Professor Sir Konstantin (Kostya) S. Novoselov FRS Curriculum Vitae

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Research Field *Condensed matter physics; Mesoscopic transport, superconductivity and ferromagnetism; Nanostructures and Nanofabrication ; Graphene and other two-dimensional crystals*

Professor Kostya Novoselov is a condensed matter physicist, specialising in the area of mesoscopic physics and nanotechnology. He has broad research interests from mesoscopic phenomena in ferromagnets and superconductors to electronic properties if two-dimensional (2D) electron gas in GaAs/AlGaAs heterostructures and graphene. He also has got a vast background in nanofabrication and nanotechnology.

Professional Career

since 2021	Director of the Institute of Functional Intelligent Materials, Singapore
since 2019	Tan Chin Tuan Centennial Professor, National University of Singapore
since 2015	Chief scientific advisor, National Graphene Institute, UK
since 2014	Royal Society Research Professor
since 2013	Langworthy Professor of Physics, University of Manchester
2010- 2013	Professor of Physics, University of Manchester
2007- 2014	Royal Society Research Fellow at the University of Manchester, UK
2005- 2006	Leverhulme Research Fellow at the University of Manchester, UK
2004	PhD at the High Magnetic Field Laboratory, University of Nijmegen, The Netherlands
2001- 2005	Researcher at the University of Manchester, UK
1999- 2001	Researcher at the High Magnetic Field Lab., University of Nijmegen, The Netherlands
1997- 1999	Researcher at the Institute for Microelectronics Technology, Chernogolovka
1997	MSc with *cum laude* from the Moscow Physical-Technical University

Prizes:

2019: Otto Warburg Prize and Lecture by *The Otto Warburg Chemistry Foundation*
"for the discovery of the unusual quantum properties of one atom thick two-dimensional materials"

2016: Dalton Medal, *by the Manchester Literary and Philosophical Society*

2016: Carbon Medal, *by the Americal Carbon Society*
The Medal of Achievement in Carbon Science and Technology is the award given by the American Carbon Society for the "... outstanding contributions to the discovery of novel carbon products or processes."

2014: Onsager Medal, *by Onsager committee at the Norwegian University of Science and Technology*
"for his work on van der Waals heterostructures"

2013: Leverhulme Medal, *by the Royal Society*
"for revolutionary work on graphene, other two-dimensional materials and their heterostructures that has great potential for a number of applications, from electronics to energy"

2012: The Kohn Prize Lecture, *by the Kohn Foundation*
"...for development of new class of materials: two-dimensional atomic crystals"

2011: W L Bragg Lecture Prize from International Union of Crystallography
"... for his work on two-dimensional atomic crystals"

2010: Nobel Prize in Physics
„...for groundbreaking experiments regarding the two-dimensional material graphene"

2008: Europhysics Prize
...for discovering and isolating a single free-standing atomic layer of carbon (graphene) and elucidating its remarkable electronic properties.

2008: Technology Review-35 Young Innovator
„...Technology Review honour the young innovators whose inventions and research they find most exciting"

2008: International Union of Pure and Applied Science, Young Scientist Prize
...for his contribution in the discovery of graphene and for pioneering studies of its extraordinary properties

2008: University of Manchester Researcher of the Year

2007: Nicholas Kurti European Prize
...to recognise the novel work in the fields of Low Temperatures and High Magnetic Fields

Professional Leadership:

Prof. Novoselov was awarded *Europe Research Council (ERC)* Synergy grant under FP7 in November 2013 (jointly with Prof. Falko and Prof. Ferrari). This was the first wave of the Synergy grants ever awarded, in which 11 grants were given (chosen from 700 applications). The project is planned for 6 years, worth around £10.5M and will require intensive research efforts from Prof. Novoselov.

Also, Prof. Novoselov is involved in co-ordination (via Scientific Advisory Council) and implementation (work-package "Fundamentals") of the European Graphene Flagship project (a 1bEuro initiative from the European Union). The project commenced in October 2013 and is expected to last for 10 years.

National Graphene Institute (UK)

Prof. Novoselov led the design, construction and establishment of the National Graphene Institute in Manchester. He also was its first scienctific director. He keeps the role of the chief scientific advisor for the National Graphene Institute.

Awards:

2019: Awarder Tan Chin Tuan Centennial Professor, National University Singapore

2019: Elected a foreign member of the National Academy of Sciences, USA

2019: Elected a member of Asia Pacific Academy of Materials

2015: Elected a member of Academia Europaea

2014: Awarded Royal Society Research Professorship

2013: Elected a foreign member of the Bulgarian Academy of Science

2013: Awarded Langworthy professor of physics, University of Manchester

2013: Awarded the Honorary Freedom of the City of Manchester
for his groundbreaking work on graphene

2012: Chosen among "Britain's 50 New Radicals" by *NESTA* and *The Observer*

2011: Awarded Knighthood of the British Empire (Knight Bachelor)
for his service to Science

2011: Awarded honorary degree of Doctor of Science from the University of Manchester

2011: Elected Fellow of the Royal Society

2011: Elected Honorary Fellow of the Royal Society of Chemistry

2011: Elected Honorary Fellow of the Institute of Physics

2010: Awarded Knight Commander of the Order of the Netherlands Lion
for his service to Science

2010: Awarded Honorary Professor of Moscow Institute of Physics and Technology (State University)

2008: European Research Council, Starting Grant
"Physics and Applications of Graphene"

2006: Royal Society Research Fellowship
"The scheme by The Royal Society aims to provide outstanding scientists, who should have the potential to become leaders in their chosen field, with the opportunity to build an independent research career."

2004: The Leverhulme Trust, Early Career Fellowship

Publications

Total citations: > 200,000 times. h-index >120. Current citation rate: > 20,000 per annum
One paper is cited over 40,000 times, Two - over 25,000 times, five – over 11,000 times, >30 – over 1,000 times.
Novoselov's *Science* 2004 paper is named among top 100 most cited papers ever in all fields.

Novoselov has published over 350 papers (mainly as the leading or the corresponding author) with more than 25 papers in *Nature* and *Science*, more than 60 *Nature Physics*, *Nature Materials*, *Nature Nanotechnology* and *Nature Communications* papers and 17 *Physical Review Letters*.

Novoselov's two papers in *Science* 2004 and *Nature* 2005 are the most cited papers on graphene and *"have opened up a fast moving front"* (according to *ISI's Essential Science Indicators*^{SM}). The *Science* paper was also included into the top 100 most cited papers of all time among all subjects.

Every year since 2014 Kostya Novoselov is included in the list of the most highly cited researchers.

He was also named among the 17 hottest researchers world-wide - "individuals who have published the greatest number of hot papers during 2012-2013"

Kostya Novoselov made into a shortlist of scientists with multiple hot papers for the years 2007-2008 (shared second place with 13 hot papers) and 2009 (5th place with 12 hot papers).

RÉSUMÉ OF RESEARCH (in chronological order)

- *Mesoscopic Superconductivity.* Novoselov has participated in development of a pioneering technique named ballistic Hall magnetometry, which for the first time allowed magnetisation measurements of individual superconductors of submicron size. This work has led to a number of surprising and counter-intuitive observations, such as giant, fractional and "negative" vortices and the paramagnetic Meissner effect. The work has received significant media attention, including dozens of articles in scientific magazines.

A.K. Geim, S.V. Dubonos, I.V. Grigorieva, *K.S. Novoselov*, F.M. Peeters & V.A. Schweigert. Non-Quantized Penetration of Magnetic Field in the Vortex State of Superconductors, *Nature* **407**, 55-57 (2000).

- *Sub-atomic movements of magnetic domain walls*. Novoselov has exploited the technique of ballistic Hall micromagnetometry to detect sub-nanometre changes in the position of individual domain walls in ferromagnetic materials. In particular, he has succeeded in the first direct observation of a condensed-matter object (a domain wall, in this case) moving between adjacent Peierls valleys and discovered a new unexpected mechanism of its propagation between the valleys.

K.S. Novoselov, A.K. Geim, S.V. Dubonos, E.W. Hill, I.V. Grigorieva. Subatomic Movements of a Domain Wall in the Peierls Potential, *Nature* **426**, 812-816 (2003).

- *Gecko tape*. Novoselov took an active part in demonstration of a new microfabricated adhesive, which is based on the same physics mechanism that underlies the amazing climbing ability of geckos. The work is highly rated among experts as the first proof of concept of dry adhesives based on van der Waals interaction. The research also attracted significant media attention. Several large and well-funded research groups, including labs at DuPont and TESA, now follow our work and have established their own research programmes on gecko tape.

A.K. Geim, S.V. Dubonos, I.V. Grigorieva, *K.S. Novoselov*, A.A. Zhukov, S.Y. Shapoval. Microfabricated Adhesive Mimicking Gecko Foot-Hair, *Nature Materials* **2**, 461-463 (2003).

- *Two-Dimensional Atomic Crystals*. Most recently, Novoselov has reported the discovery of a new class of materials – free-standing two-dimensional crystals – including single layers of graphite, boron-nitride, several dichalcogendes and complex oxides. Unexpectedly, these atomically-thin sheets (essentially gigantic 2D molecules unprotected from the immediate environment) are stable under ambient conditions, exhibit high crystal quality and are continuous on a macroscopic scale. For example, graphene (a monolayer of graphite) can be viewed as a flat fullerene molecule or as millions of carbon nanotubes somehow unrolled and stitched together. There is no doubt about the exceptional new physics that graphene offers. Quasiparticles in graphene behave like massless relativistic fermions described by the Dirac equation rather than the standard Schrödinger equation that is used to describe other materials. Novoselov has proven this in a series of elaborate experiments that led to a new paradigm of "relativistic-like condensed matter" where quantum relativistic phenomena can now be studied in bench-top nanoscience experiments. He also demonstrated first electronic devices based on graphene, which significantly improved prospects of carbon-based electronics beyond the Si age. One-atom-thick membranes made by Novoselov and coworkers group opened up new horizons in many technological areas.

For review, see A.K. Geim, *K.S. Novoselov*. The rise of graphene. *Nature Materials* **6**, 183-191 (2007).
K.S. Novoselov, A.K. Geim, S.V. Morozov, D. Jiang, Y. Zhang, S.V. Dubonos, I.V. Grigorieva, & A.A. Firsov. Electric Field Effect in Atomically Thin Carbon Films, *Science* **306**, 666-669 (2004).
K.S. Novoselov, D. Jiang, T. Booth, V.V. Khotkevich, S. V. Morozov, & A.K. Geim. Two Dimensional Atomic Crystals. *PNAS* **102**, 10451-10453 (2005).
K.S. Novoselov, A.K. Geim, S. V. Morozov, M.I. Katsnelson, I.V. Grigorieva, S.V. Dubonos, & A.A. Firsov. Two Dimensional Gas of Massless Dirac Fermions in Graphene, *Nature* **438**, 197-200 (2005).
K.S. Novoselov, E. McCann, S.V. Morozov, V.I. Fal'ko, M.I. Katsnelson, U. Zeitler, D. Jiang, F. Schedin, & A.K. Geim. Unconventional quantum Hall effect and Berry's phase of 2 in bilayer graphene, *Nature Phys.* **2**, 177-180 (2006).
K.S. Novoselov, Z. Jiang, Y. Zhang, S.V. Morozov, H.L Stormer, U. Zeitler, J.C. Maan, G.S. Boebinger, P. Kim, & A.K. Geim. Room-temperature quantum hall effect in graphene, *Science* **315**, 1379 (2007).
J.C. Meyer, A.K. Geim, M.I. Katsnelson, *K.S. Novoselov*, T.J. Booth, & S. Roth. The structure of suspended graphene sheets, *Nature* **446**, 60-63 (2007).
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D. C. Elias, R. R. Nair, T. M. G. Mohiuddin, S. V. Morozov, P. Blake, M. P. Halsall, A. C. Ferrari, D. W. Boukhvalov, M. I. Katsnelson, A. K. Geim, & *K. S. Novoselov*. Control of Graphene's Properties by Reversible Hydrogenation: Evidence for Graphane, *Science* **323**, 610-613 (2009).
A. S. Mayorov, D. C. Elias, M. Mucha-Kruczynski, R. V. Gorbachev, T. Tudorovskiy, A. Zhukov, S. V. Morozov, M. I. Katsnelson, V. I. Fal'ko, A. K. Geim, & K. S. Novoselov. Interaction-Driven Spectrum Reconstruction in Bilayer Graphene, *Science* **333**(6044), 860-63 (2011).
D. A. Abanin, S. V. Morozov, L. A. Ponomarenko, R. V. Gorbachev, A. S. Mayorov, M. I. Katsnelson, K. Watanabe, T. Taniguchi, K. S. Novoselov, L. S. Levitov, & A. K. Geim. Giant Nonlocality Near the Dirac Point in Graphene *Science* **332**(6027), 328-30 (2011).