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Physics Nobel Prize 2010: Andre Geim

When the name 'Geim' is mentioned in front of a table of physicists, the brilliant, creative, inventive, and goal-oriented, Andre Geim, who was born in October of 1958 in Sochi, Russia, is brought to mind (Nobel Prize Organization). Geim lived in the Soviet Union, while both of his parents worked as engineers. After high school, Geim attended the Moscow Institute of Physics and Technology where he studied solid-state physics – a field of study that initially was on the backburner for Geim, behind astrophysics and particle physics. After acquiring his PhD, Geim was a researcher at the Institute for Microelectronics Technology at RAS and thereafter, from 1990, worked as a post-doctoral fellow at Nottingham, Bath, and Copenhagen University. At Nottingham station with an empty wallet, but a propensity to approach every turn with a smile, Geim was a quirky researcher who had "a need to prove himself" in everything he did (Economist). Despite his successful work, Geim moved to the University Manchester, where he joined the Condensed Matter Physics Group and began his research on the properties of two-dimensional materials (Slate). It was in this same Group, that Geim proceeded to win the Nobel Prize in 2010.

The Nobel Prize was awarded to two physicists in 2010. Both Andre Geim and his partner, Konstantin Novoselov won the Prize for their work on graphene. Geim and Novoselov "found graphene hiding out in the graphite from an ordinary pencil" (Slate). Geim ran into a piece of discarded Scotch tape that had "flakes of graphite thin enough to be translucent" (Economist) on them. By repeating this process of picking up flakes of graphite using Scotch tape, Geim found, that under magnification, a "neat hexagonal lattice of pure carbon, one atom thick" (Economist). This discovery was significant because the thin sheets of graphite – also known as graphene proved to be exceptionally stable, conductive, and durable. Geim's discovery demonstrated that carbon "in such a flat form has exceptional properties that originate from the remarkable world of quantum physics" (Nobel Prize Organization). Geim asserts that graphene has potential to be an "economic powerhouse" that would revolutionize the world economy - with uses ranging from Djokovic's tennis racket, to a coolant for radioactive Fukushima reactors.

Geim's discovery, however, was ostensibly unintentional. The discovery came from a project in 2002 by a new Chinese doctoral student of Geim's that was in need of a physics project. Intrigued by a potential of "connecting an ultra-thin layer of graphite to a pair of elctrodes" (Economist), Geim recommended to his student, Da Jiang, that he should "see what could be obtained by polishing [graphite]" (Economist). During this process, researcher Oleg Shklyarevskii, from Ukraine, heard of Geim's recommendation, and, when "rummaging [through]… a

bin" from Da's lab, Oleg first discovery the slivers of graphite on the tape. Following this discovery, Geim continued on to examine the slivers even further, which led to the discovery of graphene.

Subsequent to the discovery of the Graphite slivers, Geim "diverted resources to find better ways of producing graphene" (Nobel Prize Organization). While other Universities and Institutions were investigating the potential of graphene, Geim's team and the University of Manchester were much further ahead in the field. Geim and Novoselov published their first paper, the "Electric Field Effect in Atomically Thin Carbon Films" in October of 2004, which, despite how short it was, became one of the most commonly cited papers in it's field.

While their work on graphene was done at the University of Manchester, Geim and Novoselov both had different roots that influenced their work. Geim, having grown up in the Soviet Russia, spoke little English. When Geim first showed up at Nottingham station after obtaining freedom from Russia's policy of glasnost, Geim struggled to fit in. Geim believes, however, that his strong Russian accent potentially "annoyed his new colleagues" (Economist). Peter Main, a professor at the University of Nottingham, and a colleague that worked with Geim, theorizes that Geim's difficulty fitting in with his peers derived from how his insecurities, and subsequently incentivized him to move to the University of Manchester. It was at this University, Geim's work on graphene went underway.

External to Physics, Geim faced few influences in Oxford, United Kingdom. In fact, the most significant incident at the time was the Olympics in August of 2004. Later on in October, before Geim's paper was published, Tony Blair, the Prime Minister of the UK at the time, announced his intention to resign. However, neither of these factors influenced Geim more than any other political change at the time. The only noticeable factor that influenced Geim's work was his failure to achieve cohesion with his peers at Nottingham, which helped persuade his move to the University of Manchester.

However, another, earlier factor, influenced Geim's direction and life and research altogether – this factor came from his childhood. Post-high school, Geim was denied acceptance into the Moscow Engineering Physics Institute, where he believes discrimination on behalf of his German ethnicity prevented his acceptance, ultimately led him to the Moscow Institute of Physics and Technology, where he chose to study solid-state physics. Ultimately, it was this rejection, and new field of study, that provided him a path to discovering graphene.

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