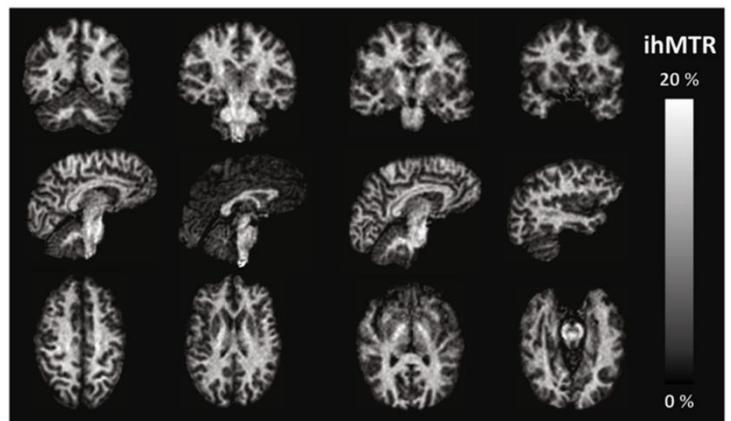


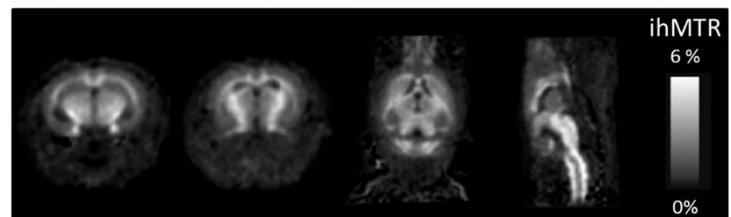
## Doctoral Position (3 years) available at CRMBM

### Application of inhomogeneous Magnetization Transfer (ihMT) MRI, a new myelin MRI biomarker, to demyelinating preclinical models

Magnetization transfer (MT) magnetic resonance imaging (MRI) is an *in vivo* imaging modality sensitive to the macromolecular content of biological tissues. Large macromolecules exhibit a wide dipolar-broadened NMR spectrum, which can be selectively saturated and visualized by MRI following magnetization transfer to the free water pool. Although, this technique has found applications into the clinics, it suffers from a lack of specificity to the underlying physio-pathological changes as it is sensitive to all sorts of macromolecule. Recently an important characteristic of dipolar-broadened macromolecular lines has been observed using MRI through the discovery of inhomogeneous magnetization transfer (ihMT). This technique allows separating the contribution to MT arising from long-lived dipolar order, hence providing additional molecular specificity to MT. **The ihMT technique applied *in vivo* on human and mice has shown tremendous specificity for brain white matter as compared to conventional MT, presumably attributed to the myelin content of the NMR spectrum, and has raised enthusiasm into the clinics. We are currently running at CRMBM an extensive research program on ihMT both on the fundamental side of this new contrast (theoretical physical model, NMR of model samples, MRI sequence developments...) and on (pre)clinical applications (animal models, patient's follow-up).**



Top: Human brain ihMT acquisition. Bottom: Mouse brain ihMT acquisition



**The proposed project aims at evaluating the sensitivity of ihMT for probing and characterizing myelin impairments occurring in animal model of myelin disorders.** The goal will be to assess whether ihMT can depict the time course of specific myelin impairments, such as progressive demyelination followed by partial or complete remyelination and to compare ihMT metrics with other MR metrics (such a conventional MT), which are often used to follow up and study myelin pathologies as well as with myelin histology imaging. The successful candidate will have in charge the conduct of these preclinical studies, including experiment planning, animal handling, MRI sequence optimization, data acquisition, analysis and statistical comparison with reference techniques. She/He will work within the ihMT team, in interaction with computer engineers, biologists, neurologists and clinicians working in the Central Nervous System MRI research team.

In parallel, the candidate will develop his general MRI knowledge and work on the development of novel ihMT approaches (pulse sequence programming for Bruker 7T and 11.75T), aiming at improving the sensitivity and specificity of the technique for given pathologies and myelin alterations.

**The impact of this project is of very high importance, as it should i) provide demonstration of the sensitivity of ihMT for probing fine microstructural alterations of the myelin over the time course of realistic myelin impairments ii) help yield to a better understanding of tissue alteration in myelin-related diseases and iii), improve ihMT sequence for current and novel applications.**

# Centre De Résonance Magnétique Biologique et Médicale – CRMBM



UMR 7339 - CNRS, Aix Marseille University, Marseille, France

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We are looking for a motivated candidate with a Master's/Engineer's degree in biomedical engineering, medical imaging, MR physics or related topic. Prior experience with MRI techniques and/or magnetization transfer would be advantageous but is not mandatory. Good writing and communication skills in English are required. The successful candidate will work in the ihMT team composed of two senior scientists and three PhD students. The duration of the project, funded by the *Agence Nationale de la Recherche*, is 36 months with a salary and benefits corresponding to usual PhD program conditions.



The CRMBM laboratory ([www.crmbm.univ-amu.fr](http://www.crmbm.univ-amu.fr)) is located in the center of the lively Marseille city, within La Timone university hospital.

Expected starting date: January 1<sup>st</sup> 2018

Interested candidates should send applications including, CV, motivation letter as well as two reference contacts to:

Guillaume Duhamel ([guillaume.duhamel@univ-amu.fr](mailto:guillaume.duhamel@univ-amu.fr)), and Olivier Girard ([olivier.girard@univ-amu.fr](mailto:olivier.girard@univ-amu.fr))