Internship offer
M2 Musculo-Skeletal system, Locomotion, Exercise (MuSkLE)

Title of the Internship: Skeletal deconditioning in microgravity : bone imaging and correlation to other biological/physiological parameters

Laboratory (name, n°, website):
SAINBIOSE, INSERM U1059 and University Jean Monnet Saint-Etienne
https://sainbiose-lab.fr

Research team (name, website): SAINBIOSE-LBTO (from 2027: SAINBIOSE-BOOST)
https://sainbiose-lab.fr/research-2/lbto_team/
https://sainbiose-lab.fr/team/laurence-vico/
https://sainbiose-lab.fr/team/maura-strigini/

Supervisor to contact (name, email address):

Maura Strigini, maura.strigini@univ-st-etienne.fr

Project description including a short introduction, aim/objectives and methods/approach to be used

We propose an interdisciplinary project combining physiology, image analysis and statistics to study how the skeleton and the cardio-vascular system adapt to microgravity.
The project aims to characterise and understand **bone remodelling** and its association with concurrent cardiovascular alterations in the settings of **space-flight analogs (bedrest, dry immersion).** This will be achieved through longitudinal **3D bone imaging** (high resolution X-ray tomography, HR-pQCT) and profiling of blood biomarkers, to be correlated with **cardiovascular phenotypes** collected in parallel from the same subjects. The goal is to reveal the mechanistic bases of impaired skeletal functions associated with bone blood perfusion and to define new early biomarkers of bone adaptation and health.
This project will rely on primary imaging data and blood samples that have been collected by the laboratory in studies organised by the European and French Space Agencies, ESA and CNES.
Specifically, the intern will:

(i) perform image analysis for the description and quantification of bone microarchitectural changes over time
(ii) correlate the results to those of the biochemical profiling metabolic and bone turnover markers in serum samples
(iii) employ state-of-the-art statistical methods for correlative studies of bone, biochemical and cardio-vascular phenotypes, these last ones collected by collaborators from the same subjects.

Such multidisciplinary and integrative novel approaches will be developed for human spaceflight, but will be relevant for diseased, multi-morbid populations on Earth, in particular those affected by bone fragility and osteoporosis resulting from sedentary lifestyle, disuse/mechanical unloading and aging.

References:

Vico and Hargens, 2018 - doi: 10.1038/nrrheum.2018.37.
Laloy-Borgna et al., 2026 - doi: 10.1109/TMI.2026.3655400.
Fernandez et al. 2026 - doi: 10.1152/japplphysiol.01194.2025

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Skills required:

Some experience in image analysis, ideally for 3D stacks.
Some programming skills.
Knowledge in basic physiology and biomechanics.
Interest in space physiology.
Willingness to work at interphase of engineering/image analysis and physiology.