FLEET
ARC CENTRE OF EXCELLENCE IN FUTURE LOW-ENERGY ELECTRONICS TECHNOLOGIES

SPA & FLEET COLLOQUIUM

On why strongly interacting Dirac fermions in two dimensions appear weakly interacting

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Abstract: Condensed matter realizations of two-dimensional Dirac fermions were once a theoretical novelty. Today, they are ubiquitous. I will begin by providing a general overview of various material systems that host Dirac fermions, with a particular focus on single monoatomic sheets of carbon called graphene – an electronic material that was isolated about ten years ago, and notable not only for its ease of preparation and theoretical simplicity, but also for its promise as future electronic devices.

Treating the electrons in graphene as weakly interacting massless Dirac fermions was met with strong validation from experiments, and in many ways, graphene became a textbook system to test some foundational ideas in condensed matter physics. However, graphene was always expected to be a strongly interacting electronic system, and the scarcity of any observations that could be definitively attributed to correlation physics was mysterious.

In this talk, I will focus on some of our most recent theoretical results where we use a combination of nonperturbative numerical and analytical techniques that incorporate both the contact and long-range parts of the Coulomb interaction. Within this framework, we will discuss applications of the theory to several open questions.

About the speaker: Shaffique Adam is an Associate Professor and an NRF Fellow at Yale-NUS College, National University of Singapore. A/Prof Adam is an expert in the theoretical physics of Dirac systems. An Associate Investigator in FLEET, he is working on gaining an understanding of the electronic transport and other properties of novel Dirac semimetals, as well as the conventional insulator to topological insulator transition in such systems.

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TIME: 2:00PM–3:00PM
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