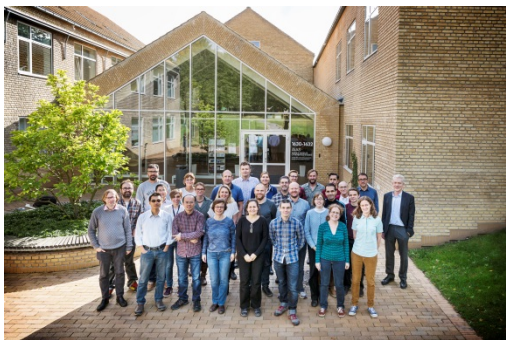




AIAS FELLOWS SPRING 2017



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AIAS Fellows Spring 2017

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Alexander Panayotov

Postdoc

AIAS and previously University of Cambridge,
UK

Fellowship: 01 Oct 2014 – 30 Sep 2017

Project title

Minority status and identity: A case study of the Jewish minority in Byzantium

Project description

The project aims to investigate the social and economic relations in the Byzantine empire that influenced the communal life of the Jewish communities. The scope of the project is defined temporally and spatially. It is proposed to begin in the fourth century and end in the seventh century CE. This will allow the inclusion of the widest possible selection of epigraphical, literary and archaeological sources. Geographically, the project will include the areas of the Balkans, the Aegean, Asia Minor and Cyprus.

Panayotov's overall aim is to establish the place Jews occupied in the stratigraphy of Byzantine society and how the social and political changes in this society influenced their communal life. This will require a study of Jewish everyday life and he will focus on the communal organisation and leadership of the Jewish community, the social status, occupation and cultural concerns of its members. His innovative idea is that Byzantine legislation has actually influenced the use of Greco-Roman civic terminology within the Jewish communities in the areas concerned, thus helping to preserve their communal structure. This facilitated the involvement of the Jewish minority in the public life of the Byzantine empire and relations to Christians, the wider Jewish world and other minority groups like the Samaritans.

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Anja Kamp

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Fellowship: 01 Oct 2014 – 30 Sep 2017

Project title

Diatoms in Darkness and Anoxia

Project description

This research project aims on revealing the eco-physiology and the environmental significance of anaerobic nitrate respiration by diatoms, eukaryotic microorganisms that are highly abundant in the oceans. Nitrate respiration by microbial eukaryotes is severely understudied and until recently only foraminifera, gromiida, and fungi were known to respire nitrate when oxygen is absent. The discovery that also the most important phototrophic group of microbial eukaryotes, the diatoms, has an anaerobic nitrate metabolism came absolutely unexpected. First, it was proved that the benthic diatom *Amphora coffeaeformis* uses intracellularly stored nitrate for Dissimilatory Nitrate Reduction to Ammonium (DNRA). Meanwhile, DNRA was also discovered in the ubiquitous pelagic diatom *Thalassiosira weissflogii*. These are the so far only records of nitrate respiration by phototrophic eukaryotes, and *T. weissflogii* is the first marine pelagic eukaryote shown to have an anaerobic nitrate metabolism. It is still unclear whether these species represent isolated cases or the tip of the iceberg.

The main objectives of this research project are thus (A) to screen for more diatoms that respire nitrate in oxygen-depleted marine (micro)habitats, (B) to identify the functional genes involved in eukaryotic nitrate respiration, and (C) to evaluate the impact of this so far overlooked scenario on the marine nitrogen cycle. Eco-physiological experiments with nitrate-storing diatom isolates will be combined with modern molecular approaches and field studies to arrive at a comprehensive understanding of anaerobic nitrate respiration by diatoms. Diatoms might be of much greater importance for the marine nitrogen cycle than expected, especially in the light of the spreading anoxic and hypoxic zones of our oceans.

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Armin W. Geertz

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Fellowship: 01 Feb 2017 – 31 Jan 2018

Project title

A Biocultural Approach to Embodiment, Ritual and Mysticism

Project description

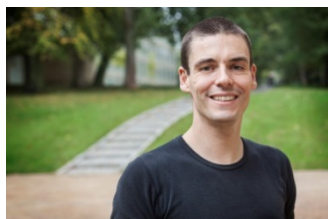
This project deals with the growing empirical knowledge of the interaction between bodily actions and human thinking and the cultural embeddedness of human cognition. The project employs state of the art cognitive predictive models on historical material, namely the activities, techniques and reported mystical experiences of Teresa of Ávila (1515-1582), a Spanish Carmelite nun who reformed that Order and founded the Discalced Carmelites. This project involves quantitative coding and text mining of her numerous books and letters in order to test the use of cognitive models in historical studies.

This project is relevant to contemporary science for several reasons. First, it addresses the need to apply methods and insights from the natural and medical sciences to historical data, as well as the other way around: The humanities have important contributions to make to the natural and medical sciences, as my involvement in transdisciplinary and interdisciplinary projects on rituals, pain, ecstatic behavior and prayer have convinced me. Second, it applies a doubly unique approach to historical documents, namely the application of neurocognitive predictive models and the use of quantitative data techniques. Third, although the case study is historical, it deals nonetheless with highly relevant contemporary phenomena, namely, spiritual and mystical experiences, occultism and healing. Fourth, this project is a stepping-stone to a larger, more ambitious attempt to apply this proof of concept case to European spirituality and mysticism through a coordinated EU-based network of scholars.

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Bjørn Panyella Pedersen

Assistant Professor

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Fellowship: 01 Oct 2014 – 30 Sep 2017

Project title

Molecular Mechanism of Sugar Uptake in Humans

Project description

The project supported by my AIAS fellowship addresses fundamental scientific questions pertaining to an essential membrane transport system in humans; namely facilitated sugar transport, where new insights will have immediate scientific impact.

Facilitated sugar transport is the process by which sugar-molecules are taken up from circulation into the individual cells of the body as a ubiquitous energy and carbon-source. Furthermore sugar uptake contributes to the generation of reducing power in the cell. Facilitated sugar transport in humans is made possible by sugar transporters called GLUTs and SWEETs located in the cellular membrane, and every cell possesses these sugar transport systems. For both GLUTs and SWEETs, structural information is sorely lacking to address important mechanistic questions to help elucidate the molecular mechanism by which they can move sugars across the cellular membrane in an efficient manner. I will address these systems using a complementary set of methods founded in macromolecular crystallography to elucidate 3-dimensional structure.

The proposed work will help to uncover general principles of facilitated diffusion systems. Furthermore an improved understanding of sugar homeostasis in humans has tremendous potential for improving general public health, and the proposed work will stimulate pharmacological efforts to identify and develop compounds of therapeutic value for e.g. obesity, diabetes and cancer.

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Btihaj Ajana

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Project title

The Over-examined Life: Body Governance and the rise of the Quantified Self

Project description

Life in the 21st century is increasingly being quantified and datafied as societies are becoming ever more reliant on algorithms and data to manage all aspects of everyday activities. In recent years, we have witnessed an abundance of techniques and devices that enable routine forms of digital self-tracking and monitoring. Bodies and minds are turning into measurable machines and information dispensers in the quest for personal development, productivity and the extraction of value. This has given rise to the Quantified Self movement whose motto is "self knowledge through numbers". While this movement is often discussed in terms of positive trends towards health-management and self-improvement, it is also raising issues of potential surveillance (by self and others) and concerns with the ramifications of excessive self-involvement.

In this research, I aim to provide a thorough and critical discussion on the ontological and ethical dimensions of health management and self-tracking technologies, and on users' experiences of these technologies and the way they make sense of their datafied self and networked bodies. I draw on empirical research as well as a theoretical framework deriving from critiques of biopolitics and neoliberalism, and the Foucauldian notion of governmentality and technologies of the self.

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Consuelo Manetta

Postdoc

AIAS and University of Rome "Tor Vergata", Italy

Fellowship: 01 Oct 2014 – 30 Sep 2017

Project title

The Different Faces of the Sky - decorative culture, floral, astral and mythological representations within figural coffered ceilings

Project description

The research focuses on ancient covering systems in Greek and Roman areas between the Late Archaic (500 BC) and the Late Antique periods (Fourth - Fifth century AD), and with specific reference to sculptured and/or painted figural coffered ceilings. The study aims to offer an iconographic and iconological reading of the decorative and figurative repertoire within the lacunars. It also points to reconstruct its decorative evolution during the long period of its use. Fundamentally, several figurative themes (prosopa, busts, and mythological representations) sculpted and/or painted within the coffers have not been identified up to now.

None of the existing studies has ever ventured to reconstruct the decorative and figurative repertoire depicted in ceilings. Furthermore, none has tried to follow the dynamics and developments of this repertoire. Nevertheless, the topic offers interesting research perspectives in view of: reconstructing a repertoire of decorative and figurative motives within coffered ceilings; decoding their meaning, with special reference to the sculpted and/or painted prosopa, their problematic identification, their relationship with decorative (such as floral and geometrical) and figurative (such as mythological) motives previously and/or contemporarily attested; the role effectively played by Pausias regarding coffered ceilings' decoration; the eventual relationship between the function of a building and its ceiling's decoration; recognizing, defining and understanding the role played by astral representations among the possible decorative motives sculpted or painted in the frame of ceilings.

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Darin Stephanov

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Project title

Monarchic Visibility, Public Space, and Collective Identities in the Romanov and Ottoman Empires (1825-1908). A Comparative Study of the Finnish and Bulgarian Trajectories of Communal-cum-national Consciousness

Project description

This project tests the hypothesis that multiplying and escalating public ruler celebrations (imperial tours, royal birthdays, accessions, etc.) across the late Russian and Ottoman Empires a) ushered in a new era of ruler visibility, forging direct vertical ties of subject loyalty to the Russian Emperor and the Ottoman sultan in the short run, and b) created a modern public space, stimulating the rise of the horizontal ties of ethno-nationalism in the long run. It traces the origins, nature and evolution of the direct relationship between a cross-section of Finns from the Grand Duchy of Finland and the Russian Emperor, on the one hand, and a cross-section of Bulgarians from the Ottoman province of Rumelia and the Ottoman sultan, on the other. It reconstructs key historical episodes and brings to light entire chapters in the history of Finnish and Bulgarian group belonging, which have so far been excluded from mainstream narratives and historical textbooks.

This project outlines the complex, syncretic modernity of late imperial regimes, which engaged in fascinating acts of ceremonial experimentation, but also exhibited many ominous sides of the looming modern state, with its unparalleled abilities to censor, discipline and control. Although drawing on the experiences of two late empires only, it has powerful implications for a broader study of the transition from imperial to ethno-national mind-frames, and ultimately, for analyzing the constituent elements of modernity and ethno-nationalism themselves.

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Djuke Veldhuis

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Fellowship: 01 Oct 2014 – 30 Sep 2017

Project title

Stress in modern human populations: A bio-cultural approach to assessing the costs and limits of adaption

Project description

In her research, Veldhuis is passionate about understanding how humans adapt to our rapidly changing world. Her research spans the fields of anthropology, psychology and endocrinology. Using cross-cultural comparisons, physiological and psychological stress measures, she is examining the costs and limits of adaptation in Europe and African populations. She will build up a comprehensive picture of the human stress response in human populations in Northern Kenya and Denmark. Being frequently ranked as one of the happiest in the world, the Danish provide a good contrast with populations in the Turkana basin in Kenya who are currently undergoing rapid cultural change.

Extrapolating environmental from social influences is notoriously difficult. However, without interdisciplinary research to look at this bigger picture, we risk being like the doctor who puts a bandage over a wound without asking why it is bleeding in the first place. By understanding what attributes make individuals resilient to cultural and environmental changes, we are better placed to understand the human condition and minimize the impact of stressors in our lives.

This project will 1) build up a physiological profile of stress, via cortisol and blood pressure measurements; and 2) assess behavioural responses to and psychological indicators of stressors amongst populations in Denmark and Kenya. These data will be 3) evaluated to consider the evolutionary context in which the human stress response evolved.

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Dorothee Birke

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Fellowship: 01 Oct 2015 – 30 Sep 2018

Project title

Situating Homelessness on the Contemporary British Stage

Project description

In the context of the so-called “Great Recession” around the end of the twenty-first century’s first decade, discussions and anxieties about homelessness have gained a new momentum in European countries. My project charts the ways in which plays in Britain from the mid-1990s up to the present day have contributed to raising consciousness about the issue of homelessness by examining and subverting the divide between ‘homeless’ and ‘housed’. The medium of the play is especially well-suited for such reflections. Not only has drama as a genre been a prime medium for engaging with social and political issues, but the stage also offers the opportunity to both perform and question the spatial relations that are at the heart of the ‘homeless/ housed’ dichotomy itself. Such relations are staged through the *mise-en-scène* as well as the characterization and interactions of the characters.

The project will furnish the first sustained and systematic discussion of the representation of the central trope of homelessness in British dramatic texts. It considers a corpus of plays from the 1990s to the present day, spanning a range of dramatic traditions, from in-your-face to verbatim to variants that have been less frequently associated with political themes, such as metadrama. The close study of the plays’ formal strategies is grounded in a theoretical framework which brings together new concepts from the emerging transdisciplinary fields of studies of home and poverty studies.

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Filip Meysman

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Project title

Unlocking the mechanism of microbial long-distance electron transport

Project description

Recently, a whole new type of long filamentous bacteria has been discovered, which are able to generate electrical currents over centimeter scale distances. This distance is a thousand times further than previously known for micro-organisms. These so-called “cable bacteria” consist of a sequence of thousands of cells that pass electrons on to each other. This mechanism, whereby living cells interact with each other via electrical currents, implies an entirely new way in which biological cells are cooperating. Yet, there is also a promising technological aspect to this discovery. The capability of cable bacteria to transport electrons over centimeter distances also implies that evolution must have somehow developed an organic structure that is highly conductive. If these conductive structures could be harnessed in an engineered way, this could pave the way for entirely new materials and applications in bio-electronics.

This attractive idea of “microbially based electronics” is currently faced with an important obstacle: we do not yet know the physical nature of the conductive structures in cable bacteria, neither do we know if these structures are sufficiently conductive for technological applications. The goal of this AIAS project is to identify the conductive structures responsible for the long-distance electron transport, and to characterize their chemical composition, physical structure and electrical properties of these conductive structures. When successful, this could open a broad avenue of research and technological applications targeting new functional molecular materials and nanosystems from microbial origin.

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Frants H. Jensen

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Fellowship: 01 Feb 2016 – 31 Jul 2018

Project title

Movement coordination, leadership and collective foraging in matrilineal toothed whales

Project description

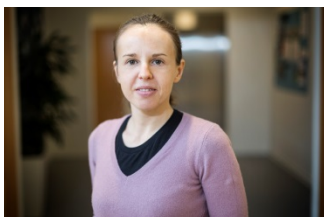
This project investigates group decision-making processes, social foraging and emergent search patterns of a highly social model toothed whale species, the long-finned pilot whale. These large, deep-diving delphinids live in matrilineal social groups that are stable across decades and like many other social animals, they coordinate a wide variety of behaviors within their social group. Such coordination often requires that animals with different degrees of intrinsic information and differences in motivation come to a shared decision for the entire group.

The aim is to investigate individual and collective decision rules during travel and foraging periods using data from acoustic and movement tags deployed simultaneously on closely associated, free-moving individuals combined with models of collective behavior. I will seek to answer the following questions: a) how do heterogeneous groups of toothed whales coordinate movement and reach consensus decisions? b) are specific individuals within social groups important for shaping collective decisions such as the location or timing of foraging? c) how does social information that is available to individuals during coordinated foraging, such as the echolocation or prey capture signals of nearby conspecifics, affect individual search behavior, resulting prey encounter rates, and shape emergent foraging patterns? d) do acoustic signals contain information on the individual identity of whales that can be used to inform decisions of other group members during potential conflicts-of-interests, and provide a mechanistic basis for improving decision accuracy?

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Federica Bertolotti

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Project title

From the atomic structure to the nanocrystal morphology: a novel Unified X-ray Scattering approach for the characterization of nanomaterials

Project description

The project proposed addresses important issues related to the establishment of robust methods for the characterization of inorganic nanoparticles (NPs). These methods will be used for providing unprecedented atomistic details on a series of highly monodisperse nanocrystals, which have a broad-spectrum of applications in emerging technologies.

The only existing approaches for characterizing nanocrystals with well determined statistical averages (in contrast to the microscopies, where individual NPs are analysed) are scattering techniques. The very small size of particles in nanosized materials can be considered as a defective representation of the corresponding bulk: the information in the powder diffraction patterns (the fingerprints of the structural features of the sample) is smeared out and reduced, while the complexity of the structure is highly increased.

Accordingly, new scattering techniques need to be developed in order to derive fundamental information, such as chemical composition, crystal structure, size and its distributions, morphology and surface effects. At this purpose, an innovative approach of *Unified Small Angle X-ray Scattering and Wide Angle X-ray Total Scattering*, **UXS**, is here proposed. This frontier method will be applied to benchmark cases, such as highly monodisperse colloidal semiconducting NPs.

Accordingly, the definition and implementation of new experimental, theoretical and analytical protocols for a full quantitative characterization of nanomaterials by *UXS* will be accomplished. Furthermore, this work will allow extracting information on an important class of materials that will be helpful in guiding future synthetic approaches.

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Iryna Mazhak

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Fellowship: 01 Oct 2015 – 30 Sep 2018

Project title

The Social Determinants of Health and Health Inequities among Working-age Population in Ukraine

Project description

Health inequalities are one of the main challenges for public health policy. To reduce and eliminate health inequalities, we need to conduct an initial assessment of health inequalities, using appropriate indicators, and conduct systematic and long-term monitoring of health inequalities.

My research aims to analyze the social determinants of health and health inequities among working-age Ukrainian population; identify indicators for monitoring health inequities; and, develop an evidence-based model for a new approach to public health policy in Ukraine based on social determinants of health and illness. An explanatory sequential mixed methods design will be used. In the first quantitative phase of the research, I will conduct a secondary data analysis of existing Ukrainian data, as well as develop and implement a national survey of health inequalities. I will also conduct a secondary data analysis of an EU-database for analyzing country differences to compare population health outcomes in Ukraine vis-à-vis the EU. The second qualitative phase will involve in-depth interviews with people experiencing vulnerability in health. Also this phase includes developing case studies of good policy practices to tackle inequalities in health in the EU countries for potential adoption in Ukraine as well as developing a policy paper considering ways to tackle health inequalities in Ukraine. The proposed research is important not only for scientists but also useful for the national government as a base for developing strategies to reduce and eliminate health inequalities.

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**Isabel Kusche**

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Project title

Non-programmatic Politics in Times of Fiscal Crisis

Project description

The project is based on the assumption that in times of fiscal crisis governments must turn to something else than programmatic politics when attempting to secure a level of popular support sufficient to remain in power. It shall answer the question to what extent political parties and personnel in countries severely affected by the recent European fiscal crisis react by intensifying non-programmatic linkages with voters or particular groups of voters respectively. Non-programmatic politics is based on strategies that do either not include public criteria for the distribution of resources or violate publicly stated criteria in actual practice in favor of partisan bias. The existence of a link between fiscal crisis and non-programmatic politics has been noted in the literature on neoliberal reforms in Latin American countries. In contrast, with regard to European parties the role of such strategies for mobilizing voters has been largely neglected or relegated to specialized analyses that do not feed back into our general conception of political processes in European countries.

The project aims to close this research gap using a systems-theoretical approach to politics, which focuses on the threefold relationship between the political public, party politics and public administration. It will compare four critical cases, which have been known for variants of non-programmatic politics in the past, namely Great Britain, Ireland, Spain and Greece.

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Isabelle Torrance

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Project title

Greek Tragedy and Irish Politics

Project description

This interdisciplinary project demonstrates the significance of Irish adaptations of Greek tragedies in political discourse from the 18th to the 21st centuries. By charting productions, adaptations and translations in both English and Irish languages, by analyzing the choices of tragic subjects, the reception of performances and the circulation of published texts, it will be argued that Greek tragic models have consistently been aligned with a variety of political messages in Ireland, especially from the early 20th-century. The politics in question are various depending on the historical context of production and the content of the plays, but include nationalist, linguistic, socialist, and feminist approaches, with recent adaptations having a global political message. The political tensions of appropriating classical models in a post-colonial context do not apply to Ireland as they do to other colonized nations, due to the pre-existing familiarity of the Irish with the Classics dating back to late antiquity, and this makes Ireland a unique case for further study.

Much scholarship exists on Irish theatre and on its relationship to Irish politics, and some scholarship has examined how major Irish authors allude to classical literature. However, no sustained examination exists of the place of Greek tragic models within the historical landscape of Irish theatre and politics. This project will fill a gap in current scholarship and will explain the enduring power and popularity of Greek tragedy in Irish culture.

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Jessica Barker

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Project title

Inter-group environmental dilemmas: can we scale up from local to global cooperation?

Project description

Cooperation not only is the foundation of social behavior in humans and other organisms, but also underpins many urgent environmental and social problems resulting from over-consumption of or under-contribution to shared resources. Many of these issues, such as air pollution and overfishing, span regional or national boundaries. However, humans likely evolved to cooperate locally with members of small groups, at the expense of people in other groups. How can we overcome the limits of group favoritism to achieve cooperation on the inter-group, global scale needed to address these critical challenges?

The goal of my AIAS-COFUND junior fellowship is to leverage interdisciplinary research on within-group cooperation to advance our knowledge of inter-group cooperation, as applied to environmental dilemmas. Taking an evolutionary perspective, I will investigate when and why people confer benefits on others versus acquire more resources for themselves. I will consider four factors known to affect within-group cooperation: 1) formation of cooperative reputations, 2) punishment of non-cooperators, 3) inequality in costs associated with cooperation, and 4) threats to group success. In lab and field experiments designed to capture real-life situations, I will investigate how these factors scale up to affect inter-group cooperation over environmental resources: for example, whether punishment can function effectively across group boundaries to enforce attainment of environmental targets. The findings will provide insight into the evolution of group-level interactions, and suggest solutions to current environmental concerns.

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Jessica Wiskus

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Project title

Rhythmical Ethics (On Music and the Performance of Philosophy)

Project description

Certainly, the challenge of describing the relationship between consciousness and world has, across millennia, inspired a range of scholars. My particular interest is to examine this relationship as a *rhythmical* one, and I seek to develop this research within the field of ethics.

While a system of ethics ordinarily concerns itself with the content of propositional statements, my work tries to take into account not only what philosophical texts say about ethics but also how certain texts enact or perform their meaning. I read the texts with a focus upon *rhythmical forms* – i.e., those transcendental structures of temporality according to which consciousness constitutes its meaning. Rhythm, in this sense, describes the power through which a present, expressing a whole, coheres with an absent past and future. Indeed, I argue that, like these very texts, our lives as subjects are constituted rhythmically. It is not simply that we possess musical rhythm – that we can anticipate, remember, and perform with a steady beat; rather it is that we are *of* rhythm (through the flowing and unified character of the body and its intentions) and we are *oriented through rhythm* (insofar as operations of perception, memory and understanding depend upon temporal cohesion). What I wish to understand, by engaging with the performative aspects of philosophical works, is how this rhythmical orientation stands beneath *ethos* (i.e. as our comportment with the world).

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Julieta Goenaga

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Project title

Sexual selection and the evolution of male and female reproductive protein

Project description

Male reproductive proteins (Acps), transferred to female at mating, have profound effects on female fecundity, female remating rate and mediate the sperm competition (SC) outcome. Acps are the primary target of postmating sexual selection (PSS) on males, a potent force that may drive rapid evolutionary change of Acps and female reproductive proteins (Frps) with consequences for speciation. Despite the vital role of PSS in the speciation has been documented, its role in Acps evolution is poorly understood. Acps were identified in few cases and our understanding of the selective forces responsible for their rapid evolution remains to be determined.

Compare the Acps between species with divergent mating system is ideal to study the effect of PSS on Acps diversification. Interlineage variation in the degree of polyandry and so, in SC intensity, might cause male reproductive gland (Ag) proteome divergence. Combining proteomics and phylogenetic comparative analysis this project will study the evolution of Ag-proteome on closely related species of beetles with different mating system. It will explore the interlineage changes in Ag-proteome and the potential for correlated evolution between Ag-proteome and female remating rate. The project will also investigate direct effects and causality of varying levels of SC on Ag-proteome using experimental evolution approach. This section will examine the Ag-proteome variation in relation with different levels of SC and identify the Acps and Frps that have evolved under different SC regimens.

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Kirill Postoutenko

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Project title

"Beasts" vs. "Supermen": Asymmetrical Mapping of Conceptual Landscapes in Bolshevik Russia, Nazi Germany and 'New Deal'- United States

Project description

The proposed project for the first time tracks down the specific roles and functions of asymmetrical concepts, looking at both media messages and population feedbacks in two "totalitarian" (Soviet Union, Nazi Germany) and one "democratic" ('New Deal'-United States) countries in 1933-1939.

The special attention is paid to the links between asymmetrical concepts and socio-political asymmetries: the preliminary analysis shows that 20th century totalitarian regimes resort to the most drastic conceptual asymmetries - from 'Übermenschen' vs. 'Untermenschen' to 'Bolsheviks' vs. 'mad dogs' – in proportion to the ossification of their organizational and communicative hierarchies. Besides, the interplays between mainstream conceptual asymmetries and other forms of semantic manipulation (such as deictic references to time and space) are looked at closely: a sample of the late Nazi rhetoric shows how 'Jewish parasites' are steadily excluded from 'tomorrow' - year after year.

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Luís Pedro Viegas

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Project title

Green Design of CFC Alternatives: an Interdisciplinary Approach

Project description

The Montreal and Kyoto protocols embody the environmental policy arising from the deep concern on global climate change and its effect on Earth. Understanding and dealing with this problem is one of the greatest scientific and social challenges for the future.

The present proposal addresses such challenges. I will focus on reactions involving hydrofluoropolyethers (HFPEs), used as substitutes of hazardous chlorofluorocarbons and related compounds in a wide variety of applications. The main objective of this proposal is to determine the environmental impact of a promising new class of HFPEs, by using molecular modelling methods in order to investigate the mechanisms and kinetics associated with their tropospheric degradation. This new class of HFPEs is recent with practically no existing data related to its environmental chemistry. I will evaluate their claimed low environmental burden by studying the OH initiated oxidation reaction rate constants of dimethoxyfluoropolyethers (a subset of this new class) and by analyzing the degradation reactions of the only products of the previous reaction: fluorinated esters. Here, two possible loss mechanisms will be considered: reaction with OH and uptake/hydrolysis by models of water droplets.

These pioneering calculations will try to break new ground and unveil fundamental aspects of the unestablished atmospheric chemistry of such HFPEs, hopefully allowing for the discovery of new alternatives for the production of new greener replacements through eco-friendly industrial processes

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Fellowship: 01 Oct 2014 – 30 Sep 2017

Project title

The renal natriuretic response following an acute potassium intake

Project description

Hypertension is a common lifestyle related health problem. It is estimated that 40% of western world adults have hypertension. The condition is a major risk factor for a number of cardiovascular and renal diseases. Even moderate elevations in blood pressure are associated with shortened life expectancy. It has long been known that high dietary K⁺ intake is able to reduce blood pressure and protect against hypertension. The mechanism underlying the positive effect of high K⁺ intake is poorly understood. Interestingly, it has been shown that high K⁺ intake acutely increases Na⁺ excretion. Since Na⁺ is the main cation in the extracellular fluid, the total amount of body Na⁺ is the defining parameter of plasma volume and thereby blood pressure. Thus, dietary K⁺-triggered reduction of total body Na⁺ likely plays a part of the beneficial effects on blood pressure.

A central study, in my previous research identified, the molecular mechanism underlying the rapid increased urinary Na⁺ excretion following ingestion of a K⁺ rich meal. This new knowledge allows for investigations of a number of important questions including: 1) How is a K⁺ rich meal that enters the gastrointestinal tract sensed? How is the sensed signal transduced from the gastrointestinal tract to the kidneys allowing for molecular alteration in renal Na⁺ handling? 2) How is K⁺-induced Na⁺ excretion regulated as a function of dietary status prior to the ingestion of a K⁺ rich meal? This project aims to elucidate these specific questions to get a better understanding of the mechanism of how a K⁺ rich diet protect again hypertension.

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Magnus Kjaergaard

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Project title

Can a cooked noodle store information? The mechanisms of disordered proteins in synaptic plasticity

Project description

Learning and memory depends on the ability to modulate the connections between neurons in the brain in a process called synaptic plasticity. An important mechanism in synaptic plasticity involves the proteins sensing chemical signals at synapses, neurotransmitter receptors. The NMDA receptor is a neurotransmitter receptor with a key role in learning, which depends on its large intracellular domains. The intracellular domains are intrinsically disordered, are the target of many kinases and bind to many other proteins. Despite its importance, we know little about how the intracellular domains regulate the receptor mechanistically, and little about how intrinsically disordered proteins can exert long-range regulatory effects in general. This is largely due to the almost complete lack of structural information on the intra-cellular domains.

In this project, I will study the intracellular domains of the NMDA receptor using a combination of NMR spectroscopy and single molecule FRET. Structural experiments will be complemented by functional measurements using electrophysiology in *Xenopus* oocytes. The goal is to identify the mechanism by which the intra-cellular domains affect synaptic plasticity on short time-scales, and how this effect is modulated by phosphorylations and ligand interactions. This will provide another piece of the enigma of how the many wonderful functions of the brain emerge from chemical and physical processes.

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Project title

How do We Sense Touch, Sound, Balance and Force?

Project description

Perception of force is a key component in our sense of touch, hearing, balance and pain as well as in regulation of blood and osmotic pressures. Fundamental to these concepts is that at some point force (newtons) is translated into electrical conductance (siemens) through the action of membrane embedded mechanosensitive channels that open or closes in response to changing forces in the lipid bilayer. Conceptually this is perfectly conceivable, but it is astonishingly little we know about the mechanism of how bilayer responses are converted into changes in channel activity. So unlike the well-described nature of taste and odorant receptors and the photoreceptors in the eye, we have not yet a clear idea of how our mechanosensitive receptors work.

When studying the relationship between lipid membrane and embedded proteins the major challenge is that, in contrast to stimulation with e.g. ligands or voltage, we don't really know the exact nature of our stimulation; we can poke or pull a cell, but we cannot quantify what the channel actually feels at a molecular level.

To increase our understanding of functional interactions between lipids and protein, we will use a minimalist approach by developing novel assays that utilize a set of molecular tools to manipulate specific forces in the membrane, while at the same time taking advantage of the detailed information available from single channel recordings.

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Michael Flaherty

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Project title

The Cage of Days: Time and Temporal Experience in Prison

Project description

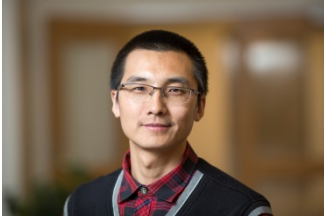
During the last two decades, the USA has embarked upon an unprecedented policy of mass imprisonment. By any measure, the scope of this policy is astonishing. In 2008, the Pew Center on the States found that, "for the first time, more than one in every 100 adults is now confined in an American jail or prison."

There is a large social science research literature on prisons, but very little of it concerns time and temporal experience. There is a smaller, but rapidly growing, social science literature on time and temporal experience, but very little of it concerns incarceration and other forms of confinement. My project integrates these lines of inquiry by looking at how prison inmates experience and deal with time.

My co-author and primary informant (K. C. Carceral, a pseudonym) was paroled two years ago after serving more than thirty years in various prisons. Our data consist of (1) my co-author's personal experiences, (2) his responses to questions I posed while he was still in prison, (3) his observations of, and interviews with, fellow prisoners, and (4) our readings of thirty-five prison autobiographies. Our analysis is inductive. From these data, we are formulating a grounded theory of time and temporal experience in prison and other forms of confinement (e.g., POWs and hostages).

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Project title

Developing a risk assessment system to evaluate the impacts of future land use and climate scenarios on aquatic ecosystems - an interdisciplinary model-based synthesis

Project description

Global changes (including land use and climate changes) have particular threats to aquatic biodiversity. To mitigate the further decline of aquatic biodiversity and develop adaptive strategies, it is necessary to develop a novel interdisciplinary modelling approach (linking future scenarios, catchment habitat properties and ecological responses) to evaluate the impacts of land use and climate changes on aquatic ecosystems. Two Danish catchments (Gudenå 2600 km², SkjernÅ 2300 km²) with solid long-term hydrologic and ecological data are selected to test the integrated models. The risk assessment system includes a dynamic DSSI/R approach (driver – stressor – state - impact/response), coupling the process-based ecohydrological and biological models. Major drivers (land use and climate changes) are the model input data, and main stressors on ecosystems (water balance, flow regime, nutrients, sedimentation) are included in the algorithms of the hydrological model. Based on the multiple stressors, the dynamic changes of the states (hydrologic processes and habitat conditions) will be defined and displayed in the model outputs. The interactions between states and aquatic ecosystems will be evaluated by comparing the base and predicted biological models. This novel combination between hydrology and ecology will help to understand how multiple stressors interact with aquatic organisms and evaluate the potential risks of future land use and climate scenarios, which is essential for developing adaptive strategies for aquatic ecosystems and future environmental policy.

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Patrick Biller

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Project title

Interdisciplinary Production of Biofuels via Hydrothermal Treatment

Project description

Development of renewable transportation fuels is crucial for solving two of Europe's most urgent challenges: energy security and mitigation of climate change. The proposed research falls in the strategic area of Hydrothermal liquefaction (HTL) which is emerging as an innovative technique for the production of liquid transportation fuels. During the conversion process, high temperature and pressure is applied to biomass feedstocks in aqueous slurries, resulting in a fuel similar to petroleum crude. The process mimics the process of fossil fuel creation which has taken place over millions of years, where heat and high pressure was applied to biomass under the earth surface, resulting in our current petroleum, coal and natural gas reserves. My work can replicate this process in a matter of minutes. The advantages of the technology are its high versatility in terms of feedstocks and products. The produced bio-crude is upgraded to fuels suitable for existing infrastructure.

I will be working closely with scientists from the Department of Chemistry and Engineering and with of the world's largest HTL pilot plants at the Aarhus Foulum Campus. The aims of my research include reducing the overall costs of the process by reducing waste and optimising the recovery of the chemical energy available in the biomass. I will also be working on optimising the fuel quality so it can be used directly in existing infrastructure. A techno-economic and environmental assessment will be carried out to assess the sustainability of the overall biofuel concept.

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Rebecca Simmons

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Project title

Screening and Early Treatment for Type 2 Diabetes

Project description

Type 2 diabetes is among the world's deadliest conditions. Individuals with diabetes have a high risk of experiencing a heart attack or stroke (cardiovascular disease). They also have a reduced life expectancy of up to ten years. Many people with the condition remain undiagnosed. When they do present at their doctor, they often show signs of diabetic complications. There is consequently a strong argument for screening for diabetes and treating the condition early. Some countries have introduced national screening programmes for diabetes and cardiovascular disease. However, the costs and benefits of this public health approach are unknown.

Using a number of Danish cohorts and national registry data, I will focus on answering key outstanding questions in the field of screening and early treatment for type 2 diabetes. Does screening for diabetes reduce future risk of experiencing a heart attack or stroke? How intensively should we treat people found to have diabetes following screening? How should we treat people we find at high cardiovascular risk but without diabetes following screening?

Answers to these questions can be used to inform health care decision makers about key uncertainties regarding screening programmes for diabetes and cardiovascular disease.

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Rima Obeid

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Project title

Hidden milestones in the roadmap of shipping cobalamin from food into the cell

Project description

Cobalamin (Cbl, vitamin B12) was discovered in the first half of the 20th century. Recently, the breath-taking pace of development in scientific technologies (e.g., proteomics, metabolomics) has changed our understanding for the role of nutrients and the complex interaction between diet, environment and diseases. My concept is that knowledge gained during the first burst of Cbl research in the period around 1950-1970 needs revisiting in order to find hidden milestones and to question concepts that have been accepted without further proof.

Conditions like aging, diet and drugs increase the risk of developing Cbl deficiency, probably because of diminished ability to liberate, absorb or distribute the food-derived vitamin. Understanding of the transport and function of Cbl, may pave the road for using this system for drug delivery. My research stay in Aarhus has the following main goals:

- 1) Tracking the evolution of cobalamin science (e.g., by the Danish scientist Einar Meulengracht (1887-1976): this will help clarifying unexplored observations by employing modern technologies.
- 2) Study cobalamin trafficking, cellular distribution and interplay with energy metabolism: the role of cobalamin in mitochondrial energy metabolism and glucose output (this part will depend on using modern technologies in clinical and experimental models).
- 3) Dissemination of knowledge: scientific meetings, workshops at international conferences and scientific publications. For example editing a book and writing a chapter on "Cobalamin", CRC Press/ Taylor & Francis Group.

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Svend-Erik Skaaning

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Project title

The Rise of Modern Democracy

Project description

Although much scholarly work has been devoted to what has been termed the first wave of democratization, this literature has a number of shortcomings. First, most previous studies of the early history of modern democracy have primarily been occupied with the changes in and differences between dominant understandings of democracy rather than if citizens actually enjoyed the democratic rights in practice. Second, studies of single countries have dominated previous works, meaning that comparative attempts to reveal more general patterns are lacking. Third, the few comparative studies have mostly taken an aggregate and rather crisp view of democracy. Against this backdrop, I propose the following research question: What were the dominant patterns of democratic sequencing during the first wave of democratization? In my attempt to answer this question, I address each of the emphasized limitations.

First, the project will have an explicit focus on de facto respect for democratic rights during the 'long nineteenth century' (here: 1789-1920) rather than merely de jure regulations and the history of democratic ideas. Moreover, the project will have a broad comparative perspective, covering all Western countries, i.e., Europe and the Americas, which are the parts of the world where we find the more interesting variation and developments in the period of interest.

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Project title

Novel methylation biomarkers for breast cancer clinical management

Project description

Breast carcinoma is the most common cancer in women. Denmark has the second highest and increasing age-standardized incidence of breast cancer in the world with 105 cases per 100,000 women. Currently, performed at diagnosis pathological examination of breast tumor tissues identifies a variety of prognostic and predictive factors. However, breast cancer patients with apparently similar clinical and pathological features often have a widely varying disease course. This emphasizes the urgent need to develop novel tests that can be used to improve the treatment by better patient selection for personalized therapy.

Various environmental and lifestyle factors (e.g. smoking or use of exercise) induce epigenetic changes to the cells' genetic material. Current research clearly shows that on the one hand those changes can contribute to disease development but at the same time can be used as targets for diagnostic tests. Those tests can potentially enable disease predisposition screening as well as early diagnosis and design of patient specific treatment. However, the use of epigenetic changes to facilitate disease diagnosis and guide treatment is still marginal.

As an AIAS fellow and in collaboration with leading internationally recognized experts in breast cancer, we aim to investigate the involvement of the epigenetic changes in breast cancer development. As well as identify and clinically validate a number of tests that can potentially be used in clinical breast cancer management.

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Ümit Akbey

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Fellowship: 01 Feb 2015 – 31 Jan 2018

Project title

Structural Biology of Bacterial Functional Amyloids: In Biofilms, Fibril Formation and Infection

Project description

Most bacteria form biofilms to survive under stress-inducing conditions by achieving a communal living. The biofilm associated pathogenic microbes are resistant to antimicrobial agents and host immune system, as a result they are more infectious and difficult to treat. Amyloid fibrils are the most crucial components supplying the structural integrity of biofilms, so the antimicrobial resistance. However, very little structural information is known on biofilms and their amyloid proteins. Understanding the structural features forming biofilm integrity, by focusing particularly on the amyloid proteins, is an important step towards development of successful therapeutics for infectious bacteria protected in robust biofilms.

The primary goal of my project is to determine the first atomic-resolution structures of biofilm forming functional amyloids from different bacteria, by using advanced solid-state Nuclear Magnetic Resonance (ssNMR) spectroscopy. Starting from these structural insights, I aim to understand fibril formation in function and disease, the role of amyloids in biofilms, ways of controlling or preventing biofilm formation in the associated chronic diseases, and finally, the structural switch of proteins between soluble, oligomeric and fibrillar states.

The results obtained from my research will be of great importance for understanding and treating functional amyloid related diseases caused by bacterial biofilms. As a result, clever design and optimization of anti-biofilm drugs targeting fibrils can be achieved.

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Fellowship: 01 Oct 2014 - 30 Sep 2017

Project title

Quantitative assessment on ecological changes and the contribution from climate in remote Greenland lakes: A multidisciplinary study

Project description

The Arctic is warming at what might be an unprecedented rate and ecosystems are undoubtedly changing. How they are changing is more moot and whether the Anthropocene will contain ecosystems unlike any that occurred over the Holocene is central to this proposed project. To answer this, I will develop and apply multidisciplinary methods to quantitatively track recent and more distant climate change and also track ecosystem response at these times based on lake sediments. The project will develop a novel method for inferring past climate change through the analysis of the stable isotopes of Oxygen (i.e. $\delta^{18}\text{O}$) preserved in biological remains. The technique will then be applied to sediment cores from areas of Greenland with different climate histories – in particular contrasting dynamics and speed of change of inland ice mass (e.g. Ilulissat vs Isua, Nuuk).

An assessment of ecosystem response independent of the inference of past climate change will be gained by diatom analysis, or cladoceran and algae pigments analysis where more appropriate. It will place the current change in the context of past change and inform on ecological regime shift and resilience for Arctic lakes. Furthermore, for a global implication, the research findings in this project will serve for comparison purpose with other aquatic ecosystems (i.e. strong human impacted Yangtze shallow lakes and unique alpine lakes in Yunnan Province in China) to understand how robust the $\delta^{18}\text{O}$ technique and different trajectory and mechanism of lake environmental changes.

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Project title

Ecological Genomics of Phototrophic Gemmatimonadetes Bacteria in Diverse Environments

Project description

Bacterial photosynthesis represents an extraordinary biological innovation. Mimicking/engineering this process has long been thought to be a promising way to meet the increasing needs for energy by human society. Achieving these goals requires a deep understanding of how bacterial photosynthesis has evolved and how it functions. Recently, purple bacterial reaction centers were found in a member of the understudied bacterial phylum Gemmatimonadetes, which gives us an inspiring example as to how nature make the photosynthesis function transferrable between distantly related bacteria. However, we still know very little about phototrophic Gemmatimonadetes bacteria (PGB). This greatly limits our ability to assess their genomic properties, ecological significance and evolutionary history.

In this project, I will study the hitherto uncultured PGB dwelling in soils, active sludge and on plant surfaces by combining traditional microbiology and cutting-edge sequencing technology. I plan to: (a), assemble a highly sensitive infrared imaging system for fast identification of bacteriochlorophyll-containing bacteria; (b), conduct a quantitative study of the abundance of PGB in various types of environments; (c), isolate PGB strains and sequence their genomes to elucidate the patterns of genomic evolution in PGB; (d), develop model PGB organisms to study their physiological responses to oxygen and light availability. The results of this project will not only enhance our understanding of this long-overlooked group of phototrophic bacteria, but also lay a foundation for future exploring their biotechnological potentials.

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Aarhus Institute of Advanced Studies, AIAS

An AIAS fellowship provides talented researchers from all academic disciplines with unique conditions for pursuing their own research interest for a period of up to three years, completely free from other obligations than exactly their core activity: researching. As an AIAS fellow you are part of a multidisciplinary environment in which you are given the opportunity to exchange projects, ideas and key points with other researchers of the same high level from diverse academic disciplines.

Both talented junior and senior researchers from all academic areas from around the world can apply for an AIAS Fellowship. Fellows are free to choose their research topic within all academic fields and are selected according to the criterion of excellence. Applicants must hold a PhD and have a minimum of two years of postdoctoral research experience after completion of a PhD.

Two types of fellowships are offered at AIAS:

The AIAS-COFUND Marie Curie fellowship programme is co-funded by Aarhus University Research Foundation and the European Union's Seventh Framework Programme for Research and targeted at researchers from all academic disciplines from around the world. The programme contains a mobility demand, comprising both incoming fellowships as well as reintegration fellowships.

The JCS (Jens Christian Skou) fellowship programme is supported by Aarhus University Research Foundation and can be applied for by Aarhus University researchers with an existing affiliation to Aarhus University, i.e. researchers who are already employed at Aarhus University.

Read more about AIAS, our fellows and the application process at:

www.aias.au.dk



Read more about AIAS, the AIAS fellows and how to apply:
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