**What is the role of the dynamics of starch storage reserves during xylogenesis in tropical trees?**

Wood biomass is the largest long-term carbon sink in tropical forests. Larger carbon allocation to wood increases the duration carbon remains in the biosphere. Thus, wood formation plays a crucial role in climate change mitigation by regulating the time and quantity of carbon stored in the biosphere. Non-structural carbohydrates (NSC) stored in wood provide energy and carbon reserves for wood formation. For some tropical species, growth never ceases, and NSC reserves, primarily in starch form, become essential for maintaining growth functions when photosynthesis is limited by environmental factors.

Nevertheless, the dynamics of starch reserves during xylogenesis remain poorly understood. Before starch can be used to build new tissues, it must first be converted into soluble sugars such as glucose, fructose, or sucrose. These sugars not only provide energy and carbon but also act as osmolytes, increasing turgor pressure, which is fundamental for enlarging wood cells during xylogenesis. Examining starch dynamics during xylogenesis will enhance our ability to predict growth patterns, including cell production, enlargement, and growth duration in tropical trees with diverse wood anatomical traits. This understanding will contribute to modeling the dynamics of wood formation, identifying growth resilience of tropical trees to environmental changes, quantifying carbon sequestration, and providing data-driven tools for improved forest management.

This project aims to address this knowledge gap by quantifying growth and starch dynamics in the stem wood of tropical trees from two contrasting ecosystems: a seasonally dry forest in Brazil (Tanguro) and a hyper-humid ever-wet forest in Colombia. The student will develop expertise in histological techniques to quantify xylogenesis, starch, and wood anatomical traits, applying these methods to characterize starch and growth dynamics in mature trees. Existing histological images stained with Lugol’s iodine, taken during wet and dry seasons in the Tanguro forest, will be leveraged for analysis. Additionally, the student will collaborate with researchers to collect samples and create new histological images from the ever-wet forest in Colombia.

This work will contribute to ongoing projects in Brazil and Colombia that have investigated carbon allocation processes, providing a rich dataset to integrate into the projects. By joining this interdisciplinary research team, the student will gain insights into tree ecophysiology and forest ecology. They will visit Yale University for two weeks, enhancing their presentation and writing skills while fostering international collaboration.

**Location:** Work will mainly be done in Colombia. Field and lab work will be conducted by the student focusing on analyzing existing images from previous field campaigns and generating new ones from the Colombian site. The student will visit Yale university at the end of the Sures program to present results and foster international collaborations.

**Mentors:** Paulo Brando, David Herrera (Yale University), Jorge Giraldo (Tecnológico de Antioquia).

**Budget for visiting New Haven two weeks and visiting the field station**

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| **Item** | **description** |  | **Price in U$** |
| Travel cost New Haven | Round trip MDE-JFK-MDE |  | 1500.00 |
| New Haven accommodation | ~15 days of visit |  | 1500.00 |
| Field trip sampling | 4 trips to the ever-wet forest in the Pacific coast of Colombia |  | 2000.00 |
|  |  | **Total** | **5000.00** |