



ΣΕΜΙΝΑΡΙΑ ΦΥΣΙΚΗΣ ΔΙΑΚΕΚΡΙΜΕΝΩΝ ΕΠΙΣΤΗΜΟΝΩΝ

Τρίτη 10 Φεβρουαρίου 2026, ώρα 1:00 μμ

Διά ζώσης, στην Κεντρική Αίθουσα Συνεδριάσεων του Τμήματος Φυσικής.

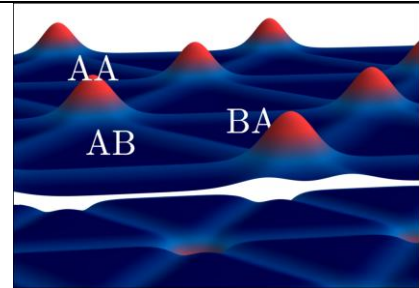
«Twistronics: the unconventional behavior of electrons in two-dimensional materials with a twist»

Efthimios Kaxiras

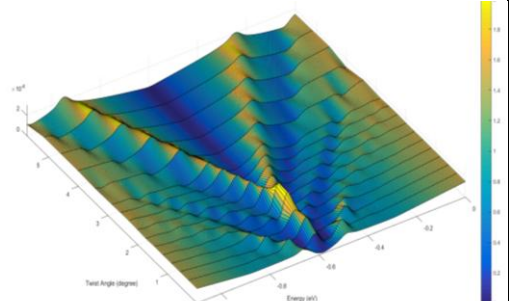
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In the past few years, the field of twisted multilayer graphene and other two-dimensional layered materials, including families of insulators and semiconductors, has blossomed to the point of being referred with by a new term, “Twistronics”. New structures, including multi-layers of successively twisted single layers, mixed layers, and multilayers of multilayers, are being studied experimentally and revealing ever richer behavior.

We discuss theoretical investigations of some representative systems, starting with the iconic twisted bilayer graphene (tBLG) near the so-called magic angle. Our work is based on first-principles calculations including full relaxation of atomistic degrees of freedom, from which simpler effective Hamiltonian models can be derived to describe the emergent phenomena. We focus on the realistic representation of single-particle states and how those can be employed in studying many-body physics related to Mott insulator behavior, superconductivity and other manifestations of correlated electronic states.



Perspective view of fully relaxed twisted bi-layer graphene, with characteristic domains (AA, AB, BA)



The density of states in tBLG, showing huge enhancement at the magic angle, $\sim 1.1^\circ$

Efthimios Kaxiras received his PhD in theoretical condensed matter physics from MIT. He is presently the John Hasbrouck Van Vleck Professor of Pure and Applied Physics at Harvard University. He has been a Visiting Faculty at ETH-Zurich, EPF-Lausanne, the University of Ioannina and the University of Crete. He has served as Director of Harvard's Institute for Applied Computational Science and the Initiative in Innovative Computing. He holds several distinctions such as Fellow of the American Physical Society and Chartered Physicist and Fellow of the Institute of Physics (London).

He has published widely in the area of computational materials science with emphasis on multiscale simulations of complex physical phenomena. He has also written two textbooks on the physics of solids. His recent research focuses on the extraordinary properties of two-dimensional, layered materials and in particular on the topic of *twistronics* (a term introduced by his research group).



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