

# The IRTG 2150

The International Research Training Group (IRTG) is formed by scientists from JARA BRAIN, an initiative of the RWTH Aachen University and the Research Center Jülich, Germany, together with the University of Pennsylvania, U.S.A.

The IRTG is a structured PhD and MD educational program and investigates a clinically and societally highly relevant topic: the neurobiology of pathological aggression and impulsivity.

Human and animal studies will focus on two specific aims: (1) How factors such as environment, traumatic experiences, personality, gender, culture and (epi-)genetic factors influence impulsive and aggressive behavior, emphasizing effects on neural networks and neurotransmitters; (2) Ways to modulate and alter aggressive behavior and cerebral networks. We will combine neuroimaging and behavioral research with neuropsychological, electrophysiological, neuroendocrinological, and molecular approaches.

**The IRTG offers fellowships for excellent medical students. Doctoral theses matching the research interests of the IRTG 2150 can receive a monthly funding of € 735 for a maximum duration of one year. In agreement with the supervisors the research activities can take place during the regular study time. Please, contact supervisors in order to get ideas for potential thesis topics.**

## **Obligations and Curriculum:**

- Bi-weekly internal/external meetings
- Monthly journal club
- Scientific writing workshop (mandatory)
- Other workshops depending on needs/wishes of members
- Logbook
- Thesis outline
- Possible research stay in UPenn
- Spring school
- Final IRTG certificate

# Research facilities and infrastructure

## **RWTH Aachen (University Hospital)**

- Neuroimaging at 3 T Siemens Prisma MR research scanner
- plus simultaneous EEG and eye-tracking system
- HR+PET scanner
- tDCS, TMS and Pathway pain stimulator
- EEG/fMRI neurofeedback and hyperscanning
- fMRI during video games and virtual reality
- Olfactometer
- Psychiatric department with a broad option to study aggression and impulsivity in diverse patient groups at different ages (children, adolescents, and adults)
- Department of Neurology to study neurodegenerative diseases such as movement disorders and dementia
- Workspaces for analyzing MEG/EEG/PET/fMRI data
- Methodological expertise for MEG/EEG/PET/MR data analysis
- Expertise in computational neuroscience and imaging databases
- Experimental tasks assessing aggressiveness and impulsivity
- Patch-clamp recording and live-cell imaging analysis
- Tissue clearing techniques (CLARITY, etc.)
- Cell morphology and ultrastructure (electron microscopic) analysis
- Automated analysis of animal behavior

## **FZ Jülich**

- The INM has broad expertise in brain imaging and houses a unique 9.4-T MR-PET hybrid scanner and a 3-T MR-PET hybrid system in addition to 3T and 7T (soon) scanners as well as an animal 9.4T and animal PET

For more detailed information, please refer to our website at [www.irtg2150.rwth-aachen.de](http://www.irtg2150.rwth-aachen.de) or email us to [irtg2150@ukaachen.de](mailto:irtg2150@ukaachen.de).



**Habel, Ute, Prof. Dr. rer. soc.** ([uhabel@ukaachen.de](mailto:uhabel@ukaachen.de)): Psychiatry and Psychotherapy, aggression, impulsivity, psychiatric disorders, neuroimaging, hormones and behavior, sex differences

**Schneider, Frank, Prof. Dr. med. Dr. rer. soc.** ([fschneider@ukaachen.de](mailto:fschneider@ukaachen.de)): Psychiatry and Psychotherapy, neurobiology of emotions in psychiatric disorders, neuroimaging (fMRI)

**Mathiak, Klaus, Prof. Dr. med. Dr. rer. nat.** ([kmathiak@ukaachen.de](mailto:kmathiak@ukaachen.de)): Psychiatry and Psychotherapy, functional imaging (MEG, fMRI) of cognition, audition, fMRI neurofeedback, fMRI during video games, virtual reality and Brain-Computer interfaces, schizophrenia, depression and personality disorders, aggression and impulsivity

**Konrad, Kerstin, Prof. Dr. rer. nat.** ([kkonrad@ukaachen.de](mailto:kkonrad@ukaachen.de)): Child Psychiatry and Psychotherapy, neural correlates of cognitive and emotional development, neuroimaging in psychiatric disorders of children, conduct disorders, autism spectrum disorders, disorders of attention

**Herpertz-Dahlmann, Beate, Prof. Dr. med.** ([bherpertz-dahlmann@ukaachen.de](mailto:bherpertz-dahlmann@ukaachen.de)): Child Psychiatry and Psychotherapy, neuroimaging in psychiatric disorders of children and adolescents, conduct disorders and antisocial behavior, autism spectrum disorders, eating disorder, early trauma, disorders of attention

**Shah, N. Jon, Prof. Dr. rer. nat.** ([n.j.shah@fzjuelich.de](mailto:n.j.shah@fzjuelich.de)): FZ Juelich, BOLD MR physics, neurobiology (fMRI), development of MR techniques, development of hybrid MR/PET, ultra-high field fMRI/MRI

**Spehr, Marc, Prof. Dr. rer. nat.** ([m.spehr@sensorik.rwth-aachen.de](mailto:m.spehr@sensorik.rwth-aachen.de)): Biology, neural processing of sensory information, mechanism of pheromone signaling, analysis of social and aggressive behavior, single neuron electrophysiology and functional imaging in vitro, in situ, and in vivo

**Nickl-Jockschat, Thomas, Jun.-Prof. Dr. med.** ([tnickl-jockschat@ukaachen.de](mailto:tnickl-jockschat@ukaachen.de)): Psychiatry and Psychotherapy, brain structure-function relationship, disturbances in mental disorders, molecular and environmental causes, methods: morphometry, diffusion tensor imaging, functional and structural connectivity, genetic imaging, cytoarchitectonic probability maps and animal models

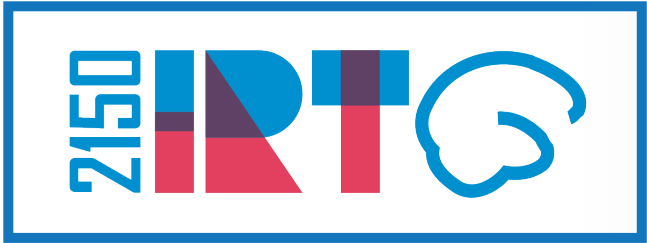
**Merhof, Dorit, Prof. Dr.-Ing.** ([dorit.merhof@lfb.rwth-aachen.de](mailto:dorit.merhof@lfb.rwth-aachen.de)): Imaging and computer vision, image analysis, visualization and exploration, feature extraction and classification, diffusion image analysis, multispectral image analysis, digital pathology and facial expression monitoring

**Reetz, Kathrin, Prof. Dr. med.** ([kreetz@ukaachen.de](mailto:kreetz@ukaachen.de)): Neurology, translational brain medicine in psychiatry and neurology, multimodal neuroimaging and its correlations with genetic, clinical and neuropsychiatric parameters

**Feldmeyer, Dirk, Prof. Dr. rer. nat.** ([d.feldmeyer@fz-juelich.de](mailto:d.feldmeyer@fz-juelich.de)): FZ Juelich, function of neuronal microcircuits, computational synaptic models in vitro and in vivo

**Bzdok, Danilo, Junior-Prof. Dr. med. Dr. rer. nat.** ([dbzdok@ukaachen.de](mailto:dbzdok@ukaachen.de)): Psychiatry and Psychotherapy, brain imaging and psychiatry, machine learning, data-driven neuroscience and personalized psychiatry, hypothesis-free analysis techniques for large datasets

# JARA BRAIN and UPenn



## MD thesis fellowships