

Colloque Département de physique / Colloquium Department of Physics
Faculté des sciences / Faculty of Science

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14 h 45 / 2:45 PM

(Café à 14 h 15 / Coffee at 2:15 pm)

ARC 233 / ARC 233

Emergent symmetries and properties in graphene multilayers

Sergio de la Barrera

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Abstract: Graphene is a beautiful and incredibly versatile platform for investigating emergent electronic phenomena. Confining electrons to two dimensions enhances their influence on one another, and empowers us to alter their environment with external fields and additional layers. Strategic combinations and arrangements of layered materials can yield new physics and surprising electronic properties. I will discuss how certain combinations lead to superconductivity, magnetism, and topology from materials that have none of these properties on their own, and how they can address essential questions in quantum materials research.

Bio: *Sergio de la Barrera* is an Assistant Professor in the Department of Physics. Originally from Mexico, he grew up in the United States, where he obtained a B.Sc. in Nuclear Engineering at the University of Tennessee, Knoxville and a PhD in Physics from Carnegie Mellon University. Prior to joining the University of Toronto, he held postdoctoral appointments at Carnegie Mellon University and the Massachusetts Institute of Technology.

His research focuses on the low-temperature physics of electrons in quantum materials, particularly in atomically thin materials like graphene. He is interested in how electrons behave and arrange themselves in extreme conditions where quantum effects dominate, at fractions of a degree above absolute zero and in large magnetic fields. Recently he has been investigating electronic behavior in layered crystals of graphene, each of which is a one-atom-thick layer of carbon atoms. When the layers are stacked with a small twist between the layers the graphene suddenly becomes superconducting, insulating or magnetic.

He is a member of the Center for Quantum Information and Quantum Control (<https://cqiqc.physics.utoronto.ca/>) and the Center for Quantum Materials (<https://cqm.physics.utoronto.ca/>) at the University of Toronto.