ScienceWatch Home
Inside This Month...
Interviews

Featured Interviews
Author Commentaries
Institutional Interviews
Journal Interviews
Podcasts

Analyses

Featured Analyses
What's Hot In...
Special Topics

Data & Rankings

Sci-Bytes
Fast Breaking Papers
New Hot Papers
Emerging Research Fronts
Fast Moving Fronts
Research Front Maps
Current Classics
Top Topics
Rising Stars
New Entrants
Country Profiles

About Science Watch

Methodology
Archives
Contact Us
RSS Feeds

AUTHOR COMMENTARIES - From Special Topics

Graphene - December 2008
Interview Date: January 2009

PDF

Zhihong Chen

From the Special Topic of Graphene

One of the key papers in the Research Front on Graphene Nanoribbons (which has been mapped), part of our Special Topic on Graphene, is "Graphene nano-ribbon electronics," (Chen ZH, et al., Physica E *40[2]: 228-32, December 2007), which has garnered 39 citations since its publication and up to August 31, 2008.*

Lead author Dr. Zhihong Chen is the Manager of the Carbon Technology Group at the IBM T.J. Watson Research Center. In Essential Science Indicators*SM from Thomson Reuters, her papers can be found in the fields of Physics, Chemistry, Materials Science, and Engineering.*

In the interview below,* ScienceWatch.com *talks with Dr. Chen about this paper and its significance in the field of graphene research.

SW: Would you please describe the significance of your paper and why it is highly cited?

In our paper, we demonstrated one of the first graphene nano-ribbon devices with channel width down to 20nm and showed the possibility of opening up a band gap in this semi-metal material. We also discussed the impact of the ribbon edges on device transport. Opening a band gap, which can strongly impact the technological values of graphene in many electronic applications, is an important topic in the graphene field. Many researchers are looking into this direction and realizing that the ribbon edges play important roles in device characteristics. Our paper provided the first experimental evidence and led to further research and discussions.

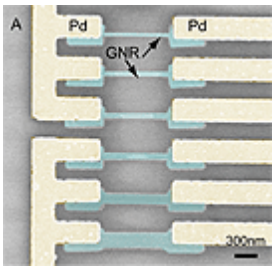
SW: How did you become involved in this research, and were there any particular successes or obstacles that stand out?

I have been working on carbon nanotubes for many years. When the first graphene paper, by Prof. Geim's group from the University of Manchester, came out in 2005, I noticed the close relationship between nanotubes and graphene and immediately identified the importance of creating a band gap in graphene. I started doing research along this path in 2006. Patterning graphene into nano-ribbons turned out to be quite smooth and we got our first set of electrical data at the end of 2006.

SW: Where do you see your research and the broader field leading in the future?

If we can identify a method to create a larger band gap in graphene and eliminate the edge effects in the transport, I expect to see more research activities on graphene towards electronic applications like logic devices and circuits. There is a strong urge to look for post-Si solutions; graphene can be one of the most promising candidates for that application if a large enough band gap can be created.

Figure 1:



+ View larger image & details

SW: What are the implications of your work for this field?

My work is one of the first experimental evidences that quantization can be intentionally introduced to a two-dimensional system and create a one-dimensional transport regime. Graphene is a material with excellent electronic properties and, at the same time, is easy to integrate with conventional semiconductor techniques. Of course, large-scale graphene growth or deposition needs to be demonstrated with a good control on thickness and material quality, in order to develop a practical technology out of graphene.

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Figure 1:

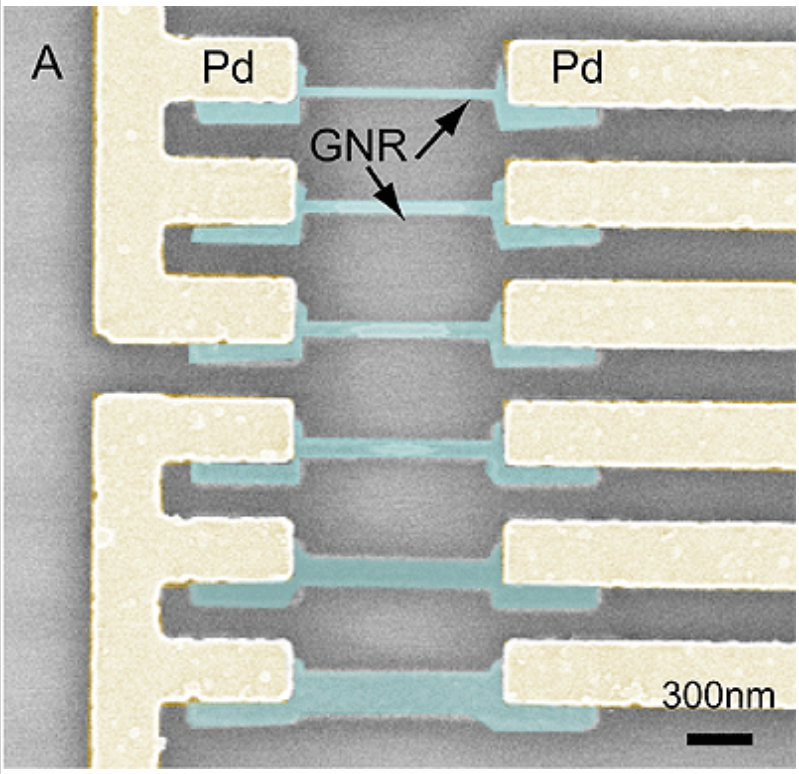

Figure 1:

Graphene Nano -ribbons. View the Research Front Map of Graphene Nano-ribbons.

Zhihong Chen's current most-cited paper in *Essential Science Indicators*, with 39 cites:

Chen ZH, *et al.*, "Graphene nano-ribbon electronics," *Physica E* 40(2): 228-32, December 2007.
Source: *Essential Science Indicators* from Thomson Reuters.

Keywords: graphene nano-ribbon devices, channel width, band gap, semi-metal material, ribbon edges, device transport, electronic applications, quantization.

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