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News

Graphene speeds pair to Stockholm win

Research on carbon sheets scores Nobel Prize in Physics.

Geoff Brumfiel

Sheets of carbon with the potential to revolutionize electronics and materials science have bagged this year's Nobel Prize in Physics. Andre Geim and Konstantin Novoselov at the University of Manchester, UK, have been awarded the prize for their work on graphene, a one-atom-thick hexagonal mesh of carbon atoms that has become physicists' material *du jour*.

Konstantin Novoselov (left) and Andre Geim: from sticky tape to Nobel prize in just six years.

Univ. Manchester (K. N.); J. King-Holmes/SPL (A. G.)

Geim and Novoselov reported the first free-standing graphene samples in 2004, having used little more than adhesive tape to create the material. Their team stuck the tape to a piece of graphite, peeled off flakes of carbon and then separated graphene from the rest of the flakes. Placing the graphene onto a silicon substrate, the researchers showed that it is a good electrical conductor[1].

Graphene's relatively recent rise to prominence makes it an unusual candidate for a Nobel, and marks the shortest lag-time between experiment and award since Johannes Georg Bednorz and Karl Alexander Müller won the physics prize for their discovery of high-temperature superconductivity in 1987, 18 months after their findings were published.

"I think very few doubted that there would be a Nobel prize," says Andrea Ferrari, an electrical engineer at the University of Cambridge, UK, who researches graphene applications. But, he adds, "I was surprised that it came so early." The award caught even Geim off guard. "When I got the telephone call, I thought, 'oh shit!'", he told reporters at a press conference shortly after the announcement. "The second thought that came to my mind was, 'Oh dear, I will not win many more prizes'."

Graphene's win may be down to the astonishing speed at which the field has developed. Almost immediately after its discovery, researchers realized that graphene was no ordinary material. Electrons travelling through the sheets display unusual quantum behaviours that can be easily studied[2,3]. Graphene's two-dimensional nature, and its atomic structure, also causes electrons to move through it much faster than they do through materials such as silicon.

These properties make graphene a hot prospect for constructing computer chips. Although the sheets themselves do not behave as semiconductors, thin ribbons of graphene do. The ribbons' properties are not ideal for electronics, but advocates believe that graphene's speedy electrons and potential affordability could allow it to one day supplant silicon. A nearer-term use may be as a transparent, conducting

layer in touch screens[4], or as flexible displays.

Graphene has also been teamed with DNA to create a chemical sensor, and can even act as a sponge to clean polluted water. Geim thinks that the material has the potential to be as revolutionary as plastics. "My hope is that graphene and other two-dimensional crystals will change our everyday lives," he says.

References

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