3rd UK-QFT Meeting: Non-Perturbative Quantum Field Theory and Quantum Gravity

Report of Contributions

Contribution ID: **3** Type: **not specified**

Holographic Renormalisation

Friday 24 January 2014 10:30 (30 minutes)

I will give a brief introduction to holographic renormalization
and discuss recent applications.

Primary author: SKENDERIS, Kostas (University of Southampton)

Presenter: SKENDERIS, Kostas (University of Southampton)

Contribution ID: **19** Type: **not specified**

PhD Student Session

Friday 24 January 2014 16:00 (15 minutes)

Primary author: Dr SAUERESSIG, Frank (University of Mainz)

Presenter: Dr SAUERESSIG, Frank (University of Mainz)

Session Classification: PhD Student Session

Contribution ID: **20** Type: **not specified**

Asymptotic safety from Ricci scalars and beyond

Friday 24 January 2014 11:30 (30 minutes)

I plan to discuss aspects of the asymptotic safety conjecture for gravity for actions constructed from Ricci-scalar and -tensor invariants.

Primary author: LITIM, Daniel

Presenter: LITIM, Daniel

Contribution ID: **24** Type: **not specified**

Gravitational RG Flows on Foliated Spacetimes

Friday 24 January 2014 16:15 (1 hour)

The role of time and the possibility of spacetime carrying a foliation structure are long standing questions which lately received a lot of renewed attention from the quantum gravity community. In this talk, I will review recent progress in formulating a Wetterich-type functional renormalization group equation on foliated spacetimes and outline its potential applications. In particular, I will discuss first results concerning the RG flow of anisotropic gravity models, highlighting the possibility of dynamical Lorentz-symmetry restoration along the RG flow.

Primary author: SAUERESSIG, Frank

Presenter: SAUERESSIG, Frank

Contribution ID: **25** Type: **not specified**

Discrepancies of the Single Field Approximation in Asymptotic Safety

Friday 24 January 2014 12:00 (30 minutes)

Motivated by recent studies at Southampton (Morris and Dietz, JHEP 1307:064, 2013) of the f(R) approximation in Quantum Gravity have found that, in certain formulations of the truncated RG flow, the space of relevant eigenoperators is empty. We demonstrate with the well understood model of a single component scalar field in d=3 dimensions that the Single Field Approximation (SFA) used in Quantum Gravity, where we identify the background field as the full classical field, can lead to discrepancies in the fixed point structure. In our scalar field example, use of the SFA gives us new non-trivial fixed point but we lose the expected Wilson-Fisher fixed point. As a means to remedy this we apply the modified shift Ward Identity, recovering the standard result and demonstrating a form of universality among RG flows.

Primary author: Mr BRIDLE, Ismail (University of Southampton)

Presenter: Mr BRIDLE, Ismail (University of Southampton)

Contribution ID: **26** Type: **not specified**

Asymptotically Safe Starobinksy inflation

Friday 24 January 2014 15:00 (30 minutes)

I will discuss how Starobinsky inflation can be successfully embedded in a quantum gravitational context, and in particular within the scenario of Asymptotic Safety. After presenting the (non—perturbative) beta functions for Newton's coupling G and the dimensionless Rˆ2 coupling, I will show how an attractive, asymptotically free UV fixed point exists for the latter, while an asymptotically safe one exists for the former under the renormalisation group (RG). I will then explain how the realisation of observationally viable Starobinsky inflation is naturally ensured by the presence of the asymptotically free fixed point under the RG, for a wide range of scales. I will also discuss the corresponding RG dynamics of the action from the UV to IR, as well as how inflationary and classical observations define the renormalisation conditions for the gravitational couplings.

Primary author: SALTAS, Ippocratis

Presenter: SALTAS, Ippocratis

Contribution ID: **27** Type: **not specified**

Effective Dispersion Relations in Z=2 Lifshitz QED

Friday 24 January 2014 11:00 (30 minutes)

In studies of Lorentz-symmetry violating QFTs, phenomenological viability is often claimed from purely classical considerations with surprisingly little attention given to the effects of quantum corrections, presumably due to their supposed "smallness" and the difficulty of their calculation. In this talk I shall give a concrete example of a model in which this assumption is shown to be false- a model of QED with Lifshitz scaling (i.e. a scaling anisotropy between space and time). I shall discuss the relevant 1-loop corrections of this theory and some of the more interesting technicalities that arose in its renormalisation.

Primary author: Mr BRISTER, James (King's College London)

Presenter: Mr BRISTER, James (King's College London)

Contribution ID: **28** Type: **not specified**

Manifest Causality and the Path Integral

Friday 24 January 2014 14:00 (30 minutes)

We describe the calculation of manifestly-causal transition amplitudes over finite space-time domains. Specifically, we show how such amplitudes arise naturally within the path-integral representation of the Schwinger-Keldysh closed-time path formalism of non-equilibrium thermal field theory. We conclude by highlighting a difference in the resulting loop structure compared with the usual scattering-matrix case and discuss potential impacts on resummation.

Primary author: Dr MILLINGTON, Peter (University of Manchester)

Presenter: Dr MILLINGTON, Peter (University of Manchester)

Contribution ID: **29** Type: **not specified**

Sequestering the Standard Model Vacuum Energy

Friday 24 January 2014 14:30 (30 minutes)

We propose a very simple reformulation of General Relativity, which completely sequesters from gravity all of the vacuum energy from a matter sector, including all loop corrections and renders all contributions from phase transitions automatically small. The idea is to make the dimensional parameters in the matter sector functionals of the 4-volume element of the universe. For them to be nonzero, the universe should be finite in spacetime. If this matter is the Standard Model of particle physics, our mechanism prevents any of its vacuum energy, classical or quantum, from sourcing the curvature of the universe. The mechanism is consistent with the large hierarchy between the Planck scale, electroweak scale and curvature scale, and early universe cosmology, including inflation. Consequences of our proposal are that the vacuum curvature of an old and large universe is not zero, but very small, that wDE⊠–1 is a transient, and that the universe will collapse in the future.

Primary author: PADILLA, Antonio (University of Nottingham)

Presenter: PADILLA, Antonio (University of Nottingham)

Contribution ID: **30** Type: **not specified**

Supergravity, the super-Higgs effect and inflation

Friday 24 January 2014 13:30 (30 minutes)

Supergravity is a very well motivated theoretical paradigm, which, if it exists, must be broken at low energies. As such, understanding the origin of this symmetry breaking is key for making contact with known phenomenology. We detail a non-pertubative breaking mechanism for supergravity in the super-Higgs effect realised via gravitino condensation, which also provides a UV motivated, phenomenologically viable inflationary mechanism at no added cost. In practice this is achieved by direct computation of one loop corrections in relevant supergravity models, allowing the analytic form for the (quantum) condensate potential to be explicitly found. We present results consistent with known physics, and detail current research establishing contact between this scenario and the NMSSM.

Primary author: Mr HOUSTON, Nicholas (King's College London)

Presenter: Mr HOUSTON, Nicholas (King's College London)