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FELLOWS
AUTUMN 2018

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Aarhus Institute of Advanced Studies, AIAS

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AIAS Fellows Autumn 2018
Edition: October 2018
Editor: Lena Bering

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Fellows

Adeline Masquelier

Professor
AIAS and Tulane University, US
Fellowship: 01 Oct 2018 – 30 Sep 2019

Project title

Haunted Schools: Schooling, Possession, and Ecology in Niger

Project description

In Niger, where girl's education is a fraught issue, schoolgirls are occasionally possessed by spirits said to have become homeless when, some time ago, the trees they dwelled in were cut to build new schools or expand existing ones. Situated at the intersection of religion, ecology, and education, this project considers what happens when schools emerge as both crucibles where futures are forged and sites of spiritual attacks that draw students back to some ancestral space-time. Through a focus on haunted schools, it explores 1) narratives of loss, displacement, subjection, and appropriation; 2) the wider claims about the past that these narratives authorize; and 3) how these claims reframe the present and ultimately call into question seemingly established futures. Far from distancing adolescent girls from a religious heritage that many have rejected, schools become entry points for the past to come rushing in, thereby endangering the very futures opened up by education. By derailing the progressive trajectories that schooling enables, possession lays bare existing struggles in the victims' lives as well as larger constraints on future-making, forcing them to recalibrate their aspirations

Area of research:

Social anthropology

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Andrew Faulkner

Professor
AIAS and University of Waterloo, Canada
Fellowship: 01 Oct 2018 – 30 Sep 2019

Project title

The Tradition of Greek Early Christian Poetry

Project description

This interdisciplinary research project explores Greek Early Christian classicizing poetry of late antiquity (3rd to 7th centuries AD), verse written on Christian themes in the traditional language and poetic forms of Greek antiquity. The study will contextualize this poetry within the tradition of Greek poetry from Homer to late antiquity, as well as within the broader tradition of Judaeo-Christian literature, through the close comparison of language, motifs, narrative structure, and theology.

Particular attention will be given to the major poetic corpora of Saint Gregory Nazianzus (4th century), Nonnus of Panopolis (5th century), and a late antique hexameter paraphrase of the Septuagint Psalms. Detailed studies of individual poems or sets of poems provide the basis for a synthetic and diachronic study of the development of this poetry. Special attention will be given throughout to the modes and characteristics of interaction in the dialogue between 'pagan' and Judaeo-Christian tradition within the wider context of late antique literature and culture.

Area of research:

Literature and Theology

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Anna Neuheimer

Associate Professor
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Fellowship: 01 Feb 2018 – 31 Jan 2020

Project title

Timing is everything: Developing a mechanistic understanding of fish timing strategies and their role as conduits of climate change (FutureFish).

Project description

In seasonal environments, timing is everything: energy dynamics and production are controlled by how well predators can match their prey in space and time. This is thought to be particularly true for larval life-stages of many fish, where limited parental investment means survival depends on how well larvae match the timing of their food. Often termed the "Match-Mismatch Hypothesis" (MMH), the dependence of production on larvae-prey match is a long-held hypothesis, but has been rarely mechanistically tested due to e.g. sampling limitations. There is an immediate need to determine the influence of the MMH in shaping fish distribution and production, now and in the future.

Through the FutureFish project, I will respond to this need by providing new mechanistic modelling tools that describe controls on larval fish timing and how timing influences the propagation of climate effects through ecosystems. Work will quantify (i) the influence of larval fish timing in controlling production, (ii) the adaptive potential of larval fish timing, and (iii) predictions of the influence of larval timing on future fish production and related ecosystem dynamics.

Area of research:

Marine Ecology

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Anni Kleino

Associate Professor
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Fellowship: 01 Oct 2017 – 31 Mar 2020

Project title

The role of functional bacterial amyloids in alpha-synuclein misfolding and aggregation in Parkinson's disease

Project description

Parkinson's disease is a progressive movement disorder characterized by a loss of dopaminergic neurons, and accumulation of misfolded alpha-synuclein into insoluble, amyloidal aggregates in the brain. Current evidence suggests that misfolding and aggregation of alpha-synuclein starts in the gut, from where the misfolded protein spreads to the central nervous system and further seeds misfolding and aggregation of the protein in the brain.

Many bacterial species produce functional bacterial amyloids, which have been shown to induce alpha-synuclein aggregation in animal models. Patients with early Parkinson's disease have inflammation in the gut, and altered species composition of gut microbiota. At AIAS, I will work in collaboration with Professor Daniel Otzen's laboratory to identify and characterize functional bacterial amyloids produced by the species prevalent in the guts of Parkinson's disease patients. Further, I will analyze whether these functional bacterial amyloids trigger inflammation, and promote alpha-synuclein misfolding, aggregation, and seeding. Understanding the factors and mechanisms that trigger and promote alpha-synuclein misfolding and aggregation could help develop therapies to delay the onset of Parkinson's disease, and/or slow down the disease progression

Area of research:

Molecular biology

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Asad Jan

Postdoc
AIAS and previously University of British Colombia, Canada
Fellowship: 01 Oct 2017 – 30 Sep 2020

Project title

Blocking the prion-like spread of alpha-synuclein pathology as a novel therapeutic target in Parkinson disease and related synucleinopathies

Project description

Parkinson's disease (PD) is the most common neurodegenerative cause of severe motor disability and eventually cognitive dysfunction. The pathological hallmarks are intraneuronal inclusions of alpha-synuclein (AS) protein in brain and loss of midbrain dopaminergic neurons. A prion-like behavior of α-synuclein (AS) protein has been hypothesized in the pathogenesis of PD. According to this hypothesis, pathogenic forms "seeds" of AS propagate from periphery into the neurons of central nervous system (CNS), where they recruit endogenous AS in the first receiving neurons, exit the cell and enter connected neurons. The ongoing AS aggregation and cell-cell propagation are considered to induce oxidative stress, neuronal dysfunction and neuronal loss in CNS. Therefore, blocking the neuronal propagation of AS will prevent AS neurotoxicity and neurodegeneration. To understand the neuronal mechanisms in the prion-like spread of AS in the CNS, I will develop a mouse model in which I will selectively modify the genetic makeup of first receiving neurons. This will be done via viral delivery of novel CRISPR/Cas9 genome editing tools. Once the tools are developed and model is refined, I will test specific hypothesis towards mitigating AS propagation and neurotoxicity.

Area of research:

Neuroscience

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Borbála Kovács

Postdoc
AIAS and previously Central European University, Hungary, Denmark
Fellowship: 01 Oct 2018 – 31 Jul 2019

Project title

Retrenchment politics in contemporary Eastern Europe: the emergence of formal insecurity regimes?

Project description

The study aims to document and explain the peculiar kind of retrenchment process observed so far in both post-socialist Hungary and Romania in a small number of social policy domains and leading to what I have termed 'formal insecurity' regimes, characterised not by an increasingly greater conformity with residual welfare states, geared towards the least advantaged in society, but rather an increasingly more pro-middle-class welfare regime at the expense of the most disadvantaged. The study is geared towards systematically documenting the exclusionary features of policy instruments in a number of post-socialist welfare regimes over the last fifteen years across several policy domains, outlining the policy design elements that produce these formal insecurity regimes. The study thus aims to reify what is purportedly a new welfare regime in post-socialist (and possibly post-industrial) societies, the formal insecurity regime; to reassess and provide a new conceptual perspective on welfare state adaptation in postsocialist societies especially; and, finally, to provide a snapshot of where welfare regimes stand today to ask further questions about the nature of the politics driving the formation of this formal insecurity regime

Area of research:

Social policy, welfare state studies, Eastern Europe

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Christina Kkona

Associate Professor
AIAS and previously Hellenic American University, Greece
Fellowship: 01 Oct 2017 – 30 Sep 2020

Project title

The unexpected: toward a politics and aesthetics of discontinuity

Project description

This project is based on the premise that liberal political programs are politics of hope: people strive in the present for a better world that they probably will not see, but that will be inherited by future generations. This postponement of any fulfillment enhances alienation and entraps the subjects into serving an invisible cause that may never inscribe itself in time. As an alternative, I aim to theorize a politics that would no longer be a future-oriented promise, but a present-oriented action embracing unpredictable events. Subscribing to the tradition of feminist, queer and antiracist studies, it approaches social exclusion from the perspective of temporal consciousness and posits the unexpected as the locus from which the present is organized as space-time of openness to the other.

The unexpected refers to what lies behind the future as a fantasy construction and, as such, it is situated outside the usual representation of time as flow. Thus, it escapes the linearity of narrative only to appear in the fissures of artworks, as the analysis of specific literary and cinematic works aims to demonstrate.

Area of research:

Cultural Studies

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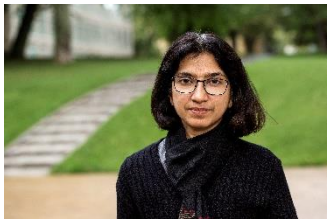

Cici Alexander

Associate Professor
AIAS and previously Bournemouth University, UK
Fellowship: 01 Oct 2017 – 30 Sep 2020

Project title

Innovative remote sensing techniques for developing green infrastructure strategies to support biodiversity conservation and carbon sequestration

Project description

This project will use innovative, and complementary, remote sensing techniques to study land cover dynamics, especially changes in woody vegetation cover, to support biodiversity conservation and carbon sequestration. Airborne Laser Scanning (ALS), using the technique of Light Detection and Ranging (LiDAR), has advantages over other remote sensing techniques in characterizing the three-dimensional structure of vegetation. Remote sensing using low-cost Unmanned Aerial Vehicles (UAVs) is another research area, which has made rapid advances in recent years. In addition, newly launched satellites provide imagery at better spectral and spatial resolutions than before, and often are free of cost.

The main objectives of the project are to develop methods for the rapid assessment of changes in woody vegetation cover, for the identification of forests of High Nature Value, and to identify indices for the quality of urban green networks, using the above datasets. This project will thus support the development of conservation strategies that give due importance to the ecosystem services provided by both grasslands and forests.

Area of research:

Remote Sensing

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Darin Stephanov

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AIAS and previously University of Jyväskylä, Finland
Fellowship: 01 Oct 2016 – 31 Jan 2019

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.

Area of research:

Comparative Imperial History

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Dennis Konnerup

Assistant Professor
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Fellowship: 01 Feb 2018 – 31 Jul 2020

Project title

Surviving saline floods – salinity and submergence tolerance of wild rice

Project description

Climate changes have resulted in rising sea levels, which in turn cause more saline water in some rivers and wetland habitats. This phenomenon can result in terrestrial plants and crops becoming temporarily submerged which now occurs more frequently. Some plants, e.g. rice and floating sweet-grass possess hydrophobic leaves that retain a thin layer of air when submerged. This air layer is called a gas film, and the aim of the project is to elucidate how this mechanism enhances oxygen and carbon dioxide exchange with the floodwater under different floodwater conditions. Furthermore, the gas film may also form a protecting barrier towards the harmful ions in saline floods preventing direct contact of the floodwater with the tissue. As model plants, I will use species of wild rice as these possess higher genetic diversity compared to cultivated rice. Submergence experiments will be conducted to assess how the species differ in their ability to retain gas films under water, and studies with microelectrodes will be used to examine how the internal aeration of the plants depends on the gas film retention time.

Area of research:

Plant Physiology

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Doug Speed

Assistant Professor
AIAS and previously University College London, UK
Fellowship: 01 Oct 2017 – 31 Mar 2020

Project title

Develop statistical tools to analyze large-scale genetic datasets and improve our understanding of complex diseases

Project description

The high heritability of many human diseases indicates the great potential of personalized medicine. For example, the heritability of schizophrenia is about 75%; loosely speaking, this means that if we perfectly understood the genetic factors, which affect schizophrenia risk, then given an individual's genome, we would be able to predict with 75% accuracy whether or not they would develop the condition. However, at present, we are a long way from realizing this potential (e.g., for schizophrenia, the best models have accuracy less than 20%). With an ever-increasing amount of genetic data being produced, this lack of success is not for want of trying. Instead, the problem is that we lack statistical tools to efficiently analyze these data.

My project has two main aims. The first is to develop and release statistical tools to improve our ability to analyze genetic data. The second is to apply these tools to large-scale datasets, with a particular focus on neurological diseases. I will make all my methods freely available to other researchers through my software LDAK (www.ldak.org).

Area of research:

Genetics

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Franco De Angelis

Professor
AIAS and University of British Columbia, Canada
Fellowship: 01 Oct 2018 – 30 Sep 2019

Project title

Conjoining Cultures and Economies in the Pre-Roman Western Mediterranean

Project description

The study of the ancient Mediterranean and Near East has witnessed an explosion of new data and approaches over the past generation. While some historical narratives have also changed to reflect this, many old, outdated narratives continue. A case in point concerns the pre-Roman western Mediterranean between the 9th and 3rd centuries BC, especially Italy, its later historical centre. These centuries witnessed the conjoining of immigrant cultures and economies from the eastern Mediterranean (particularly Greeks and Phoenicians) with indigenous cultures of the western Mediterranean (particularly Etruscans and Sardinians). Modern scholarship has long been dominated by the view that the immigrants encountered a backwards western Mediterranean, and that the supposedly more sophisticated newcomers transferred their advanced cultures and economies to them. This resulted in the western Mediterranean's emergence from the 'Dark Age' and laid the basis for its later historical success, including the Roman Empire. In the last generation, another view has challenged this narrative, thanks to the growth and interpretation of archaeological data in the western Mediterranean. More careful and systematic analyses have begun, without automatically attributing developments to Eastern Mediterranean origins. My research at AIAS will involve writing a new book re-examining this whole question.

Area of research:

Ancient Mediterranean History

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Federica Bertolotti

Postdoc
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Fellowship: 01 Feb 2017 – 31 Jan 2019

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.

Area of research: Solid State (Nano-)Chemistry

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Georgina Born

Professor
AIAS and Oxford University, UK
Fellowship: 01 Oct 2018 – 30 Sep 2019

Project title

Music, Digitisation, and Cultural and Intellectual Property

Project description

My project builds on ethnographic studies by my ERC research team (2010-15), which addressed comparatively how digitisation and digital media are transforming musical practices in the developing and developed world. It involves analysing the ethnographic material to address debates at the intersection of music, anthropology, digital culture and legal studies. Initial debates concerned the crisis caused to copyright industries by digital technologies; they assumed that the norms enshrined in Western intellectual property law are universal and beneficial and should be extended to the global South. However, counter-arguments have developed in anthropology and legal studies contesting the universality of IP law and arguing that its impact on developing countries can be deleterious. This critical paradigm draws on scholarship from the global South and calls for attention to the diverse values, economic systems and concepts of authorship manifest in cultural production in the developing world. Music is a good cultural form through which to pursue these challenges, and my aim is to bring the ethnographic material systematically to bear on them, with the potential for both intellectual and policy impact.

Area of research

Musicology, anthropology, digital culture studies, critical cultural legal studies, sound studies.

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Isabelle Torrance

Associate Professor
AIAS and previously University of Notre Dame, USA
Fellowship: 01 Oct 2016 – 30 Sep 2019

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.

Area of research:

Classical Reception and Irish Studies

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Jessie Fillerup

Associate Professor
AIAS and University of Richmond, USA
Fellowship: 01 Feb 2018 – 31 Jan 2020

Project title

Enchanted: Music and Conjuring in the Long Nineteenth Century

Project description

In nineteenth-century theatrical magic shows, music was a ubiquitous but unacknowledged presence. Little is known about the styles and genres of music that were used, the featured musical performers, and the music's function in constructing the illusionist's *mise-en-scène*. For the first part of my project, I use archival sources to develop an historical account of music in magic shows, lingering on figures of particular interest like the illusionist Robert Heller, who started his career as a virtuoso pianist and ended it performing stage illusions interspersed with selections of solo piano music. My approach interweaves histories of magic, music, spectacle, and popular entertainment in ways that challenge perceived divisions between genres considered to be "high" (opera, ballet, symphonic music) and "low" (street entertainment, circuses, variety shows).

The second part of the project uses the historical evidence I have gathered as an interpretive lens; through it, I examine sorcerer and conjurer figures in opera and ballet, like the Magician in Stravinsky's *Petrushka*, the Chinese conjurer in Satie's *Parade*, Von Rothbart in Tchaikovsky's *Swan Lake*, and Klingsor in Wagner's *Parsifal*.

Area of research:

Musicology

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Joshua Nash

Associate professor
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Fellowship: 01 Feb 2018 – 31 Jan 2021

Project title

Documenting the highly endangered Pitcairn Island language in New Zealand and Australia

Project description

The legend of the Mutiny on the *Bounty* and the fate of Pitcairn Island have reached mythical status in the annals of world and Pacific history. The linguistic outcome of the settlement of the island by 9 British naval officers and 18 Polynesians in 1790 is heralded as one of the most important contact languages on the planet. Despite this fact, the Pitcairn Island language—Pitcairn—continues to be an enigma for linguists.

Pitcairn is an endangered Anglo-Polynesian contact language spoken by around 30 speakers on Pitcairn Island, about 70 speakers in New Zealand, and approximately 10 in Australia. Because of its endangerment, miniscule speaker numbers and the aging population of its speakers, this language is in dire need of scientific attention. Research into Pitcairn lies at the heart of the world's fascination with Pitcairn Island, linguistic and cultural hybridity and the romance of the Pacific and Polynesia.

This project will contribute to understanding how small diasporic populations of contact languages manage various processes involved in language change, cross-generational transmission and language and culture loss through documenting how Pitcairn is used in New Zealand and Australia. The outcomes will be instrumental in advancing contemporary research into both pidgin and creole language typology as well the documentation of endangered contact languages more generally.

Area of research:

Linguistics

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Lucia Angelino

Assistant Professor
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Project title

The phenomenology of acting in synchrony with others: towards the bodily roots and sensorimotor foundations of the sense of we-agency in musical joint action

Project description

The dialectic of emergence of improvised (unplanned), yet intentional, joint actions represents surely one of the most pressing and controversial issues in contemporary debates on social interaction and collective action: how do we come to act together in a coordinated way without a prior plan? How do we find the way to capture the dialectic of emergence of multi-agents, improvised actions that are collectively intentional, although not fully planned in advance?

As the first multi-level phenomenological approach to the topic, this project will address this set of questions by looking at joint action through the lens of joint jazz improvisation. Combining theoretical research with carefully designed phenomenological analysis and a specific empirical test case the project aims not only at a better understanding of the role of improvisation in interpersonal and inter-group encounters. Moreover, the project's distinctively phenomenological take yield conceptual adjustments that challenge traditional accounts of joint action and allow for a systematic re-assessment and theoretical overhaul of current thinking on social cognition and joint actions.

Area of research:

Philosophy

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Luís Pedro Viegas

Assistant Professor
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Fellowship: 01 Feb 2016 – 30 Sep 2019

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.

Area of research:

Theoretical and Computational Atmospheric Chemistry

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Magnus Kjærgaard

Assistant Professor
AIAS and previously University of Cambridge, UK
Fellowship: 01 Feb 2016 – 31 Jan 2019

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.

Area of research:

Molecular Biology

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Michael Bang Petersen

Professor
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Fellowship: 01 Feb 2018 – 31 Jan 2019

Project title

Political Rumors: Why Do They Spread and How Can They Be Stopped?

Project description

Politics has changed. Citizens once passively received their news from a select number of mass media. Today, in the age of the Internet, citizens increasingly receive news via social media and are actively engaged in disseminating the news stories themselves. One consequence of this fundamental change is that rumors, i.e., difficult-to-verify information, abound in politics. This project contributes to our understanding of political rumors (1) by building a general theory of the psychology that motivates people to spread political rumors. By identifying the precise psychological mechanisms involved, the project will (2) develop strategies for media, government officials and politicians for reducing these motivations and, hence, the negative impact of political rumors.

Theoretically, the project combines the insights from biology, psychology and the social sciences to argue (a) for the existence of basic psychological motivations for spreading rumors to mobilize against enemies, (b) that these motivations are activated in the context of modern polarized politics, and (b) that modern social media technology magnifies the impact of these motivations; hence, furthering political polarization and conflict and creating a downward-spiral of political trust.

Area of research:

Political science

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Michael Voldsgaard Clausen

Assistant Professor
AIAS and previously University of Oxford, UK
Fellowship: 01 Oct 2016 – 30 Sep 2019

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 singe channel recordings.

Area of research:

Biophysics

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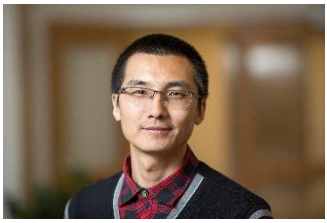

Naicheng Wu

Postdoc
AIAS and previously Kiel University, Germany
Fellowship: 01 Feb 2016 – 31 Jan 2019

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 processed-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.

Area of research:

Hydroecology

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Nicholas Vrousalis

Associate Professor
AIAS and Leiden University, The Netherlands
Fellowship: 01 Oct 2018 – 31 Jul 2019

Project title

Freedom and Economic Inequality

Project description

Vrousalis' research project studies how inequality in income and wealth impact freedom. Conventional wisdom in philosophy and economics holds that mutually consensual and beneficial transactions promote freedom and autonomy. Vrousalis challenges this view, advocating an alternative perspective on freedom.

Suppose your boss offers you a raise in return for cleaning his boots, or that a millionaire offers you thousands of euros in return for a sexual favour, or that a fellow train commuter offers you the only available seat for fifty euros. Vrousalis argues that option-improving proposals, such as these, are bad when and because they make it costly for you to do the right thing for the right reasons. The boss, millionaire, and commuter do not help you respond to the right reasons; instead, they deliberately steer you towards giving a best response to their use of power over you. When might makes right, might corrupts right.

By drawing upon recent philosophical debates on freedom and the morality of markets, Vrousalis will study the problem of mutually beneficial mutual subjection, with an eye towards autonomy-enhancing alternatives.

Area of research:

Political philosophy

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Paraskevi Manolaki

Postdoc
AIAS and previously Open University of Cyprus, Cyprus
Fellowship: 01 Oct 2017 – 30 Sep 2020

Project title

Effects of global changes on river ecosystem functioning: Understanding underlying mechanisms of multiple stressors using aquatic plant traits

Project description

Most of the global changes in rivers are occurring as multiple interacting stressors and lead to a chain of effects on the ecosystem structure and functioning. The aim of the project is to investigate the response of aquatic plants to multiple stressors in order to determine the effect of response biological trait composition of the plant community to ecosystem functioning by utilizing field and experimental data. The overall goal of the project is to disentangle the effect of these stressors to morphological and functional plant characteristics, and to specify the cause-effect chains at the heart of the relationships between species response strategy and stream ecosystem functioning.

I will seek to answer the following questions: a) what are the prevalent plant traits of aquatic plants to the stressors of increased nutrient loads (N, P and their combination) and high flow regime disturbance? b) what is the stoichiometry performance and variation of aquatic plants under different nutrient loading ratios (N:P)? c) how does nutrient and flow driven changes to macrophyte trait composition affect ecosystem functioning (denitrification, nutrient uptake and metabolism)?

Area of research:

Stream Ecology

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Peter Teglberg Madsen

Professor
AIAS and Aarhus University, Denmark
Fellowship: 01 Feb 2018 – 31 Jan 2019

Project title

Adaptive perception through active sensing

Project description

Sensible behavioral responses of an animal to the environment depend critically on the capability to sample the surroundings with a suite of sensory systems. Most senses are passive where specialized receptor cells are sensitive to intrinsic energy from the surrounding environment, such as light and sound. In contrast, a few senses, such as echolocation, are active: the animal itself produces the energy that it subsequently detects after convolving it with the environment.

With this AIAS Jens Christian Skou fellowship, I wish to harness the tremendous synergy from integrating parallel studies of how echolocating animals sense actively with sound into a big picture framework of how animals in general use sensory-motor feedback processes to actively adapt their perception via active sensing.

Area of research:

Sensory physiology

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Rasmus O. Bak

Associate Professor
AIAS and previously Stanford University, USA
Fellowship: 01 Oct 2017 – 30 Sep 2020

Project title

Precise CRISPR-mediated genomic integration of large transgenes in human cells

Project description

Genome editing is the process by which precise genetic changes can be made at exact locations in the genome in living cells. In primary human cells, the preferred method of delivering the donor template DNA, that carry the genetic changes to be introduced, is using viral vectors based on adeno-associated virus (AAV). However, a major drawback of AAV vectors is their inherent restricted carrying capacity of 4.7 kilobases (kb), which limits the applications of genome editing for large or multi-gene genomic integration.

This project aims to develop a novel genome editing platform based on multiple AAV donors that allow site-specific integration of large gene cassettes that exceed the capacity of a single AAV donor. Such a system expands the current genetic toolbox for studying gene function, and it enables therapeutic gene editing for a number of diseases.

Area of research:

Biomedicine

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Renee Van der Sluis

Assistant Professor
AIAS and University of Melbourne, Australia
Fellowship: 01 Oct 2018 – 30 Sep 2021

Project title

Evaluating the effect of genetically engineered human plasmacytoid dendritic cells to induce specific anti-HIV responses and kill HIV-infected cells

Project description

Antiretroviral therapy (ART) has revolutionised the treatment of infection with Human immunodeficiency virus (HIV) and has dramatically reduced mortality and morbidity in HIV-infected patients. However, HIV infection is still a global health burden with 36.7 million people infected at the end of 2016 with approximately only 53% of those individuals having access to ART. Although ART is successful in suppressing viral load, it needs to be taken lifelong, has side effects and is expensive. Therefore, there is an urgent need to cure HIV or strategies to induce virus remission so that ART can be stopped without viral rebound.

The aim of this research project is to evaluate the potential of using donor specific stem-cells to engineer plasmacytoid dendritic cells (pDC) and use them as cell-based therapy to treat infection with HIV. The objective is to examine how pDC can induce killing of HIV infected cells through i) $CD8^+$ T cells, ii) natural killer (NK) cells iii) antibody-dependent effector cells or iv) directly by inducing a so-called "killer DC" phenotype.

Area of research:

HIV, dendritic cells, immunomodulation, therapeutic vaccine

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Samia Joca

Associate Professor
AIAS and University of São Paulo, Brazil
Fellowship: 01 Oct 2018 – 31 Mar 2020

Project title

Investigation on the rapid and sustained antidepressant-like effects of Cannabidiol (CBD) and its mechanisms

Project description

Depression is a multifactorial and highly prevalent disease, with serious consequences to the individual and the society. Despite the wide variety of antidepressant drugs available, they all present a delayed therapeutic effect, and are not effective in about 40% of patients. Thus, research into new drugs with faster onset of action and overall improved therapeutic profile is an urgent need.

Our group recently showed that Cannabidiol (CBD), a non-psychotomimetic cannabinoid present in the *Cannabis sativa* plant, seems to be a promising compound, since it induced fast and sustained antidepressant effects in animal models. The mechanisms related to CBD effects, however, remain largely unknown. Therefore, our research aims to further investigate the therapeutic potential of CBD in depression models, and understand its molecular mechanisms, using state of the art preclinical techniques, molecular and pharmacological tools.

Since CBD has already proven efficacy for some specific neuropsychiatric conditions in humans, we believe that the study of its complex molecular properties can pave the way for a better understanding of depression neurobiology and the development of the next generation of antidepressants.

Area of research:

Behavioral pharmacology

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Shubiao Wu

Associate Professor
AIAS and China Agricultural University, China
Fellowship: 01 Oct 2017 – 30 Sep 2020

Project title

Nutrients recovery and bioremediation of polluted waters in treatment wetlands

Project description

Wastewater is often discriminated from its negative impact to the environment, since it often contains various contaminants such as organic matter, N and P which can result in eutrophication of water systems. However, these compounds cannot only be seen as waste which is just not handled properly in the right place, but are also valuable nutrients to the plants. Even though various technologies for wastewater treatment have been developed during the last decades, most of them are still focusing on the removal of these nutrients from water system by converting them into un-reusable/recoverable compounds. Moreover, wastewater generated from animals breeding systems often contains much higher contents of both N and P.

A complete and adequate treatment of these high strength waste effluents before discharge normally requires very high operational cost, which might be not affordable in some undeveloped areas. Therefore, this project is trying to investigate the possibility of using constructed wetlands as low cost but effective technique for nutrients recovery and bioremediation of polluted waters.

Area of research:

Environmental science

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Thomas Tram

Postdoc
AIAS and previously Institute of Cosmology and Gravitation, Portsmouth, UK
Fellowship: 01 Oct 2017 – 30 Sep 2019

Project title

Neutrino simulations under the spell of General Relativity

Project description

In 1687 Isaac Newton published the Philosophiæ Naturalis Principia Mathematica that described both the laws of motion and the law of universal gravitation. The Principa thus laid the foundation of classical mechanics. Newtons theory was unchallenged until Albert Einstein published his theories of relativity a series of papers between 1905 and 1916. According to the Special and the General theory of relativity Newtons laws are only approximate and receive corrections when objects move at large velocity or are in the vicinity of strong gravitational fields.

In 1922, soon after the publication of the theory of General Relativity, Alexander Friedmann showed that viable models of the Universe were expanding in time. This was observationally confirmed by Edwin Hubble in 1929, and this marked the beginning of physical cosmology.

It may then come as a surprise that the theoretical predictions for the large scale structure that we observe in the Universe today are computed using Newton's laws and not Einstein's relativistic theory. Going beyond this Newtonian approximation, even in the presence of massive neutrinos, is precisely the objective of my research proposal

Area of research:

Cosmology

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Tobias Wang

Professor
AIAS and Aarhus University, Denmark
Fellowship: 01 Feb 2018 – 31 Jan 2019

Project title

Evolution of the four-chambered heart

Project description

How did the four-chambered heart in both mammals and birds evolve independently from a three-chambered heart in their common ancestors amongst early reptiles? From a teleological point of view, this parallel evolutionary transition is consistent with rise in metabolism associated with the evolution of endothermy – the ability to maintain high and stable body temperatures – in both mammals and birds. However, it is not given that birds and mammals would solve the functional challenge of elevating oxygen transport by evolving so similar cardiovascular structures. Therefore, I am interested in elucidating whether there are evolutionary constraints in the ancestral reptilian heart and whether there were merely a few possible avenues to provide the high blood pressure and high heart rates to provide the extra oxygen transport to the body.

Area of research:

Zoophysiology

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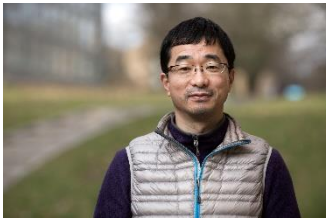

Tomonori Takeuchi

Associate Professor
AIAS and previously University of Edinburgh, UK
Fellowship: 01 Feb 2018 – 31 Jul 2019

Project title

Enhancing everyday memory with novelty

Project description

Most of our everyday memories are forgotten. However, the retention of these trivial memories is enhanced when something novel/salient happens shortly before or after the time of memory encoding. Dopamine signaling in the hippocampus plays an important role in this novelty-associated memory enhancement. We recently made a ground-breaking finding (Takeuchi *et al.*, *Nature*, 2016): projections from the noradrenergic locus coeruleus to the hippocampus can drive the novelty-induced memory enhancement via non-canonical release of dopamine. This is a completely new concept that I will explore by uncovering the molecular mechanisms of novelty detection and subsequent dopamine-dependent memory modulation.

I would like to address two issues:
(1) Which brain area detects novelty and how its signal reaches the locus coeruleus?
(2) Which proteins play crucial roles in novelty-induced memory enhancement in the hippocampus?

I will use sophisticated and well-defined everyday memory tasks in rats, designed to mimic the typical memory of daily life in humans, combined with a multidisciplinary approach. Identification of proteins that enhance memory retention will have the potential to reveal new drug targets for treatment/restoration of lost memory function.

Area of research:

Neuroscience

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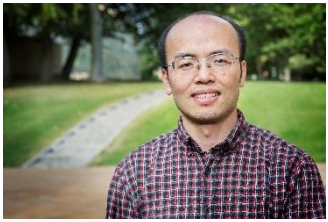

Yonghui Zeng

Associate Professor
AIAS and University of Southern Denmark, Denmark
Fellowship: 01 Oct 2016 - 30 Sep 2019

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.

Area of research: Environmental Microbiology

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Photos: by Martin Gravgaard

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.

Three types of fellowships are offered at AIAS:

The AIAS-COFUND Marie Skłodowska-Curie fellowship programme is co-funded by Aarhus University Research Foundation and the European Union's Seventh Framework Programme for Research and Horizon 2020 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.

The EURIAS fellowship programme is initiated and managed by NetIAS, the Network of European Institutes for Advanced Study. As a NetIAS member, AIAS has four EURIAS fellowships from 2017-2019. The EURIAS fellowships are co-funded by the European Union.

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

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