Villum Young Investigators 2020

VILLUM FONDEN funds early career researchers at Danish universities. Researchers with ambitions of creating their own, independent research identity

The Villum Young Investigator Programme funds particularly talented young researchers in the technical and natural sciences.

The applicants must have a clearly defined goal for their research for a period of five years and the project must be of a scale that requires the establishment of a research team. The grant amount is DKK 7-10 million.

For Danish universities and research institutions, the programme is a recruitment tool to attract talented researchers outside Denmark

VILLUM FONDEN granted funding to the first Villum Young Investigator in 2012. Since then, 165 early career academics have received funding.

Anders Bjørk

University of Copenhagen,
Department of Geosciences
and Natural Resource Management

Granted DKK 9.9m

Earth System Science

AIR – Antarctic Imagery Resurfaced

A project on how historical images from Antarctica can help us predict and understand future sea-level rise. The Antarctic Ice Sheet has just recently become unstable, but we know very little of its historical dynamic behavior. This project has resurfaced thousands of historical aerial and satellite images, and will with the recruitment of two PhD students and two postdocs reveal Antarctica's past dynamic behavior and enable us to better understand and predict its future.

Carolin Löscher

University of Southern Denmark,
Department of Biology

Granted DKK 9.9m

Earth System Science

Marine geoengineering: A tool to mitigate climate change?

Increasing carbon dioxide (CO_2) levels lead to global warming, ocean acidification, and a loss in biodiversity. This project will test the potential of adding minerals to the ocean, which naturally absorb CO_2 and stabilize the pH value of the seawater, as a tool to mitigate climate change. The grant will fund the two postdocs, one PhD student, one technician and will allow for purchasing equipment and carrying out international field campaigns.

Erik Hedegård

University of Southern Denmark,
Department of Physics, Chemistry
and Pharmacy

Granted DKK 9.6m

Physical and Analytical Chemical Sciences

The virtual enzyme lab: boosting advanced biofuels

The discovery of the enzyme family lytic polysaccharide monooxygenases (LPMOs) fundamentally changed our view on how nature breaks down biomass and the potential implications for biofuel production are large. Yet, the mechanism behind this breakdown is not understood. In this project, I will develop novel theoretical models to predict the function of LPMOs and how they can facilitate efficient biofuel production. The grant will fund a PhD student and a postdoc.

Amin Doostmohammadi

University of Copenhagen,
Niels Bohr Institute

Granted DKK 9.7m

Mechanical engineering

Engines of Life: Bioinspired, Self-Pumping Fluids

Sperms, bacteria, and tissues, all work as engines of life converting chemical energy into motion. These systems are known as active materials and are capable of self-pumping with prominent role in biological processes, from organ formation to tumor progression. This research investigates the physical conditions for the development of self-pumping flows of active matter. This grant will allow hiring of two PhD students and two postdocs as well as purchasing of high performance computing facilities.

Astrid Eichhorn

University of Southern Denmark,
Department of Physics, Chemistry
and Pharmacy

Granted DKK 9.9m

Fundamental Constituents of Matter

Probing the quantum nature of gravity

This research aims at probing the quantum properties of gravity in order to understand the fundamental properties of a force that governs not only our everyday live, but the universe as a whole. In this research programme, I will develop a mathematical probe of gravity by zooming in on spacetime with the mathematical analogue of a microscope and will take steps to bridge the gap to observations in particle physics and black holes. The grant will fund two PhD students and two postdocs.

Dennis Jeppesen

Aarhus University,
Department of Molecular Biology
and Genetics

Granted DKK 10m

Cellular and Developmental Biology

New Frontiers in Intercellular Communication

Exosomes and other extracellular vesicles are membrane-enclosed vesicles that contain proteins, RNA and lipids. They allow cells to communicate, not only with neighboring cells, but also with distant cells and tissues. And the newly discovered secretory amphisomes represents unexplored territory in the cell biology of secretion. This project will explore these intercellular communication pathways. The grant will fund the recipient, one postdoc, two PhD students, and purchase of new equipment.

Fabrizio Montesi

University of Southern Denmark,
Department of Mathematics and
Computer Science

Granted DKK 7.2m

Computer Science and Informatics

Choco: Choreographies for Connected IT Systems

Today, society makes large use of connected IT systems in digital businesses, healthcare, communications, and entertainment. However, the correct programming of these important systems is challenging, which hinders progress and can even put our well-being at risk. This project will investigate a new scientific method for ensuring that connected computers follow appropriate "choreographies" of reliable and secure data exchanges. The grant will fund two postdocs and one PhD student.

Francesco Da Ros

Technical University of Denmark,
DTU Photonics

Granted DKK 9.9m

Electrical engineering, Electronic engineering, Information engineering

Optical Processing Unit for high-speed AI systems (OPTIC-AI)

Artificial intelligence (AI) and machine learning (ML) have the potential to radically change the way we live, do science and process information. Most of the current AI and ML runs on electronics-based hardware platforms that are power hungry and slow. In this project, a new concept of an optical processing unit will be defined to enable faster processing speed and lower energy consumption. This grant will fund the recipient, one postdoc, two PhD students and equipment.

Jógvan Magnus H. Olsen

Aarhus University,
Department of Chemistry

Granted DKK 9.9m

Physical and Analytical Chemical Sciences

Computational Spectroscopy of Biomolecular Systems

Spectroscopy is essential for furthering our understanding of the structure and function of biological material. However, the use of advanced spectroscopies is hampered by the difficulty of interpreting the results. This project aims to develop computational methodologies that can simulate a wide range of biomolecular spectroscopies and thus be used to interpret the outcome of experimental studies. The grant will fund the recipient, one postdoc, two PhD students and computing resources.

Mauricio Bustamante

University of Copenhagen,
Niels Bohr Institute

Granted DKK 9.9m

Fundamental Constituents of Matter

Pushing Neutrino Physics to the Cosmic Frontier

What is Nature like at its most fundamental level? We have found answers using particle accelerators, yet ample territory remains unexplored at higher energies, ripe for discovery, but beyond their reach. Fortunately, Nature provides a way forward, via high-energy particles made by cosmic accelerators. We will harness the vast potential of cosmic neutrinos —particles with unique probing properties— to explore the highest energies. The grant will allow the recruitment of one postdoc and two PhD students.

Thomas Tram

Aarhus University,
Department of Physics and Astronomy

Granted DKK 9.5m

Universe Sciences

Illuminating the Dark Universe

Direct measurements of the current expansion rate of the Universe yields a significantly different value than the one inferred from observations of the Cosmic Microwave Background. All attempts at explaining this difference through either experimental errors or existing models have been in vain. This project aims to eliminate this discrepancy through new models of decaying Dark Matter. The grant will fund two PhD students, one postdoc and a computing cluster.

Johan Samsing

University of Copenhagen,
Niels Bohr Institute

Granted DKK 9.7m

Universe Sciences

Gravitational Wave Astrophysics: Dynamical Formation of Black Hole Mergers

The recent observation of gravitational waves (GWs) from the merger of two black holes (BHs) marks a new era in physics: GW Astrophysics. This has enabled strong tests of Einstein's Theory of Relativity, but how and where the merging BHs form in our Universe are still major open questions. This project aims at unravel their astrophysical origin, byquantifying how properties of their formation environment can be extracted from their GW signal. The grant will fund two PhD students and a postdoc.

Karen Chan

Technical University of Denmark,
DTU Physics

Granted DKK 9.9m

Chemical engineering

Computational electrochemistry for the sustainable valorization of biomass

Biomass from waste and residues has the potential to be a sustainable alternative to fossil fuels, which are the building blocks for fuels and chemicals production. Electrochemical conversion routes are advantageous since they allow for the storage of intermittent renewable electricity. This project will establish and apply design principles for efficient and low cost catalysts for the electrochemical valorization of biomass. The grant will fund three PhD students, two postdocs and computing.

Thomas Olsen

Technical University of Denmark,
DTU Physics

Granted DKK 9.9m

Condensed Matter Physics

Magnetism in 2D

For more than 50 years it has been believed that magnetism cannot exist in two dimensions (2D). Nevertheless, it has recently been demonstrated that the 2D material CrI_3 is indeed magnetic at temperatures below 45 K. The underlying mechanism is, however, very different from that of standard magnets and a proper theory for 2D magnetism is still lacking. In the present project, I will develop the framework required for a quantitative theory of 2D magnetism based on computer simulations.

Torben Krüger

University of Copenhagen,
Department of Mathematics

Granted DKK 9.3m

Mathematics

Random Matrix Approach to Universality Phenomena in Disordered Quantum Systems

Theoretically analysing first principle models of disordered quantum systems, such as quantum dots or quantum wires, is extremely challenging and often impossible. However, most macroscopically observable emergent phenomena, e.g. electric conductivity, are universal. They do not depend on microscopic details. Together with two PhD students and three postdocs we will make use of this fact by investigating and classifying such phenomena within more accessible coarse grained random matrix models.