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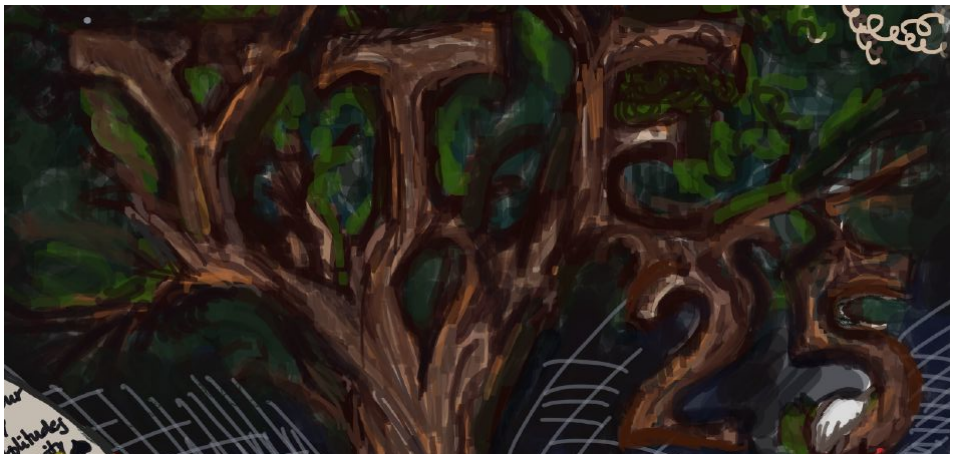

Report of Contributions

https://conference.ippp.dur.ac.uk/e/1518

Contribution ID: **52** Type: **not specified**

Recent Developments in the Dispersive Evaluation of Hadronic Vacuum Polarisation Contributions to Muon g-2

Thursday 18 December 2025 12:00 (30 minutes)

The Fermilab measurement of the anomalous magnetic moment of the muon a_μ at 127ppb is one of the most precise experimental tests of the Standard Model. However, the ultimate interpretation of this result is still unclear due to significant tensions in the theoretical predictions, particularly those of the hadronic vacuum polarisation (HVP) contributions a_μ^{HVP}. The two methods — lattice and dispersive — give potentially discrepant results and the data inputs to the dispersive calculation are also themselves in $\sim 5\sigma$ tension. I will discuss the methods used for evaluation of a_μ^{HVP} and the challenges presently faced, along with an update on my ongoing work on the KNTW group's dispersive prediction. Such work is necessary to match the Fermilab experimental precision and to confidently assess the case for new physics in lepton magnetic dipole moments.

Author: WRIGHT, Aidan (University of Liverpool)

Presenter: WRIGHT, Aidan (University of Liverpool)

Session Classification: The Cheshire Lat-tice

Contribution ID: **53** Type: **not specified**

The Price of a Large Electron Yukawa modification

Wednesday 17 December 2025 14:10 (7 minutes)

In the context of a possible Higgs pole run at FCC-ee, I discuss the theoretical 'price' of a large electron Yukawa modification. I start from an effective field theory viewpoint, considering the impact of renormalisation group effects on related observables and also examining assumptions on the broader UV flavour structure. I will then give an overview of the landscape of simplified models, investigating phenomenological constraints arising at higher orders.

Author: SMITH, Ben (University of Glasgow)

Presenter: SMITH, Ben (University of Glasgow)

Session Classification: All in the GONG afternoon

Contribution ID: **54** Type: **not specified**

Modular Properties of Generalised Gibbs Ensembles

Thursday 18 December 2025 14:00 (30 minutes)

Generalised Gibbs Ensembles (GGEs) appear in a wide range of contexts, from statistical physics to black hole thermodynamics and holography. They are constructed by inserting higher-spin conserved charges into a theory's partition function. A 2D Conformal Field Theory partition function is a modular invariant, so it is natural to ask about the modular properties of the GGE. In some cases this can be understood exactly, in others one can rely on integrability techniques. This talk will highlight some recent advances in understanding GGEs.

Author: KARIMI, Faisal (King's College London)

Presenter: KARIMI, Faisal (King's College London)

Session Classification: Amplitudes from a Caterpillar

Contribution ID: **55** Type: **not specified**

Impact of flavour coupling on SO(10)-inspired leptogenesis

Thursday 18 December 2025 10:10 (30 minutes)

I will discuss SO(10)-inspired leptogenesis, a well known scenario of leptogenesis relying on conditions realised within SO(10) models and also beyond. I will first review results within current approximations and then I will show new results including flavour coupling effects that have not yet been considered so far. I will also confront predictions and constraints from SO(10)-inspired leptogenesis with latest low-energy neutrino experimental results. I will highlight how absolute neutrino mass scale experiments are now starting to test a very important regime, partially hierarchical neutrino masses. In this case one has strongest constraints on neutrino unknown mixing parameters from SO(10)-inspired leptogenesis. Current best fit results, favouring first octant for the atmospheric mixing angles, are quite encouraging. I will also discuss strong thermal leptogenesis and how this can be realised within SO(10)-inspired leptogenesis. In this case a special portion of the allowed region of parameters is selected, with sharp predictions on unknown neutrino parameters. Interestingly, next generation neutrinoless double beta decay experiments should find a positive signal during next years. Also in this case, I will show how results change if flavour coupling effects are included.

Author: HU, Xubin (University of Southampton)

Presenter: HU, Xubin (University of Southampton)

Session Classification: Who Stole the Antimatter?

Contribution ID: **56** Type: **not specified**

Supersymmetric AdS Solitons, Coulomb Branch Flows, Twisted Compactifications and their Marginal Deformations

Wednesday 17 December 2025 17:00 (30 minutes)

I will speak about the papers https://arxiv.org/pdf/2506.10062v3 and another two to appear shortly.

We construct and analyse infinite classes of regular supergravity backgrounds dual to four-dimensional SCFTs compactified on a circle
with a supersymmetry-preserving twist. These flows lead to three-dimensional gapped QFTs preserving four supercharges. The solutions arise in Type IIB, Type IIA, and eleven dimensional supergravity, and generalise known constructions by incorporating deformations that avoid typical singularities associated with the holographic description of the
Coulomb branch of the CFT. We examine several observables: Wilson loops, holographic central charges, and complexity. We show they exhibit a universal factorisation, with each observable decomposing into a UV-CFT contribution times a flow-dependent factor. We also explore the parameter regimes where higher-curvature corrections become relevant, affecting the physical interpretation of certain observables. We also look at marginal deformations via the TsT procedure to construct new solutions using the IIB background and analyse their Page charges.

Authors: NUNEZ, Carlos; CHATZIS, Dimitrios; ZOAKOS, Dimitrios; ITSIOS, Georgios; HAMMOND, Madi (Swansea University)

Presenter: HAMMOND, Madi (Swansea University)

Session Classification: A Caucus Rave and a Long String

Contribution ID: **57** Type: **not specified**

4-dimensional string islands from asymmetric orbifolds

Wednesday 17 December 2025 17:30 (30 minutes)

String islands are isolated points in the space of worldsheet conformal field theories that have reduced number of moduli, enjoy rank reduction and lead to consistent pure supergravity theories. Asymmetric orbifold constructions are powerful tools that enable us to access these points in the moduli space that are inaccessible to more standard string compactification techniques. In this talk, I construct type II T^6/Z_9 islands with 16 supercharges, study the structure of their supersymmetry multiplets and compute helicity supertraces to prove the existence of an archipelago.

Authors: FONT, Anamaría; ANDRÉS, Eduardo; MARIENI, Elisa Iris (University of Southampton); ALDAZABAL, Gerardo; ZADEH, Ida; NARAIN, Kumar

Presenter: MARIENI, Elisa Iris (University of Southampton)

Session Classification: A Caucus Rave and a Long String

Contribution ID: **58** Type: **not specified**

Flavour hierarchies with non-minimal irreps

Wednesday 17 December 2025 14:17 (7 minutes)

We consider a new class of flavour models where the spurion breaking the flavour symmetries of the Standard Model is in a non-minimal irrep. Via multiple insertions of this spurion, flavour hierarchies accidentally arise from initial $\mathcal{O}(1)$ untuned entries. By relying on non-Abelian symmetries, the resulting pattern of flavour-violating operators at dim-6 SMEFT can be distinct from related Abelian approaches such as Froggatt-Nielsen.

Author: CRAWFORD, Graeme (University of Glasgow)

Presenter: CRAWFORD, Graeme (University of Glasgow)

Session Classification: All in the GONG afternoon

Contribution ID: **59** Type: **not specified**

Three Flavoured Leptogenesis during Reheating

Thursday 18 December 2025 09:40 (30 minutes)

The introduction of heavy right-handed neutrinos (RHNs) explains the smallness of neutrino masses and offers a mechanism for generating the baryon asymmetry of the universe via leptogenesis. While this is usually studied in thermal scenarios, a cosmological history beginning with inflation suggests a more natural alternative: the inflaton itself can decay into RHNs during rehating, this increased production enhances the produced asymmetry dramatically.

Early studies treated leptogenesis in a single-flavour approximation, but three lepton flavours exist, giving rise to flavour effects. Any accurate treatment must consider these flavour effects. However, this has not yet been done fully for leptogenesis during reheating even in a minimal model.

In this talk, we present the first consistent framework for flavoured leptogenesis during reheating, combining the non-thermal production of RHNs with a fully flavoured treatment of leptogenesis.

Authors: SPALDING, Angus (University of Southampton); Dr GOSHAL, Anish (University of Warsaw); Prof. WHITE, Graham (Univeristy of Southampton)

Presenter: SPALDING, Angus (University of Southampton)

Session Classification: Who Stole the Antimatter?

Contribution ID: **60** Type: **not specified**

Fermionic Chern–Simons theory on S2 × S1 in the 'temporal' gauge

Thursday 18 December 2025 10:10 (30 minutes)

Most of the computational evidence for the Bose–Fermi duality of fundamental fields coupled to $U(N)$ Chern–Simons theories originates in the large-N calculations performed in the light-cone gauge. The evaluation of the thermal free energy on a finite-sized sphere is elusive in the light-cone gauge but more natural in another gauge, the 'temporal' gauge. We use it to evaluate the finite-temperature partition function of $U(N)$ and $SU(N)$ coupled fermions at large N and finite chemical potential on S^2, a novel physical setting for the problem. We set up the finite-temperature gap equations, solve them, and evaluate the partition function, closely following the tricks explored in [arXiv:2307.11020], where we work out the results on $\mathbb{R}^2$ at large N, which demonstrate perfect agreement with the earlier lightcone gauge results. We find new formulae for the dynamically generated and flux-dependent masses (a completely novel feature with no flat-space counterpart). We look forward to announcing the second installment of our work soon.

Authors: Prof. MINWALLA, Shiraz (Tata Institute of Fundamental Research, Mumbai); Mr NATH, Souparna (Tata Institute of Fundamental Research, Mumbai); Mr TANWAR, Nikhil (Tata Institute of Fundamental Research, Mumbai); Mr VATSAL (Tata Institute of Fundamental Research, Mumbai)

Presenter: Mr VATSAL (Tata Institute of Fundamental Research, Mumbai)

Session Classification: A Mad Formal QFT Party

Contribution ID: **61** Type: **not specified**

The role of spectral networks in conformal field theories

Wednesday 17 December 2025 15:06 (7 minutes)

The AGT correspondence has lead to a rich interaction between 4d N=2 supersymmetric gauge theories and 2d non-rational conformal field theories. With Lotte Hollands, we hope to add another entry into this dictionary. Spectral networks are primarily objects that track the various BPS spectra of the 4d theory. In this talk, I will briefly discuss how spectral networks can be used to construct conformal blocks in 2d Liouville theory.

Authors: MURUGESAN, Subrabalan (Heriot Watt University); Dr HOLLANDS, Lotte (Heriot-Watt University)

Presenter: MURUGESAN, Subrabalan (Heriot Watt University)

Session Classification: All in the GONG afternoon

Contribution ID: **62** Type: **not specified**

Four-Fermions SMEFT Operators in the Drell-Yan Process

Thursday 18 December 2025 14:50 (30 minutes)

The Standard Model Effective Field Theory (SMEFT) provides a powerful and systematic framework to search for physics beyond the Standard Model. In this talk, I will discuss the role of dimension-6 SMEFT operators in the Drell–Yan process and present preliminary results from a fit to current collider data.

Author: FUSI, Martina (University of Southampton)

Presenter: FUSI, Martina (University of Southampton)

Session Classification: Queen of EFTs and Flavours

Contribution ID: **63** Type: **not specified**

A Bayesian analysis of axion-saxion quintessence

Thursday 18 December 2025 15:50 (30 minutes)

Motivated by recent results of DESI suggesting that a dynamical dark energy may render a better fit to experimental data in comparison to the Λ-CDM with a cosmological constant, we consider a two-field 4D effective model of quintessence. Inspired by string compactifications with a complex modulus, we study the system consisting of two real scalar fields kinetically coupled, giving rise to a curved target-space metric. We analyse the effect of the kinetic coupling in the existence of a new stable attractor giving rise to dark energy solutions, reproducing the dynamical system analysis previously performed by Cicoli et al for an exponential potential. We extend their study by considering polynomial corrections to the potential and by performing a Bayesian analysis to study the fit of the model to data in comparison with the standard cosmological model.

Authors: RAMOS HAMUD, Mario (University of Cambridge); Prof. QUEVEDO, Fernando (University of Cambridge/NYU Abu Dhabi); Prof. VAZQUEZ, J. Alberto (UNAM); Dr GARCIA-ARROYO, Gabriela (UNAM)

Presenter: RAMOS HAMUD, Mario (University of Cambridge)

Session Classification: Down the Dark Hole

Contribution ID: **64** Type: **not specified**

An Uncertainty-Anticipating Kernelised Framework for Conditional Goodness-of-Fit

Thursday 18 December 2025 14:00 (30 minutes)

The work of Sir David Cox and Halbert White is dedicated to the poverty of Maximum Likelihood fits under model misspecification, including poor data quality, as well as the necessary remedial, complex regularization. A literature on an alternative to Maximum Likelihood, Maximum Mean Discrepancy (MMD), has developed over the last seven decades. Recent contributions mathematically prove MMD's ability to handle misspecification without regularization. I present a framework for assessing a MMD-fitted model's predictive capacity without requiring the separation of data into testing and training sets, with novel contributions found in resample-free configurations of the framework.

Author: MULLINS, Aidan (Newcastle University)

Co-authors: Prof. OATES, Chris (Newcastle University); Dr RAU, Markus (Newcastle University)

Presenter: MULLINS, Aidan (Newcastle University)

Session Classification: Tweedledee and Computing

Contribution ID: **65** Type: **not specified**

Holographic entanglement entropy and c-functions in conformal and confining backgrounds

Wednesday 17 December 2025 14:59 (7 minutes)

I will discuss holographic spacelike and timelike entanglement entropy using the Ryu-Takayanagi prescription, for different-shaped entangling regions. I work with an infinite family of 10-dimensional Type IIB supergravity solutions, which are gravity duals to an infinite set of linear quiver theories which are 4-dimensional confining theories at low energy, but decompactify and flow to 5-dimensional SCFTs in the UV. I use the EE to investigate proposed c-functions, and compare with the 'flow central charge'.

Author: WHITTLE, Jonathan (Swansea University)

Presenter: WHITTLE, Jonathan (Swansea University)

Session Classification: All in the GONG afternoon

Contribution ID: **67** Type: **not specified**

Rapidity Dependent Beam Functions

Wednesday 17 December 2025 17:00 (30 minutes)

Jet vetoes are important tools that can be used to separate hard processes. A commonly used variable in which jets are identified and vetoed is the transverse-momentum of a jet. Experimentally, reconstructing small transverse momentum jets at forward rapidities is challenging, which motivates introducing a cut on a jets rapidity to reduce sensitivity to this region. Existing SCET leading-jet transverse-momentum beam functions have been used to produce partial N3LL resummed predictions for many processes but they do not include any rapidity cut.
Motivated in part by tension in the theory and experimental 0-jet WZ cross section, where the theoretical prediction does not include the rapidity cut in the jet definition used in the experimental result; we aim to compute an addition to the SCET NNLO leading jet transverse momentum beam functions to include the effects of such a cut. Here we present the progress and overview the method of this ongoing calculation.

Author: CLARK, Thomas (University of Manchester)

Presenter: CLARK, Thomas (University of Manchester)

Session Classification: The Pool of Precision

Contribution ID: **68** Type: **not specified**

Beauty, Charm and Little Photons

Thursday 18 December 2025 15:20 (30 minutes)

In this talk I will present ongoing work towards a more precise and unified description of heavy-flavour decays in Sherpa, combining modern form-factor parameterisations with QED radiative corrections.

On the hadronic side, I am implementing Boyd-Grinstein-Lebed (BGL) form factors for a set of benchmark channels: heavy-to-light pseudoscalar and vector decays ($B \to \pi, K, \rho, K^*$), heavy-to-heavy modes ($B \to D^{(*)}$), and selected baryonic decays such as $\Lambda_b \to \Lambda^{(*)}\ell\ell$. The aim is to provide a consistent, model-independent treatment across meson and baryon channels, using analyticity- and unitarity-based constraints in the BGL framework.

On the radiative side, I will switch on Yennie-Frautschi-Suura (YFS) resummation in these decays to quantify the impact of QED final-state radiation on key observables: dilepton invariant-mass spectra, angular distributions, and form-factor-sensitive kinematic variables. I will show first comparisons between "bare" and lepton-dressed definitions and discuss how QED effects propagate into quantities relevant for flavour fits.

Finally, I will outline planned extensions of the QED machinery in Sherpa, including more flexible treatments of radiation off hadronic currents and possible structure-dependent corrections, and comment on how this programme can interface with lattice inputs and experimental analyses at LHCb and Belle~II.

Authors: DUTTA, Sayantan (Durham University); KRAUSS, frank (ippp durham)

Presenter: DUTTA, Sayantan (Durham University)

Session Classification: Queen of EFTs and Flavours

Contribution ID: **69** Type: **not specified**

Meson-Glueball spectrum and matrix elements from $Sp(4)$ lattice gauge theories with matter fields in multiple representations

Thursday 18 December 2025 11:30 (30 minutes)

The asymptotic states of QCD are observed to be colour singlets. Among the possible colour singlets one can build there is the experimentally unconfirmed glueball, a bound state of gluons. Lattice simulations of $SU(3)$ Yang-Mills are able to probe several glueball channels and predict that the lightest states is heavy. With dynamical fermions the glueball becomes unstable and can mix with other states in the theory, making the phenomenological picture less clear. I will present preliminary results of the flavour-singlet spectrum, including glueballs of a $Sp(4)$ lattice gauge theory with dynamical fermions. We find a glueball state that is stable in the present of dynamical fermions and near threshold, providing a good starting point to study glueball decay.

Authors: LUCINI, Biagio (School of Mathematical Sciences, Queen Mary University of London); LIN, C.-J-. David (Institute of Physics, National Yang Ming Chiao Tung University); VADACCHINO, Davide (University of Plymouth); KI HONG, Deog (Department of Physics, Pusan National University;Extreme Physics Institute, Pusan National University); BENNETT, Ed (Swansea University); ZIERLER, Fabian (Technical University of Munich, TUM School of Natural Sciences, Physics Department); LEE, Jong-Wan (Particle Theory and Cosmology Group, Center for Theoretical Physics of the Universe, Institute for Basic Science (IBS), Daejeon); PIAI, Maurizio (Centre for Quantum Fields and Gravity, Faculty of Science and Engineering, Swansea University); BRITO, Nuno (Centre for Mathematical Sciences, University of Plymouth)

Presenter: BRITO, Nuno (Centre for Mathematical Sciences, University of Plymouth)

Session Classification: The Cheshire Lat-tice

Contribution ID: **71** Type: **not specified**

Straightening Out the IBP Equations

Thursday 18 December 2025 13:30 (30 minutes)

In this talk, I present a general and powerful strategy for solving integration-by-parts (IBP) identities, which take the form of multivariable linear homogeneous relations among Feynman integrals. Our diagonalisation approach transforms the IBP system into effectively single-variable recurrence relations. This diagonal structure exposes the analytic behaviour of the reduction and provides a direct route to closed-form solutions, making it especially valuable when propagator powers are treated as abstract variables, such as in the Mellin representation, or when very high powers appear. As a by-product of this framework, I will also briefly discuss a more specialised variant, the triangularisation method, which adapts the diagonal strategy to QCD multi-loop reductions for improved computational efficiency. Together, these developments offer both conceptual clarity and significant computational gains for modern multi-loop calculations.

Authors: Prof. MITOV, Alexander (University of Cambridge); LIU, Junhan (University of Cambridge)

Presenter: LIU, Junhan (University of Cambridge)

Session Classification: Amplitudes from a Caterpillar

Contribution ID: **72** Type: **not specified**

Supercooling in Confining Theories

Thursday 18 December 2025 09:40 (30 minutes)

The thermal deconfinement-confinement transition in SU(N) gauge theory is known to be first-order for $N \geq 3$, but the dynamics of this transition are poorly understood. Lattice data indicates the presence of a small coefficient in the exponent of the nucleation rate which likely strongly alters the phase transition dynamics. In this talk, I discuss our study in arXiv:2508.10091 that provides evidence that the small coefficient originates from a deconfined phase instability just below the critical temperature. I will also discuss its likely implications for possible future gravitational wave observations arising from such phase transitions in the early universe.

Authors: KANE, Gaurang Ramakant (Theoretical Physics, University of Oxford); Prof. MARCH-RUSSELL, John (University of Oxford); Prof. AGRAWAL, Prateek (University of California, Santa Barbara); Dr LOLADZE, Vazha (University of Oxford)

Presenter: KANE, Gaurang Ramakant (Theoretical Physics, University of Oxford)

Session Classification: A Mad Formal QFT Party

Contribution ID: **73** Type: **not specified**

Optimisation on Riemannian Manifolds & Quantum Algorithms

Wednesday 17 December 2025 14:24 (7 minutes)

The design of new quantum algorithms remains an unintuitive and elusive area that has lagged behind the rest of the developments of quantum computing. Despite decades of research, we have developed very few quantum techniques, in part due to the lack of a unifying framework to aid our understanding of existing ones and to facilitate the design of new ones. A promising route, particularly beneficial for quantum search algorithms, such as Grover's, is optimisation on Riemannian manifolds. Studying optimisation flows on the unitary manifold has recently been established to be directly linked to Grover's algorithm, providing key insights into its quadratic speed-up relative to its classical counterpart. During my talk, I will show how this link arises and present the direction of current work.

Author: ARCIA LOPEZ, Andres

Presenter: ARCIA LOPEZ, Andres

Session Classification: All in the GONG afternoon

Contribution ID: **74** Type: **not specified**

Behaviour of cosmic strings in varying-tension background

Wednesday 17 December 2025 14:52 (7 minutes)

Cosmic superstrings are an interesting possible phenomenon in the early universe. Recently, there has been increased interest in the behaviour of these superstrings under a rolling modulus background which will cause the tension of the cosmic string to vary. We explore some preliminary results in the behaviour of cosmic string loops and perturbations in cosmic string networks under various rolling moduli background. Interesting behaviour arises in the case of the Nambu-Goto string, including growth of string loops under a kinating background and broad nonlinear resonances under an oscillating modulus background.

Author: LAU, Sze (University of Oxford)

Presenter: LAU, Sze (University of Oxford)

Session Classification: All in the GONG afternoon

Contribution ID: **76** Type: **not specified**

Optimisation on Riemannian Manifolds & Quantum Algorithms

Wednesday 17 December 2025 19:00 (20 minutes)

The design of new quantum algorithms remains an unintuitive and elusive area that has lagged behind the rest of the developments of quantum computing. Despite decades of research, we have developed very few quantum techniques, in part due to the lack of a unifying framework to aid our understanding of existing ones and to facilitate the design of new ones. A promising route, particularly beneficial for quantum search algorithms, such as Grover's, is optimisation on Riemannian manifolds. Studying optimisation flows on the unitary manifold has recently been established to be directly linked to Grover's algorithm, providing key insights into its quadratic speed-up relative to its classical counterpart. During my talk, I will show how this link arises and present the direction of current work.

Author: ARCIA LOPEZ, Andres

Presenter: ARCIA LOPEZ, Andres

Session Classification: The Curious Exhibits and Mad Hatter's Dinner Party

Contribution ID: **78** Type: **not specified**

Supersymmetric Localisation = Gauge Fixing with a Twist: Refinements in the Batalin-Vilkovisky Formalism

Thursday 18 December 2025 09:10 (30 minutes)

In this talk, I will describe how supersymmetric localisation can be reinterpret and enhanced through the BV formalism. I will give a brief review of supersymmetric localisation, followed by a brief review of BRST quantisation. After this, I will explain how localisation can be reinterpret through the BRST framework. Then, I will explain how the BV formalism improves on the BRST formalism for localisation, and how this leads to improved methods for supersymmetric localisation with on-shell closing supermultiplets.

Author: KANAKARIS DECAVEL, Dimitri (University of Hertfordshire)

Presenter: KANAKARIS DECAVEL, Dimitri (University of Hertfordshire)

Session Classification: A Mad Formal QFT Party

Contribution ID: **79** Type: **not specified**

A Simple Perspective for Early Universe

Thursday 18 December 2025 12:00 (30 minutes)

I will review basics of CMB physics and show that reflecting boundary conditions from the Big Bang are sufficient to explain the primordial power spectrum. If time permits I will try to explain how higher derivative quantum corrections to gravity can explain the scale invariance of the large wavelength modes in the CMB power spectrum.

Author: VAIBHAV, Vatsalya (University of Edinburgh)

Presenter: VAIBHAV, Vatsalya (University of Edinburgh)

Session Classification: The Jabberwocky of Cosmology

Contribution ID: **80** Type: **not specified**

Supersymmetric AdS Solitons, Coulomb Branch Flows, Twisted Compactifications and their Marginal Deformations

Wednesday 17 December 2025 19:20 (20 minutes)

I will speak about the papers https://arxiv.org/pdf/2506.10062v3 and another two to appear shortly.

We construct and analyse infinite classes of regular supergravity backgrounds dual to four-dimensional SCFTs compactified on a circle
with a supersymmetry-preserving twist. These flows lead to three-dimensional gapped QFTs preserving four supercharges. The solutions arise in Type IIB, Type IIA, and eleven dimensional supergravity, and generalise known constructions by incorporating deformations that avoid typical singularities associated with the holographic description of the
Coulomb branch of the CFT. We examine several observables: Wilson loops, holographic central charges, and complexity. We show they exhibit a universal factorisation, with each observable decomposing into a UV-CFT contribution times a flow-dependent factor. We also explore the parameter regimes where higher-curvature corrections become relevant, affecting the physical interpretation of certain observables. We also look at marginal deformations via the TsT procedure to construct new solutions using the IIB background and analyse their Page charges.

Authors: NUNEZ, Carlos; CHATZIS, Dimitrios; ZOAKOS, Dimitrios; ITSIOS, Georgios; HAMMOND, Madi (Swansea University)

Presenter: HAMMOND, Madi (Swansea University)

Session Classification: The Curious Exhibits and Mad Hatter's Dinner Party

Contribution ID: **83** Type: **not specified**

Negative C-Parity Charmonium Resonances in Lattice QCD

Thursday 18 December 2025 11:00 (30 minutes)

Recent experimental progress in meson spectroscopy has revealed numerous resonant states that do not fit the conventional quark model, leading to a plethora of theoretical and phenomenological models being proposed to explain their existence. However, to move beyond phenomenology and achieve a model-independent understanding, one must turn to QCD itself. In this talk, I will review the fundamentals for obtaining scattering amplitudes from lattice QCD data, and I will present our results of the negative C-parity charmonium spectrum.

Author: MORANDÉ, Pablo (University of Cambridge)

Presenter: MORANDÉ, Pablo (University of Cambridge)

Session Classification: The Cheshire Lat-tice

Contribution ID: **84** Type: **not specified**

Spectrum of radiation from global strings

Thursday 18 December 2025 11:30 (30 minutes)

Axion strings are topological defects that arise when the Standard Model is extended to include a Peccei-Quinn symmetry, which is spontaneously broken in the early Universe. Upon that, the Universe is filled with a network of strings that decay, losing energy by emission of, among others, axions. The spectral index of the axion energy spectrum can be measured in the field theory simulations and is used to predict the mass of the axion, which is a key parameter for the haloscope experiments searching for these particles. However, the energy spectrum usually measured in the simulations contains, besides the contribution of axions, also a sizeable contamination with the string self-field. In this talk, I will present a recent work in which, using a simplified model of a sinusoidally perturbed straight string, we managed to subtract the majority of this contamination. As a result, we could compute a corrected spectral index and axion mass, showing a substantial difference between the axion mass inferred using our method and the standard approach.

Authors: Mr BUNIO, Lukasz (University of Manchester); Mr MANOJ, Pranav (Simon Fraser University); Prof. BATTYE, Richard (University of Manchester); Dr COTTERILL, Steven (University of Manchester)

Presenter: Mr BUNIO, Lukasz (University of Manchester)

Session Classification: The Jabberwocky of Cosmology

Contribution ID: **85** Type: **not specified**

M-Theory Through Matrix Models

A compelling quantum theory of gravity should provide a geometrically intuitive framework, continuing the tradition established by Einstein's insight that geometry and physics are inseparable. String theory extends this legacy by replacing point-like structures with fundamentally extended objects, offering a richer geometric vocabulary and a natural setting in which causality and topology emerge from first principles. Its historical connection to both gauge dynamics and confinement further motivates parallels with the successes of lattice QCD. In particular, the lattice approach—originally developed to address non-renormalisability and strong self-interaction in non-abelian gauge theories—suggests a promising conceptual pathway for addressing gravity' s analogous self-interaction challenges in the low-energy limit of M-theory.

Within this broader context, simplified supersymmetric systems such as the matrix model serve as valuable laboratories for exploring emergent geometric structure and testing discretised approaches to quantum gravity. These models capture key qualitative features of the full theory while remaining analytically and numerically tractable, providing insight into how extended objects and their interactions may give rise to smooth spacetime dynamics.

Author: WINTERLICH, Martin (Dublin Institute for Advanced Studies and Trinity College Dublin)

Presenter: WINTERLICH, Martin (Dublin Institute for Advanced Studies and Trinity College Dublin)

Session Classification: The Curious Exhibits and Mad Hatter's Dinner Party

Contribution ID: **86** Type: **not specified**

Investigating an interacting 4-derivative scalar field theory

Wednesday 17 December 2025 14:45 (7 minutes)

Higher-derivative QFT's are famously non-unitary, they suffer with growing modes and negative-norm states reflecting the classical Ostrogradsky instability. In this talk, I will present an interacting model whose renormalisation group flow admits a special line of solutions. On this special line we find preliminary evidence that the theory may be perturbatively unitary.

Author: ANDERSON, Maegan (University of Edinburgh)

Presenter: ANDERSON, Maegan (University of Edinburgh)

Session Classification: All in the GONG afternoon

Contribution ID: **87** Type: **not specified**

Quantum Corrections to Symmetron Fifth Forces

Thursday 18 December 2025 11:00 (30 minutes)

Non-linear scalar-tensor theories of modified gravity may explain observations attributed to dark matter and dark energy. Much is understood of their classical properties, but their quantum nature is relatively unexplored. We discuss a Green's function method for obtaining the leading order quantum corrections to the classical symmetron field in the vicinity of a spherically symmetric extended source. Our calculations indicate that leading-order quantum corrections can dramatically weaken the fifth force mediated by the symmetron field.

Author: UDEMBA, Michael (University of Manchester)

Presenter: UDEMBA, Michael (University of Manchester)

Session Classification: The Jabberwocky of Cosmology

Contribution ID: **88** Type: **not specified**

Effectiveness of Symmetry Verification for the Variational Quantum Eigensolver Algorithm

Thursday 18 December 2025 13:30 (30 minutes)

The Variational Quantum Eigensolver algorithm (VQE) offers a potential near-term implementation of state preparation on a quantum computer. A significant barrier in the current hardware landscape is the occurence of noise, and full fault tolerance through quantum error correction is not currently feasible. Thus, it is important to consider possible quantum error mitigation techniques and their effectiveness. I will show the impact of a technique called symmetry verification, where output is post-processed to only keep states that are in an expected symmetry sector, when applied to VQE preparation of the ground state of the Schwinger Model. I will demonstrate the potential to be misled by results, and argue that a lot of care should taken to justify this use case.

Authors: TOMLINSON, Alexander (University of Southampton); CHAKRABORTY, Bipasha (University of Southampton); Dr VAN GOFFRIER, Graham (University of Southampton); Dr CAI, Zhenyu (University of Oxford)

Presenter: TOMLINSON, Alexander (University of Southampton)

Session Classification: Tweedledee and Computing

Contribution ID: **89** Type: **not specified**

Plenary Talk

Wednesday 17 December 2025 15:40 (1 hour)

The plenary talk

Author: NUNEZ, Carlos

Presenter: NUNEZ, Carlos

Session Classification: Plenary Speaker

Contribution ID: **90** Type: **not specified**

Charting Higgs Self-Coupling Limits in a General Extended Scalar Sector

Wednesday 17 December 2025 14:38 (7 minutes)

Constraining the Higgs self-coupling at collider experiments allows us to better understand the shape and properties of the Higgs potential, which is a promising avenue into New Physics beyond the Standard Model (SM). The current experimental uncertainties on the Higgs self-coupling, parametrised by κ_λ, are of $\mathcal{O}(100\%)$, while Higgs couplings to the weak gauge bosons, parametrised by κ_V, have been constrained to just a few percent. Given that κ_V and κ_λ are correlated quantities beyond the SM, can we ever see New Physics effects in κ_λ, despite the tight experimental bounds on κ_V? In this project, I explore the limits of the Higgs self-coupling in general extended scalar sectors. In the singlet extension to the SM, I calculate the allowed region in κ_V-κ_λ space both analytically and numerically. Distinguishing between the spontaneous and explicit $\mathbb{Z}_2$-breaking cases, we find that the latter causes a deviation in κ_λ more than 10 times larger than the former. We further derive analytical expressions for the allowed region in κ_V-κ_λ in a general $\mathbb{Z}_2$-symmetric extended scalar sector, where an arbitrary combination of electroweak scalar multiplets are added to the SM. In the alignment limit, this reduces to a function of the electroweak charges of the multiplets, the coupling constants in the associated potential, and the masses of the emerging particles. We show this explicitly for the $\mathbb{Z}_2$-symmetric 2-Higgs-Doublet model. Like in the $\mathbb{Z}_2$-symmetric singlet model, κ_V imposes more stringent constraints than κ_λ.

Author: SIMON, Olivia (University of Glasgow)

Presenter: SIMON, Olivia (University of Glasgow)

Session Classification: All in the GONG afternoon

Contribution ID: **93** Type: **not specified**

Linking Leptogenesis and Asymmetric Dark Matter

Thursday 18 December 2025 09:10 (30 minutes)

We investigate a minimal extension of the Leptogenesis framework that simultaneously explains the observed baryon asymmetry and dark matter (DM) abundance through the decay of a heavy Majorana neutrino. In this scenario, CP violation arises from complex Yukawa couplings, enabling the generation of asymmetries in both the Standard Model (SM) and DM sectors. We explore two regimes: (i) wash-in, where an initial dark asymmetry is transferred to SM leptons by $2 \leftrightarrow 2$ scattering processes; and (ii) co-genesis, featuring a hierarchical coupling structure that allows enhanced CP violation while supporting a low-scale seesaw mechanism at order $\mathcal{O}(2)$ TeV. This setup not only links light neutrino masses to the Majorana mass term but also suggests that lepton-number violation may occur at experimentally accessible energy scales. In the co-genesis scenario, we show spin-independent cross sections for DM heavier than 10 GeV that can be tested in current direct detection experiments and motivate the exploration of cross sections inside the neutrino fog for lighter DM masses.

Author: MCKENNA, Henry (The University of Liverpool)

Co-authors: Dr SMIRNOV, Juri (University of Liverpool); Dr GORBAHN, Martin (University of Liverpool)

Presenter: MCKENNA, Henry (The University of Liverpool)

Session Classification: Who Stole the Antimatter?

Contribution ID: **94** Type: **not specified**

Black hole hair transplant with ultra light dark matter

Thursday 18 December 2025 15:20 (30 minutes)

You can create a black hole bomb using a Kerr black hole by putting mirrors around it. This can happen because of a phenomenon called superradiance using which an incident wave can get reflected back with larger energy. The mirror then reflects it back and you can keep on extracting energy until the limit is reached. For a massive field, the mass itself acts as a natural barrier. Ultra light dark matter fields, if they exist, can in principle satisfy the superradiance condition, and form a cloud around a Kerr black hole. We will talk about how the signatures of such a cloud can be detected or used to constrain masses of these particles.

Authors: Dr MCCABE, Christopher (Kings College London); PATHAK, Dhruv (King's College London); Prof. BLAS, Diego (IFAE)

Presenter: PATHAK, Dhruv (King's College London)

Session Classification: Down the Dark Hole

Contribution ID: **95** Type: **not specified**

Exploiting Perpendicular Momentum Distributions of Semileptonic Decays

Thursday 18 December 2025 15:50 (30 minutes)

We derive the differential distribution of semileptonic decays with respect to the perpendicular momentum component of the final state hadron. This approach is illustrated on the LHCb measurement of the $\bar{B}_s^0 \to D_s^{+-}$ decay distribution and uses data from the LHCb experiment in an independent phenomenological analysis for the first time.

Author: EARNSHAW, Charlie (Durham University)

Presenter: EARNSHAW, Charlie (Durham University)

Session Classification: Queen of EFTs and Flavours

Contribution ID: **96** Type: **not specified**

Dynamical Dark Energy and Tensions - A Story of Conflicting Datasets

Thursday 18 December 2025 14:50 (30 minutes)

Since the discovery of the accelerated expansion of the Universe at the end of the past century, we have obtained an abundance of precision measurements of our Universe, opening the gates for the era of precision cosmology.
However, with these new measurements and surveys came tensions and hints of new physics beyond that of the Standard Model of cosmology and particle physics.
I will attempt to briefly describe the key observations which allow us to understand so much about our Universe and how some inconsistencies between these observations have led us into a discussion about the incompleteness of the ΛCDM model, with a particular focus on the nature of dynamical dark energy and some candidates to describe it both from a phenomenological and a more fundamental level.

Author: LEE, Dong Ha (University of Sheffield)

Presenter: LEE, Dong Ha (University of Sheffield)

Session Classification: Down the Dark Hole

Contribution ID: **97** Type: **not specified**

Vector and Tensor Decay Constants of Heavy-light Mesons from Lattice QCD

Wednesday 17 December 2025 14:31 (7 minutes)

I will present a very brief overview of a nearly complete study of the vector and tensor decay constants of B^*, B_s^*, D^*, and D_s^* mesons from fully relativistic $n_f = 2 + 1 + 1$ lattice QCD. We use multiple lattice spacings, with both heavy and physical light-quark masses. Ours will be not only the first lattice results for the B^* and B_s^* tensor decay constants, but also the first with percent-level precision. These results constitute key ingredients in precision tests of Standard-Model and beyond-Standard-Model heavy-flavour phenomenology.

Authors: SMECCA, Antonio (Swansea University); DAVIES, Christine (University of Glasgow); Dr HARRISON, Judd (University of Glasgow); MILLER, Kerr (University of Glasgow)

Presenter: MILLER, Kerr (University of Glasgow)

Session Classification: All in the GONG afternoon

Contribution ID: **98** Type: **not specified**

Linking Leptogenesis and Asymmetric Dark Matter

Wednesday 17 December 2025 20:00 (20 minutes)

We investigate a minimal extension of the Leptogenesis framework that simultaneously explains the observed baryon asymmetry and dark matter (DM) abundance through the decay of a heavy Majorana neutrino. In this scenario, CP violation arises from complex Yukawa couplings, enabling the generation of asymmetries in both the Standard Model (SM) and DM sectors. We explore two regimes: (i) wash-in, where an initial dark asymmetry is transferred to SM leptons by $2 \leftrightarrow 2$ scattering processes; and (ii) co-genesis, featuring a hierarchical coupling structure that allows enhanced CP violation while supporting a low-scale seesaw mechanism at order $\mathcal{O}(2)$ TeV. This setup not only links light neutrino masses to the Majorana mass term but also suggests that lepton-number violation may occur at experimentally accessible energy scales. In the co-genesis scenario, we show spin-independent cross sections for DM heavier than 10 GeV that can be tested in current direct detection experiments and motivate the exploration of cross sections inside the neutrino fog for lighter DM masses.

Author: MCKENNA, Henry (The University of Liverpool)

Co-authors: Dr SMIRNOV, Juri (University of Liverpool); Dr GORBAHN, Martin (University of Liverpool)

Presenter: MCKENNA, Henry (The University of Liverpool)

Session Classification: The Curious Exhibits and Mad Hatter's Dinner Party

Contribution ID: **99** Type: **not specified**

Black hole hair transplant with ultra light dark matter

Wednesday 17 December 2025 19:40 (20 minutes)

You can create a black hole bomb using a Kerr black hole by putting mirrors around it. This can happen because of a phenomenon called superradiance using which an incident wave can get reflected back with larger energy. The mirror then reflects it back and you can keep on extracting energy until the limit is reached. For a massive field, the mass itself acts as a natural barrier. Ultra light dark matter fields, if they exist, can in principle satisfy the superradiance condition, and form a cloud around a Kerr black hole. We will talk about how the signatures of such a cloud can be detected or used to constrain masses of these particles.

Authors: Dr MCCABE, Christopher (Kings College London); PATHAK, Dhruv (King's College London); Prof. BLAS, Diego (IFAE)

Presenter: PATHAK, Dhruv (King's College London)

Session Classification: The Curious Exhibits and Mad Hatter's Dinner Party

Contribution ID: **101** Type: **not specified**

Analytical results for the C-angularity soft function at NNLO

Wednesday 17 December 2025 17:30 (30 minutes)

Event shapes, such as Thrust and C-Parameter, are simple observables that have been measured to high accuracy at electron-positron colliders. Using Soft Collinear Effective Theory (SCET), an event shape distribution can be factored into simpler pieces, including the soft function which describes the corrections due to low energy QCD radiation.

In this talk I will present the calculation of a NNLO soft function for a new family of event shapes called C-Angularity. These event shapes are an extension of the C-parameter, and are of particular interest for determining the strong coupling constant α_S.

Presenter: BENNETT, Alex (Durham University)

Session Classification: The Pool of Precision

Contribution ID: **102** Type: **not specified**

Semileptonic Charm Decays on the Lattice

Wednesday 17 December 2025 20:20 (20 minutes)

Semileptonic Charm Decays on the Lattice

Author: ZUCHANKE, Aurelia (University of Liverpool)

Presenter: ZUCHANKE, Aurelia (University of Liverpool)

Session Classification: The Curious Exhibits and Mad Hatter's Dinner Party