

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Neuroscience and Medicine, Medical Imaging Physics (INM-4)
http://www.fz-juelich.de/inm/inm-4/EN/Home/home_node.html

Supervising scientist: PD Dr. F. Grinberg, Prof. Dr. N. J. Shah

University for Registration: RWTH Aachen University

Research Field: Neuroimaging, MR physics

Position: PhD Student Sandwich PhD Student

Research Area: **Human Brain Mapping: Novel Diffusion MRI Contrasts**

Diffusion MRI provides exciting insights into the brain organization and allows for unprecedented understanding of the human brain connectome in ever-greater detail. The proposed study aims at developing novel diffusion-based biomarkers of the brain microarchitecture and quantitative indices of axonal integrity and global connectivity. These methods should improve our understanding of the complex relationships of the brain anatomy and function in neurodevelopment, neuroplasticity, ageing, neurodegeneration, and in pathological conditions.

The Institute of Neuroscience and Medicine in FZ Juelich provides a world-wide highly reputed research in neuroscience and a unique environment to support breakthrough discoveries. Among others, it runs an internationally unique imaging equipment such as the Ultra-High Field 9.4-tesla magnetic resonance scanner.

The successful applicant will participate in interdisciplinary research related to the development, validation and application of the new diffusion-based MRI contrasts.

Specific Requirements:

Desirable: experience with MRI data acquisition and imaging software
Obligatory: excellent educational records in the related field, good programming and data processing skills (Matlab), interest in MRI and neurosciences
Desirable applicant's background: physics, biophysics, biomedical physics, neuroscience, and related.
Good knowledge of English language (writing and speaking).

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: good knowledge of English language (writing and speaking)

Name and Address of the Supervisor: PD Dr. F. Grinberg, Prof. Dr. N. J. Shah,
Forschungszentrum Jülich, Institute of Neuroscience and Medicine (INM-4), 52425 Jülich, Germany
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Department/Institute: Institute of Neuroscience and Medicine, Medical Imaging Physics (INM-4)
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Supervising scientist: PD Dr. F. Grinberg, Prof. Dr. N. J. Shah

University for Registration: RWTH Aachen University

Research Field: Neuroimaging, MR physics

Position: PhD Student Sandwich PhD Student

Research Area: **Human Brain Mapping: Multimodal Connectome**

In vivo diffusion MRI provide fascinating insights into the brain architecture with novel fibre reconstruction algorithms allowing one to map brain connections at ever higher angular resolution. The proposed study aims at developing of advanced quantitative approaches to access white matter along specific tracts and at constructing the multimodal human brain connectome based on the functional and structural connectivity analysis. It will also include a development of physical "phantoms" ("ground truth" devices made of synthetic fibres) to mimic axonal pathways and to be used for validation of the developed methods in multi-centre/multi-scanner studies.

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The successful applicant will participate in interdisciplinary research related to the development, validation and application of the new diffusion-based MRI contrasts.

Specific Requirements:

Desirable: experience with MRI data acquisition and imaging software
Obligatory: excellent educational records in the related field, good programming and data processing skills (Matlab), interest in MRI and neurosciences
Desirable applicant's background: physics, biophysics, biomedical physics, neuroscience, and related.
Good knowledge of English language (writing and speaking).

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: good knowledge of English language (writing and speaking)

Name and Address of the Supervisor: PD Dr. F. Grinberg, Prof. Dr. N. J. Shah,
Forschungszentrum Juelich, Institute of Neuroscience and Medicine (INM-4), 52425 Jülich, Germany
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Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Energy and Climate Research, Stratosphere (IEK-7)
http://www.fz-juelich.de/iek/iek-7/EN/Home/home_node.html

Supervising scientist: Dr. Martin Kaufmann and Prof. Dr. Ralf Koppmann

University for Registration: University of Wuppertal

Research Field: Atmospheric and Space Physics

Position: PhD Student Sandwich PhD Student

Research Area:

The project deals with the modelling of the dynamics of the neutral thermosphere. It is supposed that neutral winds drive a complex systems of ionospheric currents and electric fields and affect ionospheric variability significantly. To understand, quantify and delineate this internal source of variability from external, solar (storm) driven variations is assigned with highest priority by space agencies and heliophysicists these days, because ionospheric disturbances affect the broadcasting of radio signals, thus deteriorating the precision of global positioning and communication.

Within this project a global thermosphere/ ionosphere/ plasmasphere model will be used to predict neutral thermosphere winds. The model data will be compared with ground based wind measurements over China and Europe and potentially with upcoming satellite measurements. The effect of neutral atmosphere waves will be compared to the external forcing of the thermosphere and approaches shall be developed to account for the forcing 'from below' in space weather models.

This work will be conducted in collaboration with the State Key Laboratory of Space Weather of the Chinese Academy of Science (CAS) and the Institute of Communications and Navigation of the German Aerospace Center (DLR).

Specific Requirements:

The candidate should have a Masters degree in physics or related subject, and should be familiar with thermosphere/ ionosphere/ plasmasphere physics and modelling.

Duration of stay: 4 years

Work Place: Forschungszentrum Juelich (near Coogne) and Wuppertal, Germany

Earliest Start: September 2017

Language Requirement: Very good English skills (writing and speaking)

Name and Address of the Supervisor: Dr. Martin Kaufmann and Prof. Dr. Rolf Koppmann,
Forschungszentrum Juelich, Institute of Energy and Climate Research
(IEK-7), 52425 Jülich, Germany
University of Wuppertal, Institute for Atmospheric and Environmental
Research
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Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de
Department/Institute: Institute of Energy and Climate Research, Stratosphere (IEK-7)
http://www.fz-juelich.de/iek/iek-7/EN/Home/home_node.html
Supervising scientist: Prof. Dr. Martin Riese and Dr. Martin Kaufmann
University for Registration: University of Wuppertal
Research Field: Optics, Remote Sensing, Atmospheric Physics
Position: PhD Student X Sandwich PhD Student □

Research Area:

This project deals with the development of an optical remote sensing instrument for a satellite mission. The scientific objectives are the observation of NO gamma bands at the 250nm ultra-violet spectral region. NO is a valuable proxy for solar activity and particle precipitation affecting Earth's upper atmosphere and near space environment. The instrument to be developed in this work shall be a monolithic spectrometer suitable to be operated on a micro satellite. A precursor instrument to measure atmospheric temperature from a nanosatellite (CubeSat) is currently under development in the same group. This instrument is extremely compact and has an exceptionally high throughput (one to two orders of magnitude larger than other instruments of that size). The development will be conducted in an international team involving experts from Germany Canada and China.

Specific Requirements:

The candidate should have a Masters degree in physics, mechanical/aerospace engineering or related subject and should be familiar with some of the following topics: CAD, structural/thermal analysis, optical design, interferometry.

Duration of stay: 4 years
Work Place: Forschungszentrum Juelich (near Cologne) and Wuppertal, Germany
Earliest Start: September 2017

Language Requirement: Very good English skills (writing and speaking)

Name and Address of the Supervisor: Prof. Dr. Martin Riese and Dr. Martin Kaufmann,
Forschungszentrum Juelich, Institute of Energy and Climate Research
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Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH - www.fz-juelich.de

Department/Institute: Institute for Energy and Climate Research, Nuclear Waste Management (IEK-6)
http://www.fz-juelich.de/iek/iek-6/DE/home/_node.html;jsessionid=D185D5B7FF5D71C55B18A16C25126145

Supervising scientist: Prof. Dr. Evgeny V. Alekseev

University for Registration: RWTH Aachen University

Research Field: Chemistry, Radiochemistry, Solid State Chemistry

Position: PhD Student Sandwich PhD Student

Research Area:

The proposed work will be done in the field of inorganic, structural and solid state chemistry of radioactive elements, mostly actinides. The successful candidate will be working with the elements such as Th, U, Np and Pu. He/She will perform synthesis of novel materials bearing with mentioned elements using different synthetic methods such as solid state, water solutions and hydrothermal reactions. Additionally the successful candidate will have an access to the state of the art high-pressure and high-temperature equipment for synthesis under extreme conditions. The obtained materials will be investigated by means of different structural and properties characterization techniques such as XRD, IR/Raman, DSC, HT-PXRD and etc. The obtained results will be then used for analysis of a possibility of such phase formation in natural conditions or within the technological processes including actinides.

Specific Requirements:

The ideal candidates should have a background in inorganic synthetic and structural chemistry and in crystal growth. He/She should know the methods of X-ray diffraction and vibrational and optical spectroscopies. The candidates with an experience in radiochemistry and in handling of radioactive materials will have a priority.

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich GmbH, Germany (near Cologne)

Earliest Start: October 2017

Language Requirement: IELTS 6,0

Name and Address of the Supervisor: Prof. Dr. Evgeny V. Alekseev, Forschungszentrum Jülich GmbH, Institute for Energy and Climate Research (IEK-6), 52425 Jülich, Germany, e.alekseev@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Complex Systems, Structural Biochemistry (ICS-6)
http://www.fz-juelich.de/ics/ics-6/EN/Home/home_node.html;jsessionid=2B2B3DAE57BD3384F557A2F5C44A295F

Supervising scientist: PD Dr. Renu Batra-Safferling

University for Registration: Heinrich-Heine-University Düsseldorf

Research Field: Protein structure / Structural biology / X-ray Crystallography

Position: PhD Student **X**

Research Area:

Our team is investigating the structures of blue-light photoreceptors containing light-oxygen-voltage (LOV) domains, which regulate a myriad of different physiological responses in both eukaryotes and prokaryotes. Due to their intrinsic photochemical and photophysical properties, LOV proteins have proven as novel fluorescent reporters and blue-light sensitive photo-switches. Biotechnological applications include their use as real-time oxygen independent flavin-based fluorescent reporter proteins (FbFPs), as biological trap to produce flavin mononucleotide (FMN), as well as in development of LOV-based optogenetic tools. Main objective of this project is to design and identify LOV proteins exhibiting novel photoproperties. Following spectroscopic characterization, high-resolution structures of selected LOV proteins will be determined using X-ray crystallography and solution NMR techniques. A successful PhD candidate will defend thesis at Düsseldorf University.

Specific Requirements:

- Master degree in Biochemistry or equivalent;
- Laboratory experience in protein overexpression and purification;
- Fluency in English language

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English (fluent in writing and speaking)

Name and Address of the Supervisor: PD Dr. Renu Batra-Safferling, Forschungszentrum Jülich, Institute of Complex Systems (ICS-6), 52425 Jülich, Germany
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<http://www.ipb.hhu.de/en/teams/teams/team-batra-safferling-granzin.html>

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Supervising scientist: PD Dr. Renu Batra-Safferling

University for Registration: Heinrich-Heine-University Düsseldorf

Research Field: Protein structure / Structural biology / X-ray Crystallography

Position: PhD Student **X**

Research Area:

Current focus of our group is to investigate the proteins and macromolecular complexes involved in signal transduction pathways at molecular level for which we employ several biophysical methods. Specific proteins studied extensively in our lab are members of arrestin family: arrestin, its splice variants and constitutively active mutants. Both, non-visual and visual arrestins play a central role in the regulation of signal transduction by binding the respective G protein-coupled receptors (GPCRs). In the proposed project, we will focus on studying selective arrestin-GPCR complexes. We will employ X-ray crystallography technique to determine high-resolution structures and small angle X-ray scattering (SAXS) to study the respective protein-protein interactions 'in solution'. A successful PhD thesis will be defended at University of Düsseldorf.

Specific Requirements:

- Master degree in Biochemistry or equivalent;
- Laboratory experience in protein overexpression and purification;
- Fluency in English language

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English (fluent in writing and speaking)

Name and Address of the Supervisor: PD Dr. Renu Batra-Safferling, Forschungszentrum Jülich, Institute of Complex Systems (ICS-6), 52425 Jülich, Germany
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Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich -- www.fz-juelich.de

Department/Institute: Institute for Bio- and Geosciences, Agrosphere (IBG-3)
http://www.fz-juelich.de/ibg/ibg-3/EN/Home/home_node.html

Supervising scientist: Prof. Dr. Nicolas Brüggemann

University for Registration: University of Bonn

Research Field: Earth and Environment

Position: PhD Student Sandwich PhD Student

Research Area:

Northwest Germany is one of the most intensive livestock production areas in the world. The associated nitrogen (N) surplus from applying pig and cattle slurry has become a severe environmental problem, leading to an increasing nitrate load in near-surface groundwater bodies that become ultimately unusable for drinking water purposes. Despite three decades of research the nitrogen surplus is still prevalent, and no practical solution of the problem has been developed so far other than reducing the animal density in this region. However, implementation of such drastic measures would have severe socio-economic implications for the region.

The aim of this PhD project is on the one hand to assess the potential of biological treatment of the slurry under varying conditions and with various amendments by analyzing the N conversion rates, the fixation of N in the amendments, and the release of greenhouse gases (GHG) and ammonia. The aim of this first part of the work is to identify the ideal conditions and amendments for binding most of the N originally contained in the slurry, while minimizing the N losses and GHG emissions. In the second part of the study, the identified amendments after slurry treatment shall be analyzed for their suitability as soil amendments for the improvement of the soil N status and N retention capacity. The successful PhD thesis will be defended at University of Bonn.

Specific Requirements:

MSc in natural sciences (biology, chemistry, soil science or related subjects) or engineering (environmental engineering, agricultural engineering) with sound technical skills. Very good knowledge of English language is required. Experience in stable isotope analysis and/or GC or GC/MS measurements are desirable.

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Fluent English (written and spoken)

Name and Address of the Supervisor: Prof. Dr. Nicolas Brüggemann, Institute for Bio- and Geosciences – Agrosphere (IBG-3), Forschungszentrum Jülich, 52425 Jülich, Germany (n.brueggemann@fz-juelich.de)

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Energy and Climate Research, Photovoltaics (IEK-5)
http://www.fz-juelich.de/iek/iek-5/EN/Home/home_node.html

Supervising scientist: Prof. Dr. Uwe Rau

University for Registration: RWTH-Aachen University

Research Field: Photovoltaics

Position: PhD Student Sandwich PhD Student

Research Area:

This project deals with the development of large area up-scaling of nanocrystalline silicon oxide (nc-SiOx:H) thin-films as highly transparent and highly conductive front side layer in industrial sized 156 x156 mm² silicon heterojunction (SHJ) solar cells. The SHJ technology has progressed rapidly in the last few years reaching record solar energy conversion efficiency up to 25.1% for two-side contacted and 26.33% for back-contacted devices. The nc-SiOx:H as an innovative material system, grown by plasma enhanced chemical vapor deposition, can potentially contribute to further improvement by reducing optical loss without affecting the electrical performance. This material is standardly used in large area silicon thin-film solar cells and was successfully demonstrated on small size SHJ solar cell. The IEK5 as a pioneer in the development of nc-SiOx:H is aiming at the demonstration of the industrial applicability of this material in SHJ solar cells. This project is planned to have a good balance between scientific and technological value. This work takes place on a large area deposition system where 9 156 x156 mm² cells can be produced in the same run.

Specific Requirements:

Besides optimizing throughput, homogeneity and reproducibility, this project targets at finding the correlation between material properties and solar cell performance on the basis of reliably large statistics. Due to the material properties of nc-SiOx:H that can be intentionally tuned within a wide range by changing the deposition conditions, the solar cell statistics can lead to deeper understanding of the physical working principles of SHJ solar cells (e.g. the contact formation, passivation mechanisms etc.)

- Excellent knowledge in electrical and optical phenomena in semiconductors.
- Laboratory experience on vapor deposition techniques.
- Experience with fabrication and/or characterization of Si wafer based PV.
- Know-How in electrochemistry e.g. metal plating preferred.
- **Business fluent English skills (very important criteria).**

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English (fluent in speaking and writing)

Name and Address of the Supervisor: Prof. Dr. Uwe Rau, Forschungszentrum Jülich, Institute of Energy and Climate Research (IEK-5), 52425 Jülich, Germany,
u.rau@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Juelich GmbH – www.fz-juelich.de

Department/Institute: Institute of Complex Systems, Theoretical Soft Matter and Biophysics (ICS-2)
http://www.fz-juelich.de/ics/ics-2/EN/Home/home_node.html

Supervising Scientist: Dr. Dmitry Fedosov, Prof. Dr. Gerhard Gompper

University for Registration: University of Cologne

Research Field: Biophysics, Soft Matter, Computational Physics

Position: PhD Student Sandwich PhD Student

Research Area:

Microorganism motility is essential in many biological processes, including infection, survival, and reproduction. The propulsion of various biological and artificial microswimmers through a viscous fluid has received enormous attention in several recent decades including studies on propulsion mechanisms, different swimmer geometries and structures, swimming efficiency, and collective behavior. However, there is a growing interest in microswimmer propulsion through a viscoelastic fluid, since many microswimmers have to propel through non-Newtonian fluids (e.g., sperm in a reproductive tract). We propose to investigate numerically propulsion of microswimmers through different viscoelastic fluids. The main goal of this research is to identify the differences in swimmer propulsion through a viscoelastic fluid in comparison to that in a viscous Newtonian liquid. Mesoscopic simulations will be used for numerical modeling, where microswimmers as well as passive microstructures will be modeled explicitly. The student will use one of the best European super-computing facilities for simulations. Finally, PhD graduation at the University of Cologne is expected.

Specific Requirements:

- A university degree or diploma in physics, biophysics, applied mathematics, or a relevant engineering discipline.
- Good programming skills and experience with numerical modelling.
- Good knowledge of English (writing and speaking)

Duration of Stay: 4 years

Work Place: Forschungszentrum Juelich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Good knowledge of English (writing and speaking)

Name and Address of the Supervisor: Dr. Dmitry Fedosov, Prof. Gerhard Gompper, Forschungszentrum Jülich, Institute of Complex Systems (ICS-2), 52425 Juelich, Germany; Email: d.fedosov@fz-juelich.de, g.gompper@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

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Department/Institute: Institute of Complex Systems, Theoretical Soft Matter and Biophysics (ICS-2)
http://www.fz-juelich.de/ics/ics-2/EN/Home/home_node.html

Supervising Scientist: Dr. Dmitry Fedosov, Prof. Dr. Gerhard Gompper

University for Registration: University of Cologne

Research Field: Biophysics, Soft Matter, Computational Physics

Position: PhD Student X Sandwich PhD Student

Research Area:

Microcirculatory blood flow plays an important role in many physiological processes and pathologies in the organism. To understand these processes, detailed investigation of blood flow is required under realistic conditions including cell deformability, hydrodynamic interactions, and complex geometries. In this project, we will investigate blood flow behavior in microvascular networks using numerical simulations. The smoothed dissipative particle dynamics method, a mesoscopic hydrodynamic simulation technique, will be employed to model blood as a suspension of deformable cells represented by a viscoelastic spring-network which incorporates appropriate mechanical and rheological cell-membrane properties. We will describe and potentially classify the properties of microcirculation perfusion including blood flow and pressure distribution, hemodynamic resistance, and blood cell trafficking. In addition, the effects of red blood cell aggregation and vessel wall elasticity on the microvascular flow characteristics will be explored. The student will use one of the best European super-computing facilities for simulations. Finally, PhD graduation at the University of Cologne is expected.

Specific Requirements:

- A university degree or diploma in physics, biophysics, applied mathematics, or a relevant engineering discipline.
- Good programming skills and experience with numerical modelling.
- Good knowledge of English (writing and speaking)

Duration of Stay: 4 years

Work Place: Forschungszentrum Juelich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Good knowledge of English (writing and speaking)

Name and Address of the Supervisor: Dr. Dmitry Fedosov, Prof. Gerhard Gompper, Forschungszentrum Juelich, Institute of Complex Systems (ICS-2), 52425 Juelich, Germany; Email: d.fedosov@fz-juelich.de, g.gompper@fz-juelich.de

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Department/Institute: Institute of Complex Systems, Theoretical Soft Matter and Biophysics (ICS-2)
http://www.fz-juelich.de/ics/ics-2/EN/Home/home_node.html

Supervising Scientist: Dr. Dmitry Fedosov, Prof. Dr. Gerhard Gompper

University for Registration: University of Cologne

Research Field: Biophysics, Soft Matter, Computational Physics

Position: PhD Student Sandwich PhD Student

Research Area:

Cell deformability can serve as a natural biomarker for the state of a cell, since it can change in a diseased state or under stress conditions. Recently, several deformability-based flow cytometers have been suggested to measure the deformability of cells and their properties. However, the interpretation of such measurements remains difficult and limited. Hydrodynamic simulations with realistic cell-mechanics models have a great potential for the establishment of a theoretical basis for the interpretation of cell deformation in fluid flow. In this project, the deformation of biological cells in microfluidic flow will be investigated using mesoscopic hydrodynamics approaches. We will explore how different cell properties (e.g., shape, elasticity, viscosity, bending rigidity) and flow and suspension characteristics (e.g., microfluidic device geometry, flow rate, fluid viscosity, cell concentration) affect cell deformation in microfluidics and whether we can identify the different contributions to the deformation. The student will use one of the best European super-computing facilities for simulations. Finally, PhD graduation at the University of Cologne is expected.

Specific Requirements:

- A university degree or diploma in physics, biophysics, applied mathematics, or a relevant engineering discipline.
- Good programming skills and experience with numerical modelling.
- Good knowledge of English (speaking and writing)

Duration of Stay: 4 years

Work Place: Forschungszentrum Juelich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Good knowledge of English (speaking and writing)

Name and Address of the Supervisor: Dr. Dmitry Fedosov, Prof. Gerhard Gompper,
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Germany; Email: d.fedosov@fz-juelich.de, g.gompper@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Neuroscience and Medicine, Molecular Organization of the Brain (INM-2)
http://www.fz-juelich.de/inm/inm-2/EN/Home/home_node.html

Supervising scientist: Prof. Dr. Dirk Feldmeyer/Prof. Dr. Björn Kampa

University for Registration: RWTH Aachen University

Research Field: Neuroscience

Position: PhD Student Sandwich PhD Student

Research Area:

Neuronal connectivity in the brain is considered to be the basis of sensory signal processing, learning and memory. The neocortex contains many excitatory and inhibitory cell types which differ markedly in structure, function and synaptic connectivity. This poses the question how the different neuron types interact with one another and with other brain areas and is one of the main research interests of the hosting institution. The advertised PhD project is aimed at describing the structural and functional properties of neocortical pyramidal neurons that projecting to and receiving input from different cortical and subcortical brain. For this, the prospective PhD student will be involved in a research project that describes the synaptic input-output relationship of the somatosensory cortex. To reveal long-range synaptic connectivity of neurons in vivo and in vitro labeling techniques and their functional properties, optogenetics and laser photostimulation as well as electrophysiological patch-clamp recordings will be used. In addition, immunohistochemical and neuroanatomical approaches will be applied to reveal morphological differences between the neuronal cell types and their synaptic connectivity profiles. The combination of optogenetic techniques, laser photostimulation, patch-clamp and neuroanatomy make this project multidisciplinary. Therefore, the prospective PhD student will have the opportunity to learn different techniques in a collaborative and stimulating research environment.

Specific Requirements:

The applicant should have a biological background, ideally with expertise in animal handling. He/she should be interested (or even be experienced) in patch-clamp recording methods and optogenetic techniques (no prerequisite). He/she should be willing to participate in animal research in rodents and have a strong commitment to teamwork. Very good knowledge of English language (speaking and writing).

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne) and RWTH Aachen University

Earliest Start: September 2017

Language Requirement: English; a German language course will be offered parallel to the project

Name and Address of the Supervisors: Prof. Dr. Dirk Feldmeyer & Prof. Dr. Björn Kampa, Forschungszentrum Jülich, Institute of Neuroscience and Medicine (INM-2), 52425 Jülich, Germany, Email: d.feldmeyer@fz-juelich.de, b.kampa@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Bio- and Geosciences, Agrosphere (IBG-3)
http://www.fz-juelich.de/ibg/ibg-3/EN/Home/home_node.html

Supervising scientist: Prof. Dr. Harrie-Jan Hendricks-Franssen

University for Registration: RWTH Aachen

Research Field: Land Surface Hydrology, Data Assimilation

Position: PhD Student Sandwich PhD Student

Research Area:

Land surface temperature assimilation in the integrated subsurface-land surface-atmosphere model TerrSysMP

This PhD-research will focus on the assimilation of land surface temperature in the integrated subsurface- land surface- atmosphere model TerrSysMP. Land surface temperature is an important state that links the water and energy cycles and its assimilation should give information about these two cycles. It is therefore expected that land surface temperature assimilation can improve the modelling of the exchange fluxes of water, energy and also carbon dioxide between the land and the atmosphere. The assimilation of land surface temperature was tested in several studies, but it was found that it hardly improved model states and fluxes in those studies. This work will focus on an improved methodology to assimilate land surface temperature. The first part of the PhD-work will focus on the development of this new methodology, and a comparison will be made with the traditional assimilation strategy. A second contribution of the PhD-work will be the estimation of sensitive soil and ecosystem parameters in combination with land surface temperature assimilation. Finally, the developed methodology will be tested in a real-world study (for example the Rur catchment in Germany), together with the assimilation of other data like groundwater levels and surface soil moisture content. The capacity to assimilate soil moisture content and groundwater levels in TerrSysMP has already been developed.

Specific Requirements:

- Background in hydrology, soil science, remote sensing
- Programming experience is essential
- Good statistical knowledge is important
- Experience with data assimilation is of advantage

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: October 2017

Language Requirement: very good English skills (writing and speaking)

Name and Address of the Supervisor: Prof. Dr. Harrie-Jan Hendricks-Franssen,
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Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Central Institute for Engineering, Electronics and Analytics (ZEA-3)
http://www.fz-juelich.de/portal/EN/AboutUs/organizational_structure/Institutes/CentrallnstituteEngineering/_node.html

Supervising scientist: Dr. Pitter F. Huesgen

University for Registration: University of Cologne

Research Field: Proteomics, Analytical Chemistry, Biochemistry

Position: PhD Student Sandwich PhD Student

Research Area:

Project: C-terminomics

Proteolysis modifies proteins, generating new N and C termini, also called neo-N and neo-C termini. Such truncation leads to new proteoforms with often dramatically altered functions compared to the precursors. In recent years, selective enrichment of protein N termini from complex proteomes enabled identification of many new proteolytic proteoforms and determination of protease substrates (methods reviewed e.g. in: PMID:22023699). This provided tremendous advances in our understanding of the regulatory function of proteolysis in health and disease.

In principle, highly complementary information could be obtained from protein C-termini profiling. This is especially relevant for carboxypeptidases, because their activity does not produce fragments that allow determination by N termini enrichment. We and others have shown that enrichment of C-terminal peptides on a proteome wide level is feasible, but so far technical challenges have restricted their application. With this project, we want to test several modifications/improvements of the established CTAILS procedure (Nature Methods, PMID: 20526347) and evaluate alternative approaches using biologically relevant samples. With the improved method we will determine C-terminally processed proteins in relevant complex biological samples, determine physiological substrates of selected carboxy-peptidases and/or endoproteases and attempt to identify novel C-terminal protein modifications.

Specific Requirements:

- M.Sc. in (bio)analytical chemistry, biochemistry or related field
- Hands-on experience either in biological sample preparation and/or mass spectrometry, preferably nano-LC-MS/MS.
- Experience in proteomics and computational data analysis is highly advantageous
- High degree of reliability, dedication and willingness to work in a team

Duration of stay: 4 years

Work Place: Forschungszentrum Juelich, Germany (between Aachen and Cologne)

Earliest Start: September 2017

Language Requirement: Very good oral and written **English** communication skills
A German language course will be offered parallel to the project

Name and Address of the Supervisor: Dr. Pitter F. Huesgen, Forschungszentrum Jülich, Central Institute for Engineering (ZEA-3), 52425 Jülich, Germany, p.huesgen@fz-juelich.de; (please send relevant documents including your cover letter and CV as pdf document)

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Neuroscience and Medicine, Molecular Organization of the Brain (INM-2)
http://www.fz-juelich.de/inm/inm-2/EN/Home/home_node.html

Supervising scientist: Prof. Dr. Björn Kampa, Prof. Dr. Dirk Feldmeyer

University for Registration: RWTH Aachen University

Research Field: Neuroscience, Life Science

Position: PhD Student Sandwich PhD Student

Research Area:

The brain state affects sensory perception, cognition, and learning. Many cortical areas exhibit changes in the pattern and synchrony of neuronal activity between sleep and wakefulness or in quiet versus active behaviours. What mechanisms control brain states, and what are the functions of the different states? These questions describe the main research interests of the hosting institute. The advertised PhD project focuses on the impact of acetylcholine on neuronal signal integration and sensory processing in rodent cortex. The prospective PhD student will participate in a research project in which the impact of optogenetic excitation (Channelrhodopsin) of basal forebrain cholinergic neurons on cortical neurotransmitter release will be measured with combinations of state-of-the-art in vitro and in vivo techniques. Optogenetics, Multiphoton-Imaging, Patch-Clamp electrophysiology and Neuroanatomical methods are multi-disciplinary, so that the candidate has the opportunity to experience collaborative research and teamwork among various disciplines and laboratories at the Forschungszentrum Jülich and the University of Aachen.

Specific Requirements:

The applicant should have a biological background, ideally with expertise in animal handling. He/she should be interested (or even be experienced) in patch-clamp recording methods and optogenetic techniques (no prerequisite). He/she should be willing to participate in animal research in rodents and have a strong commitment to teamwork. Very good knowledge of English language (speaking and writing).

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich and RWTH Aachen University, Germany (both near Cologne)

Earliest Start: September 2017

Language Requirement: English; a German language course will be offered parallel to the project

Name and Address of the Supervisors: Prof. Dr. Björn Kampa & Prof. Dr. Dirk Feldmeyer, Forschungszentrum Jülich, Institute of Neuroscience and Medicine (INM-2), 52425 Jülich, Germany, Email: b.kampa@fz-juelich.de, d.feldmeyer@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute for Energy and Climate Research, Photovoltaics (IEK-5)
http://www.fz-juelich.de/iek/iek-5/EN/Home/home_node.html

Supervising scientist: Prof. Dr. Thomas Kirchartz

University for Registration: University of Duisburg-Essen

Research Field: Photovoltaics

Position: PhD Student Sandwich PhD Student

Research Area:

Solar cells made from lead-halide based perovskites have been shown to enable efficiencies > 20 % using a solution-based fabrication process. However, the materials currently lack stability and are insufficiently well understood in many respects related to electrostatics and charge carrier recombination in these materials. We are looking for candidates that support our research efforts on fabricating and characterizing layers of lead-halide perovskites made from solution or alternatively by co-evaporation. We aim to focus on efforts to reduce and understand recombination in the bulk and at interfaces and will use methods like transient photoluminescence to study the recombination. In addition, we are interested in improving material stability e.g. by using alternative cations.

Specific Requirements:

The successful candidate should have a background in physics, or electrical engineering and be familiar with the physics of semiconductors. The PhD would be in the faculty of Electrical Engineering, so basic courses in Electrical Engineering would be required.

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Very good English skills (writing and speaking)

Name and Address of the Supervisor: Prof. Dr. Thomas Kirchartz, Forschungszentrum Jülich,
Institute for Energy and Climate Research (IEK-5), 52425 Jülich,
Germany, t.kirchartz@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute for Advanced Simulation/Jülich Supercomputing Centre (JSC)
http://www.fz-juelich.de/ias/jsc/EN/Home/home_node.html;jsessionid=9D041228661165CCA A994AD4C2FCE075

Supervising scientist: Dr. rer. nat. habil. Andreas Kleefeld

University for Registration: Brandenburg University of Technology Cottbus-Senftenberg

Research Field: Applied Mathematics

Position: PhD Student Sandwich PhD Student

Research Area:

Interior transmission eigenvalues and non-destructive testing:

The aim in non-destructive testing is to visualize the interior of a given three-dimensional object in order to uncover location, size, and geometry of inhomogeneities. Interior transmission eigenvalues can be used for this purpose. However, the efficient numerical calculation of interior transmission eigenvalues is a challenging task due to the fact that the corresponding interior transmission problem is nonlinear, non-elliptic, and non-self-adjoint.

The applicant will focus on a very active research topic. More precisely, what interior transmission eigenvalues are, how they can be computed to high accuracy (for example with the help of boundary integral equations), and how they might be used to visualize the interior of a given three-dimensional object. Additionally, some open problems both from the theoretical and practical point of view shall be solved as well. In this context, we might open a new research area: eigenvalue optimization.

Specific Requirements:

Very good knowledge in Mathematics: elliptic partial differential equations, integral equations, boundary element method, numerical linear algebra (numerical computation of eigenvalues).

Basic knowledge in Mathematics: numerical analysis, optimization, complex analysis (residue theorem and Cauchy's theorem)

Very good knowledge in programming: C or C++, Matlab or Octave

Basic knowledge in high performance computing (MPI, openMP).

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Fluent in English (both oral and written)

Name and Address of the Supervisor: Dr. Andreas Kleefeld, Forschungszentrum Jülich GmbH,

Institute for Advanced Simulation/Jülich Supercomputing Centre,
52425 Jülich, Germany

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ResearchGate: https://www.researchgate.net/profile/Andreas_Kleefeld

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Energy and Climate Research, Nuclear Waste Management and Reactor Safety (IEK-6)
http://www.fz-juelich.de/iek/iek-6/DE/home/_node.html

Supervising scientist: Dr. P. Kowalski

University for Registration: RWTH Aachen or Cologne University

Research Field: Computational Materials Science and Nuclear Waste Management

Position: PhD Student Sandwich PhD Student

Research Area:

In Institute of Energy and Climate Research: Nuclear Waste Management and Reactor Safety (IEK-6) we investigate solid state chemistry and physics of materials that could be suitable for storage of nuclear waste or form as secondary phases during waste disposal. The project consists of advance atomistic modeling of actinide-bearing materials in order to characterize their physical and chemical properties that are determined by presence of actinide cations, including T & P driven phase transition and electronic properties. The studies will aim into computational characterization of newly synthesized actinide-bearing solid phases by application of reliable, quantum chemistry-based computational techniques suitable for simulation of actinides-bearing materials and will be performed using superior supercomputing resources available at Forschungszentrum Jülich (Research Centre Jülich), including JUQUEEN – one of the largest supercomputer in Europe. The research will complement the experimental effort on solid state chemistry of actinides ongoing in our institute and will require active interaction with various internal and external experimental and modeling groups.

Research area:

- atomistic modeling of materials: ab initio & force fields simulation techniques using state-of-the-art methods of modern quantum chemistry and materials science.
- Solid state chemistry of actinides and nuclear waste management: atomistic modeling of actinide-bearing solid phases.
- High performance computing.

Specific Requirements:

For PhD student: Master degree in physics, chemistry, computational, geo- or material science. Experience in: working under Linux environment, atomistic simulations and high performance computing would be appreciated but not essential.

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: fluent knowledge of English language

Name and Address of the Supervisor: Dr. Piotr Kowalski, Forschungszentrum Jülich GmbH, Institute for Energy and Climate Research (IEK-6), 52425 Jülich, Germany, p.kowalski@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Energy and Climate Research, Electrochemical Process Engineering (IEK-3)
http://www.fz-juelich.de/iek/iek-3/EN/UeberUns/Ansprechpartner/Heads%20of%20Department/lehneri_person_2015.html?nn=557422

Supervising scientist: Prof. Dr. Werner Lehnert

University for Registration: RWTH Aachen, Faculty of Mechanical Engineering

Research Field: Modeling in Electrochemical Process Engineering (CFD)

Position: PhD Student Sandwich PhD Student

Research Area:

Polymer electrolyte fuel cells and polymer electrolyte electrolyzers are currently under development with a focus on high efficiency and lifetime. The development of these electrochemical energy converters is supported by modeling and simulation. One major challenge is still the mathematical description of the simultaneous transport of water and gas in the cells. These two-phase flow phenomena take place inside the flow channels as well as inside the stochastic porous components of the Membrane Electrode Assembly. The flow channels have dimensions in the mm range, whereas the pore sizes of the porous media under examination are in the micrometer range.

The proposed work addresses the development of mathematical models which will be implemented into computational fluid dynamics (CFD) software in order to simulate the operating behaviour of these electrochemical devices. The focus will be on coupled heat and mass transfer and electrochemistry inside single cells. In addition to the simulations on the cell level, complete stacks of cells will also be described with mathematical models.

A successful PhD-thesis will be defended at RWTH Aachen University.

Specific Requirements:

Computational fluid mechanics; mathematics/physics/engineering; object oriented programming skills; process engineering; electrochemistry; ability to work in a team / excellent team player

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: fluent knowledge of English language

Name and Address of the Supervisor: Prof. Dr. Werner Lehnert, Forschungszentrum Jülich GmbH, Institute for Energy and Climate Research (IEK-3), 52425 Juelich, Germany
w.lehnert@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Energy and Climate Research, Electrochemical Process Engineering (IEK-3)
http://www.fz-juelich.de/iek/iek-3/EN/UeberUns/Ansprechpartner/Heads%20of%20Department/lehneri_person_2015.html?nn=557422

Supervising scientist: Prof. Dr. Werner Lehnert

University for Registration: RWTH Aachen, Faculty of Mechanical Engineering

Research Field: Modeling in Electrochemical Process Engineering (Lattice Boltzmann)

Position: PhD Student Sandwich PhD Student

Research Area:

Polymer electrolyte fuel cells and polymer electrolyte electrolysers are currently under development with a focus on high efficiency and lifetime. The development of these electrochemical energy converters is supported by modeling and simulation. One major challenge is still the mathematical description of the simultaneous transport of water and gas in the cells. These two-phase flow phenomena take place inside the flow channels as well as inside the stochastic porous components of the Membrane Electrode Assembly. The flow channels have dimensions in the mm range, whereas the pore sizes of the porous media under examination are in the micrometer range.

The proposed work addresses the simulation of single and two-phase flow behavior in the porous components and the flow channels of the mentioned electrochemical devices.

During the last years we developed our own Lattice Boltzmann simulation computer code which is the basis for the planned work. Besides improving the code, simulations shall be performed in order to describe the fluid flow. The simulations require the use of supercomputers of the Research Center Jülich or of the RWTH Aachen University.

A successful PhD-thesis will be defended at RWTH Aachen University.

Specific Requirements:

Foundations in gas kinetics; excellent grades in mathematics; excellent programming skills; excellent knowledge in process engineering; very good understanding of chemistry; ability to work in a team / excellent team player

Duration of stay: 4 years

Work Place: Research Centre Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: fluent knowledge of English language

Name and Address of the Supervisor: Prof. Dr. Werner Lehnert, Forschungszentrum Jülich, Institute Energy and Climate Research (IEK-3), 52425 Jülich, Germany
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Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH - www.fz-juelich.de

Department/Institute: Institute for Energy and Climate Research, IEK-1/IEK-2
http://www.fz-juelich.de/iek/iek-1/EN/Home/home_node.html
http://www.fz-juelich.de/iek/iek-2/EN/Home/home_node.html

Supervising scientist: Dr. J. Malzbender, Prof. Dr. L. Singheiser

University for Registration: RWTH Aachen

Research Field: Materials Science

Position: PhD Student Sandwich PhD Student

Research Area:

Awareness to climate related aspects and limited environmental resources receive increasing consideration in the progress of energy technology. An important aspect of this scientific field and hence of the work at the Institute for Energy and Climate Research is the characterization of thermal barrier coatings for the use in advanced energy systems. The use of thermal barrier coatings is essential in stationary and mobile turbine components, where advanced concepts rely upon drilled components, where air cooling is applied to reduce the surface temperature of the thermal barrier ceramics layer. The current work concentrates on the effect of such holes drilled by different technologies onto the lifetime of thermal barrier composites in different loading situations, i.e. thermal cycling, low cycle and thermomechanical fatigue. Assessment of the lifetime requires careful assessment of materials failure initiation and progress on micro- and macroscopic level, via a combination of advanced testing and non-destructive as well as post-operational characterization techniques in combination with advanced optical and electron microscopy based microstructural characterization techniques. Along with considerations of degradation effects, aim is the derivation of lifetime prediction models. Hence characterization and data based modelling are the aim of the PhD work, where especially the relationships between long term behavior under different loading condition and microstructure are to be analyzed on the basis of supporting light-, scanning electron and tunneling electron microscopic investigations. The scientific work is focused on an extremely important subject with application importance in a strong interdisciplinary environment with the possibility to use up-to-date characterization technologies and access to modern light and electron microscopic methods.

Specific Requirements:

A university degree (BEng., BSc., MSc) in one of the subject mechanical engineering, materials science, mineral science or applied physics and creativity, scientific interest and team working ability

Duration of stay: 4 years

Work Place: Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English

Name and Address of the Supervisor: Prof. Dr. L. Singheiser, Forschungszentrum Jülich GmbH,
Institute for Energy and Climate Research (IEK-2), 52425 Jülich,
Germany
l.singheiser@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH - www.fz-juelich.de

Department/Institute: Institute for Energy and Climate Research, Institute for Energy and Climate Research, Microstructure and Properties of Materials (IEK-2) and Materials Synthesis and Processes (IEK-1)
http://www.fz-juelich.de/iek/iek-2/EN/Home/home_node.html
http://www.fz-juelich.de/iek/iek-1/EN/Home/home_node.html

Supervising scientist: Prof. Dr. W. A. Meulenber, Dr. J. Malzbender

University for Registration: University of Twente, Enschede, Netherlands

Research Field: Materials Science

Position: PhD Student Sandwich PhD Student

Research Area:

Awareness to climate related aspects and limited environmental resources receive increasing consideration in the progress of energy technology. In this respect the development of new materials receives increasing attention in basic and applied research. An important aspect of this scientific field and hence of the work at the Institute for Energy and Climate Research is the development and characterization of oxygen transport membrane materials for the use in advanced energy systems, where development is based on modern freeze and tape casting methods and characterization covers the range from functional properties to mechanical limits under operation relevant conditions. The current work concentrates on dual phase materials that combine two ceramic phases advantageously offering electronic and ionic conductivity, respectively. In addition to an optimization of manufacturing porous supports and deposition of dense layers with optimized performance and chemical stability, current challenges include the application relevant mechanical limits, requiring careful assessment of materials properties on micro- and macroscopic level. This can be realized via advanced destructive and non-destructive characterization techniques in combination with optical and electron microscopy based microstructural characterization. Along with clarification and consideration of degradation mechanisms, those properties are to be used in lifetime prediction models.

Such characterizations for ceramic composite materials are the aim of the proposed PhD work, where especially the relationships between properties and microstructure are to be analyzed on the basis of supporting light-, scanning electron and tunneling electron microscopic investigations. The scientific work is focused on an extremely important subject with relevance for industrial application in a strongly interdisciplinary environment with the opportunity to use up-to-date processing and characterization technologies.

Specific Requirements:

A university degree (BEng., BSc., MSc) in one of the subject mechanical engineering, materials science, mineral science, or applied physics as well as creativity, scientific interest and team working ability are required.

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English (fluent in speaking and writing)

Name and Address of the Supervisor: Dr. J. Malzbender, Forschungszentrum Jülich GmbH, Institute for Energy and Climate Research (IEK-2), 52425 Jülich, Germany
Email: j.malzbender@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Complex Systems, Bioelectronics (ICS-8)
http://www.fz-juelich.de/pgi/pgi-8/EN/Home/_node.html

Supervising scientist: Prof. Dr. Andreas Offenhäusser, Dr. Vanessa Maybeck

University for Registration: University of Aachen (RWTH)

Research Field: Biomedical research / Biomaterials / Bioelectronics

Position: PhD Student X

Research Area: Three dimensional, nanostructured surfaces have attracted considerable attention in biomedical research since they have proven to represent a powerful platform to influence cell development. For biomedical applications, where cells are in contact with artificial solid surfaces, micro- and nanostructured materials are utilized to provide chemical and physical stimuli, which give control over the cell development. In particular, nanocolumns or nanopillars possess great potential for control of cell adhesion and differentiation, gene and biomolecular delivery, or electrical stimulation and recording. We plan to investigate the influence of surface structures of different dimensions on the adhesion and maturation of neurons. For this purpose, nanostructured thin polymer films will be fabricated and utilized to grow cells on them. The neurons will be genetically modified to allow live cell imaging. A systematic study on cell development as function of structure size will be conducted to enhance the performance of biomedical devices. We offer an up-to-date research topic in the field of biomedical research involving microfabrication of sample surfaces. The institute operates a clean room facility, has a strong expertise in cellular and molecular biology.

Specific Requirements:

The candidate should have been trained either in biochemistry, molecular biology, genetics, or biophysics. Interest in interdisciplinary research is requested for the successful development of the project. Instruction and guidance will be provided for all experimental techniques by the supervising team.

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Very good English skills (speaking and writing); a German language course will be offered parallel to the project

Name and Address of the Supervisor: Forschungszentrum Jülich, Dr. Vanessa Maybeck,
Institute of Complex Systems (ICS-8), 52425 Jülich, Germany
v.maybeck@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Peter-Grünberg-Institute, Bioelectronic (PGI-8)
http://www.fz-juelich.de/pgi/pgi-8/EN/Home/_node.html

Supervising scientist: Prof. Dr. Andreas Offenhäusser, Dr. Dirk Mayer

University for Registration: University of Aachen (RWTH)

Research Field: Biomedical research / Biomaterials / Bioelectronics

Position: PhD Student X

Research Area: **Influence of neuron development by nanoparticles.**

Nanomaterials have been widely used as powerful platform to influence cell fate and development. For biomedical applications, nanomaterials are commonly utilized for drug delivery, photothermal therapy, biosensing, and bioimaging. In particular, gold nanoparticle possess great potential in biomedical research due to their chemical inertness and the fact that their shape and size can be easily controlled. In the scope of this project we aim to bind gold nanoparticles of different shape and size to solid surfaces in order to enhance the performance of biomedical devices and improve the biocompatibility of bioelectronics implants. We expect that the particles will modulate the adhesion of neurons, their maturation as well as their electrophysiological properties. For this purpose, gold nanoparticles will be synthesized, bound to solid surfaces, and utilized to grow cells on them. Lithographical methods will be used to define patterns of particles for a local control of neuron adhesion and network formation. A systematic study on neuron development as function of particle size, density, and distribution will be conducted. We offer an up-to-date research topic in the field of biomedical research involving microfabrication of sample surfaces. The institute operates a clean room facility, has a strong expertise in cellular and molecular biology.

Specific Requirements:

The candidate should have been trained either in biochemistry, chemistry, material sciences, or biophysics. Interest in interdisciplinary research is requested for the successful development of the project. Instruction and guidance will be provided for all experimental techniques by the supervising team.

Duration of stay: PhD Student (4 years)

Work Place: Forschungszentrum Juelich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Very good English skills (speaking and writing); A German language course will be offered parallel to the project

Name and Address of the Supervisor: Forschungszentrum Jülich, Dr. Dirk Mayer, Peter-Grünberg-Institute (PGI-8), 52425 Jülich, Germany
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Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH - www.fz-juelich.de

Department/Institute: Institute of Energy and Climate Research, Microstructure and Properties of Materials (IEK-2)
http://www.fz-juelich.de/iek/iek-2/EN/Home/home_node.html

Supervising scientist: PD Dr. Michael Müller

University for Registration: RWTH Aachen

Research Field: Energy Conversion, Gasification, Thermochemistry

Position: PhD Student Sandwich PhD Student

Research Area:

Thermodynamics and viscosity of slags from entrained flow gasification
Slag behaviour plays a major role in determining the optimum operating conditions of entrained-flow slagging gasifiers. Therefore, reliable thermochemical and –physical models and databases for the prediction of slag properties under relevant process conditions are necessary. In recent years, the Thermochemistry group at IEK-2 has developed a comprehensive thermodynamic database and a viscosity model for liquid oxide systems. However, since the occurrence of partially crystallized, mixed oxide-carbonate melts can be expected in high pressure entrained-flow gasification of biomass, these models and databases can only be used as basis and need to be extended. Aim of future work is the extension of the thermodynamic database by further relevant oxides and carbonates. Furthermore, the viscosity model shall be extended for the calculation of partially crystallised, multi-phase liquids. The new model shall not only predict the influence of the amount and shape of crystals on the viscosity in dependence of composition, temperature and shear rate but also describe the crystallization kinetics. The work will be performed in a team of PhD-students and postdocs working on different topics in this area.

Specific Requirements:

Master degree in the field of materials science, physics, chemistry or engineering, strong interest in modelling, social competence and good communication skills for collaborative work in and with interdisciplinary teams

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: a September 2017

Language Requirement: very good English skills (speaking and writing)

Name and Address of the Supervisor: Priv.-Doz. Dr. Michael Müller, Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research (IEK-2), 52425 Jülich, Germany, email: mic.mueller@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Central Institute for Engineering, Electronics and Analytics (ZEA-3)
http://www.fz-juelich.de/zea/zea-3/EN/Home/home_node.html

Supervising scientist: Dr. Volker Nischwitz

University for Registration: Karlsruhe Institute of Technology (KIT)

Research Field: Analytical Chemistry, Particle Separation with Elemental Detection

Position: PhD Student Sandwich PhD Student

Research Area:

The project is closely related to remediation of pollutants in lakes, which is also a problem for lakes in China. A major problem for example in TaiHu is the excessive growth of micro-algae. The task of the advertised PhD project will be the development and adaptation of particle separation techniques (using field flow fractionation (FFF)) online with various detectors including inductively coupled plasma mass spectrometry (ICP-MS) for elemental characterization. The developed methods will be applied for detailed characterization of the suspended particulate matter in lake water. The goals will be on the one hand a better understanding of sedimentation and re-suspension processes on availability of nutrients in the water and on the other hand the analytical evaluation and documentation of the efforts to implement novel water treatment and cleaning technology by the other partners of the project network. The hyphenation of FFF online with ICP-MS is frequently applied for nanoparticle characterization and will be extended for this project to cover natural particles from nanometer to low micrometer range.

Specific Requirements:

The successful candidate requires an excellent background in analytical chemistry with experience in liquid separation techniques and elemental mass spectrometry combined with an interest in environmental chemistry. In addition high level English language skills are mandatory. The method development and optimization will be performed at Forschungszentrum Jülich within the first part of the PhD project and afterwards the system will be applied to real world water samples from cooperation partners. Therefore, high motivation to relocate and work in Germany is required and ability to work independently. Our institute hosts several PhD students from China and other countries. The candidate is expected to provide good communication and team working skills.

Duration of stay: 3 - 4 years, respectively

Work Place: Research Centre Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English (fluent in speaking and writing)

Name and Address of the Supervisor:

Dr. Volker Nischwitz
Forschungszentrum Jülich GmbH
Central Institute for Engineering, Electronics and Analytics (ZEA-3)
52425 Jülich, Germany
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Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Complex Systems, Bioelectronic (ICS-8)
http://www.fz-juelich.de/pgi/pgi-8/EN/Home/_node.html

Supervising scientist: Prof. Dr. Andreas Offenhäusser, Dr. Vanessa Maybeck

University for Registration: University of Aachen (RWTH)

Research Field: Neuroscience / Biophysics / Bioelectronics

Position: PhD Student X

Research Area: **Wiring cortical networks by controlled outgrowth of neurons.**

Engineering of microstructured approaches enable a defined controlling of neuronal network formation. Using Microcontact printing and microgradient methods allows reducing the complexity of the brain to address single cell function and control neuronal interactions. We will use dendritic tree-shape patterns with various bifurcation structures to guide neurons into defined morphologies. Immunostaining will be used to analyze the cell morphology and in particular the axon/dendrite polarity. The signal propagation between patterned neurons will be assessed by electrophysiology and optogenetics. Live cell imaging will be employed to evaluate the process of axon-dendrite polarity. This work will aim for an effective method for the neuronal polarity control by surface patterning and will reveal the possible underlying mechanisms of axon-dendrite polarity in vitro, which will facilitate the further research in developing directional neuronal circuits and neuronal tissue engineering.

We offer an up-to-date research topic in the field of neuroscience research involving microfabrication, cell biology, optogenetics, and electrophysiology. The institute operates a clean room facility, has a strong expertise in cellular and molecular biology.

Specific Requirements:

The candidate should have been trained either in biology, neuroscience, or biophysics. Interest in interdisciplinary research is requested for the successful development of the project. Instruction and guidance will be provided for all experimental techniques by the supervising team.

Duration of stay: 4 years

Work Place: Forschungszentrum Juelich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Very good English skills; a German language course will be offered parallel to the project

Name and Address of the Supervisor: Forschungszentrum Jülich, Prof. Dr. Andreas Offenhäusser, Institute of Complex Systems (ICS-8), 52425 Jülich, Germany
a.offenhaeusser@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Peter-Grünberg-Institute, Bioelectronic (PGI-8)
http://www.fz-juelich.de/pgi/pgi-8/EN/Home/_node.html

Supervising scientist: Prof. Dr. Andreas Offenhäusser, Dr. Vanessa Maybeck

University for Registration: University of Aachen (RWTH)

Research Field: Neuroscience / Biophysics / Bioelectronics

Position: PhD Student X

Research Area: **Influence of neuron development by nanoparticles.**

Engineering of microstructured approaches enable a define controlling of neuronal network formation. Using Microcontact printing and microgradient methods allows reducing the complexity of the brain to address single cell function and control neuronal interactions. We will use dendritic tree-shape patterns with various bifurcation structures to guide neurons into defined morphologies. Immunostaining will be used to analyze the cell morphology and in particular the axon/dendrite polarity. The signal propagation between patterned neurons will be assessed by electrophysiology and optogenetics. Live cell imaging will be employed to evaluate the process of axon-dendrite polarity. This work will aim for an effective method for the neuronal polarity control by surface patterning and will reveal the possible underlying mechanisms of axon-dendrite polarity in vitro, which will facilitate the further research in developing directional neuronal circuits and neuronal tissue engineering.

We offer an up-to-date research topic in the field of neuroscience research involving microfabrication, cell biology, optogenetics, and electrophysiology. The institute operates a clean room facility, has a strong expertise in cellular and molecular biology.

Specific Requirements:

The candidate should have been trained either in biology, neuroscience, or biophysics. Interest in interdisciplinary research is requested for the successful development of the project. Instruction and guidance will be provided for all experimental techniques by the supervising team.

Duration of stay: 4 years

Work Place: Forschungszentrum Juelich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: Very good English skills; a German language course will be offered parallel to the project

Name and Address of the Supervisor: Forschungszentrum Jülich, Prof. Dr. Andreas Offenhäusser, Institute of Complex Systems (ICS-8), 52425 Jülich, Germany
a.offenhaeusser@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH - www.fz-juelich.de

Department/Institute: Institute for Energy and Climate Research, Microstructure and Properties of Materials (IEK-2)
http://www.fz-juelich.de/iek/iek-2/EN/Home/home_node.html

Supervising scientist: Prof. Dr. R. Spatschek, Prof. Dr. L. Singheiser

University for Registration: RWTH Aachen

Research Field: Materials Science

Position: PhD Student Sandwich PhD Student

Research Area:

The non-linear material behavior of new structural and energy materials plays a central role in their development. For example, Li-battery materials may undergo severe deformation up to several hundred percent during intercalation. Similarly, a thorough understanding of thermal and chemical expansion of membrane materials is important for various green energy applications. Successful computer-based design of new materials with specific and superior mechanical properties is crucially dependent on the availability of accurate and reliable models for their non-linear behavior. In particular, these require (i) material properties determined via experiment and/or *ab initio* computation for varying composition and temperature, (ii) scale-bridging between electronic structure density functional theory (DFT), mesoscale phase field (crystal) PF(C) approaches, and macroscale continuum modeling. An example of this is the recent work of the PIs in the unification of DFT data via large-deformation PFC modeling with a fully analytical understanding. This represents a novel approach to quantitatively model material behavior on mesoscopic and macroscopic scales based on *ab-initio* information. The objective of the proposed research is the exploration of scale-bridging connections between *ab initio* DFT-based and continuum PF(C)-based modeling of non-linear material behavior, i.e. extreme loading conditions, in conjunction with experimental benchmarking. This challenging multi-scale and multi-subject project will bring fresh insights into the understanding and application of large elastic deformations in fundamental, structural and energy materials with important engineering applications, and simultaneously deliver important steps towards modern quantitative modeling techniques on the mesoscale. Undertaking this project will benefit from the combined and unique experimental and computational engineering expertise of the institute.

Specific Requirements:

A university degree (BEng., BSc., MSc) in mechanical engineering or physics and creativity, scientific interest and team working ability. Experience in mechanical testing and/or programming skills are desirable. but not mandatory.

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English (fluent in speaking and writing)

Name and Address of the Supervisor: Prof. Dr. R. Spatschek, Forschungszentrum Jülich GmbH,
Institute for Energy and Climate Research (IEK-2), 52425 Jülich,
Germany
r.spatschek@fz-juelich.de

Helmholtz Call for 2017 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Institute of Complex Systems, Structural Biochemistry (ICS-6)
www.fz-juelich.de/ics/ics-6/DE/strodel

Supervising scientist: Prof. Dr. Birgit Strodel

University for Registration: Heinrich Heine University Düsseldorf

Research Field: Computational Chemistry

Position: PhD Student Sandwich PhD Student

Research Area:

In the Computational Biochemistry Group at the Juelich Research Centre we employ biomolecular simulation methods such as molecular dynamics (MD) aiming to understand the physicochemical principles that govern the highly complex process of protein aggregation. This process may lead to fatal diseases, as in the case of Alzheimer's disease, but we can also profit from it in the form of novel nanomaterials. However, all-atom MD studies of protein aggregation suffer from the problem that the accuracy of current all-atom force fields in representing protein-protein interactions is insufficient, preventing the reproduction and consequently the interpretation of experimental results. In this project you will perform quantum chemical (DFT) calculations of peptide aggregates in order to understand the origin of the force field failures and work on improving the force fields. For more information please contact Prof. Strodel.

Specific Requirements:

1. Excellent knowledge in chemistry.
2. Experience with quantum chemistry.
3. Experience with Linux.
4. Programming experience (C++, Python or Perl) is beneficial.
5. Very good English skills (speaking and writing)

Duration of stay: 4 years

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2017

Language Requirement: English; a German language course will be offered parallel to the project

Name and Address of the Supervisor: Prof. Dr. Birgit Strodel, Forschungszentrum Jülich, Institute of Complex Systems (ICS-6), 52425 Juelich, Germany.
b.strodel@fz-juelich.de