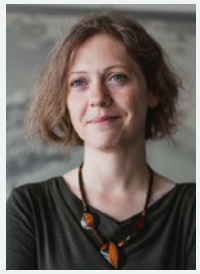
New DNRF Centers of Excellence 2022

Danmarks Grundforskningsfond
Danish National Research Foundation

Center of Excellence

Centre for Culture and the Mind – CULTMIND



Host	Department of English, German and Romance Studies, University of Copenhagen
Budget	39.4 M DKK
Center leader	**Ana Antic**, Professor (WSR), University of Copenhagen
Core team	**Peter Leese**, Associate Professor, University of Copenhagen (history of trauma and migration)
	Jessica Carlsson Lohmann, Associate Professor, Department of Clinical Medicine, University of Copenhagen, and Centre for Transcultural Psychiatry, Copenhagen (transcultural psychiatry)
	Lamia Moghnieh, Associate Professor, University of Copenhagen (medical anthropology)
	NN, Assistant Professor to be recruited, University of Copenhagen (literature and medical humanities)

Description

Can the emotional worlds of diverse groups of people be translated? Are the core characteristics of the human mind universal across cultures, ethnic groups and 'civilisations'? Can the 'psy' disciplines be global?

These questions have been plaguing both 'psy' sciences and humanities for over a century, while the trend was further accelerated in response to the decolonisation processes. The puzzling relationship between cultural difference and the human psyche has been reframed multiple times, with the rise of transcultural psychiatry in mid-twentieth century playing a major role. However, the core questions about the universality or otherwise of the human mind remain as difficult to answer today as they were a century ago.

The Centre will demonstrate that the issue of culture-mind relationship lays at the core of many social, political and medical debates: within cross-cultural psychiatry/psychotherapy, in trauma studies, and in migration and refugee studies. It will explore how the human mind and common humanity have been imagined in different cultural, sociopolitical and disciplinary contexts, examining the assumptions and forces which shaped such definitions. By analysing how different cross-cultural models of the psyche were formulated and critiqued, the Centre's interdisciplinary team will develop a new framework for understanding cross-cultural interventions, which pushes beyond the binary of universalism and cultural relativism in order to arrive at a more nuanced model of interaction between socio-cultural contexts and ideas of the psyche.

Center of Excellence

Center for Global Mobility Law – MOBILE

Host	Faculty of Law, University of Copenhagen
Budget	36.0 M DKK
Center leader	**Thomas Gammeltoft-Hansen**, Professor of Migration and Refugee Law, University of Copenhagen
Core team:	**Morten Broberg**, Professor of development law, University of Copenhagen
	Urska Sadl, Tenure-track associate professor specializing in computational law, University of Copenhagen
	Dorte Sindbjerg Martinsen, Professor of political science specializing in EU law and politics, University of Copenhagen
	NN – research leader to be recruited

Description

Human mobility has always been a precondition for development, cultural exchange and, ultimately, survival. Yet today few other issues remain subject to such detailed and elaborate regulation. From immigration rules to visa and aviation standards, laws govern not only who have access to mobility, but also how easy and along which routes people move. For better or worse, rules and regulations related to mobility are defining for individual livelihood opportunities, social structures, and the economic development of countries.

Despite the centrality of law for this issue, the regulation of human mobility has never been systematically studied. Consequently, we know little about how different laws interact and shape mobility across geographies, social divides and time. Addressing this gap, MOBILE will provide the first comprehensive study of global mobility law covering regions in both the Global North and South. MOBILE's central proposition is to situate the different legal regimes impacting mobility in a single coherent framework: legal infrastructures; enabling us to empirically study formally distinct regimes as entangled legal networks. The outcome of MOBILE thus aims to provide ground-breaking and broadly applicable insights both for our understanding of human mobility and for legal theory.

Center of Excellence

Center for Gene Expression – CGEN

Host	Institute of Cellular and Molecular Medicine, University of Copenhagen
Budget	68.6 M DKK
Center leader	**Jesper Sveistrup**, Professor, University of Copenhagen
Core team	**Simon Bekker-Jensen**, Professor, University of Copenhagen. **Lea Gregersen**, Associate Professor, University of Copenhagen **NN** (Young group leader to be recruited).

Description

Gene expression is the highly conserved pathway used to selectively decipher the coded messages in our DNA. It is essential for making and sustaining cells capable of responding to differentiation cues, stimuli, and insults.

Decoding of our DNA occurs via two distinct processes, transcription and translation. The RNA transcripts are initially made as pre-mRNAs which are then processed further, such as by the removal of untranslatable regions of RNA by 'splicing'. The final product, mRNA, encodes information not only for the synthesis of proteins, but also for regulation. Despite decades of research into gene expression, our understanding of the proofreading processes and feedback loops ensuring that the 'translation of our DNA' is coordinated and precise, remains poorly understood. In short, a holistic view of the process is lacking. The research in Center for Gene Expression (CGEN) will use a cutting-edge ensemble of genetic, cell biological, biochemical, organismal, and modern 'omic'-approaches to achieve a comprehensive understanding of the process of gene expression.

Center of Excellence

Center for Big Data in Finance – BigFi

Host	Department of Finance, Copenhagen Business School
Budget	59.4 M DKK
Center leader	**Lasse Heje Pedersen**, Professor, Copenhagen Business School
Core team	**Anders Bjerre Trolle**, Professor of Finance, Copenhagen Business School **Annette Vissing-Jørgensen**, Senior Advisor, Monetary Affairs, U.S. Federal Reserve Board of Governors and Professor of Finance, University of California, Berkeley **Arna Olafsson**, Assistant Professor of Finance, Copenhagen Business School **David Lando**, Professor of Finance, Copenhagen Business School **Julie Marx**, Assistant Professor of Finance, Copenhagen Business School **Kim Peijnenburg**, Professor of Finance, EDHEC **Peter Feldhütter**, Professor of Finance, Copenhagen Business School **Rasmus T. Varneskov**, Professor in Statistics and Financial Econometrics, Copenhagen Business School **Steffen Andersen**, Professor of Finance, Copenhagen Business School **Yingjie Qi**, Assistant Professor of Finance, Copenhagen Business School

Description

The aim of the center is to use big data and state-of-the-art economic theory to address pressing societal issues such as financial stability, the origins of financial crises, financial markets' role in promoting economic activity, the effect of investments based on environmental, social, and governance (ESG) considerations, and households' obstacles for financial security.

The team is headed by Lasse Heje Pedersen who has a record of ground-breaking research with significant real-world impact. He is one of the most cited and downloaded finance researchers in the world, his work has been cited by the Nobel Prize committee 4 times, and he was recognized as the best European economist under 40 in 2011.

The team also includes Annette Vissing-Jørgensen, a star researcher with a career at top US universities now at the Federal Reserve, and other top researchers with international careers at London Business School, HEC Paris, and beyond.

The team is uniquely positioned to make research breakthroughs using big finance data because of:

- a unique access to micro data, including data from two large banks, regulatory data, and Danish register data;
- broad macro data, including numerous global data sets on asset prices, security characteristics, and economic activity;
- synergies from a diverse group of top researchers at the intersection of finance, economics, econometrics, and machine learning who can combine these data in powerful ways

Center of Excellence

Center for Interdisciplinary Study of Pandemic Signatures – PandemiX

Host	Department of Science and Environment, Roskilde University
Budget	47.0 M DKK
Center leader	**Lone Simonsen**, Professor, Roskilde University
Core team	**Viggo Andreasen**, Associate Professor of Mathematics, Roskilde University
	Thea Kølsen Fischer, MD, Director of Clinical Research at the University Hospital of Northern Zealand, Hillerød, Denmark; Professor of Public Health Science, Virus Infections and Epidemics, University of Copenhagen
	Karen A. Krogfelt, Professor of Medical Microbiology, Roskilde University
	Johnny Tom Ottesen, Professor of Mathematics and Director of Center for Mathematical Modeling – Human Health and Disease, Roskilde University
	Anders Gorm Pedersen, Professor of Bioinformatics, Technical University of Denmark (DTU)
	Kim Sneppen, Professor of Physics, Niels Bohr Institute (NBI), University of Copenhagen
	Romola Davenport, Senior Research Associate, Group for the History of Population and Social Structure (CAMPOP), University of Cambridge
	Marc Lipsitch, Professor of Epidemiology, Harvard T.H. Chan School of Public Health and director of science in CDC's Center for Forecasting and Outbreak Analytics (CFA)
	Cecile Viboud, Senior Scientist, Fogarty International Center, National Institutes of Health (NIH), Bethesda

Description

Pandemics are "black swan" events, rare but often devastating. An emerging pathogen and its human host enter into a complex relationship in which humans develop immunity and change behavior while the pathogen counters with mutations to overcome these defenses. Despite their enormous health impact, pandemics remain poorly understood.

I propose an interdisciplinary research center to study these extreme events. The Center will bring together a diverse team of experts in historical studies, genomics, clinical studies and mathematical modelling of infectious diseases. Every pandemic—whether emerging or historic—has a characteristic set of signature features. The Center will uncover the mechanisms behind these features for past pandemics and COVID-19 alike, helping us prepare for pandemics yet to come. The work will address a set of central guiding questions that frame a pandemic as an evolutionary process:
Which features allow some pathogens to emerge and cause a pandemic? What are the inner workings of the pandemic period in which the pathogen evolves and human immunity builds? What controls a pandemic's trajectory; e.g., recurrent waves? What is the impact on population health? And lastly, what governs the end of the pandemic period and potential transition to endemic disease?

By answering these core questions and bringing diverse fields together with a common quantitative focus, we will introduce pandemiology—the study of pandemics—as a field in its own right.

Center of Excellence

Center for Chemistry of Clouds – C3

Host	Department of Chemistry, Aarhus University
Budget	60.0 M DKK
Center leader	**Merete Bilde**, Professor, University of Aarhus
Core team	**Ove Christiansen**, Professor, Aarhus University
	Tobias Weidner, Associate Professor, Aarhus University
	Marianne Glasius, Associate Professor, Aarhus University
	Jonas Elm, Assistant Professor, Aarhus University

Description

Our vision is to provide molecular level understanding of the processes leading to clouds. Lack of scientific understanding at this fundamental level currently limits accuracy in climate prediction.

Revolutionary developments in atmospheric simulation facilities, analytical methods, ultrafast lasers and capabilities of quantum chemistry during recent years, finally bring understanding of the chemistry involved in cloud formation within reach. We propose a Center for Chemistry of Clouds (C_3) to make full use of these developments and target the grand challenge of cloud formation in a bottom-up approach coupling chemical reactions with physical factors such as temperature and light. We hypothesize, that it is crucial to understand the interfacial surface layer of aerosol particles. Our specific goals are to uncover the dynamics of aerosol formation and growth, understand transfer of molecules across the aerosol surface and provide molecular level details of aerosol-cloud interactions.

C_3 unites experts in atmospheric and aerosol chemistry, surface spectroscopy, theoretical and computational chemistry. Our integrated approach includes:

1) laboratory studies in an atmospheric simulation facility with advanced instruments for aerosol characterization
2) laser spectroscopy to probe photochemical reactions and molecular transfer in real time at aerosol surfaces and
3) computational and quantum chemistry studies to uncover molecular structures, energetics, dynamics and kinetics.

Center of Excellence

Center for Polariton-driven Light-Matter Interactions – POLIMA

Host	Danish Institute for Advanced Study, University of Southern Denmark
Budget	60.0 M DKK
Center leader	**N. Asger Mortensen**, Professor, University of Southern Denmark
Core team	**Sergey I. Bozhevolnyi**, Professor, University of Southern Denmark
	Joel D. Cox, Assistant Professor in Theoretical Quantum Optics, University of Southern Denmark
	Christian Wolff, Tenure-track Assistant Professor in Computational Physics, University of Southern Denmark
	Fei Ding, Tenure-track Assistant Professor in Experimental Nano Optics, University of Southern Denmark
	Shailesh Kumar, Tenure-track Assistant Professor in Experimental Nano Optics, University of Southern Denmark
	Christos Tserkezis, Assistant Professor in Condensed-Matter Physics, University of Southern Denmark

Description

Expanding the frontiers of information and communication technology (ICT) remains an important societal challenge, also calling for development of quantum perspectives. In this context, EU considers photonics a key-enabling technology (KET) that can fuel emerging quantum-information processing. While integrated photonic devices suffer from inherently weak, hard-to-control coupling of light with matter, polaritonic configurations have emerged as a new paradigm that drives nanoscale light–matter interactions in solid-state systems to entirely new regimes.

Polaritons represent hybrid light–matter states, in which electromagnetic (EM) waves are coupled with dipole-active matter excitations such as plasmonic electron oscillations in metals, excitonic electron-hole pairs in semiconductors, or phononic lattice vibrations. With the emergence of 2D materials—from crystalline ultrathin metal flakes to graphene and transition-metal-dichalcogenide monolayers—polaritons can be explored and manipulated in flatland, in engineered metasurfaces interfacing light-emitting quantum systems, or serving as light sources themselves. Enabled by concerted efforts from fundamental theory, nano- and quantum-optics experiments, low-dimensional material synthesis, advanced nanofabrication, and atomic-scale material characterization, Center for Polariton-driven Light-Matter Interactions—POLIMA—embraces a curiosity-driven exploration with new paradigms intersecting quantum optics and polaritonic matter.

Center of Excellence

Center for Volatile Interactions – VOLT

Host	Department of Biology, University of Copenhagen
Budget	60.0 M DKK
Center leader	**Riikka Rinnan**, Professor, University of Copenhagen
Core team	**Kathrin Rousk**, Assistant Professor, University of Copenhagen
	Lasse Riemann, Professor, University of Copenhagen
	Anders Priemé, Professor, University of Copenhagen

Description

Organisms on our planet produce a wide range of volatile compounds to communicate, cooperate, and compete with each other. These complex, yet invisible, interactions are not only essential to the organisms, but also have profound effects on climate via atmospheric processes, such as aerosol and cloud formation. While the processes exchanging the greenhouse gases, CO2 and methane, are well-studied, we have a poor understanding of the biological processes releasing and taking up reactive trace gases, such as volatile organic compounds, reactive nitrogen gases, and sulfur compounds (here 'volatiles'). This hampers our ability to predict how the exchange of volatiles responds to environmental changes and feeds back on climate.

In VOLT, we assess the biology of production, consumption and transport of volatiles across organisms and ecosystems. We will use experimental approaches in the field and laboratory to develop mechanistic understanding of how the organism-ecosystem-atmosphere gas exchanges interact and respond to climate change. Our ambition is to produce generic process understanding of volatile interactions, applicable across ecosystems, to improve modeling of the biological processes involved. Our overarching hypothesis is that volatile emissions and their effects on current and future climates can only be quantified, if we understand the intricate interactions among the organisms producing and consuming the volatiles.

Center of Excellence

Center for immunology of viral infections – CiViA

Host	Department of Biomedicine, Aarhus University
Budget	60.0 M DKK
Center leader	**Søren Riis Paludan**, Professor, Aarhus University
Core team	**Trine H Mogensen**, Professor, Aarhus University, Denmark / Aarhus University Hospital, Denmark **Jacob Giehm Mikkelsen**, Professor, Aarhus University, Denmark **David Olagnier**, Associate professor, Aarhus University, Denmark **Andreas Pichlmair**, Professor, Technical University Munich, Germany / Aarhus University, Denmark

Description

Why do viruses cause disease? Why does our immune system not always eliminate viruses?

Virus infections can cause severe illness, when not properly controlled by the immune system. Thus, understanding how the immune system fights viruses represents one of the main challenges in modern-day science. However, there is a fundamental knowledge gap in this area, which we propose is partially explained by shortcomings in current concepts in immunology. CiViA will challenge the dogma that pattern recognition receptors represent the first line of specific host defense. Rather, we propose the existence of a hitherto unrecognized layer of the immune system, which we hypothesize is important for defense and disease prevention.

We will:

I) identify novel mechanisms mediating anti-viral defense,
II) decipher the role of these mechanisms in viral diseases, and
III) progressively develop a new concept with paradigm-shifting potential.

The center will bring together leading scientists with overlapping interests and complementary intellectual and methodological expertise. We will merge cellular and molecular immunology with our vast expertise in unbiased screening technologies and clinical/animal virus infection research, and we will form a strong partnership with experts in cutting-edge mass spectrometry and big data analysis at the Technical University of Munich. Together, our results will change the way we think about viral immunology and pave the way for development of new treatments.

Center of Excellence

Center for Ecological Dynamics in a Novel Biosphere – ECONOVO

Host	Department of Biology, Aarhus University
Budget	60.0 M DKK
Center leader	**Jens-Christian Svenning**, Professor, University of Aarhus
Core team	**Felix Riede**, Professor, Aarhus University **Michael Møller Hansen**, Professor, Aarhus University **Trine Kellberg Nielsen**, Associate Professor, Aarhus University **Alejandro Ordonez**, Tenure-track Assistant Professor, Aarhus University **Elizabeth Le Roux**, Tenure-track Assistant Professor, Aarhus University **Robert Buitenwerf**, Tenure-track Assistant Professor, Aarhus University

Description

Earth's rich biosphere makes our planet a wonderful place to live, and humanity's very survival depends on it. Mastering ecological stewardship to overcome the current global environmental crisis is therefore of utmost importance. A critical challenge is that we are facing a novel and poorly understood biosphere.

Novel ecosystems (NEs) have species compositions or abiotic conditions without historical precedent, e.g., intercontinental species invasions and extraordinary warming. NEs are spreading fast and expected to be globally dominant by the late 21st century. Key drivers are climate change, globalization, and extirpation of large-sized organisms, resulting in ecosystems deviating from anything seen for millions of years.

The spread of NEs is likely to profoundly affect biosphere functioning, but how is poorly understood due to fragmented research, ecological complexity and inadequate baselines. We will investigate the consequences, assessing past to future NE spread, NE biodiversity dynamics, promotors of NE biodiversity, consequences for climate change resilience and mitigation, and upscaling to the biosphere. Our hypothesis is that NEs often have high capacity for biodiversity and facilitating its realization will enhance future biosphere functioning.

To address this complex theme, we will take an unparalleled, interdisciplinary approach, integrating Big Data and field-based ecology, satellite-based remote sensing, archaeology, paleoecology, and population genomics.

Center of Excellence

GeoGenetics Centre for Ancient Environmental Genomics – CAEG

Host	Globe Institute, University of Copenhagen
Budget	75.0 M DKK
Center leader	**Eske Willerslev**, Professor, Globe Institute, University of Copenhagen
Core team	**Kurt H. Kjær**, Professor, University of Copenhagen.
	Karina K. Sand, Associate Professor, University of Copenhagen.
	Martin Sikora, Associate Professor, University of Copenhagen.
	Antonio Fernandez Guerra, Assistant Professor, University of Copenhagen.
	Thorfinn Sand Korneliussen, Assistant Professor, University of Copenhagen.
	Mikkel W. Pedersen, Assistant Professor, University of Copenhagen.
	Ana Prohaska, Assistant Professor, University of Cambridge.
	Enrico Cappellini, Associate Professor, University of Copenhagen.
	Tobias Guldberg Frøslev, Associate Professor, University of Copenhagen.
	Nicolaj Krog Larsen, Professor, University of Copenhagen.
	Rasmus Nielsen, Professor, UC-Berkeley
	Thomas Werge, Co-director, Lundbeck Foundation Center for Geo-Genetics, University of Copenhagen; Copenhagen University Hospital

Description

A single gram of sediment can contain billions of DNA fragments from organisms that inhabited the surrounding environment, including bacteria, fungi, plants, animals, humans, and viruses, even in the complete absence of fossilised remains. This ancient environmental DNA (aeDNA) can be found in most sediment settings across the globe. As fossils are exceedingly rare, the analysis of aeDNA is uniquely suited to capture the complex dynamics of ecological and evolutionary processes across space and time.

However, to unleash the immense potential of aeDNA, we need a transition from the analysis of a few short DNA sequences, that only allow relatively shallow taxonomic and functional identification, onto whole-genome analysis. This opens doors to studying population-level processes such as demography, natural selection, and adaptation over large spatial and temporal scales.

The proposed GeoGenetics Centre for Ancient Environmental Genomics (CAEG) will drive this shift by improving our understanding of aeDNA preservation and tackling bottlenecks in high-throughput sample processing and data analysis, thus laying the methodological foundation for the next generations in aeDNA research. We will employ the newly generated knowledge and methods to address fundamental questions about life on Earth in an unprecedented level of detail, impacting a variety of scientific fields from ecology and evolution to archaeology, microbiology, and biodiversity conservation.