on the Monday Afternoon 12:00 - 18:00 and Thursday Morning 8:30 - 13:00. To access this room you will need to speak to one of the members of the Oxford Maths Institute.

Parking

Accessible parking places at the conference venue are available by prior booking with a clear explanation of the circumstances of need. Other than this there is no parking at the department. If you are travelling by car, we recommend using the Pear Tree Park and Ride car park and catching the bus route 300, which stops opposite the Mathematical Institute.

Wireless Internet Access

Wi-fi access will be available through Eduroam. You will need to set up Eduoram with your home institution in advance. If you are staying in our conference accommodation there is a separate Wi-Fi network available there.

Local Amenities

Although there is food at the conference not all meals are catered for. We add here a short list of places to eat and drink around the centre of Oxford, and some useful amenities.

- Restaurants
  - Zheng (Oriental), 82 Walton St
  - The Standard (Indian), 117 Walton St
  - Branca (Italian), 111 Walton St
  - Pierre Victoire (French), 9 Little Clarendon St
  - Manos (Greek), 105 Walton St
  - G&D's (Ice Cream), 55 Little Clarendon Street
- Pubs (which also serve food)
  - The Old Bookbinders, 17-18 Victor St
  - The Lamb and Flag, 12 St Giles'
  - Gardener's Arms, 39 Plantation Rd
- Supermarkets
  - Tesco Metro, 9 Magdalen Street
  - Sainsbury's Local, 7 Magdalen Street
  - Sainsbury's, 21 Westgate

- Pharmacy
  - Boots, 8-10 Cornmarket Street.

Monday Afternoon

09:30 –12:30	***Arrivals & Registration*** Foyer					
12:30 –13:00	***Intro***, L1					
13:00 –14:00	***Lunch*** in the Mezzanine					
14:00 –15:00	Fluid Dynamics Keynote: **Frank Smith (University College London)** *Bodies and droplets* L1			Number Theory Keynote: **Andrew Granville (Université de Montréal)** *Patterns in the primes* L2		
15:00 –15:30	***Tea & Coffee*** in the Mezzanine					
	Algebra Room L1	Dynamical Systems Room C5	Geometry Room L2	Mathematical Biology Room L6	Number Theory Room C1	Combinatorics and Graph Theory Room C6
15:30 –16:00	Ana Agore (Vrije Universiteit Brussel) *The factorization index for finite groups*	Neil Sherborne (University of Sussex) *Dynamics of multi-stage infections on networks*	Ali Jizany (University of Buckingham) *On quasi Einstein metrics*	Mitchell Gooding (University of Oxford) *Modeling Evolutionary Rescue With Competing Superprocesses*	Florian Bouyer (University of Warwick) *On the Picard Lattice of some K3 surfaces*	Jacob Dyer (University of York) *Enumerating rooted hypermaps and constellations through matrix integration*
16:00 – 16:30	Daniel Rogers (Warwick) *Necklaces and spinor norms of permutation matrices*	Andrew Mellor (University of Leeds) *The Role of Luddism on Innovation Diffusion*	Joseph Cook (Loughborough University) *Spectral Theory of the Bolza Surface*	Adewale Sunday Olumuyiwa (Ladoke Akintola University of Technology, Ogbomoso, Nigeria) *Mathematical model for measuring pancreas response to glucose*	Mairi Walker (The Open University) *Gaussian Integer Continued Fractions*	Tom Bourne (University of St Andrews) *Combinatorics on Words*
16:30 –17:00	Ha Thu Nguyen (University of Cambridge) *First degree cohomology groups and two problems of Hemmer*	Italo Cipriano (Warwick) *Large Deviations*	Rhiannon Dougall (University of Warwick) *Growth of closed geodesics and amenable groups*	Elizabeth Gothard (University of York) *Modelling scar tissue formation during dermal wound healing*	Riccardo Walter Maffucci (King's College London) *About nodal sets of eigenfunctions of the Laplacian on the torus*	John Sylvester (University of Warwick) *Paths, resistance and hitting times in Erdős-Rényi random graphs*
17:00 –18:00	Dynamical Systems Keynote: **Jonathan Fraser (University of Manchester)** *Dynamically defined fractals* L1			Probability and Stochastic Processes Keynote: **Wilfrid Kendall (University of Warwick)** *Probability coupled with Geometry* L2		
19:00 –	***Heilbronn Institute Wine Reception*** in the Common Room including ***Poster Competition***.					

Tuesday Morning

09:30 –10:30	Geometry Keynote: **Ragni Piene (University of Oslo)** *Projective geometry from a toric point of view* L1			PDEs Keynote: **Barbara Niethammer (University of Oxford)** *Title 2* L2		
10:30 – 11:00	***Tea & Coffee*** in the Mezzanine					
	Algebra Room L1	Fluid Mechanics Room L6	Mathematical Finance Room C1	Mathematical Physics Room C6	Number Theory Room L2	Probability and Stochastic Processes Room C5
11:00 – 11:30	Laura Elena Nastasescu ("Simion Stoilow" Institute of Mathematics of the Romanian Academy and University of Bucharest) *Are graded semisimple algebras symmetric?*	Sam Cox (University of Leicester) *Long-time, large-scale simulation of mantle convection*	Ruolong Chen (University of Oxford) *Optimal hedging on betting exchanges*	Matthew Wright (UCL) *Stars in Gauss-Bonnet gravity*	Christopher Nicholls (The University of Oxford) *Descent methods on Jacobians of higher genus curves*	Javed Hussain (University of York) *Large Deviation Principle for heat equation on Hilbert Manifold*
11:30 – 12:00	Ana Rovi (University of Glasgow) *Jacobi algebras*	Michael Cornish (Imperial College London) *On the Stability of Stratified Conducting Fluids in the Presence of Magnetic Fields*	Gonçalo Simões (University of Oxford) *Robust Portfolio Optimisation for Medium Frequency Trading Strategies and Heavy-Tailed Returns*	Felix Leditzky (University of Cambridge) *Second order asymptotic expansions in Quantum Information Theory*	Maria Nastasescu (California Institute of Technology) *Smooth L^2 Distances and Zeros of Approximations of Dedekind Zeta Functions*	James Thompson (University of Warwick) *Gradient Estimates for Conditioned Brownian Motion*
12:00 –12:30	Wilf Wilson (University of St Andrews) *Being clever with semigroup calculations*	Alex Tisbury (University of Birmingham) *The Propagation of fronts in reaction-diffusion equations with a cut-off in the reaction*	Martin Jonsson (Copenhagen University) *Stochastic Volatility for Utility Maximisers*	Rodrigo Pires dos Santos (University of Leeds) *A spectral approach to Monopoles in $\mathbb{R}^5$*	Kwok Wing Tsoi (University College London) *Congruences of CM forms*	Steven Pagett (University of Bath) *Universality in a class of fragmentation-coalescence processes*
12:30 – 13:00	Charles Cox (University of Southampton) *What is the R infinity property?*	George William Stagg (Newcastle University) *Classical-like wakes in atomic Bose-Einstein condensates*	Simon Ellersgaard Nielsen (University of Copenhagen) *The Fundamental Theorem of Derivative Trading - Exposition, Extensions, and Experiments*	Oliver Allanson (University of St Andrews) *An inverse problem in plasma physics: from fluid equilibria to kinetic equilibria*	Raphael S. Steiner (University of Bristol) *Supnorms of half-integral weight Modular Forms*	Chak Hei Lo (Durham University) *Non-homogeneous random walks with combined drift on a semi-infinite strip*

Tuesday Afternoon

13:00 –14:00	***Lunch*** in the Mezzanine					
14:00 –15:00	Topology Keynote: **Constantin Teleman (University of California, Berkeley)** *Division by 2 in characteristic 2 and quadratic topology* L1			Numerical Analysis Keynote: **Carola-Bibiane Schonlieb (University of Cambridge)** *The Variational Image: Structure of Images and Their Computational Treatment* L2		
15:00 –15:30	***Tea & Coffee*** in the Mezzanine					
	Analysis Room L6	PDEs Room L2	Mathematical Biology Room C1	Number Theory Room C5	**G-Research Quantitative Finance Workshop** Room L1	Topology Room C6
15:30 –16:00	Tobias Hartung (King's College London) *Zeta-Functions of Fourier Integral Operators*	Fatmir Qirezi (Brunel University London) *Stability and error estimates for linear thermoviscoelasticity*	Hannah Williams (University of Nottingham) *Using mathematics to tackle global food security*	Vandita Patel (University of Warwick) *The Hunt for Totally Real Number Fields*		Tom Harris (University of Southampton) *Dold–Puppe complexes amd algebraic K-theory*
16:00 – 16:30	Niccolo Salvatori (King's College London) *Logarithmic structures of categories and Elliptic Boundary Values*	Ben Pooley (University of Warwick) *Global well-posedness for the diffusive 3D Burgers equations*	Chloe Spalding (Univeristy of Birmingham) *Mathematical Modelling of the population dynamics of Pseudomonas aeruginosa with a view to developing novel antimicrobials*	Benjamin Green (University of Oxford) *Algebraic Automorphic Forms and the Langlands Program*		Gareth Wilkes (University of Oxford) *Profinite groups and manifolds*
16:30 –17:00	Matthew Jacques (Open University) *Semigroups of Möbius transformations*	Jamie Taylor (Oxford University) *Maximum entropy methods in Onsager's mean-field free energy*	James Kwiecinski (University of Oxford) *Self-Assembly in Mechanical Systems*	Sam Chow (University of Bristol) *Equidistribution of values of linear forms on a cubic hypersurface*		Yumi Boote (University of Manchester) *On the symmetric square of quaternionic projective space*
17:00 – 17:30						
18:00 – 19:00	LMS 150th Anniversary Public Lecture: **Vicky Neale (University of Oxford)** *7 things you need to know about prime numbers* L1					
19:00 –	***LMS Wine Reception*** in the Common Room					

Wednesday Morning

09:30 –10:30	Machine Learning Keynote: **Steffan Grunewalder** (**Lancaster University**) *A Challenge for Mathematics* L1			Algebra Keynote: **Kobi Kremnitzer** (**University of Oxford**) *Relative algebraic geometry and analytic geometry.* L2	
10:30 – 11:00	***Tea & Coffee*** in the Mezzanine				
	Algebra/Number Theory Room L2	Computational Biology Room C1	PDEs Room L1	Logic and Set Theory Room C6	Probability and Stochastic Processes Room L6
11:00 – 11:30	Christopher Fish (University of Sheffield) *Quantum cluster algebras*	Fergus Cooper (WCMB, Oxford) *Two cell-based modelling frameworks with applications to developmental biology*	Anton Muehlemann (Oxford) *The morphology of lath martensite: a new perspective*	Lubna Shaheen (University of Oxford) *Geometric Model for the Representations of Z.*	Watthanan Jatuviriyapornchai (University of Warwick) *Coarsening dynamics in condensing stochastic particle systems*
11:30 – 12:00	Cangxiong Chen (University of Cambridge) *Asai's functions analogous to* $\log\lvert\eta(z)\rvert$	Stephen Kissler (University of Cambridge) *Planes, trains, and other ways in which pandemic flu doesn't spread*	Arran Fernandez (University of Cambridge) *Fractional calculus and the Fokas method*	Richard Whyman (The University of Leeds) *Could we ever compute the uncomputable?*	Michael Tsardakas (Heriot-Watt University) *Spatiotemporal modelling of criminal activity*
12:00 –13:00	Think Tank Maths Keynote: **Cyrille Mathis** (**Think Tanks Maths, Ltd**) *What kind of mathematicians for the challenges of the future?* L1				
13:00 – 13:15	Conference Photo on Penrose Paving				
13:15 –14:00	***Lunch*** in the Mezzanine				

Wednesday Afternoon

15:00 –15:30	***Tea & Coffee*** in the Mezzanine				
14:00 –15:00	Mathematical Finance Keynote: **Kostas Kardaras** (**London School of Economics**) *A version of the Fundamental Theorem of Asset Pricing* L1			Mathematical Biology and Mathematical Physics Keynote: **Martine Ben Amar** (**École Normale Supérieure**) *Title TBA* L2	
	Algebra Room L2	Analysis/PDEs Room L1	Computer Science Room C1	Mathematical Biology Room L6	Probability and Stochastic Processes Room C5
15:30 –16:00	Jo French (University of Oxford) *Chiral Algebras*	Oliver Dunbar (University of Warwick) *A Diffuse Interface Model of a Multiphase Fluid with Surfactant*	Aleksandra Petrova (Design Bureau NAVIS) *Weighted, smoothing and bicubic weighted splines in the hydrometeorological data interpolation problems*	Lucie Bowden (University of Oxford) *A morphoelastic model of dermal wound closure*	Horatio Boedihardjo (Oxford-Man Institute of Quantitative Finance) *Stochastic Taylor Expansion: A pathwise remainder estimate*
16:00 – 16:30	Katherine Horan (University of Kent) *Invariant Rings of p-groups*	Tobias Barker (University of Oxford) *Ancient solutions to the Navier Stokes equations*	Hector Zenil (University of Oxford) *Surprising applications of graph and complexity theory to genetics*	Gemma Cupples (University of Birmingham) *Mathematical modelling of a synthetic bionanofibre flow detector*	Sebastian Vollmer (University of Oxford) *Unbiased Monte Carlo for infinite dimensional models*
16:30 –17:00	Daniel Bennett (University of St Andrews) *Thompson's Group V and Lehnert's Conjecture*	Muhammad Usman (Stockholm University) *Pseudo-Hermitian point interactions on quantum star graph, reality of spectrum and self-adjointness*	Brett McLean (University College London) *Algebras of Functions*	***No talk scheduled***	Daniel Molina-García (Basque Center for Applied Mathematics) *Modelling anomalous diffusion inside biological cells*
17:00 – 18:00	Plenary Lecture: **Frances Kirwan** (**University of Oxford**) *Non-reductive geometric invariant theory and applications in algebraic, symplectic and hyperkahler geometry* L1				
19:00 –	***Conference Dinner*** at Somerville College				

Thursday Morning

09:30 –10:30	Combinatorics and Graph Theory Keynote: **Daniela Kühn** (**University of Birmingham**) *Decompositions of graphs: splitting huge structures into simple pieces* L1			Statistics Keynote: **Simon Tavaré** (**University of Cambridge**) *Approximate Bayesian Computation: treasure trove or trivial pursuit?* L2	
10:30 – 11:00	***Tea & Coffee*** in the Mezzanine				
	Algebra Room L1	Mathematical Biology Room L2	Mathematical Physics Room C1	Number Theory Room L6	Numerical Analysis Room C5
11:00 – 11:30	Gareth Tracey (University of Warwick) *Two questions concerning the minimal generation of transitive permutation groups*	Lei Wang (University of Glasgow) *Propagation of Arterial Dissection*	Pietro Servini (UCL) *Roughing up Wings - A New Technique in Laminar Flow Control*	Aled Walker (Oxford University) *A multiplicative analogue of Schnirelmann's Theorem*	Tijana Stojančević (University of Novi Sad) *Eigenvalues of the Sample Average Hessian Approximation*
11:30 – 12:00	Karina Kirkina (University of Warwick) *Lie methods in the study of certain pro-p groups*	Auni Aslah Mat Daud (Universiti Malaysia Terengganu) *A mathematical model of population dynamics of hypertension during pregnancy*	Johar Muhammad Ashfaque (University of Liverpool) *Non-Tachyonic Semi-Realistic Non-Supersymmetric Heterotic String Vacua*	Matthew Spencer (University of Warwick) *Brauer Relations in positive characteristic*	Milena Kresoja (University of Novi Sad) *Methods for unconstrained optimization in noisy environment*
12:00 – 13:00	Close of Conference				

Abstracts

After the plenary talks, the keynotes are listed by track and then the contributed talks are listed by track and alphabetically by author's surname.

Plenary Lecture

Professor Frances Kirwan FRS (University of Oxford) Wednesday 17:00 - 18:00

Non-reductive geometric invariant theory and applications in algebraic, symplectic and hyperkahler geometry

Mumford's geometric invariant theory (GIT) provides a method for constructing quotient varieties for linear actions of complex reductive groups on algebraic varieties, and has many applications (for example in the construction of moduli spaces in algebraic geometry). The aim of this talk is to describe the main features of Mumford's GIT, together with an extension to actions of linear algebraic groups which are not necessarily reductive, and some of its applications. Non-reductive GIT is linked to the construction known as symplectic implosion (due to Guillemin, Jeffrey and Sjamaar) and more recently an analogous construction in hyperkahler geometry.

LMS 150th Anniversary Public Lecture

Dr Vicky Neale (University of Oxford) Tuesday 18:00 - 19:00

7 things you need to know about prime numbers

Prime numbers are fundamentally important in mathematics. Join Vicky to discover some of the beautiful properties of prime numbers, and learn about some of the unsolved problems that mathematicians are working on today.

Keynote Lectures

Algebra:

Professor Kobi Kremnitzer (Oxford University) Wednesday 9:30 - 10:30

Relative algebraic geometry and analytic geometry.

I will describe how to do geometry relative to a symmetric monoidal category.

I will give several examples of this approach. One of them will be geometry relative to the category of Banach spaces. This will produce a version of (complex or p-adic) analytic geometry.

Combinatorics and Graph Theory:

Professor Daniela Kühn (University of Birmingham) Thursday 9:30 - 10:30

Decompositions of graphs: splitting huge structures into simple pieces

The study of combinatorial decomposition problems has a long and rich history. To date, a major branch of Combinatorics, called design theory, is devoted to this topic. Given two graphs G and F, we say that G has an F-decomposition if the edges of G can be split into edge-disjoint copies of F. A classical result in this area is Kirkman's schoolgirl problem from 1847, which solves the F-decomposition problem for the case when F is the triangle and the host graph G is complete. A fundamental theorem of Wilson extends this to general graphs F (in the case when G is still complete). In general, this area of Combinatorics abounds with open problems. In my talk will discuss recent advances and some unresolved questions.

Dynamical Systems:

Dr Jonathan Fraser (University of Manchester) Monday 17:00 - 18:00

Dynamically defined fractals

Highly complicated and irregular sets are often derived from very simple dynamical processes. Well-known examples include: dynamical repellers (like Julia sets), attractors of iterated function systems (like the Sierpinski triangle) or limit sets of Kleinian groups (like the Apollonian circle packing). One can often use the dynamics of the defining process to derive useful geometric information about the associated fractal sets or measures. In this talk I will give some simple examples of this philosophy in action and also mention some directions in which this vast and exciting area is moving in.

Fluid Dynamics:

Professor Frank Smith (University College London) Monday 14:00 - 15:00

Bodies and droplets

This talk is about problems of many parts: whizzing bodies, particles, droplets, ice growth, dust, impacts, food grains, people, sport, complexity, storms. The research is motivated by particular contacts and applications in different branches of industry, biomedicine and social dynamics. Several case studies will be described which show the common themes involved and cover specific problems where mathematicians help, guide or lead the research. The work itself involves a combination of modelling, analysis, computation and experiments.

Geometry:

Professor Ragni Piene (University of Oslo) Tuesday 9:30 - 10:30

Projective geometry from a toric point of view

"Classical projective geometry addresses questions like classification, duality, divisors, sections and projections, enumerative geometry, etc. Although projective toric varieties form but a small subset of all projective

varieties, they constitute nonetheless a rich and interesting playground for the study of such ques- tions. The fact that there is a "dictionary" between toric projective varieties and lattice point configurations and convex lattice polytopes, makes it possible to use combinatorial methods to prove algebraic geometric results, and vice versa.

In this talk I will survey some recent results by various authors, especially con- cerning the classification of "hollow" polytopes and the characterization of selfdual and higher order selfdual toric varieties. In both cases, so-called Cayley polytopes play a major role."

Machine Learning:

Dr. Steffen Grünewälder (University College London) Wednesday 9:30 - 10:30

A Challenge for Mathematics

Machine learning is a research area that is currently on the forefront of technological developments, being a key component in the much-hyped area of Big Data. Companies like Google, Facebook, Microsoft or Amazon are betting fortunes on the usefulness of it. The discipline builds on many different areas of pure and applied mathematics, including the theory of function spaces and approximation theory, probability theory and the concentration of measure phenomenon, convex analysis and mathematical optimisation. Bringing together insight into data-generating processes, and these powerful mathematical results from disparate areas, results in tools for the analysis of complex data sets which have both theoretical guarantees of performance and provide insight in novel ways. I will give an overview of some major advances in machine learning, emphasising the underpinning mathematical theory. I will then demonstrate the interplay of these areas in more detail on the empirical process. The empirical process is a tool which is used to generalise the central limit theorem and it is highly valuable for the study of machine learning algorithms.

Mathematical Biology and Mathematical Physics:

Professor Martine Ben Amar (École Normale Supérieure) Wednesday 14:00 - 15:00

TBA

Mathematical Finance:

Professor Kostas Kardaras (London School of Economics) Wednesday 14:00 - 15:00

A version of the Fundamental Theorem of Asset Pricing

In this talk, the market viability condition of absence of arbitrage of the first kind will be introduced, and it will be shown to be equivalent to existence of strictly positive local martingale deflators. Full treatment for the case of continuous-path asset-price processes will be given.

Mathematics as a Living Language:

Dr Cyrille Mathis (Think Tank Maths, Ltd) Wednesday 12:00 - 13:00

What kind of mathematicians for the challenges of the future?

Mathematics for the future: languages rather than techniques.

Why should mathematics not be memorised as techniques, but be learned and understood as living and evolving languages?

Number Theory:

Professor Andrew Granville (Université de Montréal) Monday 14:00 - 15:00

Patterns in the primes

One can find many patterns when examining the primes, and make conjectures, some of which one can prove, but many of which are open. In this talk we shall examine some of the conjectures that most compel the speaker and discuss some of the techniques that have been used to resolve and/or attack these questions.

Numerical Analysis:

Dr Carola-Bibiane Schönlieb (University of Cambridge) Tuesday 14:00 - 15:00

The Variational Image: Structure of Images and Their Computational Treatment

Images are a rich source of beautiful mathematical formalism and analysis. Associated mathematical problems arise in functional and non-smooth analysis, the theory and numerical analysis of partial differential equations, harmonic, stochastic and statistical analysis, and optimisation. Starting with a discussion on the intrinsic structure of images and their mathematical representation, in this talk we will learn about variational models for image analysis and their connection to partial differential equations, and go all the way to the challenges of their mathematical analysis as well as the hurdles for solving these - typically non-smooth- models computationally. The talk is furnished with applications of the introduced models to image de-noising, de-blurring and segmentation, as well as their use in biomedical image reconstruction such as it appears in magnetic resonance imaging.

PDEs:

Professor Barbara Niethammer (University of Oxford) Tuesday 9:30 - 10:30

Dynamic scaling in models for coarsening phenomena

Coarsening processes induced by surface tension are ubiquitous in nature. Typical examples are the increase of the average cell size in foams, the formation of liquid droplets in an oversaturated gas or the coarsening of microstructure in metal alloys. In this talk I will discuss for some fundamental examples how one can derive effective models that allow to predict the evolution of characteristic macroscopic quantities for large times.

A question of particular interest is whether these models confirm the dynamic scaling hypothesis that predicts universal long-time behaviour of such systems.

Probability and Stochastic Processes:

Professor Wilfrid Kendall (University of Warwick) Monday 17:00 - 18:00

Probability coupled with Geometry

I shall talk about two beautiful ways in which probability meets geometry, both arising from the theory of coupling. Coupling is about proving results by considering the behaviour of carefully interrelated random structures, and perhaps it is not obvious how geometry might enter into this. But enter it does, and we will see how (a) Riemannian geometry and (b) modern metric geometry both have fundamental roles to play.

Statistics:

Professor Simon Tavaré FRS (Cancer Research UK Cambridge Institute & DAMTP - University of Cambridge) Thursday 9:30 - 10:30

Approximate Bayesian Computation: treasure trove or trivial pursuit?

Approximate Bayesian Computation (ABC) has become a standard part of the statistician's toolbox. In this talk I will outline what ABC is about, how it arose, and what it can (and cannot) do. I will illustrate the approach with an example from cancer biology, and I will highlight some open statistical problems that might interest research students. No previous knowledge of cancer biology is needed to understand the talk.

Topology:

Professor Constantin Teleman (University of Oxford) Tuesday 14:00 - 15:00

Division by 2 in characteristic 2 and quadratic topology

An integer-valued symmetric bilinear form $B(x, y)$ on $\mathbb{Z}^k$ is the Hessian of a quadratic function precisely when $B(x, x)$ is even for all x. This is obstructed by the *characteristic functional* $v(x) := B(x, x) \pmod 2$, a *linear* map. For Poincaré duality on H_2 of a closed oriented four-manifold X, v is the Stiefel-Whitney class $w_2 \in H^2(X; \mathbb{Z}/2)$, generalizing to the middle Wu class $v_{2n}(X)$ in dimension $4n$. A 'derived' version of this obstruction is the total Wu class. We will relate these facts to the construction of some simple topological quantum field theories and their boundary conditions; in dimensions 3 and 4, we will discover the difference between a (group-like) modular tensor category and its spin version. The theories detect the signature mod 8, and see a shadow of Wall's famous 'surgery obstructions' in manifold theory.

Contributed Talks

Algebra

Ana Agore (Vrije Universiteit Brussel) Monday 15:30 - 16:00

The factorization index for finite groups

Let A be a subgroup of a group G. An A-complement of G is a subgroup H of G such that $G = AH$ and $A \cap H = \{1\}$. Let H be a given A-complement of G and $(\triangleright, \triangleleft)$ the canonical left/right actions associated to the factorization $G = AH$. Then the description of all complements is given: $\mathbb{H}$ is an A-complement of G if and only if $\mathbb{H}$ is isomorphic to H_r, for some deformation map $r : H \to A$ of the matched pair $(A, H, \triangleright, \triangleleft)$. The factorization index is introduced as the cardinal of the set of isomorphism types of all A-complements of G. As an application we show that the theoretical formula for computing the number of isomorphism types of all groups of order n arises only from the factorization $S_n = S_{n-1}C_n$. Based on a joint work with G. Militaru.

Daniel Bennett (University of St Andrews) Wednesday 16:30 - 17:00

Thompson's Group V and Lehnert's Conjecture

A brief introduction to Thompson's Group V, an example of a finitely presented, infinite simple group. V is also a co$\mathcal{CF}$ group, i.e. a group with a context free co-word problem. Lehnert's conjecture asks if V contains all co$\mathcal{CF}$ groups up to isomorphism. This will be discussed and all the above terms explained.

Charles Cox (University of Southampton) Tuesday 12:30 - 13:00

What is the R infinity property?

Does an infinite group necessarily have infinitely many conjugacy classes? No! Way back in 1949 Graham Higman, Bernhard Neumann, and Hanna Neumann used HNN extensions to construct an infinite group with 2 conjugacy classes. The R infinity property extends this idea by replacing conjugacy with twisted conjugacy. There will be plenty of examples to help to get to grips with this problem.

Laura Elena Nastasescu ("Simion Stoilow" Institute of Mathematics of the Romanian Academy and University of Bucharest) Tuesday 11:00 - 11:30

Are graded semisimple algebras symmetric?

We study graded symmetric algebras, which are the symmetric monoids in the monoidal category of vector spaces graded by a group. We show that a finite dimensional graded division algebra whose dimension is not divisible by the characteristic of the base field is graded symmetric. Using the structure of graded simple (semisimple) algebras, we extend the results to these classes. In particular, in characteristic zero any graded semisimple algebra is graded symmetric. We show that the center of a finite dimensional graded division algebra is often symmetric. This is joint work with prof. Sorin Dascalescu and prof. Constantin Nastasescu.

Christopher Fish (University of Sheffield) Wednesday 11:00 - 11:30

Quantum cluster algebras

Jo French (University of Oxford) Wednesday 15:30 - 16:00

Chiral Algebras

Arising originally from physics and formalised by Beilinson and Drinfeld, Chiral algebras play an important role in geometric representation theory, as well as in 2-dimensional conformal field theories. Here, I will try to introduce these algebras and discuss them in relation to D-modules.

Katherine Horan (University of Kent) Wednesday 16:00 - 16:30

Invariant Rings of p-groups

Let k be a field of characteristic p, V a k-vector space and $P \subset GL(V)$ a p-group, so that we have an action of P on $k[V]$. I will discuss the structure of the invariant ring $k[V]^P = \{f \in k[V] : g(f) = f \forall g \in P\}$ in this case, the importance of reflection and bi-reflection groups and give some examples.

Karina Kirkina (University of Warwick) Thursday 11:30 - 12:00

Lie methods in the study of certain pro-p groups

Let G be an infinite group and denote by $a_n(G)$ the number of subgroups of G of index n. It is interesting to study the growth type of the function $a_n(G)$ for various groups since the subgroup growth type itself determines certain algebraic properties of the group. For certain pro-p groups, a useful method involves associating a graded Lie algebra to the group in order to derive facts about the group from facts about the Lie algebra. I will illustrate this method using the example of the pro-p group $SL_d^1(\mathbb{F}_p[[t]])$, the first congruence subgroup of $SL_d(\mathbb{F}_p[[t]])$.

Ha Thu Nguyen (University of Cambridge) Monday 16:30 - 17:00

First degree cohomology groups and two problems of Hemmer

For a Specht module S^λ of the symmetric group Σ_d, the cohomology $H^i(\Sigma_d, S^\lambda)$ is known only in degree $i = 0$. Further available results about first cohomology groups concern mostly Specht modules corresponding to hook partitions or two-part partitions. However, the proofs for these involve lots of powerful and complicated algebraic groups machineries. Recently, David Hemmer proposed a method that allows (in principle, although it is difficult in practice) to check whether $H^1(\Sigma_n, S^\lambda)$ is trivial or not, only by means of combinatorics. We will discuss a few problems that might be particularly amenable to proof using this description, which leads to the discovery of an unexpected and surprising link between Design Theory and the representation theory of the symmetric groups. Finally, we show how this link might be used to solve representation theoretic problems.

Daniel Rogers (Warwick) Monday 16:00 - 16:30

Necklaces and spinor norms of permutation matrices

In this talk we will explore a connection between a field automorphism of a certain module of $\Omega_n^\epsilon(q^d)$ and the combinatorial notion of a necklace, and how rephrasing the former question in terms of the latter allows us to find determinants and spinor norms of permutation matrices which centralise the form antidiag$(1, .., 1)$.

Ana Rovi (University of Glasgow) Tuesday 11:30 - 12:00

Jacobi algebras

Jacobi algebras are a generalisation of Poisson algebras. I will give a survey on these algebras and their applications.

Gareth Tracey (University of Warwick) Thursday 11:00 - 11:30

Two questions concerning the minimal generation of transitive permutation groups

For a group G, let $d(G)$ denote the minimal number of elements required to generate G. If G is a transitive permutation group of finite degree n, then there are two obvious questions we can ask, concerning the minimal generation of G. First, how many elements does it take to generate G, in terms of n?

And secondly, suppose that we want to find a subset X of G, with $|X|$ as small as possible, but such that $\langle X \rangle$ remains transitive. How small can we make $|X|$ (in terms of n)?

In this talk, we address the history of both questions, and we describe some recent developments.

Wilf Wilson (University of St Andrews) Tuesday 12:00 - 12:30

Being clever with semigroup calculations

Given a semigroup, we might want to calculate one of its properties, for example its size. This could be pretty slow. However, we might be able to work out the answer in a smart way if we use what we already know about our semigroup.

Using examples, I'll demonstrate how considering all approaches to a problem, and being aware of the assumptions we can make, can be immensely valuable to performing efficient calculations.

Analysis

Tobias Hartung (King's College London) Tuesday 15:30 - 16:00

Zeta-Functions of Fourier Integral Operators

Zeta-functions are an important tool in defining traces and determinants on operator algebras. As such, they provide means of computing geometric, topological, spectral, and physical invariants. In this talk, I will introduce the notion of gauged poly-log-homogeneous distributions which will allow us to calculate the Laurent expansion of zeta-functions of gauged Fourier Integral Operators. This result will furthermore yield a generalization of the Kontsevich-Vishik trace for Fourier Integral Operators.

Matthew Jacques (Open University) Tuesday 16:30 - 17:00

Semigroups of Möbius transformations

Motivated by the theory of Kleinian groups and recent work of Fried, Marotta and Stankewitz, we explore the dynamics of semigroups of Möbius transformations.

We show how semigroups of Möbius transformations can be used to answer natural questions about the convergence of continued fractions. In particular, for any compact set X that does not contain 0, we find necessary and sufficient conditions for the convergence of every continued fraction with coefficients chosen from X.

Niccolo Salvatori (King's College London) Tuesday 16:00 - 16:30

Logarithmic structures of categories and Elliptic Boundary Values

The mathematical formalization of Topological Quantum Field Theories suggested that the essential structures of index theory or geometrical analysis, for instance, are better understood if related to their dependence on representations of the cobordism category. Such representation has been sharpened, as logarithmic structures appear as linked to additive properties of some manifold invariants. LogTQFT arises in this context and provides a more refined tool for studying such invariants. As an example, the (relative) Euler characteristic can be seen as the character of a LogTQFT, as well as the topological signature. Final remarks will point out at natural generalization to higher signatures and briefly present the analytical difficulties on the way.

Muhammad Usman (Stockholm University) Wednesday 16:30 - 17:00

Pseudo-Hermitian point interactions on quantum star graph, reality of spectrum and self-adjointness

One dimensional Schrödinger operator with $\mathcal{PT}$-symmetric potentials is determined by the following expression

$$L_V = -\frac{d^2}{dx^2} + V(x),$$

where the potential $V(x)$ is complex-valued and satisfies $V(-x) = \overline{V(x)}$. Using the space reflaction operator $\mathcal{P} : (\mathcal{P}\psi)(x) = \psi(-x)$ and the complex conjugation operator $\mathcal{T}\psi = \overline{\psi}$ the last property can be written as $\mathcal{PT}V = V$. Then the differential operator L_V is formally $\mathcal{PT}$-symmetric, that is, $\mathcal{PT}L_V = L_V\mathcal{PT}$.

In this talk, I will discuss the question of $\mathcal{PT}$-symmetry in the framework of quantum graphs-differential operators on metric graphs-. I will present a natural generalization of $\mathcal{PT}$-symmetry to quantum graphs and will discuss the spectrum of $\mathcal{PT}$-symmetric Laplace operator on a star graph.

Combinatorics and Graph Theory

Tom Bourne (University of St Andrews) Monday 16:00 - 16:30

Combinatorics on Words

The generalised star-height problem is one of many questions in the field of formal language theory that is easy to state but extremely difficult to answer. In this talk we'll explore how combinatorics on words might be one of the better approaches to take when tackling the problem and, if time allows, how it fits in with the pre-existing algebraic approach.

Jacob Dyer (University of York) Monday 15:30 - 16:00

Enumerating rooted hypermaps and constellations through matrix integration

We present a method of computing generating functions for enumerating rooted hypermaps (3-constellations) by number of edges, vertices and faces, using matrix integral methods derived from the theory of finite quantum systems. We use this to compute such functions in closed form, as well as discussing the method's generalisation to constellations of higher order.

John Sylvester (University of Warwick) Monday 16:30 - 17:00

Paths, resistance and hitting times in Erdős-Rényi random graphs

We will present some expectation and concentration results for various graph indices in the Erdős-Rényi model. These include effective resistances, random walk hitting times between uniformly chosen vertices and other related indices. These results are proven using a modified breadth-first search algorithm which allows us to show that with high probability there are many edge independent paths in an Erdős-Rényi random graph $G(n,p)$ with edge probability $p \geq c\log(n)/n$ for $c > 1$.

Computational Biology

Fergus Cooper (WCMB, Oxford) Wednesday 11:00 - 11:30

Two cell-based modelling frameworks with applications to developmental biology

Computational modelling can provide a useful framework within which to investigate multicellular structures on an individual cell based level. Feedback between experimental data and computational modelling can help inform experimental design and elucidate underlying biological processes. There are many cell-based modelling frameworks available, and in this talk I will briefly outline two: Vertex Models in the context of epithelial dynamics, and the Immersed Boundary Method with an application to modelling the cross section of a tissue.

Stephen Kissler (University of Cambridge) Wednesday 11:30 - 12:00

Planes, trains, and other ways in which pandemic flu doesn't spread

Influenza pandemics arise when a novel viral strain, to which virtually no one is immune, emerges. Consequently, one might expect that a pandemic strain would hit cities early and hard, and then spread long distances very quickly, hitching rides on our transit systems. For the 2009 H1N1 pandemic in the United States, the reverse was true - the disease spread more slowly and uniformly than most seasonal outbreaks, and showed no special preference for cities, nor did it speed up once it did enter into densely-populated areas. This all suggests that pandemic influenza transmission relies on local dynamics far more than on long-range interactions. In this talk, I will first discuss the methods we have developed to mechanistically model influenza transmission. Then, I will introduce insights we have made into how spatial separation, age, and certain social factors may have caused the 2009 pandemic to behave as it did.

Computer Science

Brett McLean (University College London) Wednesday 16:30 - 17:00

Algebras of Functions

One thing that algebraic logicians do is study classes of (universal) algebras consisting of those that are isomorphic to an algebra of 'concrete' objects. Some computer scientists are interested in algebras of binary relations, for reasoning about nondeterministic programs, or of partial functions, for reasoning about deterministic programs.

The case of binary relations has the longer history, but the more recent investigations into algebras of functions has revealed them to be considerably better behaved-the classes having finite axiomatisations, decidable equational theories and so on.

I will give more detail in order to explain what all this means and hopefully give a short account of at least one thing I've done in this area.

Aleksandra Petrova (Design Bureau NAVIS) Wednesday 15:30 - 16:00

Weighted, smoothing and bicubic weighted splines in the hydrometeorological data interpolation problems

In my report I'll consider algorithms for constructing three kinds of interpolating cubic splines: one-dimensional weighted spline and two-dimensional weighted spline constructed by means of method of moments and one-dimensional smoothing spline. I'll also describe a visual application on C# that implements these algorithms. In terms of real hydrometeorological data the benefits of using each of cubic splines considered will be shown in the report.

Keywords: interpolation; weighted cubic splines; smoothing splines; bicubic weighted splines; hydrology; meteorology; C#.

Hector Zenil (University of Oxford) Wednesday 16:00 - 16:30

Surprising applications of graph and complexity theory to genetics

Biological networks are complex because the connections can represent non-linear and convoluted activation or inhibition among genes represented in the adjacency matrix. I will show that Shannon's information entropy, Kolmogorov complexity and algorithmic probability quantify different properties of evolving graphs. I will introduce formal definitions of complexity for both labelled and unlabelled graphs. These tools are at the intersection of information theory and network biology and a surprising application of this work is the reprogramming of biological cells to have them perform different task and potentially better understand ho nature originally program them and even ultimately reverse the development of some complex diseases.

Dynamical Systems

Italo Cipriano (Warwick) Monday 16:30 - 17:00

Large Deviations

The Birkhoff ergodic theorem is for some authors in Ergodic theory the most important result. It gives an invariant for a dynamical systems constructed from the asymptotic average along the trajectory of points on a set of full measure. Points on the complement of this set does not satisfy the Birkhoff ergodic theorem. In this talk we will study the measure of these points for some continuous dynamical systems.

Andrew Mellor (University of Leeds) Monday 16:00 - 16:30

The Role of Luddism on Innovation Diffusion

We generalize the classical Bass model of innovation diffusion to include a new class of agents — Luddites — that oppose the spread of innovation. Our model also incorporates ignorants, susceptibles, and adopters. In response to the rate of adoption, an ignorant may become a Luddite and permanently reject the innovation. Instead of reaching complete adoption, the final state generally consists of a population of Luddites, ignorants, and adopters. The evolution of this system is investigated analytically and by stochastic simulations. We determine the stationary distribution of adopters, the time needed to reach the final state, and the influence of the network topology on the innovation spread. Our model exhibits an important dichotomy: when the rate of adoption is low, an innovation spreads slowly but widely; in contrast, when the adoption rate is high, the innovation spreads rapidly but the extent of the adoption is severely limited by Luddites.

Neil Sherborne (University of Sussex) Monday 15:30 - 16:00

Dynamics of multi-stage infections on networks

The talk will be based on a paper which I hope will be published soon. The abstract of which is given below:

This paper investigates the dynamics of infectious diseases with a nonexponentially distributed infectious period. This is achieved by considering a multistage infection model on networks. Using pairwise approximation with a standard closure, a number of important characteristics of disease dynamics are derived analytically, including the final size of an epidemic and a threshold for epidemic outbreaks. Stochastic simulations of dynamics on networks are performed and compared to the results of pairwise models for several realistic examples of infectious diseases to illustrate the role played by the number of stages in the disease dynamics. The agreement between the pairwise and simulation methods is excellent in the cases we consider.

Fluid Mechanics

Michael Cornish (Imperial College London) Tuesday 11:30 - 12:00

On the Stability of Stratified Conducting Fluids in the Presence of Magnetic Fields

Magnetohydrodynamics is increasingly becoming a popular topic for many reasons. From the ability to control fluids via magnetic fields at a distance (helping metallurgical processes, fusion reactions, and lab-on-a-chip systems) to astrophysical phenomena (such as the dynamics of the earth's core or the sun) the field is rich in problems and applications. Generalizing the work of Yih [1967] and Yantsios & Higgins [1988], the stability of an interface between two stratified fluids in a channel is examined analytically. The base magnetic field is taken to be a constant parallel to the flat, undisturbed interface and the base fluid takes the parallel flow approximation.

Sam Cox (University of Leicester) Tuesday 11:00 - 11:30

Long-time, large-scale simulation of mantle convection

Whole-earth mantle convection simulation requires large numbers of degrees of freedom to capture the lengthscales necessary for accurate solution, given the nonlinearity of the mechanisms responsible. Adaptivity is a crucial tool in attempts to model with resolutions approaching 10km, while highly parallelised code is required to solve the system in a reasonable time, particularly when modelling long time periods. This talk will discuss some ongoing work to implement this technique for the Boussinesq model, using *a posteriori* error estimators for the underlying Stokes and convection-diffusion equations in a parallelised FEM scheme, with the aim of modelling the full mantle over 100 million years.

George William Stagg (Newcastle University) Tuesday 12:30 - 13:00

Classical-like wakes in atomic Bose-Einstein condensates

Superfluidity is a state of matter with two amazing properties: flow without viscosity, and quantised vorticity. Unlike in ordinary fluids, superfluid vorticity is discrete and takes the form of quantum vortices of fixed circulation.

Bose-Einstein condensates are ideal for studying quantum vortices. Along with providing an experimental path to testing superfluid theories, they also easily support 2D quantum vortices, something difficult to do in other superfluids, such as liquid helium.

We show that an elliptical obstacle moving through a Bose-Einstein condensate generates wakes which resemble those of classical viscous flow past a cylinder. Initial symmetric wakes, similar to those observed in classical flow at low Reynolds number, lose their symmetry and form clusters of like-signed vortices, in analogy to the classical Karman vortex street.

Our findings, demonstrated numerically in 2D, confirm the intuition that a large number of quanta of circulation reproduces classical physics.

Alex Tisbury (University of Birmingham) Tuesday 12:00 - 12:30

The Propagation of fronts in reaction-diffusion equations with a cut-off in the reaction

We investigate the change in the properties of fronts that arise in reaction-diffusion equations in the presence of a cut-off. The latter was previously introduced in order to capture the discrete nature of the chemical and biological phenomena at the microscopic level and models a reaction that is effectively disabled at points where the concentration lies below some threshold. We first establish the existence of front solutions, before using matched asymptotics to describe the effect of the cut-off on the front's speed of propagation and profile for both small and large cut-off values.

Geometry

Joseph Cook (Loughborough University) Monday 16:00 - 16:30

Spectral Theory of the Bolza Surface

The Bolza surface has the highest symmetry group among all surfaces of genus 2, with constant negative curvature -1. In this talk, I will give an overview of the group structure, and the representation theory of this group. I will use this theory to generate mixed boundary problems for the Laplace-Beltrami operator. I will discuss of Jenni (1981) regarding the bottom of the spectrum of the Laplacian on the Bolza surface.

Rhiannon Dougall (University of Warwick) Monday 16:30 - 17:00

Growth of closed gedodesics and amenable groups

For a compact, negatively curved manifold M, it is classically known that the number of closed geodesics of length at most T grows exponentially in T. We can ask how the exponential growth rate compares for a regular cover $\widetilde{M}$ of M. We find that the exponential growth rates agree precisely when the covering group is amenable. This is proven using the dynamics of the geodesic flow.

Ali Jizany (University of Buckingham) Monday 15:30 - 16:00

On quasi Einstein metrics

What is quasi Einstein metric and when will it be similar to Einstein metric and Ricci soliton? Some topological properties such as Hitchin-Thorpe inequality will be used to find suitable geometric conditions to satisfy this inequality. Also, some results on quasi Einstein metric will be shown.

Logic and Set Theory

Lubna Shaheen (University of Oxford) Wednesday 11:00 - 11:30

Geometric Model for the Representations of Z.

The aim of this project is to attach a geometric structure to the ring of integers. It is generally assumed that the spectrum Spectrum of Z, defined by Grothendieck serves this purpose. However, it is still not clear what geometry this object carries. E.g. Y I. Manin discusses what the dimension of Spec(Z) could be, speculating that it may be 1,3 or infinity. A.Connes and C.Consani published recently an important paper which introduces a much more complicated structure called the arithmetic site on the basis of Spec(Z).

Our approach is based on the generalisation of constructions applied by Boris Zilber for similar purposes in non-commutative (and commutative) algebraic geometry.

The current version is quite basic. We describe a category of certain representations of integral extensions of Z and establish its tight connection with the space of elementary theories of pseudo-finite fields. From model-theoretic point of view the category of representations is a multisorted structure which we prove to be superstable with pregeometry of trivial type. It comes as some surprise that a structure like this can code a rich mathematics of pseudo-finite fields.

Note that the model-theoretic analysis of the structure establishes that the Morley rank of Spec(Z) is infinity while the u-rank is 1 thus identifying formally two of the three Manin's dimensions.

Richard Whyman (The University of Leeds) Wednesday 11:30 - 12:00

Could we ever compute the uncomputable?

Could some property of the reality we live in allow us to violate the Church-Turing thesis? In this talk I will attempt to explain what form I believe any future computational device utilising unknown quirks of physics would have to take, before giving examples of scenarios where computing something uncomputable by a Turing machine is possible. I will finish by explaining how a couple of simple restrictions on our capabilities would result in us never being able to compute the uncomputable.

Mathematical Biology

Lucie Bowden (University of Oxford) Wednesday 15:30 - 16:00

A morphoelastic model of dermal wound closure

A model of wound healing is developed in the framework of finite elasticity, with attention focussing on growth and contraction in the dermal layer of the skin. The dermal tissue is treated as a hyperelastic cylinder surrounding the wound and is subject to symmetric deformations. By considering the initial recoil observed upon wounding, we estimate the degree of residual tension in the skin, and build an evolution law for mechanosensitive growth of the dermal tissue. Contraction of the wound is governed by a phenomenological law in which radial pressure is prescribed at the wound edge. The model reproduces three main phases of the healing process. Initially the wound recoils due to residual stress in the surrounding tissue; the wound then heals as a result of contraction and growth; and finally, healing slows. Over a longer time period the surrounding tissue remodels, returning to the residually stressed state. The model is used to predict the outcome of mechanical experiments.

Gemma Cupples (University of Birmingham) Wednesday 16:00 - 16:30

Mathematical modelling of a synthetic bionanofibre flow detector

The ability to detect pathogens in a sample without the need for laboratory processing can be highly beneficial. Using rod shaped biomolecules, suspended in the sample, and subjecting this sample to linear dichroism spectroscopy, it is possible to test for certain pathogens. The fibres in the suspension are aligned according to the stress applied to the material, and the direction of this alignment is detectable through a difference in the absorption of light polarised in orthogonal directions.Designs for a device that will optimise the linear dichroism signal and sensitivity need to be developed, we aim to maximise the signal produced for a compact design. The presence of fibres in a fluid can significantly alter its rheology. We discuss the basic properties of these fluids and how unidirectional pressure driven flow differs from the Newtonian case.

Mitchell Gooding (University of Oxford) Monday 15:30 - 16:00

Modeling Evolutionary Rescue With Competing Superprocesses

Evolutionary rescue is the phenomenon where a new mutant evolves from a population which is otherwise heading for extinction, and the mutant successfully repopulates the environment. In order to study this behaviour, population models which do not assume constant standing population size need to be developed. In this talk, we show how interesting statistics in this model can be calculated by modeling the interacting populations as superprocesses which kill each other according to their collision local time.

Auni Aslah Mat Daud (Universiti Malaysia Terengganu) Thursday 11:30 - 12:00

A mathematical model of population dynamics of hypertension during pregnancy

(Joint work with Toh Cher Qing.) In this study, a mathematical model of population dynamics of hypertension during pregnancy has been proposed and analysed. In the modelling process, five dependent variables have been considered, namely the numbers of non-pregnant and non-hypertensive women, pregnant hypertensive women, non-pregnant and hypertensive women, pre-eclamptic pregnant women and eclamptic pregnant women. The model is described using a system of ordinary differential equations. Its stability is studied using Routh-Hurwitz criteria. It is found that the model has only one non-negative equilibrium, which is locally asymptotically stable. Numerical simulation of the model has been carried out to confirm and illustrate the analytical results.

Elizabeth Gothard (University of York) Monday 16:30 - 17:00

Modelling scar tissue formation during dermal wound healing

Predicting healing outcomes is both a theoretically interesting and clinically relevant problem. Dysregulated healing can cause production of abnormal scar tissue, leading to debilitating skin conditions. Scar tissue

consists of a network of collagen fibres produced by fibroblast cells at the wound site. Orientation of fibres determines tissue functionality: viable skin contains collagen in a mesh structure, whereas alignment in scar tissue is more parallel. Previous studies used deterministic models to describe how average orientations of collagen fibres and fibroblasts evolve over time and space. However, whether fibres are parallel or perpendicular is a defining characteristic of the resulting tissue, and hence mathematical descriptions should go beyond mean orientations. We propose a model for the local distributions of cell and fibre orientations, which may better describe the organisation of fibres in scar tissue and provide insights to inform experimental and clinical studies.

James Kwiecinski (University of Oxford) Tuesday 16:30 - 17:00

Self-Assembly in Mechanical Systems

The presentation will focus on the shaping of biological membranes by means of curvature-inducing proteins. The membrane is an important building block at the cellular level, coating certain parts of the cell and forming independent biological objects. The shape of these resultant entities is fundamental to their function, so the self-assembly process, and the understanding thereof, is important. If the biological object does not shape properly, then that affects its function which hurts the sustainability of the cell.

To this end, we introduce a model that provides a macroscopic description of self-assembly. To do this, we employ mechanics: continuum mechanics to describe the elastic response of the membrane to bonding stresses and statistical mechanics to provide a thermodynamically consistent description of bonding stresses and bending energies in the system. The result is a relatively simple mathematical model whose solution and stability regimes can be further analyzed.

Adewale Sunday Olumuyiwa (Ladoke Akintola University of Technology, Ogbomoso, Nigeria) Monday 16:00 - 16:30

Mathematical model for measuring pancreas response to glucose

In this research work, we present a mathematical model which takes into account the molecular weight of carbohydrates intakes in a diabetes subject. The model was rigorously analyzed to investigate the effect of the carbohydrates intakes on the pancreatic response. We also developed a numerical scheme to solve the problem which form the basis of the software used for measuring the level of the pancreatic cell permeability.

Chloe Spalding (Univeristy of Birmingham) Tuesday 16:00 - 16:30

Mathematical Modelling of the population dynamics of Pseudomonas aeruginosa with a view to developing novel antimicrobials

Antibiotic resistance is fast becoming one of the largest global health concerns of the 21st century and understanding how resistance develops is fundamental in establishing new therapies to cure bacterial infections. Here, we introduce a differential equation model that can describe the population dynamics of P. aeurginosa treated with the antibiotic meropenem. P. aeurginosa is a nosocomial opportunistic pathogen which is especially dangerous for those that are immunocompromised due to its versatility. Various data fitting techniques are used to fit the model to experimental data. These shed light on the mode of action of meropenem on P. aeruginosa and suggest a novel model formulation that should be used to capture the mechanistic interactions between the drug and pathogen. We discuss possible extensions to the model to aid with the development of novel antimicrobials.

Lei Wang (University of Glasgow) Thursday 11:00 - 11:30

Propagation of Arterial Dissection

An arterial dissection is an axial tear within the wall, which may create a false lumen through which blood flows. Propagation of the tear can quickly lead to death as a result of decreased blood supply to other organs, damage to the aortic valve, and sometimes rupture of the artery. We aim to compute the critical condition for tear propagation, where the tear propagates and to investigate the effect of residual stress, length and depth of tear, with the ultimate aim of providing a quantitative prediction on the outcome of an existing arterial dissection, so aiding its clinical management.

Hannah Williams (University of Nottingham) Tuesday 15:30 - 16:00

Using mathematics to tackle global food security

As populations expand and the popularity of protein rich diets surges, the demand for meat will rise. This motivates the need to improve feed conversion efficiency in agriculture. One way is to use growth promoters and we focus on how they alter metabolism within pigs.

A statistical analysis on gene expression profiles of the muscle from control fed and treated pigs determines pathways that differ. This is combined with a system of ODEs to describe how metabolites change within a muscle cell. Analysing this allows us to test hypotheses of how the growth promoter works. We find necessary conditions that allow alternative regimes to steady states.

Although this model is simplified, the information gathered from its examination points to areas where components deemed excessive may now be crucial. Ultimately, we aim to determine parameter ranges that remove the cell from a normal growth state, and use this to target pathways for drug interventions to stimulate improved feed conversion.

Mathematical Finance

Ruolong Chen (University of Oxford) Tuesday 11:00 - 11:30

Optimal hedging on betting exchanges

Traditionally, the betting industry in the UK has been dominated by bookmakers offering fixed odds bets, that is, the payoff a bettor receives upon winning a bet is specified by the bookmaker in advance of the outcome. In the last few decades, person-to-person betting (where bettors place bets with each other) has been gaining popularity. This has led to the growth of betting exchanges - online platforms that facilitate matching bets between bettors. Betting on sporting events in progress is known as in-play betting.

In this talk, we study the problem of maximising the bettor's expected utility by optimally hedging a risky position in a bet by trading in-play on the betting exchange. We set up the optimal control problem first in the framework of piecewise deterministic Markov processes, and then look at what happens when we introduce noise into the market price movements. This results in a nonlinear Hamilton-Jacobi-Bellman PDE which is then solved numerically.

Martin Jonsson (Copenhagen University) Tuesday 12:00 - 12:30

Stochastic Volatility for Utility Maximisers

From an empirical perspective, the stochasticity of volatility is manifest, yet there have been relatively few attempts to reconcile this fact with Merton's theory of optimal portfolio selection for wealth maximising agents. In this talk we present an analysis of optimal asset allocation for the Heston model, and the 3/2 model. Under the assumption that the market price of risk is proportional to volatility, we can derive closed form expressions for the optimal portfolio using the formalism of Hamilton-Jacobi-Bellman. We also perform an empirical investigation, which strongly suggests that there in reality are no tangible welfare gains associated with hedging stochastic volatility in a single-stock/bond market.

Simon Ellersgaard Nielsen (University of Copenhagen) Tuesday 12:30 - 13:00

The Fundamental Theorem of Derivative Trading - Exposition, Extensions, and Experiments

When estimated volatilities are not in perfect agreement with reality, delta hedged option portfolios will incur a non-zero profit-and-loss over time. There is, however, a surprisingly simple formula for the resulting hedge error, which has been known since the late 90s. We call this The Fundamental Theorem of Derivative Trading. This paper is a survey with twists of that result. We prove a more general version of it and discuss various extensions (including jumps) and applications (including deriving the Dupire-Gyöngy-Derman-Kani formula). We also consider its practical consequences both in simulation experiments and on empirical data thus demonstrating the benefits of hedging with implied volatility.

Gonçalo Simões (University of Oxford) Tuesday 11:30 - 12:00

Robust Portfolio Optimisation for Medium Frequency Trading Strategies and Heavy-Tailed Returns

Although classical mean-variance portfolio optimisation assumes exponentially decaying tails, most asset classes actually exhibit heavy tailed returns, and hence frequency estimates of large scale losses based on first and second moments are inadequate. By classifying returns as either "normal" or "extreme" via a filter, we combine extreme value theory, principal component analysis and convex relaxation in a novel way to arrive at time-poor man's version of a CVAR constraint. This can be cast in second-order programming form and hence the resulting model has the same complexity as a standard mean-variance model. Alternatively, we use this CVAR-like constraint to design an uncertainty set to be used in a robust optimisation framework. In particular we investigate its use on a relative robust optimisation model which has a tractable inner approximation.

Mathematical Physics

Oliver Allanson (University of St Andrews) Tuesday 12:30 - 13:00

An inverse problem in plasma physics: from fluid equilibria to kinetic equilibria

We present the solution to an inverse problem arising in the context of finding a distribution function for a specific collisionless plasma equilibrium. The inverse problem involves the solution of two integral equations, each having the form of a Weierstrass transform. We prove that inverting the Weierstrass transform using Hermite polynomials leads to convergent infinite series. We also show that the resulting solutions are non-negative and bounded as required for a distribution function.

Johar Muhammad Ashfaque (University of Liverpool) Thursday 11:30 - 12:00

Non-Tachyonic Semi-Realistic Non-Supersymmetric Heterotic String Vacua

The majority of semi-realistic heterotic string models constructed to date possess N = 1 spacetime supersymmetry. In the absence of evidence of supersymmetry at the LHC recent interest in non-supersymmetric heterotic string vacua has emerged. It has therefore become necessary to examine what can be learned in this context from the semi-realistic free fermionic models.

Felix Leditzky (University of Cambridge) Tuesday 11:30 - 12:00

Second order asymptotic expansions in Quantum Information Theory

A coding theorem for an information-theoretic task establishes an entropic quantity as the optimal rate in the asymptotic, memoryless setting, characterizing how well we can perform the task. On the other hand, in a more realistic "one-shot" scenario, we only consider a single copy of the input resource, and allow for a non-zero error in the protocol. However, the evaluation of these one-shot characterizations becomes intractable as the number of copies (n) grows. A possible solution is to approximate so-called one-shot entropies for large n via a second order asymptotic expansion. In this talk, I will sketch how to obtain the second order expansion of the information spectrum entropy. The proof is a simple application of the well-known Berry-Esseen Theorem that quantifies the rate of convergence in the Central Limit Theorem. I will then use this second order expansion of the information spectrum entropy to obtain a second order asymptotic characterization of quantum source coding.

Rodrigo Pires dos Santos (University of Leeds) Tuesday 12:00 - 12:30

A spectral approach to Monopoles in $\mathbb{R}^5$

We can define $\mathbb{R}^5$ as the fourth symmetric power of the defining representation of $SU(2)$ and endow it with a natural twistor theory. We also have an Atiyah-Ward correspondence giving monopoles on $\mathbb{R}^5$ and shall investigate how to use spectral curve methods to construct monopoles and how it gives Nahm's equations in this case. Moreover, we shall use the $SU(2)$ action on $\mathbb{R}^5$ to define the symmetry of monopoles and then find some explicit examples of spectral curves.

Pietro Servini (UCL) Thursday 11:00 - 11:30

Roughing up Wings - A New Technique in Laminar Flow Control

Laminar flow control - the process of influencing the structure of a laminar boundary layer as it moves over a surface - is important in the field of aerodynamics for the purposes of drag reduction and safety: new and more effective techniques are constantly being sought. The work of Huebsch (2006), Huebsch & Rothmayer (2011) and Huebsch et al. (2012) demonstrates the potential of small dynamic roughnesses for delaying or suppressing the separation of a laminar boundary layer from a surface. In this talk, I'll present their numerical and experimental results, as well as the conclusions from our 2D model.

Matthew Wright (UCL) Tuesday 11:00 - 11:30

Stars in Gauss-Bonnet gravity

In this talk I will introduce Gauss-Bonnet gravity, a generalisation of Einstein's general relativity to include the Gauss-Bonnet term. I will explain why adding this extra term becomes becomes non-trivial only in dimensions greater than four. I will then discuss some results on the effects of the size of a star in this modified gravity.

Number Theory

Florian Bouyer (University of Warwick) Monday 15:30 - 16:00

On the Picard Lattice of some K3 surfaces

In the talk we will introduce some families and subfamilies of K3 surfaces, of which we have calculated the Picard lattice. We will show how those Picard lattices and subfamilies fit together.

Cangxiong Chen (University of Cambridge) Wednesday 11:30 - 12:00

Asai's functions analogous to $\log|\eta(z)|$

The function $\log|\eta(z)|$ defined on complex upper half plane has many applications in number theory. In 1970s, Tetsuya Asai obtained a function analogous to $\log|\eta(z)|$ through generalising Kronecker's (first) limit formula for non-holomorphic Eisenstein series. I will explain how we could further generalise Asai's function to arbitrary number fields using representation theory for GL_2.

Sam Chow (University of Bristol) Tuesday 16:30 - 17:00

Equidistribution of values of linear forms on a cubic hypersurface

Recently Sargent used ergodic methods to establish the equidistribution of values of real linear forms on a rational quadric, subject to modest conditions. His ideas stemmed from quantitative refinements of Margulis' proof of the Oppenheim conjecture. Such techniques do not readily apply to higher degree hypersurfaces. We use analytic methods to obtain similar results for a cubic hypersurface. The motivation for these problems is to make precise the concept that points on our hypersurface are evenly distributed. We are led to consider a hybrid system comprising a cubic equation and several linear inequalities. Our approach is to use the Hardy–Littlewood circle method in unison with the Davenport–Heilbronn circle method.

Benjamin Green (University of Oxford) Tuesday 16:00 - 16:30

Algebraic Automorphic Forms and the Langlands Program

In this talk I will define algebraic automorphic forms, first defined by Gross, which are objects that are conjectured to have Galois representations attached to them. I will explain how this fits into the general picture of the Langlands program and, giving some examples, briefly describe one method of proving certain cases of the conjecture.

Riccardo Walter Maffucci (King's College London) Monday 16:30 - 17:00

About nodal sets of eigenfunctions of the Laplacian on the torus

"I will discuss nodal intersections of random eigenfunctions of the Laplacian on the (two dimensional) torus, and in particular the variance of the number of nodal intersections with a straight line.

The problem is of arithmetic flavour, and is closely related to the theory of lattice points on circles."

Maria Nastasescu (California Institute of Technology) Tuesday 11:30 - 12:00

Smooth L^2 *Distances and Zeros of Approximations of Dedekind Zeta Functions*

We consider a family of approximations of the Dedekind zeta function $\zeta_K(s)$ of a number field K. Weighted L^2-norms of the difference of two such approximations of $\zeta_K(s)$ are computed. We work with a weight which is a compactly supported smooth function. Mean square estimates for the difference of approximations of $\zeta_K(s)$ can be obtained from such weighted L^2-norms. Some results on the location of zeros of a family of approximations of Dedekind zeta functions are also derived. These results extend results of Gonek and Montgomery on families of approximations of the Riemann zeta-function.

Christopher Nicholls (The University of Oxford) Tuesday 11:00 - 11:30

Descent methods on jacobians of higher genus curves

I will discuss how to perform a descent via isogeny on the jacobian of a genus two curve, and how this allows us to find elements of the Tate-Shafarevich group of such jacobians.

Vandita Patel (University of Warwick) Tuesday 15:30 - 16:00

The Hunt for Totally Real Number Fields

Number fields and modular forms are fundamental objects that belong to different areas of number theory, and much effort has been invested into developing algorithms for computing them. There is a connection between totally real number fields and modular forms via theta series. This little known connection should give useful insights into totally real number fields. We explore this connection and explain how it should help us compute totally real fields.

Matthew Spencer (University of Warwick) Thursday 11:30 - 12:00

Brauer Relations in positive characteristic

Given some finite group G it is natural to study its action on finite sets, from such a pair we can form a vector space over some field K with an action of G and thus a representation of G over K. Two distinct sets may give rise to the same representation and we call elements of this kernel Brauer relations. Brauer relations over K=Q have been entirely classified. In my talk I will give an introduction to such relations, and hopefully describe some of my work towards such a classification in characteristic p.

Raphael S. Steiner (University of Bristol) Tuesday 12:30 - 13:00

Supnorms of half-integral weight Modular Forms

We give subconvex upper bounds on the supnorm of half-integral weight Hecke-eigenforms in the Kohnen plus space of level 4 in the weight aspect. This is achieved by combining bounds for both the Fourier expansion and for an amplified Bergman Kernel. The methods further generalise to arbitrary real weight.

Kwok Wing Tsoi (University College London) Tuesday 12:00 - 12:30

Congruences of CM forms

In a recent work of M.Kakde, a congruence relation predicted by non-commutative Iwasawa theory was verfied for a family of Λ-adic Hilbert modular Eisenstein series. This talk aims to show that the same congruence holds for Λ-adic CM forms.

Aled Walker (Oxford University) Thursday 11:00 - 11:30

A multiplicative analogue of Schnirelmann's Theorem

In the late 1980s Erdös asked, for large primes q, whether every non-zero residue class modulo q could be expressed as the product of two primes, each less than q. Although this conjecture is still open, even assuming the extended Riemann hypothesis, we will present a bouquet of past and present results, constituting some weak partial progress towards it. These will include a positive density theorem for products of two primes, a result for almost-primes, and results taken by averaging over q. The methods will be analytic and combinatorial, but, within those confines, they will be extremely varied in nature. The simple observation that sieve weights enjoy more pleasant Fourier-analytic properties than the primes themselves will be a recurring theme.

Mairi Walker (The Open University) Monday 16:00 - 16:30

Gaussian Integer Continued Fractions

It is well-known that continued fractions can be viewed as compositions of Möbius transformations, and this leads to a representation of them using hyperbolic geometry. In this talk we will use this representation to study continued fractions with Gaussian integer coefficients, which relate firstly to elements of the Picard

group, the group of Möbius transformations with Gaussian integer coefficients, and secondly to paths in a graph that arises naturally in three-dimensional hyperbolic geometry.

Numerical Analysis

Milena Kresoja (University of Novi Sad) Thursday 11:30 - 12:00

Methods for unconstrained optimization in noisy environment

In this work we propose algorithm for solving stochastic optimization problems. Problem we consider can be written in form of unconstrained minimization problem in noisy environment. We assume that the objective function is continuously differentiable and only noisy observations of the function and gradient are available. One of the well-known methods for solving this problem is stochastic approximation (SA) algorithm. SA iterative rule is motivated with deterministic descent gradient method and uses only noisy measurements. Under certain assumptions, almost sure convergence is ensured. We propose modification of SA algorithm based on adjusting step size in order to accelerate SA algorithm. Guidance for new criterion of step size adaption as well as step size choices are suggested and analyzed. Performance of new algorithm is tested on a set of standard test problems and compared to classical SA algorithm. Numerical results verify efficiency of the algorithms.

Tijana Stojančević (University of Novi Sad) Thursday 11:00 - 11:30

Eigenvalues of the Sample Average Hessian Approximation

The unconstrained optimization problem with the objective function given in the form of mathematical expectation is transformed into SAA problem. Given that a large sample is generally needed for a reasonably good approximation, the SAA is in general expensive. Finding the analytical form of the objective function can be very difficult or even impossible. Since the evaluation of the function under expectation is usually very expensive, the number of these evaluations is a common way of measuring the cost of an algorithm and applying some deterministic method on the SA function can be very costly. On the other hand, it is known that the eigenvalues of the Hessian play a dominant role in the characteristics of the methods of the second order and therefore it is very important to examine the behavior of eigenvalues of the Hessian approximation. We will consider the behavior of Hessian and some quasi-Newton matrices as well as their eigenvalues with SAA approximation.

PDEs

Tobias Barker (University of Oxford) Wednesday 16:00 - 16:30

Ancient solutions to the Navier Stokes equations

The relationship between the so-called ancient (backwards) solutions to the Navier-Stokes equations in the space or in a half space and the global well-posedness of initial boundary value problems for these equations will be explained.

Oliver Dunbar (University of Warwick) Wednesday 15:30 - 16:00

A Diffuse Interface Model of a Multiphase Fluid with Surfactant

I wish to introduce a phase field model of a fluid flow comprising several subfluids, or have multiple phase structure. One starts with a 'natural' sharp interface model deduced from conservation laws. Then introduce a smooth order parameter which will approximately distinguish the phases/subfluids and create carefully a new energy based PDE system. This approach is known for its ability to deal with topological changes and may be easier to study analytically or numerically. Additionally I wish to look at the effect of surfactants (chemicals which adsorb to interfaces and reduce surface tension) on these systems, as they are of interest in many physical applications.

Arran Fernandez (University of Cambridge) Wednesday 11:30 - 12:00

Fractional calculus and the Fokas method

Fractional calculus is the study of differentiation and integration to non-integer orders. The Fokas method is an algorithm for constructing explicit solutions to certain PDEs. I will give a brief introduction to both of these topics and then show how they may be brought together to give a method for finding explicit solutions to fractional PDEs.

Anton Muehlemann (Oxford) Wednesday 11:00 - 11:30

The morphology of lath martensite: a new perspective

Typical energy functionals in the modelling of martensitic phase transformations (Ball and James, 1987 and 1992) are not quasiconvex and thus do in general not attain their minimum. A remedy is to consider minimisers in the enlarged space of gradient Young measures (GYM). The GYM efficiently describes the main features of the microstructure such as the volume fractions and the macroscopic deformation gradient. This theory has been very successful in predicting the main features of interfaces between twinned martensite and austenite in e.g. NiTi. Because of the relatively large strains involved steel seemed to be out of the scope of this theory. However, backed by some successful predictions, we propose that the same mechanics holds in this case and thereby provide an example where an interface between a second order laminate and the austenite seems preferable.

(This is joint work with K. Koumatos).

Ben Pooley (University of Warwick) Tuesday 16:00 - 16:30

Global well-posedness for the diffusive 3D Burgers equations

We will examine the 3D vector-valued analogue of the diffusive Burgers equations. These are very closely related to the Navier-Stokes equations, however we will see how global well-posedness in $H^{1/2}$ is not so difficult to obtain in a periodic domain, using arguments applicable to the Navier-Stokes equations together with a maximum principle.

Fatmir Qirezi (Brunel University London) Tuesday 15:30 - 16:00

Stability and error estimates for linear thermoviscoelasticity

We consider a coupled time-dependent problem which characterises a linear solid viscoelastic body subject to a load and under non-isothermal conditions. Further, we assume that the acceleration is negligible, and

that the displacement is small thus confining ourselves to the theory of linear elasticity. Stability and error estimates are derived for this model and some numerical examples are presented showing that the scheme converges.

Jamie Taylor (Oxford University) Tuesday 16:30-17:00

Maximum entropy methods in Onsager's mean-field free energy

A common method for reducing complexity of probabilistic many body systems is to approximate a full model by one concerning only moments of a distribution. In general the approximating system can have varying degrees of success in capturing the behaviour of the original model. In this talk a class of particularly simple static models, relevant in modelling liquid crystals, will be considered. It will be shown that within these models the maximum entropy moment-closure goes further than simply approximating the original problem, but in fact retains all information about stable, locally stable and unstable equilibria (or global minimisers, local minimisers and critical points) that existed in the original model. In particular, it is shown that the infinite dimensional minimisation problem can be reduced to a finite dimensional min/max problem that can be tackled using elementary calculus techniques.

Probability and Stochastic Processes

Horatio Boedihardjo (Oxford-Man Institute of Quantitative Finance) Wednesday 15:30 - 16:00

Stochastic Taylor Expansion: A pathwise remainder estimate

The Taylor's expansion for stochastic differential equations (Azencott 1982), as in one variable calculus, will in general diverge, however smooth the vector fields are. We give a pathwise factorial decay type estimate for the remainder of the Taylor series.

Javed Hussain (University of York) Tuesday 11:00 - 11:30

Large Deviation Principle for heat equation on Hilbert Manifold

In this talk our aim is to present large deviation property for the solution of stochastic heat equation on Hilbert manifold with Stratonovich noise. For this we are going to employ the weak convergence method for studying large deviation priciple .

Watthanan Jatuviriyapornchai (University of Warwick) Wednesday 11:00 - 11:30

Coarsening dynamics in condensing stochastic particle systems

Under certain conditions on the jump rates, stochastic particle systems can exhibit a condensation transition where a non-zero fraction of all particles accumulates on a single site. This has been studied recently for various models with stationary product measures, including inclusion processes and zero-range processes with jump rates of the form $g(k) = 1 + b/k^\gamma, b > 0, \gamma \in (0, 1]$. We study the coarsening dynamics towards condensation from homogeneous initial conditions. The evolution equation for the empirical process is not closed and we derive a heuristic solution which we extend to the case $\gamma \in (0, 1)$ for zero-range processes. We also connect the coarsening dynamics to a toy model of mixing and relaxation dynamics for birth death chains, which can be estimated rigorously.

Daniel Molina-García (Basque Center for Applied Mathematics) Wednesday 16:30 - 17:00

Modelling anomalous diffusion inside biological cells

Some molecules, such as the mRNA inside living E. Coli cells, often exhibit stochastic trajectories that differ from the classical Gaussian processes. In particular, the mean square displacement of individual particles measured during an interval time T follows a power-law $T^a, a <> 1$. To remark the difference with respect to normal diffusion, where $a = 1$, this behaviour is referred to anomalous diffusion. Two common frameworks which give rise to anomalous diffusion are the fractional Brownian motion (fBm) and the continuous time random walk (CTRW). However, none of them is always satisfactory. The so-called p-variation is usually observed to be similar to that of the fBm, while the processes are often non-ergodic, which indeed is a property of the CTRW. Instead, we found that the process named generalised grey Brownian motion is characterised by both properties. In addition, we set the model in order to reproduce ageing, an important property that appears in several experiments.

Chak Hei Lo (Durham University) Tuesday 12:30 - 13:00

Non-homogeneous random walks with combined drift on a semi-infinite strip

Many stochastic processes arising in applications exhibit a range of possible behaviours depending upon the values of certain key parameters. Investigating phase transitions for such systems leads to interesting and challenging mathematics. Much progress has been made over the years, using various techniques. The most subtle case is when the system is near-critical in some sense (near a phase boundary). Here one technique that can provide a powerful analytical tool is the method of Lyapunov functions. This presentation will give a brief introduction on a particular near-critical Markov model (random walk on a strip), with an aim to extend known criteria for classifying recurrence and transience. This will serve as a prototypical model for developing novel aspects of the semi-martingale method, which can then be deployed in other applications.

Steven Pagett (University of Bath) Tuesday 12:00 - 12:30

Universality in a class of fragmentation-coalescence processes

I will introduce a class of random fragmentation-coalescence processes on a system of particles. These are processes where multiple particles will, at random times, join together (coalesce) into a larger cluster of particles and then, at other random times, a cluster will be split (fragmented) into single particles again. I'll show that under mild conditions on the coalescence rates, the distribution of cluster sizes becomes non-random in the thermodynamic limit. Moreover, in the limit of small fragmentation rate this distribution exhibits self-organised criticality with universal exponent 3/2.

James Thompson (University of Warwick) Tuesday 11:30 - 12:00

Gradient Estimates for Conditioned Brownian Motion

A diffusion process on a Riemannian manifold whose generator is one half of the Laplacian is called a Brownian motion. Suppose that we condition a Brownian motion to arrive in a fixed submanifold at a fixed positive time. Under suitable conditions, this results in a process which can be understood in terms of the logarithmic derivative of the integral of the heat kernel over the submanifold. I will show how a Bismut-Elworthy-Li type formula for the derivative of the heat semigroup and Stroock's method of gradient estimates can be applied to this setting to deduce basic properties of the conditioned process.

Michael Tsardakas (Heriot-Watt University) Wednesday 11:30 - 12:00

Spatiotemporal modelling of criminal activity

We examine a variety of ODE systems that model the evolution of the number of serious and minor criminals, fitting parameters from actual crime data . We also propose a diffusion-based PDE model that describes the spatiotemporal evolution of criminal activity in a city. The model successfully replicates the usual patterns of crime distribution in a city, such as the formation and persistence in time of crime hotspots'.

Sebastian Vollmer (University of Oxford) Wednesday 16:00 - 16:30

Unbiased Monte Carlo for infinite dimensional models

We consider the problem of unbiased estimation of expectations with respect to measures which are only available as limits of distributions. This work builds on an unbiasing technique by Peter Glynn and Chang-han Rhee. We demonstrate how the bias due to burn-in can be removed in the computation of expectations with respect to limiting distributions of Markov chains using appropriate couplings. We can also couple Markov chains with invariant measures of different dimensionality. This method allows us to estimate expectations without bias with respect to a limiting distribution of Markov chains in a function space in infinite dimensions. At heart of this approach lies a replacement of computationally expensive and highly accurate models by a sequence of models with varying accuracy and by coupling them. This is joint work with Sergios Agapiou and Gareth Roberts (http://arxiv.org/abs/1411.7713).

Topology

Yumi Boote (University of Manchester) Tuesday 16:30 - 17:00

On the symmetric square of quaternionic projective space

In this talk, I shall describe some geometry and topology associated to the symmetric square of quaternionic projective space, and compute its integral cohomology ring. The method also works for the complex case, which will be discussed in a forthcoming joint paper.

Tom Harris (University of Southampton) Tuesday 15:30 - 16:00

Dold–Puppe complexes amd algebraic K-theory

I will introduce Dold–Puppe complexes and their use in defining the derived functors of a non-additive functor (the exterior or symmetric powers of R-modules, for example). I will then explain how I have used these methods to define new exterior power operations on the higher K-theory of schemes.

Gareth Wilkes (University of Oxford) Tuesday 16:00 - 16:30

Profinite groups and manifolds

I will introduce profinite groups and their connection with manifolds, illustrated with some examples, known theorems, and conjectures.

List of Posters

The poster presentation takes place on Monday from 19:00 onwards, during the Wine Reception sponsored by the Heilbronn Institute.

Oliver Allanson (University of St Andrews)
Exact low beta nonlinear force-free Vlasov-Maxwell equilibria

Horatio Boedihardjo (Oxford-Man Institute of Quantitative Finance)
Data analysis via Iterated Integrals

Lucie Bowden (University of Oxford)
A simple model of wound healing in normal and diabetic mice

Eduard Campillo-Funollet (University of Sussex)
A Bayesian approach to parameter identification in Turing systems

Italo Cipriano (Warwick)
Entry times

Joseph Cook (Loughborough University)
Spectral Theory of the Bolza Surface

Charles Cox (University of Southampton)
Dehn's problems and Houghton's groups

Rhiannon Dougall (University of Warwick)
Growth of closed geodeics and amenable groups

Mitchell Gooding (University of Oxford)
Modeling Evolutionary Rescue With Competing Superprocesses

Elizabeth Gothard (University of York)
Differential equation models of epidermal wound healing

Elizabeth Holden (The University of Nottingham)
A multiphase multiscale model of nutrient limited tissue growth

Matthew Jacques (Open University)
Continued fractions and semigroups of Möbius transformations

Martin Jonsson (Copenhagen University)
The Fundamental Theorem of Derivative Trading

Amandeep Kaur (University of Cambridge)
On solving an Isospectral flow

Andrew Krause (University of Oxford)
Fluid-Growth Interactions in Bioactive Porous Media

Chak Hei Lo (Durham University)
Non-homogeneous random walks with combined drift on a semi-infinite strip

Daniel Molina-García (Basque Center for Applied Mathematics)
Modelling anomalous diffusion inside biological cells

Christopher Nicholls (The University of Oxford)
Descent methods on jacobians of higher genus curves

Simon Ellersgaard Nielsen (University of Copenhagen)
Stochastic Volatility for Utility Maximisers - A Risk to be Hedged?

Adewale Sunday Olumuyiwa (Ladoke Akintola University of Technology, Ogbomoso, Nigeria)
Mathematical model for measuring pancreas response to glucose

Aleksandra Petrova (Design Bureau NAVIS)

Weighted, smoothing and bicubic weighted splines in the hydrometeorological data interpolation problems

Emilio Pierro (Birkbeck, University of London)
A picture of the small Ree groups

Rodrigo Pires dos Santos (University of Leeds)
A spectral curve approach to monopoles in $\mathbb{R}^5$

Chloe Spalding (Univeristy of Birmingham)
Mathematical Modelling of Antibiotic Action on Pseudomonas aeruginosa

George William Stagg (Newcastle University)
Classical-Like Wakes in Two-Dimensional Bose-Einstein Condensates

John Sylvester (University of Warwick)
Paths, resistance and hitting times in Erdős-Rényi random graphs

Alex Tisbury (University of Birmingham)
The Propagation of fronts in reaction-diffusion equations with a cut-off in the reaction

Alex Torzewski (Warwick)
Multiplicative Galois Module Structure

Michael Tsardakas (Heriot-Watt University)
Mathematical modelling of crime

Kwok Wing Tsoi (University College London)
Congruences of CM forms

Mairi Walker (The Open University)
Gaussian Integer Continued Fractions

Lei Wang (University of Glasgow)
Propagation of Arterial Dissection

Richard Whyman (The University of Leeds)
Could we ever compute the uncomputable?

List of Participants

Name	Email Address	Affiliation
Naseer Sabah Abdullah	nsabdullah1@sheffield.ac.uk	Sheffield University
Ana Agore	ana.agore@gmail.com	Vrije Universiteit Brussel
Ahlam	ahm-423@hotmail.com	swansea university
Harleen Ahluwalia	harleen.ahluwalia@gmail.com	BP
Sukaina Al-bairmani	saal-bairmani1@sheffield.ac.uk	Sheffield University
Ahmed Al-Jaberi	1400314@buckingham.ac.uk	university of Buckingham
Luca Cesare Biagio Alasio	alasio@maths.ox.ac.uk	University of Oxofrd
Oliver Allanson	oa67@st-andrews.ac.uk	University of St Andrews
Demi Allen	dda505@york.ac.uk	University of York
Maryam Argungu	m.argungu14@imperial.ac.uk	Imperial College London
Aras Tawfeeq Asaad	aras.asaad@hotmail.co.uk	The University of Buckingham
Johar Ashfaque	jauhar@liv.ac.uk	University of Liverpool
Francesca Balestrieri	balestrieri@maths.ox.ac.uk	University of Oxford
Luis Alejandro Barbosa	labt1@le.ac.uk	University of Leicester
Tobias Barker	tobias.barker@seh.ox.ac.uk	University of Oxford
Lucy Barnes	lem26@kent.ac.uk	University of Kent
Martine Barons	martine.barons@warwick.ac.uk	University of Warwick
Lawrence Jack Barrott	lb489@cam.ac.uk	Univeristy of Cambridge
Daniel Bennett	db397@st-andrews.ac.uk	University of St Andrews
Matthew Bisatt	m.d.bisatt@warwick.ac.uk	University of Warwick
Andreas Bode	ab921@cam.ac.uk	University of Cambridge
Horatio Boedihardjo	horatio.boedihardjo@oxford-man.ox.ac.uk	Oxford-Man Institute of Quantitative Finance
Yumi Boote	yumi.boote@postgrad.manchester.ac.uk	University of Manchester
Tom Bourne	tjb5@st-andrews.ac.uk	University of St Andrews
Florian Bouyer	f.bouyer@warwick.ac.uk	University of Warwick
Lucie Bowden	luciebowden@gmail.com	University of Oxford
John Box	jb635@york.ac.uk	University of York
Christian Brown	christian_jb@hotmail.co.uk	Nottingham University
Sam Brown	s.brown.12@ucl.ac.uk	University College London
Sam Brzezicki	sb3710@ic.ac.uk	Imperial College
Miles Caddick	miles.caddick@maths.ox.ac.uk	University of Oxford
Eduard Campillo-Funollet	e.campillo-funollet@sussex.ac.uk	University of Sussex
Ruolong Chen	ruolong.chen@maths.ox.ac.uk	University of Oxford
Cangxiong Chen	cc666@cam.ac.uk	University of Cambridge
Sam Chow	sam.chow@bristol.ac.uk	University of Bristol

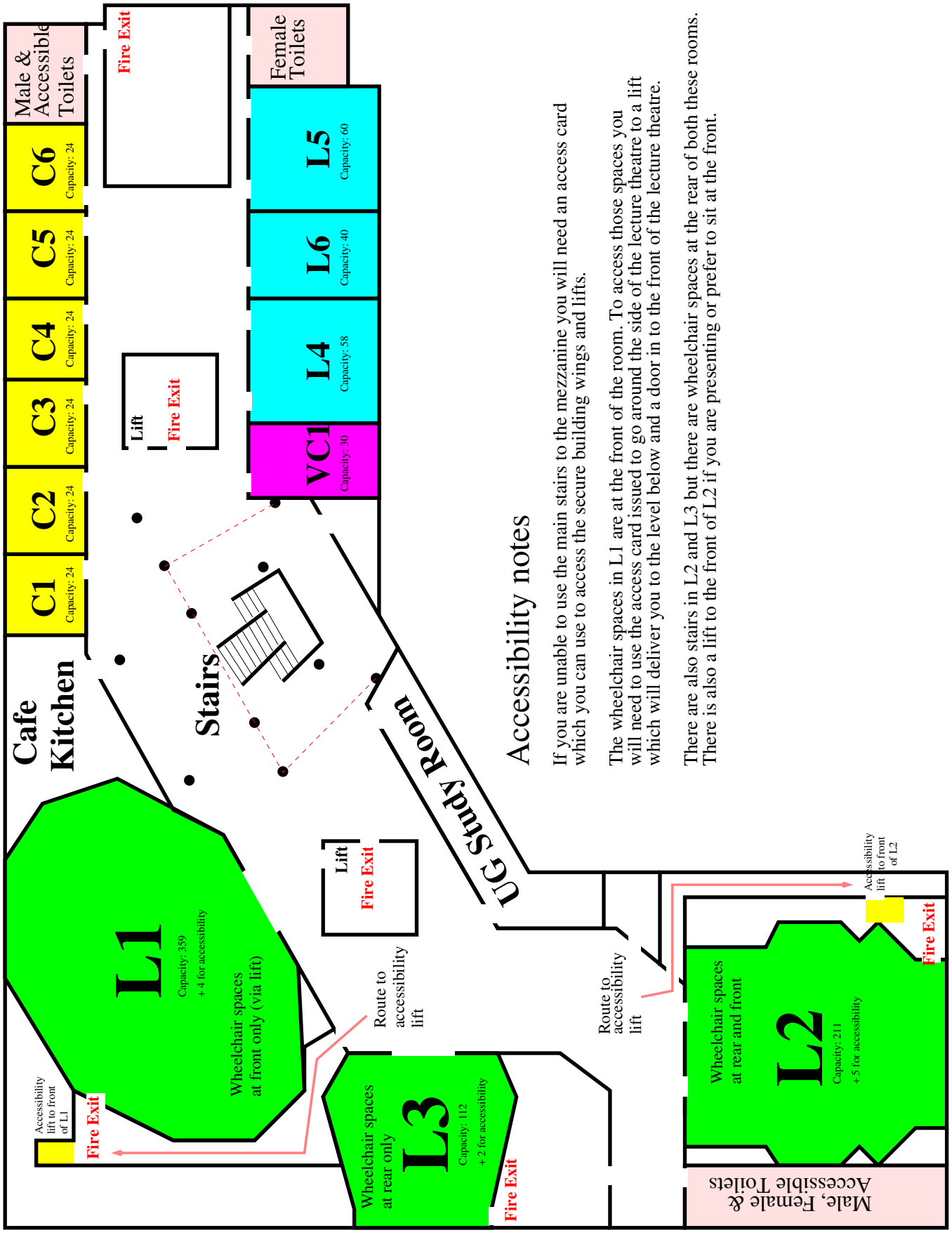
Name	Email Address	Affiliation
Italo Cipriano	icipriano@gmail.com	Warwick
Joe Cook	j.cook@lboro.ac.uk	Loughborough University
Fergus Cooper	cooper@maths.ox.ac.uk	WCMB, Oxford
Michael Cornish	m.cornish14@imperial.ac.uk	Imperial College London
Sam Cox	spc29@le.ac.uk	University of Leicester
Charles Cox	cc14v07@soton.ac.uk	University of Southampton
Gemma Cupples	gxc074@student.bham.ac.uk	University of Birmingham
Auni Aslah Mat Daud	auni_aslah@umt.edu.my	Universiti Malaysia Terengganu
Philip Dittmann	philip.dittmann@maths.ox.ac.uk	University of Oxford
Rhiannon Dougall	r.dougall@warwick.ac.uk	University of Warwick
Drew Duffield	ddd2@le.ac.uk	University of Leicester
Oliver Dunbar	o.dunbar@warwick.ac.uk	University of Warwick
Nicolas Dupré	nd332@cam.ac.uk	University of Cambridge
Jacob Dyer	jpd514@york.ac.uk	University of York
Nastasescu Laura Elena	lauranastasescu@gmail.com	"Simion Stoilow" Institute of Mathematics of the Romanian Academy and University of Bucharest
Alexander Erlich	alexander.erlich@gmail.com	University of Oxford
Arran Fernandez	af454@cam.ac.uk	University of Cambridge
Marco Ferrarini	marco.ferr.88@gmail.com	University of Leeds
Christopher Fish	smp12cdf@sheffield.ac.uk	University of Sheffield
Molly Fitches	lfarrell@brookes.ac.uk	Oxford Brookes University
Jo French	josephine.french@keble.ox.ac.uk	University of Oxford
Alexander Giles	alexander.giles@bristol.ac.uk	The University of Bristol
Zlata Gogol	yanovskaya-z@mail.ru	Pushkin Leningrad State University
Mitchell Gooding	mitchell.gooding@spc.ox.ac.uk	University of Oxford
Elizabeth Gothard	ejg531@york.ac.uk	University of York
Benjamin Green	benjamin.green@maths.ox.ac.uk	University of Oxford
Elisabeth Greiger	elisabeth.grieger@kcl.ac.uk	King's College London
Josephine Gunns	jmg540@york.ac.uk	York University
Karim El Haloui	k.el-haloui@warwick.ac.uk	Warwick university
Tom Harris	tkmharris@gmail.com	University of Southampton
Tobias Hartung	tobias.hartung@kcl.ac.uk	King's College London
Elizabeth Holden	pmxeh5@nottingham.ac.uk	The University of Nottingham
Katherine Horan	kh385@kent.ac.uk	University of Kent
Javed Hussain	jh1037@york.ac.uk	University of York
Dr Adakole Ikpe	carterikpe@gmail.com	National Open University of Nigeria, Victoria Island, Lagos, Nigeria
Matthew Jacques	jacques.matthew@gmail.com	Open University
Watthanan Jatuviriyapornchai	w.jatuviriyapornchai@warwick.ac.uk	University of Warwick
Ali Jizany	1305535@buckingham.ac.uk	University of Buckingham

Name	Email Address	Affiliation
Syafiq Johar	johar@maths.ox.ac.uk	University of Oxford
Philip Johnson	philip.p.johnson@kcl.ac.uk	King's College London
Martin Jönsson	maj@math.ku.dk	Copenhagen University
Sam Kamperis	skamperis@brookes.ac.uk	Oxford Brookes University
shadman kareem	shadmath79@gmail.com	univeristy of sheffield
Amandeep Kaur	ak741@cam.ac.uk	University of Cambridge
Karina Kirkina	k.kirkina@warwick.ac.uk	University of Warwick
Stephen Kissler	sk792@cam.ac.uk	University of Cambridge
Anja Komatar	mmak@leeds.ac.uk	University of Leeds
Andrew Krause	krause@maths.ox.ac.uk	University of Oxford
Milena Kresoja	milena.kresoja@dmi.uns.ac.rs	University of Novi Sad
Robert Kropholler	kropholler@maths.ox.ac.uk	University of Oxford
Emily Kruger	emily.kruger@some.ox.ac.uk	Oxford University
James Kwiecinski	james.kwiecinski@maths.ox.ac.uk	University of Oxford
Rodolgo Gameros Leal	r.m.gameros-leal@warwick.ac.uk	University of Warwick
Felix Leditzky	f.leditzky@statslab.cam.ac.uk	University of Cambridge
Chak Hei Lo	c.h.lo@durham.ac.uk	Durham University
Riccardo Walter Maffucci	riccardo.maffucci@kcl.ac.uk	King's College London
David Matthews	dm1x07@soton.ac.uk	University of Southampton
Eleanor McDonald	eleanor.mcdonald@new.ox.ac.uk	Oxford University
Brett Mclean	brettmclean1@googlemail.com	University College London
Andrew Mellor	mmasm@leeds.ac.uk	University of Leeds
Daniel Molina-García	dmolina@bcamath.org	Basque Center for Applied Mathematics
George Morrison	gam34@sussex.ac.uk	University of Sussex
Anton Muehlemann	muehlemann@maths.ox.ac.uk	Oxford
Simon Myerson	rydinmyerson@maths.ox.ac.uk	Oxford University
Maria Nastasescu	mnastase@caltech.edu	California Institute of Technology
Ha Thu Nguyen	htn21@cam.ac.uk	University of Cambridge
Christopher Nicholls	christopher.nicholls@balliol.ox.ac.uk	The University of Oxford
Simon Ellersgaard Nielsen	ellersgaard@math.ku.dk	University of Copenhagen
Heiki Niglas	heiki.niglas@gmail.com	University of Cambridge
Feyisayo Olukoya	shayuze@hotmail.com	University of St Andrews
Adewale Sunday Olumuyiwa	soadewale@lautech.edu.ng	Ladoke Akintola University of Technology, Ogbomoso, Nigeria
Wojciech Ozanski	wojciech.ozanski@gmail.com	University of Warwick
Steven Pagett	s.pagett@bath.ac.uk	University of Bath
Vandita Patel	vandita_patel@hotmail.co.uk	University of Warwick
Aleksandra Petrova	alepet.petr1638@yandex.ru	NAVIS Design Bureau of Navigation Systems
Emilio Pierro	e.pierro@mail.bbk.ac.uk	Birkbeck, University of London

Name	Email Address	Affiliation
Ben Pooley	b.c.pooley@warwick.ac.uk	University of Warwick
Fatmir Qirezi	fqirezi@hotmail.com	Brunel University London
Matthew Rigby	matthew.rigby@maths.ox.ac.uk	Oxford
Daniel Rogers	d.rogers@warwick.ac.uk	Warwick
Ana Rovi	arovi27@gmail.com	University of Glasgow
Niccolo Salvatori	niccolo'.salvatori@kcl.ac.uk	King's College London
Rodrigo Pires dos Santos	rdgpires@gmail.com	University of Leeds
Matthew Schrecker	matthew.schrecker@gmail.com	University of Oxford
Jannick Bruun Garde Schreiner	jasch@math.ku.dk	University of Copenhagen
Pietro Servini	pietro.servini.14@ucl.ac.uk	UCL
Belgin Seymenoglu	belgin.seymenoglu.10@ucl.ac.uk	University College London
Lubna Shaheen	lubna.shaheen@maths.ox.ac.uk	University of Oxford
Neil Sherborne	njs30@sussex.ac.uk	University of Sussex
George Simpson	gws21@sussex.ac.uk	Sussex university
Gonçalo Simões	simoes@maths.ox.ac.uk	University of Oxford
Chloe Spalding	cxs094@bham.ac.uk	Univeristy of Birmingham
Matthew Spencer	m.j.spencer@warwick.ac.uk	University of Warwick
George William Stagg	george.stagg@ncl.ac.uk	Newcastle University
Raphael Sebastian Steiner	raphael.steiner@bristol.ac.uk	University of Bristol
Tijana Stojan?evi?	tijana.stojancevic@uns.ac.rs	University of Novi Sad
John Sylvester	j.a.sylvester@warwick.ac.uk	University of Warwick
Jamie Taylor	jamie.taylor@maths.ox.ac.uk	University of Oxford
James Thompson	j.thompson.2@warwick.ac.uk	University of Warwick
Alex Tisbury	axt034@bham.ac.uk	University of Birmingham
Alex Torzewski	alex.torzewski@gmail.com	Warwick
Gareth Tracey	garethtracey1@gmail.com	University of Warwick
Michael Tsardakas	mtsarduckas@gmail.com	Heriot-Watt University
Tabea Tscherpel	tscherpel@maths.ox.ac.uk	Mathematical Institute, University of Oxford
Kwok Wing Tsoi	ucahkwt@ucl.ac.uk	University College London
Muhammad Usman	muhammadusman729@gmail.com	Stockholm University
Katie Vokes	k.m.vokes@warwick.ac.uk	University of Warwick
Michaela Vollmer	sjvollmer@gmail.com	University of Oxford
Sebastian Vollmer	michaela.vollmer@maths.ox.ac.uk	University of Oxford
Aled Walker	aledwalker@gmail.com	Oxford University
Mairi Walker	mairi.walker@open.ac.uk	The Open University
Lei Wang	l.wang.3@research.gla.ac.uk	University of Glasgow
Richard Whyman	mmrajw@leeds.ac.uk	The University of Leeds
Thomas Wilder	tom16wilder@googlemail.com	

Name	Email Address	Affiliation
Gareth Wilkes	wilkes@maths.ox.ac.uk	University of Oxford
Hannah Williams	stxhewi@nottingham.ac.uk	University of Nottingham
Wilf Wilson	waw7@st-andrews.ac.uk	University of St Andrews
Matthew Wright	matthew.wright.13@ucl.ac.uk	UCL
Hector Zenil	hzenilc@gmail.com	University of Oxford

Mezzanine Map



Accessibility notes

If you are unable to use the main stairs to the mezzanine you will need an access card which you can use to access the secure building wings and lifts.

The wheelchair spaces in L1 are at the front of the room. To access those spaces you will need to use the access card issued to go around the side of the lecture theatre to a lift which will deliver you to the level below and a door in to the front of the lecture theatre.

There are also stairs in L2 and L3 but there are wheelchair spaces at the rear of both these rooms. There is also a lift to the front of L2 if you are presenting or prefer to sit at the front.

Andrew Wiles Building

Somerville College

Lincoln College Porter's Lodge

Shops

Bus Stops

Towards Train Station