The Electrons in Your Pencil: Observations of a Carbon Flatland

Carbon is unique among elements due to the wide variety of structures that it can support. This property has long provided a playground for chemists and biologists, but it is only relatively recently that physicists have discovered what a flexible material carbon is for creating nanostructures with quantum mechanical behavior unlike any other substance. It is ironic that the most recent big breakthrough in the study of carbon-based materials has come from isolating the particulate matter of pencil scratchings, now called graphene. The irony is that from such mundane origins comes such a surprisingly interesting material. In this talk I will provide a termite’s view of graphene, and describe some of the phenomena that you would see if you could shrink yourself down to the size of an atom and jump into a graphene flatland. The tool that gives us this view is the scanning tunneling microscope (STM). I will describe how the STM gives us new insight into the unusual ways that electrons move in pieces of graphene that have been structured at the nanometer scale.

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