

Within its graduate program “Quantitative Plant Sciences” the Institute of Bio- and Geosciences - Plant Sciences (IBG-2) seeks a

**PhD student (natural, agronomical or bioinformatics sciences)**

**D051/2016**

for a 3 year position

**Background:**

Plants provide biomass for the growing demands in a world with increasing population, less fossil resources and higher risks for the environment. Plants are the basis of a future bio-economy, where renewable raw materials from plants are used for delivering healthy food to a growing population as well as for non-food applications for materials, chemicals and energy. Plant production is affected by climate change and plants are key elements in mitigation of climate change.

On the basis of molecular, physiological and ecological expertise, the Institute focuses on integrated concepts for an intensified and sustainable crop production. New technologies, such as phenotyping with non-invasive methods combined with bioinformatics, open up new opportunities to generate and apply knowledge on plants for a sustainable bio-economy.

**Offered Ph.D. position:**

**Accurate quantitative and dynamic PET imaging with the phenoPET scanner for plant studies**

Project description:

To study and investigate carbon transport processes in plants, Positron Emission Tomography (PET) represents one method of choice. Now phenoPET, a novel PET scanner equipped with the newest generation of photon detectors (digital Silicon Photomultipliers, SiPM) is available for such studies. To realize accurate quantitative PET imaging with high image quality the system has yet to be characterised in terms of multiple relevant technical performance parameters to gain a solid understanding of the scanner characteristics inevitable for system optimisation.

Particularly the recorded raw PET coincidence events require several important data corrections which address detector efficiencies, random events, object attenuation, Compton scattering and count rate dependent system dead time. Among the implementation and improvement of the mandatory correction methods, a full data processing pipeline needs to be implemented to provide all inputs for a reliable quantitative image reconstruction.

Apart from the characterisation and implementation of the data corrections further hardware-related setup parameters (e.g. detector bias voltage, detection trigger setup, detector temperature, etc.) have to be investigated and optimised to achieve the best possible scanner stability and performance in terms of timing resolution and

sensitivity. Finally, after having achieved a reliable quantitative imaging, the well-known Maximum a Posteriori (MAP) image reconstruction using prior morphological information from other modalities, e.g. MRI, provides further potential of improving PET image quality. As novelty, special priors tailored to the needs of plant imaging have to be developed and evaluated.

### **Requirements:**

- Good programming skills (preferred C++) and data processing skills
- Solid knowledge of mathematics and statistics
- University degree in physics, informatics, mathematics or a related field with a good final grade (in the German system 2.0 or better).
- Preferably experience in PET image reconstruction and PET data acquisition hardware
- Minimum one letter of recommendation, a statement on your research interest and experience and a description of your specific interest in the topic.
- Strong interest in working in interdisciplinary teams
- Strong English writing and communication skills

### **We Offer:**

IBG-2 - Plant Sciences offers a unique interdisciplinary working environment developing and using excellent infrastructure and modern approaches in plant physiology addressing major challenges of plant production for a sustainable bioeconomy.

- We offer world-class infrastructure and expertise in plant phenotyping
- The opportunity to work in a unique interdisciplinary team (scientists, engineers, technicians) and with national and international partners.
- Professional development and career plans with specific training programs (incl. a doctoral program of FZJ and IBG-2) and national and international conferences.

Equal opportunity is a cornerstone of our staff policy. Applications from disabled persons are welcomed. Payment of the PhD fellow will be based on salary grade EG 13 (50%). Collective Agreement for the Civil Service (TVöD). Depending on the candidate's profile and the subject of his/her PhD thesis an additional allowance may be granted.

Please send your application – quoting the reference number and the position/topic of interest – ideally as an electronic version with the relevant documentation until 1<sup>st</sup> of July 2016 to:

Prof. Dr. Ingar Janzik, Institut für Bio- und Geowissenschaften,  
Forschungszentrum Jülich GmbH, 52425 Jülich, Germany,  
e-mail: [i.janzik@fz-juelich.de](mailto:i.janzik@fz-juelich.de)

Only complete applications will be considered. Job interviews will take place in July 2016. Depending on the candidates availability the positions can be filled promptly.