RECOGNITION OF FIVE PHDS

Read about some of the most interesting research results produced by the latest PhD year group at Aarhus University. The five researchers each receive the AUFF Talent Prize for their PhD projects.

FILIP GRAUGAARD ESMARCH

Th s year is the 17th time the research foundation awards its PhD prize to highly talented researchers who have conducted research at an impressively high level. The five PhDs receive the DKK 50,000 prize in recognition of their research and dissemination hereof.

Together the university and research foundation have selected the best candidates, considering both the quality of the theses as well as the overall efforts of the researchers in the course of their training.

Th s time the prize goes to a doctor, a physicist, a student of political science, an anthropologist and a chemical engineer. Th y have enriched the research literature with new knowledge on HIV research, high-precision measurements using quantum sensors, the destabilisation of political regimes, the liveliness of Kalahari landscapes and flow batteries for storing green energy, respectively.

FACTS ABOUT THE PHD PRIZE

- The Aarhus University Research Foundation instituted its annual PhD Prize in connection with the university's 75th anniversary in 2003.
- Based on recommendations from the faculties the Aarhus University graduate schools recommends a number of candidates for the prize, before the senior management team and the research foundation make the final recommendation.
- All recipients have completed their PhD project in the previous year, in this case in 2018.

EVIDENCE-BASED INSTRUCTIONS FOR THAWING BLOOD

BO LANGHOFF HØNGE

HIV RESEARCH

Bo Langhoff Hønge has researched the two types of HIV virus. In the process he has, among other things, identified an improved method for thawing frozen blood samples.

The e are two types of the Human Immunodefi iency Virus (HIV) of which HIV-2 has never really left the African continent. Various aspects of the two types still remain to be uncovered, but now Doctor Bo Langhoff Hønge's PhD project has taken the research a step further.

In the West African country of Guinea-Bissau, a group of AU researchers have been collaborating with a local HIV clinic since 2007. During his research training, Bo Langhoff Hønge took on the role as academic head of the clinic responsible for the eight local assistants who, among other things, assist with blood samples and registration. Concurrently, he spent a lot of time in the laboratory in Aarhus.

'Combining one of the best places in the world to do research with one of the most difficult has been interesting', says Bo Langhoff Hønge.

He began by conducting two method projects. The first was prompted by a concrete problem concerning the blood samples made in Guinea-Bissau. Here he learned that there was a need for evidence-based instructions for thawing the samples in a way that ensures that the largest number of cells survive. After thorough tests he came up with a better approach than the existing. In the second method project he learned which HIV test best distinguishes between the two types of HIV.

'Th s enabled me to compare the immune system and level of virus in the blood of persons with one of the two types of viruses and persons with both', Bo Langhoff Hønge explains.

HIGH-PRECISION MEASUREMENTS WITH HUGE POTENTIAL

ALEXANDER HOLM KIILERICH

QUANTUM METROLOGY

Alexander Holm Kiilerich has significantly increased the precision of measurements made using quantum sensors. His research can be used in countless areas, including cancer research.

'Due to its wave function, an atom is scattered across the room. So the atom can be both here and there at the same time. But that is only until we measure it, because once we have measured the atom, naturally it is where our measurement says it is. Within quantum mechanics this means that we as observers affect the physical condition of the atom simply by looking at it. We call this the measuring counter-effect', says Physicist Alexander Holm Kiilerich.

In his thesis he demonstrates how you can reverse the counter-effect in practice to your own advantage, making measurements much more precise.

'At this point in the technological development it is becoming increasingly relevant to understand these quantum systems and how they can be used in the development of various types of instruments. It is interesting as a theoretician to be able to develop strategies and methods that may be relevant a few years from now', he says.

Working on his PhD project, Alexander Holm Kiilerich collaborated, among others, with an experimental research group in Paris on a test showing how quantum metrology can be used to make images from a hospital scanner much more detailed, e.g. clearly revealing dysplasia.

POLITICAL CHOICES CAN HELP OVERTHROW DEMOCRACIES

SUTHAN KRISHNARAJAN
POLITICAL INSTABILITY
Sometimes financial crises affect the stability of a political regime, sometimes they do not. Suthan Krishnarajan wanted to determine what decides the matter.

'Why do some countries manage to scrape through severe finan ial crises, while other democracies or autocracies break down when faced with similar finan ial conditions?'

PhD in political science Suthan Krishnarajan asked this question in his thesis, which offers a more nuanced answer than researchers have so far been able to provide. He used new statistical methods to answer the question.

'I took as my starting point existing data sets covering all democracies and autocracies in the world from 1875 till today. I combined this data with data I constructed for various types of finan ial crises in the same period. Th s enabled me, via statistical analyses, to determine what decides whether the effect of a crisis is extensive or limited in time and space', he says.

Suthan Krishnarajan shows how a destabilisation process consists of a series of stages – from general dissatisfaction with the democracy through fundamental challenges in the form of coup attempts or civil war to collapse or retaliation by the government. He also demonstrates that different conditions are vital in various stages of the process. And paradoxically, something that can really stabilise a democracy is when a finan ial crisis is combined with elections.

THE LIVELINESS OF LANDSCAPES

PIERRE DU PLESSIS
CROSS-DISCIPLINARY ANTHROPOLOGY
Pierre du Plessis has studied the landscape in Kalahari seen through the eyes of the native San people. This offers a whole new perspective on human-nature coexistence.

In his thesis Anthropologist and PhD Pierre du Plessis presents a complex understanding of what he terms the liveliness of landscapes in the Kalahari Desert in Southern Africa through a study of the dynamic interactions of various organisms – plants, fungi, animals, humans. Th ough fi ld studies among the San people (the so-called Bushmen) Pierre du Plessis has learned the art of tracking antelopes and desert truffles. Nevertheless, his research cannot be described as traditional anthropology.

'In fact, the very object of the study was the landscape in the Kalahari Desert. So I did not focus on the life and culture of the San people. But through my work with people who are experts in tracking animals and gathering plants in the area I was able to study the way they look at the landscape', he says.

The e is a special reason for the fundamental cross-disciplinarity of his project – which is also the reason why Pierre du Plessis, who is from Botswana, came to Aarhus to do his PhD and now a postdoc.

'My research project was part of the Aarhus University Research on the Anthropocene project funded by the Danish National Research Foundation. Here we explored the claim that we geologically find ourselves in the Anthropocene age, where humans have become the driving force on the planet', Pierre du Plessis explains.

IT SHOULD BE CHEAPER TO STORE SOLAR AND WIND ENERGY

KRISTINA KORNING WEDEGE
GREEN ENERGY STORAGE
Kristina Korning Wedege's research has focussed on replacing metals in large flow batteries with organic material and on how flow batteries can be combined with solar cell materials.

How can we in a cost-effective way store power from renewable energy sources in batteries that are also sustainable? Chemical Engineer Kristina Korning Wedege has sought an answer to this question in her PhD project, which is a solid piece of research on which other research groups are now building their work. The project focusses on so-called flow batteries, which are currently produced using vanadium.

'If we replace the metal with an organic molecule, we may be able to produce flow batteries using fossil materials such as oil or plants. Such flow batteries would be fairly cheap and easier to recycle', says Kristina Korning Wedege.

Working on her PhD project she therefore spent a lot of time in the laboratory testing molecules electrochemically.

'We screened around 30 different materials for their battery-related qualities in flow batteries. I believe this enabled us to contribute significantly to the discussion, because although a series of tests had been made to find suitable substances, there was no practical guidance telling you which functional groups to focus on', she explains.

Another main part of Kristina Korning Wedege's thesis focusses on a special combined technology, where flow batteries are charged directly in sunlight using a solar cell material found within the actual battery.