# Following the Nobel Prize, big things planned for graphene

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If you had never heard of “graphene” a few days ago, you might know something about it today – if you follow the Nobel Prize announcements.

Two physicists at the University of Manchester (UK) were awarded the Nobel Prize in Physics "for groundbreaking experiments regarding the two-dimensional material graphene," carbon flakes that are only as thick as a single atom yet as strong as steel and as conductive as copper.

But, what happens next for this revolutionary nanoscale material?

Two social scientists began a study earlier in 2010 to understand the as yet undeveloped pathway to the commercialization of graphene – the processes, plans, promises and perils. Team leaders with the Center for Nanotechnology in Society at Arizona State University (CNS-ASU), Jan Youtie at Georgia Institute of Technology (Georgia Tech) and Philip Shapira at the University of Manchester and Georgia Tech are in the throes of their project on the Comparative Research and Innovation Approaches of Graphene Centers.

Graphene is anticipated to have potential applications in electronics to build semiconductors beyond the limits of silicon-based technology. It also offers promising applications for higher performance solar cells, LCD screens and photon sensors. Now that graphene has been identified and found to be stable in ultra-thin sheets, research efforts to understand it more thoroughly and to produce it in large quantities have ballooned. Yet, graphene is still at the development stage, and its commercialization

pathway remains to be determined.

To kick-off their work on graphene innovation, Youtie and Shapira have been undertaking field work in two of the world's leading centers for graphene development: the University of Manchester and Georgia Tech. As acknowledged by the Nobel Committee for Physics when it awarded its 2010 Prize to Manchester physicists Andre Geim and Konstantin Novoselov, Manchester is the site of seminal work on graphene, including the first laboratory production of graphene sheets. Georgia Tech is the site of a National Science Foundation-funded Materials Science and Engineering Center (MRSEC) focused on research and development on epitaxial graphene.

Youtie's and Shapira's project seeks to understand similarities and differences in the plans, programs and approaches to commercialize graphene-related applications in both locations. This includes examination of both the strategies for research and development and those for fostering commercialization in terms of external partnerships in the metropolitan regions of Manchester and Atlanta, elsewhere in the country, and internationally. In addition to field work, Youtie and Shapira also are undertaking analyses of publications, patents, funding, and corporate activities in graphene.

Over the coming year, Youtie and Shapira plan to expand their research focus to other locations in the United States and around the world where graphene research and commercialization clusters are emerging. Although graphene's full impacts may take many years to materialize, the results of Youtie's and Shapira's research will provide real-time insights to researchers, companies, policymakers and other stakeholders keen to understand how research in specific nanotechnology domains moves into early applications, what barriers and concerns are raised, and how these are being addressed.

Youtie's and Shapira's pilot project has received travel funding from a UK-US Collaboration Development Award (CDA) of the British Embassy and British Consulates in the United States, with supplementary support through CNS-ASU and the Manchester Institute for Innovation Research.

## About CNS-ASU

In 2005, the U.S. National Science Foundation (NSF) announced a set of major grants in nanotechnology in society, including the creation of the Center for Nanotechnology in Society at Arizona State University (CNS-ASU) to pursue scholarship on and methodological and theoretical approaches to the social studies of nanotechnology. In 2010, NSF renewed its grant to fund CNS-ASU for another five years. CNS-ASU is the largest center for research, education and outreach on the societal aspects of nanotechnology in the world.

The guiding goals of CNS-ASU are two-fold: to increase the capacity for social learning that informs about the available choices in decision making about nanotechnology and to increase the ability of society and institutions to seek and understand a variety of inputs to manage emerging technologies while such management is still possible. Through this improved contextual awareness, CNS-ASU can help guide the path of nanotechnology knowledge and innovation toward more socially desirable outcomes and away from undesirable ones.

CNS-ASU pursues these goals through two cross-cutting research programs: real-time technology assessment (RTTA), including such activity as analyzing research and innovation systems, surveying public opinion and values, creating opportunities for public deliberation and participation regarding nanotechnology decision-making, and evaluating the impact of CNS-ASU activities; and two thematic research clusters (TRC) that investigate equity and responsibility, and human identity,

enhancement and biology.

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