ESRF | The European Synchrotron

Master student traineeship proposal

Title: *Air channel architecture and seed dormancy in the model plant* A. thaliana

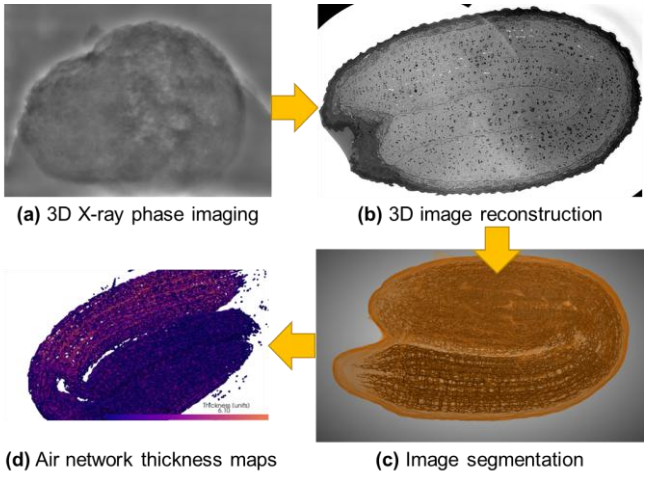
Abstract:

Seed dormancy allows plants to time germination to favorable environmental conditions. Dormancy is progressively released during dry seed storage through a yet unknown mechanism. Uncovering this mechanism would represent a major advance in plant biology, with important implications for a sustainable agriculture.

X-ray imaging studies have revealed that mature dry seeds contain a complex network of **intercellular air channels**, which may influence oxygen distribution and dormancy release. Preliminary results suggest that low temperatures during seed development reduce the volume of these air channels, consistent with the deeper dormancy observed under these conditions. In addition, seeds from mutants with altered dormancy levels (either enhanced or reduced dormancy) remain to be analyzed, providing a strong genetic framework for the project and potentially leading to the identification of the "ticking" mechanism.

Within this project, the student will collect tomograms of intact seeds using **X-ray nano-holotomography** at ID16A, and **use and develop machine learning** tools to quantify the morphology of the air networks inside seeds, possibly linking morphological features to the dormancy phenotype.

The student will be located at ESRF in Grenoble and co-supervised by Dr. Claire Seydoux and Pr. Luis Lopez-Molina (Geneva University). We are looking for a highly motivated M2 student in plant biology, computational biology, bioinformatics, computer science, applied mathematics, or a related field. The ideal candidate should have an interest in image analysis. Experience with scientific computing is desirable, and prior exposure to machine learning or 3D image processing would be an asset but is not required. Curiosity, strong analytical skills, and the ability to work both independently and collaboratively in an interdisciplinary research environment are essential. Applications, including a CV and a short cover letter should be sent to claire.seydoux@esrf.fr



Scientist in charge: Claire Seydoux (ESRF)

Beamline(s)/Host Group: ID16A

Traineeship supervisor(s): Claire Seydoux (ESRF) and Luis Lopez-Molina (University of Geneva, Switzerland)

Access to Instruments/labs/computing/software: Experiments will be performed at the ID16A beamline. All computing tools (softwares and computing cluster) will be made available to the candidate.

Starting date and Duration: 6 months, start date is flexible.

Contact : claire.seydoux@esrf.fr