(idw)

Pressemitteilung

Schwedischer Forschungsrat - The Swedish Research Council

Annika Sand, Linnaeus University.

09.01.2018

http://idw-online.de/de/news687198

Forschungsergebnisse
Physik / Astronomie
überregional

Dissertation increases understanding of how electrons behave at the nano level

Becoming a researcher was a long-term goal for Alexander Gustafsson which was realized when he realized that, with the help of computers, he could model almost anything in physics. The TV series The Big Bang Theory was also a source of inspiration.

Research is rarely a wide and straight freeway towards the destination. The road is often narrow and crooked and the target is difficult to find. As for Alexander Gustafsson, who just before Christmas presented his doctoral thesis in Physics at Linnaeus University, "Theoretical Modeling of Scanning tunneling microscopy".

"One year before the dissertation, it looked dark for the second time. I was heading into a dead end. In a final attempt, I made a substantial calculation, several days on a supercomputer, far more accurate than I thought would be necessary, and it yielded results that were similar to the corresponding experiments. It was a turning point; now I knew that my thesis would reach its goal."

Alexander's research is about the transport of electrons in nanostructures and his tool is the computer. His research area is scanning tunnel microscopy, a tool that can be used to "look" at molecules through their electrical properties. At nano levels, at distances comparable to atomic magnitude, the electrons don't behave like we are used to. Instead, quantum mechanics must be used to explain an electric current through a molecule, for example.

"The most important results are that using the computer, with the help of mathematical and physical models, I have repeatedly managed to recreate reality, that is, quantum mechanical experiments. I have thus managed to calculate scanning tunnel microscopy images that are very similar to the corresponding experiments in reality."

Since Alexander works primarily with basic research, the main objective of his research is to better understand why nature behaves as it does, not practical applications. Nevertheless, he can see application fields for the theoretical models that he, together with his supervisor, has created.

"An increased understanding of how electrons behave in nanostructures can contribute to the development of smaller transistors, which is important in order to extract as much computational power as possible from a smart phone, for example."

After focusing on road cycling for a few years, Alexander began studying physics in 2008. He immediately decided to eventually go for a doctor's degree. At the time he didn't really know what that meant, but he was looking for a long-term goal that was difficult but possible to achieve.

"The very interest in research, I received during the writing of my master's degree, when I realized that computer calculations can model almost anything in physics. At that time, I also watched the TV series The Big Bang Theory a lot,

which, admittedly, gives an embellished image of the reality as a physics scientist, but where reality is reflected quite felicitous on a regular basis."

More information
Alexander Gustafsson, PhD in Physics, +46 (0)470-70 87 41, alexander.gustafsson@lnu.se

Anders Runesson, Research Communications Officer, +46 (0)470 70 81 70, anders.runesson@lnu.se

URL zur Pressemitteilung: http://The thesis in the research database DiVA
URL zur Pressemitteilung: http://lnu.diva-portal.org/smash/record.jsf?pid=diva2%3A1160381&dswid;=5796