Barry Dillon: Exploring holographic Composite Higgs Models

Simple Composite Higgs models predict new vector-like fermions not too far from the electroweak scale, yet LHC limits are now sensitive to the TeV scale. Motivated by this, we explore the holographic dual of the minimal model, MCHM5, to understand how far naive 4D predictions are from their 5D duals. We find that the usual hierarchy among the vector-like quarks is not generic. Specifically, we find that lowering the hierarchy of scales in the 5D picture allows for heavier top partners, while keeping the mass of the Higgs boson at its observed value. In the 4D dual this corresponds to increasing the number of colours N. Lastly, we show that 5D contributions to the top Yukawa can reduce the deviations that one would expect in a 4D model. We conclude that the 5D holographic realisation of the MCHM5 with a small hierarchy of scales may not be in tension with the current experimental data.

Lucía Fonseca de la Bella: Effective Field Theory of Large Scale Structures

The next generation of surveys in Observational Cosmology (Euclid, DES, WiggleZ, BOSS) will enable us to collect high precision cosmological data. Nevertheless, these observations would be pointless if they are not matched by theoretical predictions. For that purpose, it is important to take into account back-reaction from high-energy physics in the context of cosmological Large Scale Structure (LSS) formation. These surveys offer information about the distribution of galaxies and also about their velocity fields, which are affected by small-scale physics. Therefore, the effective field theory (EFT) formalism becomes an excellent tool since it allows us to capture all the relevant degrees of freedom of a system and to describe relevant physics at macroscopic scale of interest.

Johannes Noller: Symmetries and Dualities for Galileons

I will discuss new (enhanced) symmetries in scalar field theories and how the gauge-invariance of models can lead to non-trivial redundancies/ dualities in theory space.

James Scargill: Strong coupling scales in multi-gravity theories

Multi-gravity consists of multiple metrics (or vielbeins) with interactions between them. At the perturbative level they are theories of multiple interacting spin-2 fields all but one of which are massive, and are effective field theories which have a perturbative cutoff at some energy scale above their mass gap and below the Planck scale.

Lorenzo Fratino: An organizing principle for two-dimensional strongly correlated superconductivity

Superconductivity and Mott insulating phase intertwine in materials such as cuprates and organic conductors. We study the d-wave superconducting phase at finite temperature in the two-dimensional Hubbard model on the square lattice within cellular dynamical mean-field theory and continuous-time quantum Monte Carlo. The whole phase diagram as a function of temperature, doping and interaction strength shows that a transition to the superconducting state from a Mott insulator is obtained at the cellular dynamical mean-field level, whether the transition is bandwidth or doping driven.

Matthew Hull: Covariantised Higgs mechanism for vector Galileons

We shall discuss the construction of a non-minimally covariantised Higgs mechanism which generates a ghost free extension of the Proca equation spontaneously. The vector theories generated by this mechanism have been shown to have interesting cosmological applications.