2026 INTERNATIONAL PDE WORKSHOP
15TH OXBRIDGE PDE CONFERENCE

16-20 MARCH 2026
PEMBROKE COLLEGE, OXFORD

UNIVERSITY OF OXFORD
Mathematical Institute

Oxford
Centre for
Nonlinear
PDE

NATIONAL PDE JOINT WORKSHOP
16-19 MARCH

Monday, 16 March 2026

9:00-9:55	Arrival Refreshments at Pichette Auditorium, Pembroke College
10:00-10:15	Opening Remarks
10:20-11:05	Manuel Del Pino (University of Bath)
11:10-11:55	Min Tang (Shanghai Jiaotong University)
12:00-12:45	Young-Pil Choi (Yonsei University)
12:55-13:55	Lunch at Pichette Auditorium
14:00-14:45	Matthew Schrecker (University of Bath)
14:50-15:35	Amélie Loher (University of Oxford)
15:40-16:10	Break at Pichette Auditorium
16:15-17:00	Dehua Wang (University of Pittsburgh)
17:00	End of the First-Day Programme

Tuesday, 17 March 2026

08:30 - 08:55	Arrival Refreshments at Pichette Auditorium
9:00-9:45	Mikhail Feldman (University of Wisconsin-Madison)
9:50-10:35	Amir Sagiv (New Jersey Institute of Technology)
10:40-11:10	Break at Pichette Auditorium
11:15-12:00	Markus Schmidtchen (University of Dresden)
12:00-13:00	Lunch at Pichette Auditorium
13:05-13:50	Myoungjean Bae (KAIST, South Korea)
13:55-14:40	Difan Yuan (Beijing Normal University)
14:45-15:15	Break at Pichette Auditorium
15:20-16:05	Marco Di Francesco (University of L'Aquila)
16:10-16:55	Immanuel Ben-Porath (University of Basel)
17:00	End of the Second-Day Programme

Wednesday, 18 March 2026

8:30-8:55	Arrival Refreshments at Pichette Auditorium
9:00-9:45	Franz Gmeineder (University of Konstanz)
9:50-10:25	Dowan Koo (University of Oxford)
10:30-11:00	Break at Pichette Auditorium
11:05-11:50	Jakub Skrzeczkowski (University of Oxford)
11:55-12:55	Lunch at Pichette Auditorium
13:00-13:45	Wei Xiang (City University of Hong Kong)
13:50-14:35	Hyangdong Park (KAIST, South Korea)
14:40-15:10	Break at Pichette Auditorium
15:15-16:00	Michael Weinstein (University of Columbia)
16:05-16:50	Simon Schulz (University of Versailles Saint-Quentin)
17:00	End of the Third-Day Programme

NATIONAL PDE JOINT WORKSHOP 16-19 MARCH

Thursday, 19 March 2026

8:30-8:55	Arrival Refreshments at Pichette Auditorium
9:00-9:15	Opening Remarks
9:20-10:05	Moncia Musso (University of Bath)
10:10-10:45	Sameh Hameedi (University of Oxford)
10:50-11:15	Break at Pichette Auditorium
11:20-12:05	Alexis Vasseur (University of Texas at Austin)
12:10-12:55	Maria Bruna (University of Oxford)
13:00-14:00	Lunch at Pembroke Hall
14:05-14:50	Pieter Blue (University of Edinburgh)
14:55-15:30	Gerarad Orrilos (University of Cambridge)
15:35-16:05	Break at Pichette Auditorium
16:10-16:55	Clément Mouhot (University of Cambridge)
17:00	End of the Joint Programme

INTERNATIONAL PDE WORKSHOP

Friday, 20 March 2026

8:30-8:55	Arrival Refreshments at Pichette Auditorium
9:00-9:45	Mihaslis Dafermos (University of Cambridge)
9:50-10:25	Matt Smith (University of Cambridge)
10:30-11:05	Shuchen Guo (University of Oxford)
11:10-11:55	Break and light lunch at Pichette Auditorium
12:00-12:45	Ewelina Zatorska (University of Warwick)
12:50-13:25	Mónica Tapia del Moral (University of Cambridge)
13:30-14:15	Jeffrey Eric Galkowski (UCL)
14:15-14:30	Remarks
14:30	End of the Conferences

Professor Manuel del Pino

Overhanging Water Waves in Incompressible, Constant Vorticity Fluids

The analysis of water waves in incompressible fluids is among the most classical and fundamental problems in the theory of partial differential equations. In this talk, we consider the classical water wave problem for an incompressible, inviscid fluid occupying a time-dependent domain in the plane, whose boundary consists of a fixed horizontal bed and an unknown free surface separating the fluid from the surrounding air.

We present the first construction of overhanging gravity water waves that resemble a disk connected to a strip by a thin neck. These are solitary waves with constant vorticity, and they exist when a suitable dimensionless gravitational parameter is sufficiently small. Our construction combines three explicit solutions to related problems: a rigidly rotating fluid disk, a linear shear flow in a strip, and a rescaled version of the exceptional domain known as the "hairpin," discovered by Hauswirth, Hélein, and Pacard. The method we employ is inspired by gluing techniques used in the construction of constant mean curvature surfaces.

This is joint work with Juan Dávila, Monica Musso, and Miles Wheeler.

Professor Min Tang

Pathway Based Diffusion Model---Modeling and Stability

The pathway-based diffusion model (PBDM) is a degenerate parabolic system that describes bacterial density dynamics, where cell motility is modulated by the external environment via intracellular reactions. This system can be derived from a kinetic model for many-particle system,enables quantitative explanations of biological experiments and reproduces rich, biologically relevant spatial patterns. A notable feature of its stability analysis is that the steady-state solution exhibits a delta distribution in the trait variable. We perform a formal stability analysis for the full system and investigate the long-time behavior of a discrete variant of the PBDM.

This discrete version comprises N reaction–diffusion equations corresponding to N distinct species, each characterized by a unique diffusion coefficient and thus distinct motility. Species are allowed to transition gradually from one type to another in response to environmental cues.

Professor Young-Pil Choi

Quantified Diffusion Limit for the Vlasov-Fokker-Planck Equation

In this talk, we develop a quantitative relative entropy framework for the diffusion limit of kinetic equations with Riesz-type interactions and Fokker-Planck relaxation. The focus is on the derivation of a drift-diffusion equation from the Vlasov-Fokker-Planck equation. By combining entropy dissipation, Fisher information bounds, and modulated interaction energies, the method yields stability estimates that provide the quantitative convergence rates in this regime.

Professor Marco Di Francesco

Deterministic Particles and Smoothing Effects

Deterministic particle approximations are one of the possible ways to construct solutions to scalar conservation laws, to nonlinear diffusion equations, and to some Wasserstein gradient flows. Despite their finite-dimensional nature, they can catch certain "smoothig-effect" properties of the relevant PDE. We will review some recent results on this aspect, focusing on discrete counterparts of two celebrated properties: the Oleinik one-sided Lipschitz property for scalar conservation laws and the Aronson-Bénilan estimate for the porous medium equation. We will also consider the case of the one-dimensional nonlocal interaction equation with repulsive Morse potential.

The results involve M. Schmidtchen (TU Dresden), V. Iorio (L'Aquila), M. D. Rosini (Chieti-Pescara), and D. Matthes (TU Munich) as co-authors.

Dr. Amélie Loher

Decay Estimates for Weak Solutions of the Boltzmann Equation on Bounded Domains

We discuss how weak solutions of the Boltzmann equation with moderately soft potentials generate some amount of pointwise polynomial decay in velocity, and we explain why soft potentials cannot generate an arbitrary polynomial decay. These results are conditional to the solution having finite mass, energy, entropy, and no vacuum.

This is joint work with Cyril Imbert.

Professor Dehua Wang

Global Weak and Smooth Solutions to the Gauss-Codazzi Equations and Isometric Immersions

The isometric embedding of surfaces in geometry can be formulated as an initial/boundary value problem for the Gauss-Codazzi equations. We shall discuss related results on global solutions and present a recent result on global smooth solutions for surfaces with finite total curvature.

Professor Mikhail Feldman

Vorticity in Shock Reflection Problems and Transport Equations

In this talk we discuss self-similar solutions of two-dimensional Riemann problems with transonic shocks, focusing on regular shock reflection. After briefly reviewing known results for global self-similar solutions in the potential flow framework, we address the extension to the isentropic Euler system, where vorticity plays a central role. We show that regular reflection solutions exhibit low regularity and establish existence, uniqueness, and stability of renormalized solutions to the associated vorticity transport equation in this low-regularity setting. The analysis builds on recent results for transport equations without a time variable in general domains in any dimension, allowing vector fields with possible stagnation points.

Professor Amir Sagiv

Floquet Hamiltonians - Spectrum and Dynamics

Time-periodic parametric forcing of space-periodic Schrödinger operators ("Floquet driving") is a basic PDE model for how oscillatory modulation can alter wave propagation in crystalline media. While the physics literature largely relies on discrete effective Hamiltonians, the continuum PDE-level theory is still limited.

A paradigmatic example is graphene: driven lattice models predict a transition to a "Floquet insulator," typically interpreted as spectral gap opening. In the corresponding PDE model, however, no proper spectral gap is expected to form. We reconcile this seeming contradiction by proving the existence of an effective gap, a dynamical notion at the level of the Floquet propagator that captures suppression of transport without a true spectral gap. We conclude with a brief survey of recent results on dispersion and quantitative spectral near-invariance in bulk Floquet media.

Professor Markus Schmidtchen

On the Mesa Problem for a Viscoelastic System

We establish the stiff limit for a viscoelastic two-species model with applications to tissue growth in arbitrary space dimensions. The presence of the two species generates a joint population pressure, to which both respond via Brinkman's law. We introduce a novel approach for the singular limit that relies neither on the L^∞-control of the pressure nor on the kinetic reformulation used in previous results, thereby circumventing the need for the associated heavy machinery. Rather, we develop a new L^2-based theory and leverage the compactness method of Belgacem, Bresch, and Jabin for local compactness. Furthermore, a careful analysis of the dissipation of the nonlocal compactness quantity shows that the pressure is strongly compact. Together, these techniques allow us to establish the incompressible limit under weaker assumptions, while still relying on simpler arguments.

Professor Myoungjean Bae

From Subsonic to Supersonic: Recent Progress on Multidimensional Euler–Poisson Flows and the de Laval Nozzle Problem

Over the past decade, significant progress has been made on the existence and local stability of multidimensional subsonic, supersonic, and smooth transonic solutions to the compressible Euler–Poisson system.

In the first part of this talk, I will survey these developments and explain how they provide a systematic framework for addressing classical open problems in mathematical fluid dynamics. In particular, I will discuss how these results shed new light on the de Laval nozzle problem, a long-standing challenge in the theory of compressible flows.

In the second part, I will present recent results on the global uniqueness of subsonic solutions to the Euler–Poisson system. These results establish global uniqueness under natural boundary conditions and clarify the rigidity and structural stability of steady subsonic regimes in multidimensional domains.

This talk is based in part on joint work with Ben Duan, Chunjing Xie, Hyangdong Park, and Jingjing Xiao.

Professor Difan Yuan

Stability of 3D Isentropic Elastic Vortex Sheets

In this talk, I will present the nonlinear stability of 3D isentropic elastic vortex sheets. By analyzing the Lopatinskii determinant, we identify a geometric stability condition. An upper triangularization technique isolates outgoing modes, enabling energy estimates despite derivative loss. Key challenges addressed include recovering ellipticity in the front symbol via the non-parallel deformation gradient, and resolving strong degeneracy from double root-pole collisions through a refined diagonalization. Using Nash-Moser iteration, we establish local existence and nonlinear stability in the subsonic regime under small perturbations.

Dr Matthew Schrecker

Stability of Gravitational Collapse

In the Newtonian setting, a star is modelled as a spherically symmetric gas obeying the compressible Euler-Poisson system. In certain regimes, smooth initial data may give rise to blow-up solutions, corresponding to the collapse of a star under its own gravity, and such solutions have been rigorously constructed In recent years. In this talk, I will present the nonlinear stability of the simplest of these blow-up profiles, the Larson-Penston solution to the Euler-Poisson equations. This is based on joint works with Yan Guo, Mahir Hadzic, and Juhi Jang.

Professor Immanuel Ben-Porath

Propagation of Moments and Regularity for the Magnetized Vlasov-Poisson Equation

The Vlasov-Poisson equation is a fundamental model in kinetic theory. The problem of propagation of velocity moments is a formidable problem and is intimately related to propagation of regularity, thereby leading to the existence of classical solutions. When an external magnetic field is included in the Vlasov-Poisson system this further complicates the analysis, especially in the 3D case which necessitates the study of Eulerian moments. I will review the classical methods going back to the seminal work of Lions-Perthame and then discuss the problem in the magnetized settings.

Based on joint work with Antoine Gagnebin, Mikaela Iacobelli, and Jonathan Junne.

Professor Franz Gmeineder

L1-based estimates and spaces: Old and New

It is a classical fact that Calderón–Zygmund theory does not extend to the borderline case p=1. Yet several weaker estimates often survive, with crucial consequences for the associated natural energy spaces arising in a variety of nonlinear PDEs. In this talk, we give an overview of recent results in this direction, with a particular focus on trace and restriction operators. On the one hand, this opens the door to a unifying framework for many energy spaces; on the other hand, it also provides new insights, such as Stokes' theorem for weakly differentiable functions.

Dr Dowan Koo

Exponential and Algebraic Decay in Euler—Alignment System with Nonlocal Interaction Forces

In this talk, I will discuss the long-time behaviour of the pressureless Euler—Alignment model with non-local interaction forces, focusing on the emergence of flocking and explicit convergence rates.

First, I will show how the confining effect of the interaction potential can replace the classical fat-tail assumption on the communication weight in order to obtain unconditional flocking. This provides an alternative mechanism ensuring alignment, independent of the global decay properties of the communication weight. I will then examine convergence towards the long-time asymptotic profile. Remarkably, the rate of convergence depends solely on the local behaviour of the communication weight: bounded kernels lead to exponential decay, whereas weakly singular kernels yield algebraic rates. This establishes a sharp transition in decay behaviour driven entirely by the local singularity of the communication weight — a regime that has remained largely unexplored.

This talk is based on joint work with José Carrillo (University of Oxford), Young-Pil Choi (Yonsei University), and Oliver Tse (Eindhoven University of Technology).

Dr Jakub Skrzeczkowski

Global Solutions to Cross-Diffusion Systems with Independent Advections in One Dimension

We consider cross-diffusion systems describing evolution of two species u and v moving under the Darcy's law with the pressure law $p(s) = \frac{1}{\alpha-1} s^{\alpha-1}$ where $s=u+v$. One of the most challenging questions in the field is the construction of solutions for general class of advection fields, without imposing any artificial structure (for instance, preventing the species from mixing). Here, we solve the problem in one space dimension for all pressure laws $\alpha \in (0,\infty)$ and all initial conditions (segregated, mixed or partially mixed). For $\alpha \in (0,1]$ we complement existing results for particular initial conditions obtained recently by Mészáros, Parker and Elbar, Santambrogio while for $\alpha \in (1,\infty)$ we provide for the very first time new and complete result.

Professor Wei Xiang

Regular Shock Reflection-Diffraction Problem

We will talk about our recent results on the convexity, uniqueness, and stability of regular reflection solutions for the potential flow equation in a natural class of self-similar solutions. The approach is based on a nonlinear version of the method of continuity.

Dr Hyangdong Park

Contact discontinuities for the steady Euler system in 3-D cylinders

We prove the existence of contact discontinuities for subsonic Euler flows with nonzero vorticities in three-dimensional infinitely long cylinders. The problem is formulated as a two-phase free boundary problem, and a solution is obtained using the Helmholtz decomposition method and the Schauder fixed point theorem.

Professor Michael Weinstein

Edge States in Periodic and Aperiodic Structures

Edge states are solutions of energy conserving, dispersive wave equations which are bounded and oscillatory (plane-wave like) in the direction of a line defect, and localized transverse to it. We discuss edge states in systems with honeycomb symmetry, which arise in two dimensional quantum materials such as graphene and their metamaterial analogues. We first consider the case of a "rational edge", a line defect (domain wall or sharp termination) oriented in a direction which is commensurate with the underlying period lattice. We then discuss very recent work with P. Amenoagbadji on edge states which localize transverse to an "irrational edge".

Professor Simon Schulz

Regularity for Active Particles with Angle-Averaged Diffusions

We study the regularity and uniqueness of weak solutions of a degenerate parabolic equation, arising as the limit of a stochastic lattice model of self-propelled particles, and which may be interpreted as a perturbation of a gradient flow. The angle-average of the solution appears as a coefficient in the diffusive and drift terms, making the equation nonlocal. We prove that, under unrestrictive non-degeneracy assumptions on the initial data, weak solutions are smooth for positive times. Our method rests on deriving a drift-diffusion equation for a particular function of the angle-averaged density and applying De Giorgi's method to show that the original equation is uniformly parabolic for positive times. We employ a Galerkin approximation to justify rigorously the passage from divergence to non-divergence form of the equation, which yields improved estimates by exploiting a cancellation. By imposing stronger constraints on the initial data, we prove the uniqueness of the weak solution, which relies on Duhamel's principle and gradient estimates for the periodic heat kernel to derive L^∞ estimates for the angle-averaged density.

This is joint work with Luca Alasio (LJLL, Sorbonne Université).

Professor Monica Musso

Compact Equilibria in the Liquid Drop Model

This work studies the liquid drop model, introduced by George Gamow (1930) and Niels Bohr–John Archibald Wheeler (1939), which describes atomic nuclei through an energy balancing surface tension and nonlocal repulsion under a volume constraint. While spheres minimize the energy for small volumes, finding non-minimizing critical points at larger volumes is harder. We construct new large-volume solutions resembling "pearl collars" arranged in a circle, close to Delaunay's unduloids, and also small-mass solutions shaped like two nearly equal spheres joined by a thin neck. Joint work with Manuel del Pino, Andrés Zúñiga, and Rupert Frank.

Mr. Sameh Hameedi

Homogenization of Periodic Schrodinger Operators at Dirac Points

Periodic Schrodinger operators play a central role in the study of materials with linear dispersion, including graphene, photonic crystals, and Floquet-engineered media. In this talk, we study the homogenization of a semiclassical Schrödinger equation with a rapidly oscillating periodic potential and a time-dependent magnetic forcing near a Dirac point. Using two-scale convergence and Bloch-wave decompositions, we show that solutions admit a two-scale approximation given by a superposition of Bloch modes with slowly varying envelopes. The envelope function evolves according to an effective Dirac equation, and the associated two-scale ansatz converges strongly in $L2(Rn)$ to the exact solution as the semiclassical parameter tends to zero. Time permitting, we will also discuss a quantitative homogenization result. For sufficiently regular initial data with prescribed Fourier decay, we derive an explicit L2-error estimate between the exact Schrödinger evolution and its two-scale Dirac approximation, uniform on finite time intervals.

Professor Alexis Vasseur

BV Solutions to the Compressible Euler Equations with Physical Boundaries

We study the isentropic compressible Euler equations with physical boundary conditions. For the subsonic regime--the most analytically challenging case--we establish existence, uniqueness, and weak-BV stability of small BV solutions. In the outflow case, we further prove that these solutions and their associated boundary conditions arise rigorously as the inviscid limit of Navier-Stokes equations, providing physical justification for the mathematical framework.

This is joint work with Moon-Jin Kang, Jiayun Meng, and HyunSeop Oh.

Professor Maria Bruna

Hydrodynamic Limit of an Active-Passive Lattice Gas

In this talk, I will discuss a model mixture of active (self-propelled) and passive (diffusive) particles with non-reciprocal effective interactions (or forces that violate Newton's third law). We derive the hydrodynamic PDE limit for the particle densities, which is not a Wasserstein gradient flow of any free energy, consistent with the microscopic model having non-equilibrium steady states. We study the emergence of collective behaviour, which includes phase separation and dynamical (travelling) solutions.

Joint work with Clément Erignoux, Rob Jack and James Mason.

Dr. Pieter Blue

A Simple Model of Supersonic Shocks in Quasilinear Waves

Singularity formation is a central phenomenon in the study of nonlinear, dynamical PDE. In the study of fluids, supersonic shocks are expected, and the Euler equation, for example, can be recast to include quasilinear wave. This talk will present a very simple model of an initial value problem for a quasilinear wave which exhibits several of the expected behaviours of shock formation for the Euler equation, namely: A singularity forms on a codimensions 2 set. A Cauchy hypersurface emanates from the singularity in one characteristic direction. In the other characteristic direction, there is a surface up to which there is a unique smooth solution. However, in this region, there is also a weak solution, satisfying an entropy condition, that has a supersonic shock, with a singularity that interrupts the smooth solution.

This is joint work with L. Abbrescia, J. Sbierski, and J. Speck and based on arXiv:2511.07594.

Dr. Gerard Orriols

Compactness of Fueter Sections of Large Mass Monopole Bundles

Motivated by the concentration phenomenon of large mass higher dimensional monopoles along calibrated submanifolds, Donaldson and Segal suggested that in order to define enumerative invariants in higher dimensional gauge theory on manifolds with special holonomy, one should take into account the fine behaviour of the monopoles around the concentrating submanifold. In the adiabatic limit, these correspond to Fueter sections of the hyperkähler bundles of 3D monopoles with large mass. In joint work with Yang Li, we show that when appropriately normalised, these sections converge strongly in $W^{1,2}$ to Q-valued harmonic 1-forms, generalizing the recent work of Esfahani–Li to arbitrary charge.

Professor Clément Mouhot

Critical Trajectories in Kinetic Geometry

We construct critical trajectories in kinetic geometry, i.e. curves in (t,x,v) that are tangential to the transport and v-gradient, connecting any two given points, respecting the underlying kinetic scaling, and matching scaling properties of the stochastic trajectories near the starting point. The construction is based on solving the laws of motions with a forcing made up of desynchronised logarithmic oscillations. These critical trajectories provide an "almost exponential map" that allows to prove several functional analytic estimates. In particular they allow to extend to the kinetic setting the universal estimate for the logarithm of positive supersolutions by Moser 1971, and deduce optimal (weak) Harnack inequalities.

This is a joint work with Helge Dietert, Lukas Niebel and Rico Zacher.

Professor Mihaslis Dafermos

On the Stability Problem of Black Holes in General Relativity

I will review the current status of the problem of the stability of black hole exterior spacetimes in general relativity, in both its linear and nonlinear aspects, staring from the Schwarzschild case and ending with the case of extremal Reissner–Nordstrom and extremal Kerr, which have attracted considerable interest in recent years.

Mr Matt Smith

Shell Crossing and the Dynamical Formation of Thin Shells in Dust Collapse

In 1939, Oppenheimer and Snyder studied the collapse of a homogenous ball of dust in general relativity, finding the first example of a black hole forming dynamically. Subsequent study of dust collapse in spherical symmetry has however been restricted by the issue of 'shell crossing' singularities. In this talk, I will discuss the problem of shell crossing, and present upcoming work on the existence of a spacetime extending beyond a shell crossing singularity, forming a thin shell of dust. This spacetime can be understood as a weak solution of the Einstein-dust system and is unique provided a 'determinism condition' is satisfied.

Mr Shuchen Guo

Mean-Field Derivation of the Space-Homogeneous Landau Equation via BBGKY Hierarchy Method

We consider the Kac particle system for the space-homogeneous Landau equation. For the Coulomb potential, we show that the Fisher information of the Liouville equation is monotonically decreasing in time. The monotonicity ensures the compactness to derive a weak solution of the Landau hierarchy. For hard potentials, we show that the propagation of exponential moments holds at the particle level. The moments bound ensures the uniqueness of weak solutions of the Landau hierarchy, which implies propagation of chaos.

Professor Ewelina Zatorska

Weak-Strong Uniqueness for Bi-Fluid Compressible System with Algebraic Closure

I will talk about a real two-fluid system of compressible viscous fluids with a common velocity field and algebraic closure for the pressure law. The constitutive relation involves densities of both fluids through an implicit function. The existence of global-in-time finite energy weak solutions to this system is known since the work of Novotn´y and Pokorn´y [Arch. Rational Mech. Anal., 2020]. On the other hand, existence of local-in-time strong solutions is due to Piasecki and Zatorska [J. Math Fluid Mech., 2022].
I will explain our newest result in which we establish the weak–strong uniqueness principle using the relative entropy method. In sharp contrast to the two-phase model of Baer-Nunziato type, the volume fraction of phase + obeys a transport equation with an additional nonlinear term. This gives rise to new challenging terms in the relative entropy inequality. We are able to close the estimate by making an elaborate use of the structure of the system.

Ms. Mónica Tapia del Moral

Characteristic Gluing for the Einstein Equations with Positive Cosmological Constant

The study of characteristic gluing for the Einstein equations was initiated in a seminal series of papers by Aretakis, Czimek, and Rodnianski (2021), and has since proven to be a powerful and effective tool for generating new solutions. A remarkable example of this is the work of Kehle and Unger (2022), who used characteristic gluing for the spherically symmetric Einstein equations to construct solutions that exhibit gravitational collapse to extremal black holes, disproving the so-called third law of black hole thermodynamics, and challenging the intuition that had prevailed for decades in much of the theoretical physics community.

All these works focused on the Einstein equations with vanishing cosmological constant ($\Lambda=0$). However, there has been growing interest in recent years in the study of the Einstein equations with non-vanishing Λ. Of special relevance in the context of cosmology is the $\Lambda>0$ case. In this talk, we will discuss recent work in which characteristic gluing techniques are extended to the $\Lambda>0$ case, leading to a whole new family of gravitational collapse solutions to the spherically symmetric Einstein equations with $\Lambda>0$.

Professor Jeffrey Eric Galkowski

Spectral Asymptotics for the Schrödinger Equation with Bounded, Unstructured Potentials

High energy spectral asymptotics for Schrödinger operators on compact manifolds have been well studied since the early 1900s and it is now well known that they are intimately related to the structure of periodic geodesics. In this talk, we discuss analogous questions for Schrödinger operators, $-\Delta +V$ on R^d, where V is bounded together with all of its derivatives. Since the geodesic flow on $\backslash R^d$ has no periodic trajectories (or indeed looping trajectories) one might guess that the spectral projector has a full asymptotic expansion. Indeed, for (quasi) periodic V this has been known since the work of Parnovski–Shterenberg in 2016.

We show that when d=1, full asymptotic expansions continue to hold for any such V. When d=2, we give a large class of potentials whose spectral projectors have full asymptotics. Nevertheless, in d$\backslash$geq 2, we construct examples where full asymptotics fail.

Based on joint work with L. Parnovski and R. Shterenberg.

INFORMATION

Parking

Parking is not available at Pembroke College. Here is a link to our travel page: https://www.pmb.ox.ac.uk/contact-us-and-visitor-information

Vehicle access is available for drop-off and collection of materials and equipment. Please provide the name of the driver, vehicle model and registration in advance. Please note that a congestion charge applies. For more information, visit: https://www.oxfordshire.gov.uk/transport-and-travel/oxfords-temporary-congestion-charge-cars

Mobility

There are disabled parking spaces on-site. Please contact the event organisers in advance if you require a space.

Wifi

Network connection when attending a meeting does not require any local IT account. Network connection can be obtain via Eduroam or The Cloud wifi services in the building.

Toilets

There are large male and female toilet facilities outside of the Pitchette Room, by the stairs. There are also gender-neutral accessibility toilets near these male/female toilets.

Catering

Lunch will be provided each day: sandwiches on Monday–Wednesday and Friday, and hot lunches served in the Pembroke (Dining) Hall on Thursday. There is also a café located near the Pichette Room, as well as local shops such as Tesco and Sainsbury's within a 10-minute walk from Pembroke College.

Emergency Contact Details

Events Office line– ask for Erika (Pembroke College Events Manager): 01865 276400

Erika: +44 (0) 7840709928

Sireethon(Organiser): 01865615234