PEPR B-BEST – FillingGaps

Postdoctoral researcher in magnetic resonance imaging
to characterize reference biomass *and* identify markers of biomass properties and reactivity in bioconversion

Keywords: magnetic resonance imaging, plant biomass, water relaxation, water density and diffusion

A 12-m fully funded postdoctoral position in the field of magnetic resonance imaging of plant biomass in a context of bioconversion is available at the BIA-BIBS lab, embedded in the INRAE institute in Nantes, France.

JOB DESCRIPTION

Context:

The architecture of biomass is highly complex and variable across species, and can be defined as a continuum of spatial scales ranging from molecules to particles, polymers, nano-structures, assemblies, cells and tissues. These scales are highly interconnected and reflect not only the chemical and structural properties of biomass, but above all its reactivity to transformation processes such as chemical, physical, mechanical or biological reactions.

This post-doctoral contract is part of the project « La Biomasse à toutes les échelles pour comprendre ses propriétés » (FillingGaps, ANR-23-PEBB-0006, 2023-2026) funded by the French ANR agency through the program PEPR B-BEST (Programme et Equipement Prioritaire de Recherche *Biomasse, biotechnologies, technologies pour la chimie verte et les énergies renouvelables*) co-led by IFPEN and INRAE. The aim of the project is to develop multi-scale approaches, for representative biomass species, in order to establish relationships between scales with a view to highlighting markers of biomass properties and reactivity. Within this project, you will take part in the Correlative Imaging task, and interact with the Mass-spectrometry imaging, Atomic Force microscopy, Raman spectroscopy team members in order to develop common techniques and tools to characterize reference plant biomass types at different complementary length-scales.

In particular, you will develop µMRI data acquisition at 9.4 T and associated image analysis methods to study water distribution and mobility at tissue level in maize and poplar stalks, as well as in marine biomass.

You will work also in collaboration with two other post-doctoral fellows, who will be recruited as part of the project. One will deploy mass spectrometry imaging, vibrational Raman spectroscopy and atomic force microscopy, the second will work on methods allowing all image modalities to be merged in order to provide an integrative vision of the complementary information they convey.

This position is available within the BIBS platform, interacting with the Plant cell wall and polymers (PVPP) team, two highly collaborative teams working at the interface of technical development and application in plant studies.

You will present your results at leading international conferences in MRI and/or plant spectroscopy, and will publish in peer review journals.

Your work will be supervised Dr Catherine Deborde. The anticipated start date is October 1, 2024, but reasonable accommodations can be made for the right candidate.

Related publications of the group*:

1. Fanuel, M.*; Grélard, F.*; Foucat, L.*; Alvarado, C.*; Arnaud, B.; Chateigner-Boutin, A.-L.*; Saulnier, L.*; Legland, D.*; Rogniaux, H.* Spatial Correlation of Water Distribution and Fine Structure of Arabinoxylans in the Developing Wheat Grain. *Carbohydrate Polymers* 2022, 294, 119738. https://doi.org/10.1016/j.carbpol.2022.119738.
2. Grélard, F.*; Legland, D.*; Fanuel, M.*; Arnaud, B.; Foucat, L.*; Rogniaux, H*. Esmraldi: Efficient Methods for the Fusion of Mass Spectrometry and Magnetic Resonance Images. *BMC Bioinformatics* 2021, 22, 56. https://doi.org/10.1186/s12859-020-03954-z.

3. Chateigner-Boutin, A.L.*; Alvarado, C.*; Devaux, M-F.*; Durand, S.*; Foucat, L.*; Geairon, A.*; Grélard, F.*; Jamme, F.; Rogniaux, H.*; Saulnier, L.*; Guillon, F.* The endosperm cavity of wheat grains contains a highly hydrated gel of arabinoxylan. Plant Science 2021, 306:110845. https://doi.org/10.1016/j.plantsci.2021.110845.

4. Méchin, V.; Reymond, M.; Legland, D.*; El Hage, F. ; Baldy, A.; Griveau, Y.; Jacquemot, M-P.; Coursol, S.; Devaux, M-F.*; Rogniaux, H.*; Guillon, F*. (2024). Power of Imaging in the Study of Lignocellulosic Biomass Tissues. In: Baumberger, S. (eds) Green Chemistry and Agro-food Industry: Towards a Sustainable Bioeconomy. Springer, Cham. https://doi.org/10.1007/978-3-031-54188-9_16

DESIRED SKILLS AND QUALIFICATIONS

Required:
- A PhD degree in MRI, Biomedical engineering, Physics, Physical-Chemistry, Chemistry or Biology;
- Significant experience in MRI acquisition and image processing
- Capacity to quickly acquire new knowledge and master new skills;
- Interest in both hands-on research activities and data analysis;
- Ability to work independently and as a member of a research team;
- Ability to report and communicate results
- Interest in multidisciplinary projects

Preferred:
- Practice with Bruker software
- Knowledge of plant structures

EMPLOYER

INRAE (www.inrae.fr)
INRAE is a world-leading institute for research on agriculture, food and the environment, with a responsibility to address the global challenges of our time, namely climate change, food insecurity and biodiversity loss. Through an integrated approach, INRAE is able to identify and develop solutions with multiple applications to achieve the agro-ecological, nutritional and energy transitions we need to make.

INRAE is committed to nurturing an inclusive culture and a welcoming atmosphere. The Institute has made the "Social and Environmental Responsibility" a collective priority, in line with its commitment to sustainable development. This strategy should lead the Institute's research and internal practices to converge with ambitious values of environmental responsibility, solidarity and equity.

CONDITIONS OF EMPLOYMENT

Contract: 12-month.
The pay is commensurate with experience and ranges from 2,815 to 3,066 EUR per month.

By joining us, you will benefit from:
- 30 + 15 days of annual leave (for full-time employees, meaning 38.5h/week);
- Support for parenthood;
- Skills development programmes;
- Social support, holiday and leisure services;
- Sport and cultural activities.

APPLICATION PROCEDURE

Interested candidates are invited to submit a cover letter, an up-to-date CV and the contact details of at least one reference to catherine.deborde@inrae.fr
Deadline for application: July 15, 2024
Contract start date: October 1, 2024 (Adjustable depending on availability of the selected candidate)