Helmholtz Call for 2017 CSC Fellowship Applicants

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

Department/Institute: Institute of Complex Systems, Structural Biochemistry (ICS-6), outstation
Center for Structural Systems Biology at DESY-Campus, Hamburg
http://www.fz-juelich.de/ics/ics-6/EN/Home/home_node.html

Supervising scientist: Prof. Dr. Jörg Labahn

University for Registration: Heinrich-Heine-University Düsseldorf

Research Field: Structural biology of proteins relevant in infectious deseases

Position: PhD Student **X**   Sandwich PhD Student ☐

Research Area:

Structural and functional characterization of proteins and their interactions, directed at proteins of human or pathogenic origin, which are relevant for the infection process or its sustenance.
We are mainly focused on spectroscopic and crystallographic analysis in in-vitro experiments, but opportunities for NMR, EM and XFEL exist on Jülich or Desy-campus. We are open for in-vivo approaches to study infection-relevant processes (biological security level 3* laboratory will be available in CSSB).
Candidates with Interdisciplinary interests are welcome. The specific research program will be developed in cooperation with the applicant based on interest and skills.

Specific Requirements:

Interest in protein sciences (molecular biology/biochemistry/biophysics).
Masters in Biology or Biochemistry or related subject for a biological oriented study.
Fluent in German or English (certified).
Enrolment at Heinrich-Heine-Universität Düsseldorf is required:
http://www.uni-duesseldorf.de/

Duration of stay: 4 years

Work Place: Center for Structural Systems Biology at DESY-Campus, Hamburg
https://www.cssb-hamburg.de

Earliest Start: October 2017

Language Requirement: Fluent in German or English (writing and speaking)

Name and Address of the Supervisor: Prof. Dr. J. Labahn, CSSB-FZJ c/o DESY, Notkestr. 85,
D-22607 Hamburg, Germany
j.labahn@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, Medical Imaging Department (INM-4), www.fz-juelich.de/inm/inm-4/EN

Supervising scientist: Dr. J. Dammers

Research Project: Investigation of spatio-temporal brain dynamics using multi-variate pattern analysis and machine learning

Research Field: Neuroimaging, MEG/EEG signal processing

Position: PostDoc **X**

Research Area:

The understanding of how active brain areas are functionally connected including their causal relationship has been of great interest. The excellent temporal resolution of magnetoencephalography (MEG) and electroencephalography (EEG) provide the ability for the investigation of slow and rapid interactions of functionally connected brain areas. The neurodynamic propagation typically involves a larger network of communication pathways, representing short and long distant interactions, which can nicely be investigated using MEG. This however, requires analysis tools that are capable of exploring the underlying information flow from single trials at low signal-to-noise (SNR).
In this project we aim to investigate causal interactions using novel strategies based on multivariate pattern analysis and machine learning that are appropriate to assess the true source level coupling of active brain regions measured by MEG. The successful applicant will participate in interdisciplinary research related to cognitive and computational neuroscience.

Specific Requirements:

Experienced in MEG or EEG data acquisition and time series analysis.
Excellent educational records in the related field,
Good programming and data processing skills
Desirable applicant's background: neuroscience, electrophysiology, physics, neuroscience and related.
Very good knowledge of English language (writing and speaking)

Funding: CSC-scholarships will be increased by hosting institution (500 €month and costs for health, emergency-call and liability insurance (50 €))

Duration of stay: 2 years

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

Earliest Start: October 2017

Language Requirement: English

Name and Address of the Supervisor: Dr. J. Dammers, Prof. Dr. Dr. N.J. Shah, Forschungszentrum Jülich, Institute of Neuroscience and Medicine (INM-4), 52425 Jülich, Germany
j.dammers@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, Medical Imaging Department (INM-4). www.fz-juelich.de/inm/inm-4/EN

Supervising scientists: Prof. Dr. N. J. Shah

University for Registration: RWTH Aachen University

Research Project: Magnetic Field Corrections for 9.4T Human MRI

Research Field: Ultra-High Field MRI, Neuroimaging

Position: PhD Student **X**   Sandwich PhD Student ☐

Research Area:

Magnetic resonance imaging (MRI) and spectroscopy (MRS) experiments require exquisitely uniform magnetic fields in order to produce high quality data. Numerous advantages are expected when performing MRI/MRS at ultra-high field, such as 9.4T, but confounded by the increased difficulty of maintaining the necessary field uniformity. A technique called shimming is used to correct the magnetic field disrupted by the presence of the human body, but for the advanced MRI and MRS on our **worldwide unique** 9.4T human MR-PET hybrid system, we require greatly improved shimming.

In this project the PhD candidate will develop appropriate techniques to dynamically correct for the magnetic field disruptions with dynamic shimming - a technique that extends conventional shimming to permit very fine, real-time control of the magnetic field. The PhD candidate will develop the necessary electronics and/or software programs to dynamical control our state-of-the-art shim coils. A feedback system will be produced to correct for breathing and movement related dynamic field disruptions as well as the application of switching the system during imaging and spectroscopy to further improve data quality beyond what is currently possible.

Specific Requirements:

Desirable: Experience with MRI or NMR. Practical experience with analogue electronics. Computer programming skills.

Obligatory: BSc or MSc in Physics, Computer Studies or electrical engineering. English language fluency.

Duration of stay: 4 years

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

Earliest Start: October 2017

Language Requirement: English

Name and Address of the Supervisor: Prof. Dr. Dr. h.c. N.J. Shah, Forschungszentrum Jülich, Institute of Neuroscience and Medicine (INM-4), 52425 Jülich, Germany n.j.shah@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, Medical Imaging Department (INM-4), www.fz-juelich.de/inm/inm-4/EN

Supervising scientists: Prof. Dr. N. J. Shah

University for Registration: RWTH Aachen University

Research Project: Water Compartmentalisation in the Brain using MRI

Research Field: Ultra-High Field MRI, Neuroimaging

Position: PhD Student **X**   Sandwich PhD Student ☐

Research Area:

Since water content is highly regulated in the healthy brain but no highly precise water mapping method for in vivo use exists. The myelin water fraction can be extracted from the fit of very high-SNR multiple-echo T2 decay curves with a superposition of a large number of exponentials. Diseases involving de- or dysmyelination can be investigated and lead to novel observations regarding the water compartmentalisation in tissue, despite limited spatial coverage.

Highly precise and accurate mapping of the absolute water content and distribution, as developed by our group, requires a significant number of corrections and also involves mapping of other MR parameters. We have developed several methods over the years, adapted to measurement time requirements, precision and, more recently, the correct treatment of high field effects.

This PhD thesis develop novel quantitative tools to simultaneously determine water and myelin content on the human 9.4T whole-body scanner – *a worldwide unique instrument*.

Specific Requirements:

Desirable: Experience with MRI or NMR. Practical experience with analogue electronics. Computer programming skills.

Obligatory: BSc or MSc in Physics, Computer Studies or electrical engineering. English language fluency (writing and speaking).

Duration of stay: 4 years

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

Earliest Start: October 2017

Language Requirement: English

Name and Address of the Supervisor: Prof. Dr. Dr. h.c. N.J. Shah, Forschungszentrum Jülich, Institute of Neuroscience and Medicine (INM-4), 52425 Jülich, Germany n.j.shah@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, Medical Imaging Department (INM-4), www.fz-juelich.de/inm/inm-4/EN

Supervising scientists: Prof. Dr. N. J. Shah

University for Registration: RWTH Aachen University

Research Project: Sodium MRI of Neurodegeneration in Humans at 9.4T

Research Field: Ultra-High Field MRI, Neuroimaging

Position: PhD Student **X** Sandwich PhD Student ☐

Research Area:

Until recently, there has been little interest in using sodium MRI for the study of neurodegenerative diseases such as Alzheimer disease or other causes of dementia such as frontotemporal dementia and Lewy body disease, Parkinson disease, amyotropic lateral sclerosis.

The major goal of this project is to establish a paradigm to determine whether sodium MRI might deliver stable and reliable information about the status of neurodegeneration in patients affected by dementia.

The quantitative methods for *in vivo* sodium imaging developed by the group will be used in this project. Further, new methods will also be developed. The aims of this project, using aged-matched controls, are: 1) the creation of uniform standards for sodium MRI acquisitions which will be used as measures in future treatment trials, and 2) development of statistical models of cross-sectional and longitudinal data from several different sources, which can be used for future hypothesis generation and testing. **The 9.4T MR scanner, a worldwide unique machine, will be used for in vivo water mapping and myelin water mapping.**

Specific Requirements:

Desirable: Experience with MRI or NMR. Practical experience with analogue electronics. Computer programming skills.

Obligatory: BSc or MSc in Physics, Computer Studies or electrical engineering. English language fluency (writing and speaking)

Duration of stay: 4 years

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

Earliest Start: October 2017

Language Requirement: English

Name and Address of the Supervisor: Prof. Dr. Dr. h.c. N.J. Shah, Dr. W. Worthoff
Forschungszentrum Jülich, Institute of Neuroscience and Medicine (INM-4), 52425 Jülich, Germany
n.j.shah@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, Medical Imaging Department
(INM-4), www.fz-juelich.de/inm/inm-4/EN

Supervising scientists: Dr. J. Dammers, Prof. Dr. N. J. Shah, Prof. Dr. K. Vogeley

University for Registration: RWTH Aachen University

Research Project: Uncover the brain dynamics of social information processing

Research Field: Neuroimaging, MEG/EEG data analysis, Psychology

Position: PhD Student **X**   Sandwich PhD Student ☐

Research Area:

Over the last decade, cognitive neuroscience has started to systematically study
the neural mechanisms of social cognition or social information processing.
Essentially, two different neural systems, which appear to be complementary,
have been established in this research domain, most likely to constitute two
different routes of processing our social cognitive capacities in everyday social
encounters.
The project aims at uncovering the brain dynamics of the underlying network
processing social information, including the analysis of the causal relationship of
areas being involved. For this, magnetoencephalography (MEG) provides
excellent temporal resolution and the ability for investigating slow and rapid
interactions between functionally connected brain areas.
The Institute of Neuroscience and Medicine at FZ Juelich provides a world-wide
highly reputed research in neuroscience and a unique environment to support
breakthrough discoveries. The successful applicant will participate in
interdisciplinary research related to cognitive neuroscience and to the
development and validation of new strategies in MEG data analysis.

Specific Requirements:

Desirable: Experience with M/EEG data acquisition and analysis.
Obligatory: excellent educational records in the related field, good programming and
data processing skills, time series analysis.
Desirable applicant's background: neuroscience, electrophysiology, physics,
neuroscience and related. Very good knowledge of English language (writing and
speaking).

Duration of stay: 4 years

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

Earliest Start: October 2017

Language Requirement: English

Name and Address of the Supervisor: Dr. J. Dammers, Prof. Dr. Dr. N.J. Shah,
Forschungszentrum Jülich, Institute of Neuroscience and Medicine
(INM-4), 52425 Jülich, Germany
j.dammers@fz-juelich.de