Postdoctoral Fellowship Highlight

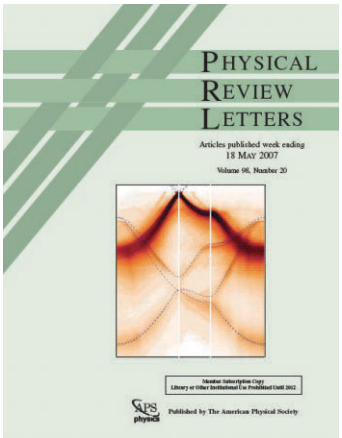
Taisuke Ohta, B.S., Ph.D., Physics

Years of Fellowship: 2006-2008
Collaborating Institution: Fritz-Haber Institute
Currently: Staff Scientist, Sandia National Laboratory

Project: **Synthesis and characterization of graphene**

Graphene, a single layer of carbon atoms arranged in a honeycomb, is one of the most attractive new materials to be discovered in recent years. Among its incredible properties, it has remarkably high tensile strength and electronic mobility. Furthermore, its electronic structure can be easily tailored and a variety of new device schemes have been proposed based on graphene. It also has fascinating properties of interest to fundamental physics, the most famous of which is that electrons in graphene propagate as though they were massless fermions.

A joint fellowship was established between ALS (E. Rotenberg) and the Fritz Haber Institute (Prof. Karsten Horn, collaborator) for Taisuke Ohta to study the properties of layered compounds, including graphite, with a two-fold purpose: to advance the ARPES instrumentation at beamline 7.0, and to study fundamental physics of two dimensional materials. The research led directly to fundamental advances in graphene just at the onset of a huge worldwide effort to study this material.



Principle findings of the research included the first ARPES measurement of the band structures of monolayer, bilayer, trilayer, and quadlayer graphenes, the determination of the growth modes of graphene using STM (with Mike Crommie Group at UCB) and NCEM's low energy electron microscope, and the direct determination of the out-of-plane screening constants. Together these papers [1-7] have been cited nearly 2600 times (as of Feb 2013)* and constitute a major contribution of ALS to condensed matter research. (This work was done in close collaboration with two other postdoctoral fellows, A. Bostwick and J. L. McChesney.)

After Taisuke's visit to the ALS, he moved to Sandia National Laboratory in New Mexico, where he is currently a staff scientist at the Sandia National Laboratory in New Mexico, working on low energy electron microscopy and other techniques. He has continued to be an ALS user, most recently studying the electronic properties of twisted bilayer graphenes [8]

[1] Controlling the electronic structure of bilayer graphene *OHTA, T; *BOSTWICK, A;

SEYLLER, T; et al. Science Volume: 313 Issue: 5789 Pages: 951-954 Published: AUG 18 2006

[2] Towards wafer-size graphene layers by atmospheric pressure graphitization of silicon carbide; Nature Materials Volume: 8 Issue: 3 Pages: 203-207 (2009)

[3] Quasiparticle dynamics in graphene, BOSTWICK, A; OHTA, T; SEYLLER, T; et al.; Nature Physics Volume: 3 Issue: 1 Pages: 36-40 (2007)

[4] Title: Interlayer interaction and electronic screening in multilayer graphene investigated with angle-resolved photoemission spectroscopy; OHTA, T; BOSTWICK, A; MCCHESNEY, JL; et al. Physical Review Letters Volume: 98 Issue: 20 Published: 2007

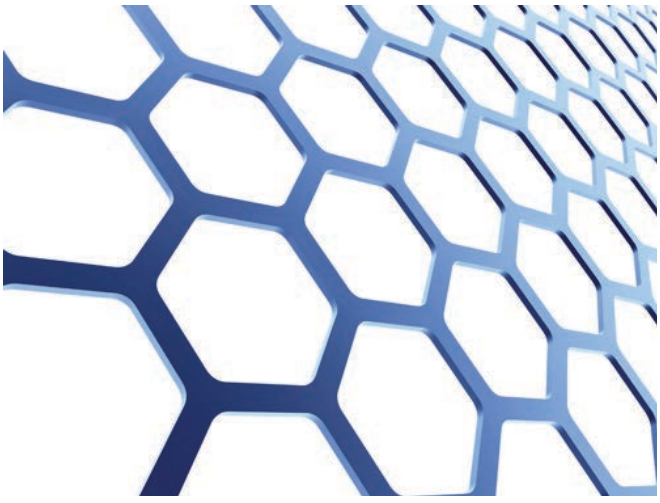
[5] Symmetry breaking in few layer graphene films; Author(s): BOSTWICK, A; OHTA, T; MCCHESNEY, JL; et al.; New Journal of Physics; Volume: 9 Published: 2007

[6] Title: Morphology of graphene thin film growth on SiC(0001), OHTA, T; EL GABALY, F; BOSTWICK, A; et al.; New Journal of Physics Volume: 10 Published: 2008

[7] Scanning tunneling spectroscopy of inhomogeneous electronic structure in monolayer and bilayer graphene on SiC; BRAR, VW; ZHANG, Y; YAYON, Y; et al; Applied Physics Letters; Volume: 91 122102 (2007)

[8] Evidence for Interlayer Coupling and Moiré Periodic Potentials in Twisted Bilayer Graphene. T. OHTA et al, Physical Review Letters 109, 186807 (2012).

**Citation statistics provided by Ġompson ISI, Feb 13, 2013.*



Graphene graphic