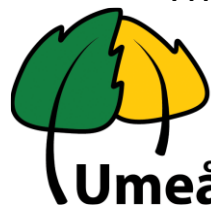


# Resolving the determinants of lignocellulose recalcitrance to bioconversion *in situ* at a micrometer scale with imaging techniques

Sacha Escamez, Bio4Energy Autumn Researcher's meeting, 2020-11-05

Independent post-doctoral researcher  
Umeå Plant Science Centre (UPSC)  
Department of Forest Genetics and Plant Physiology  
The Swedish University of Agricultural Sciences (SLU)



**Umeå Plant Science Centre**

tm = 550 - 1000 [ps]

# Idea behind the project: lignin fluorescence lifetime tells about biomass chemistry

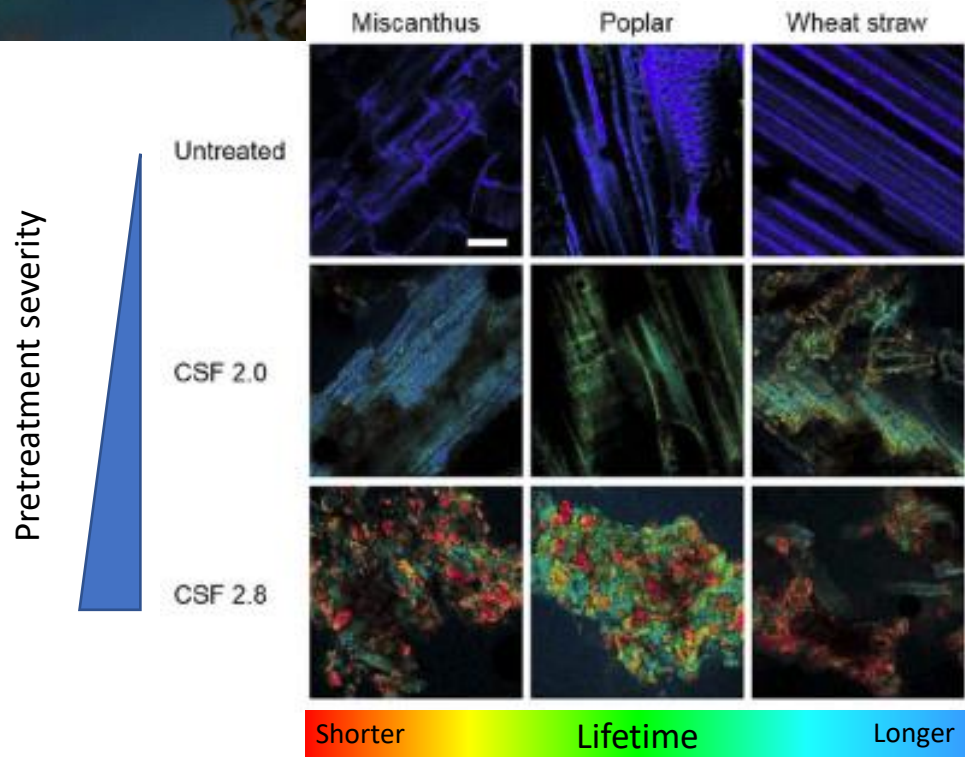


## SCIENTIFIC REPORTS

OPEN Seeing biomass recalcitrance through fluorescence

Thomas Auxenfans<sup>1</sup>, Christine Terryn<sup>2</sup> & Gabriel Paës<sup>1</sup>

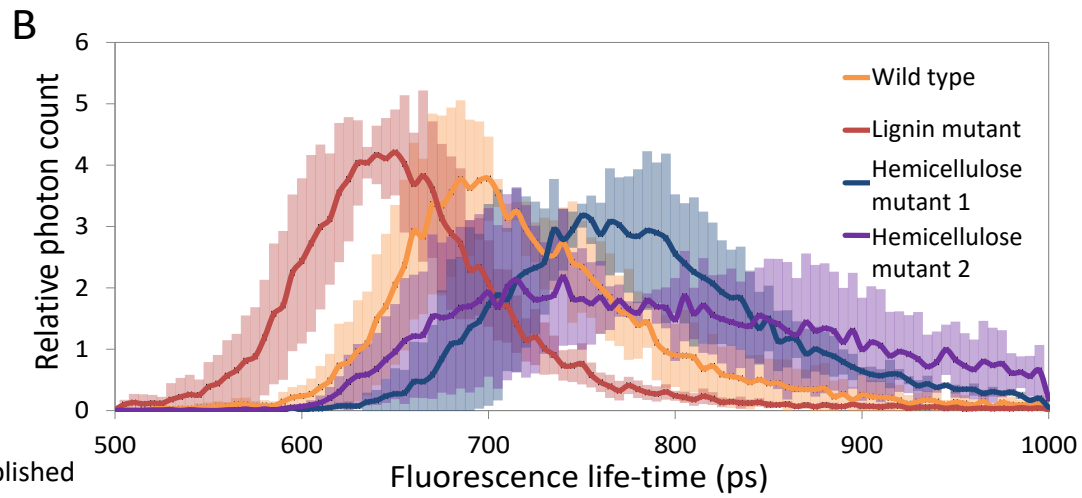
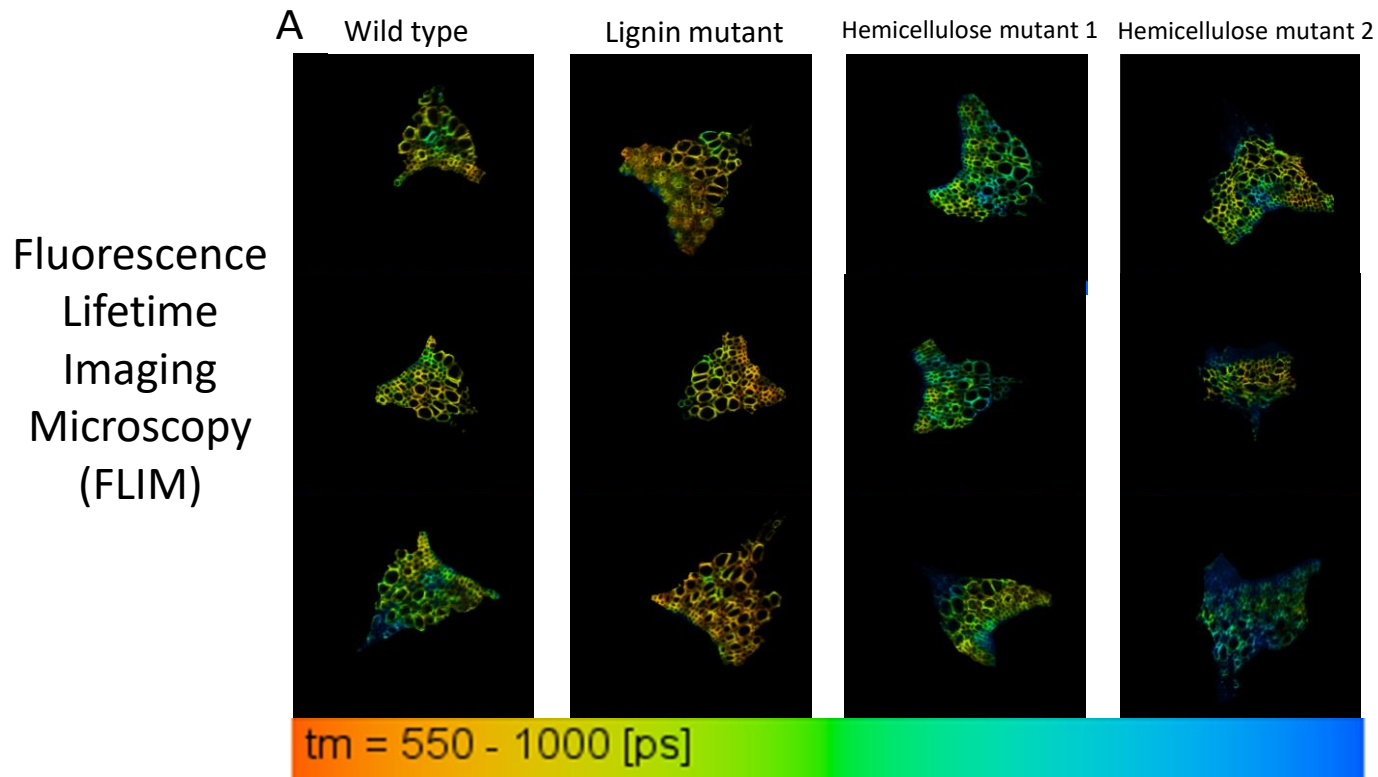
2018



Fluorescence Lifetime Imaging Microscopy (FLIM)

➔ Lignin fluorescence lifetime changes with increasing pretreatment severity.

# Lignin fluorescence lifetime correlates with different lignocellulose biomass chemistry





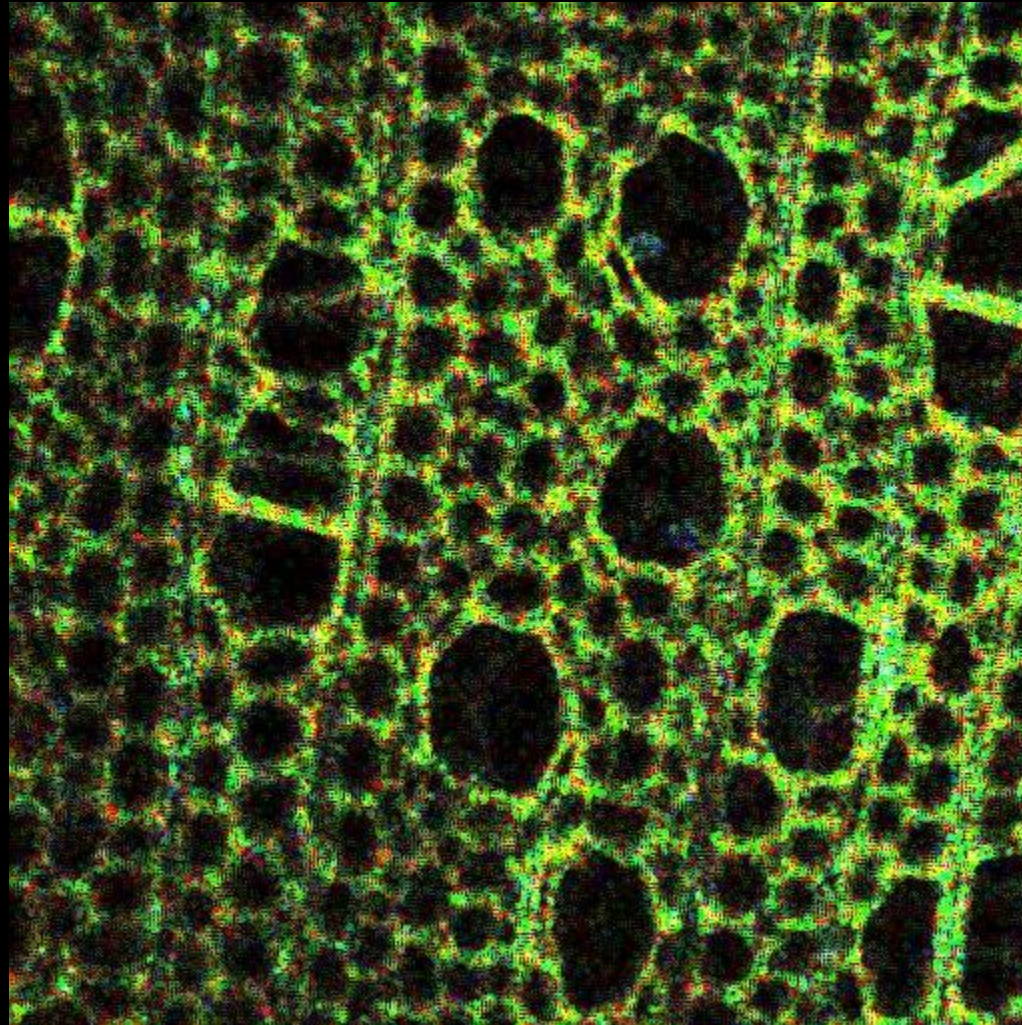
# Fluorescence lifetime varies between cell wall micro-domains

Hybrid aspen wood  $\sim 1\mu\text{m}$  resolution

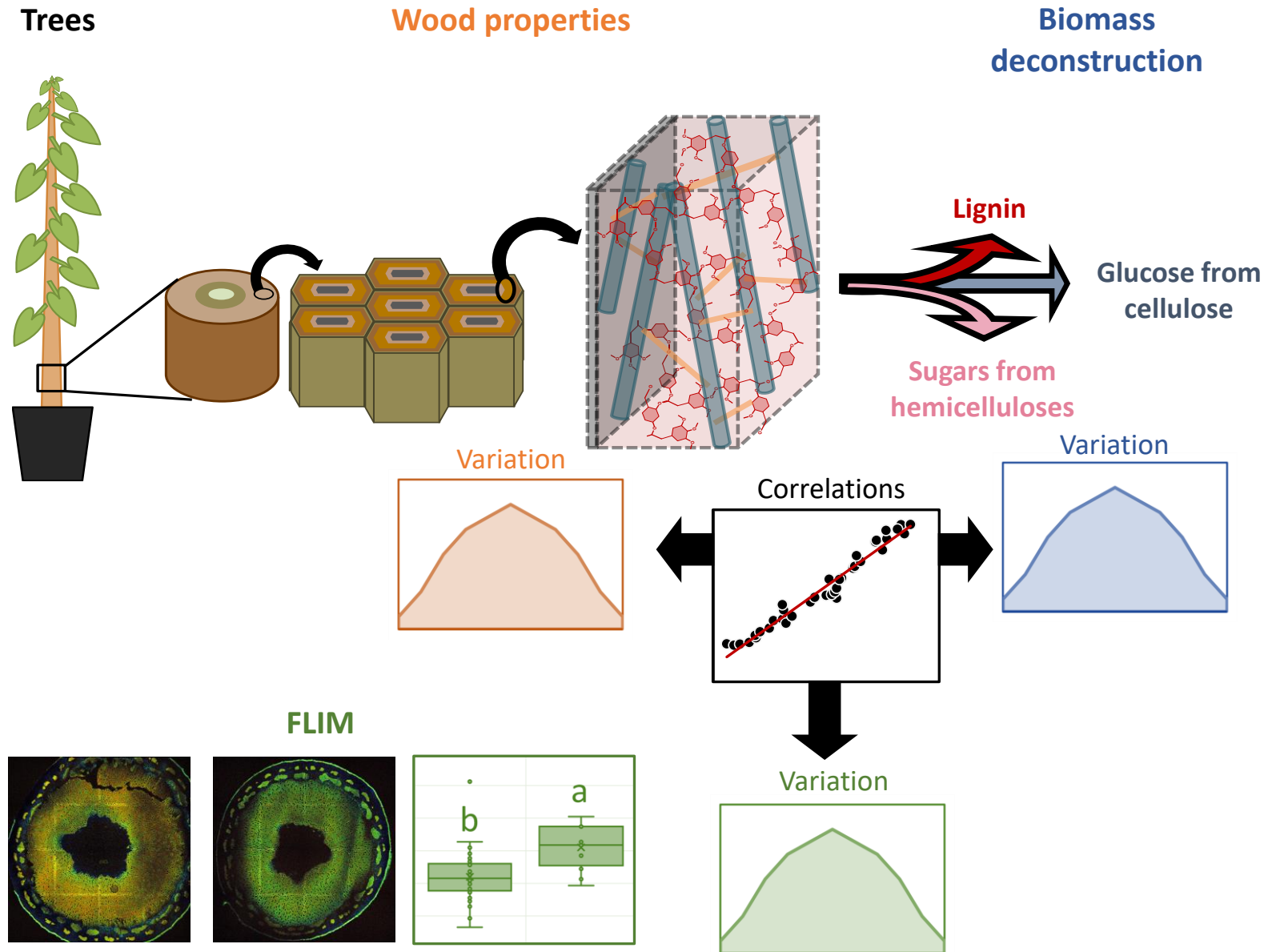
Fluorescence lifetime (ns)

0.2

3.2



# measuring variation is needed to find correlations between FLIM and chemistry

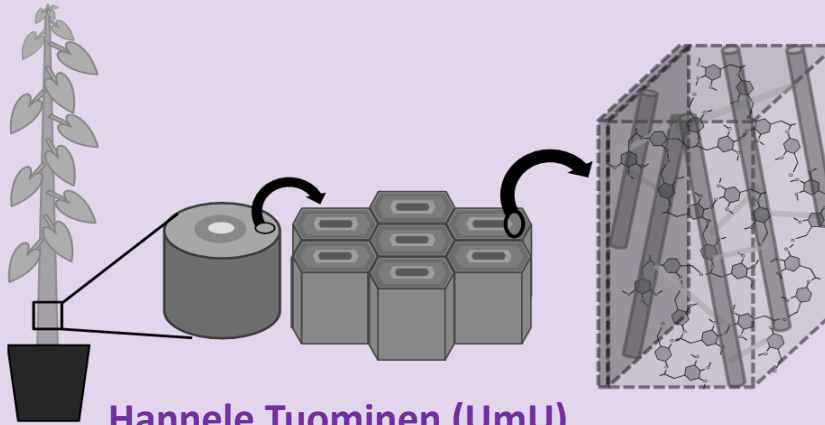


# Recruitment of project members based on identified needs: **original plan**

## Feedstock platform

Trees

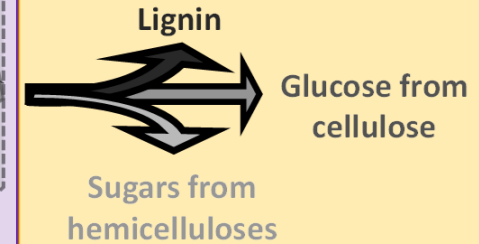
Wood properties



Hannele Tuominen (UmU)  
Totte Niittylä (SLU)  
Gerhard Scheepers (RISE)  
Sacha Escamez (UmU & SLU)

## Biopolymers and Biochemical Conversion Technologies platform

Biomass deconstruction

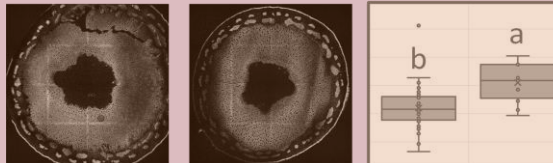


Leif J Jönsson (UmU)  
Madhahi Latha Gandla (UmU)

International collaboration

Gabriel Paës  
Christine Terryn

FLIM



Sacha Escamez (UmU & SLU)

# Recruitment of project members based on identified needs: **final plan**

**Environment and Nutrient Recycling platform**

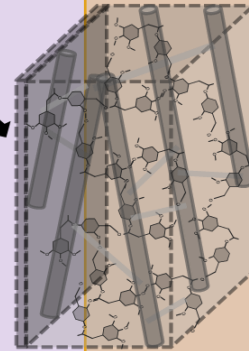
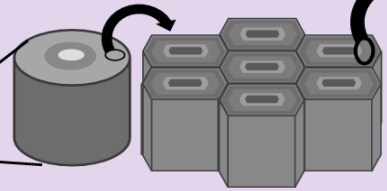
**Torgny Näsholm (SLU)**

**Trees**



**Feedstock platform**

**Wood properties**

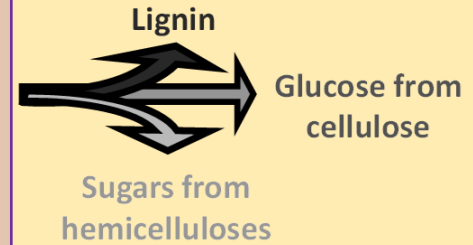


**Hannele Tuominen (UmU)  
Totte Niittylä (SLU)  
Gerhard Scheepers (RISE)  
Sacha Escamez (UmU & SLU)**

**Ola Sundman (UmU)**

**Biopolymers and Biochemical Conversion Technologies platform**

**Biomass deconstruction**

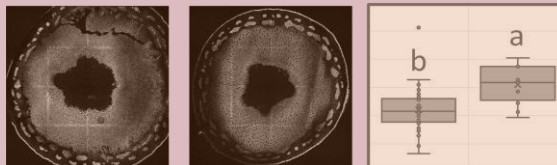


**Leif J Jönsson (UmU)  
Madhahi Latha Gandla (UmU)**

**International collaboration**

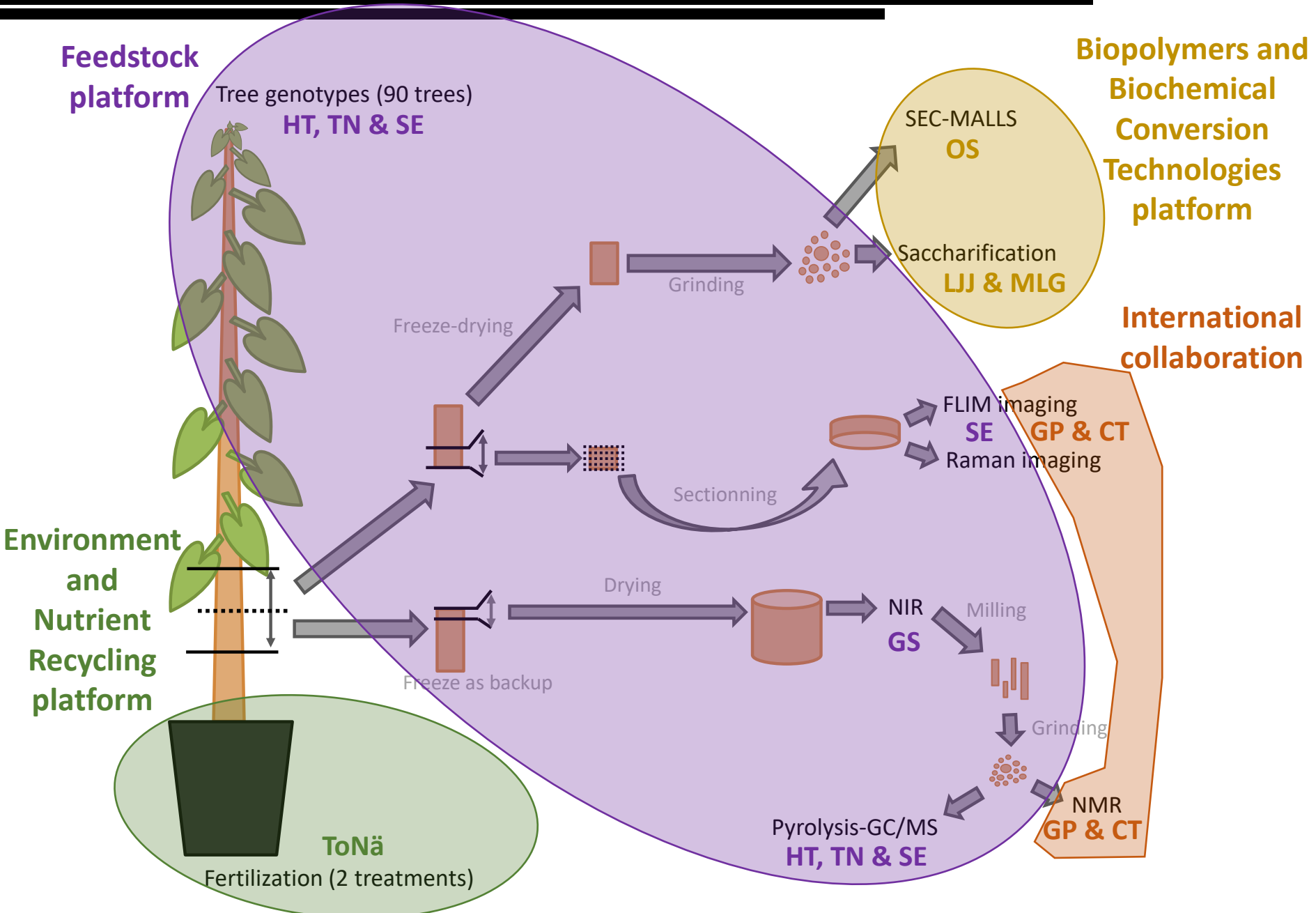
**Gabriel Paës  
Christine Terryn**

**FLIM**



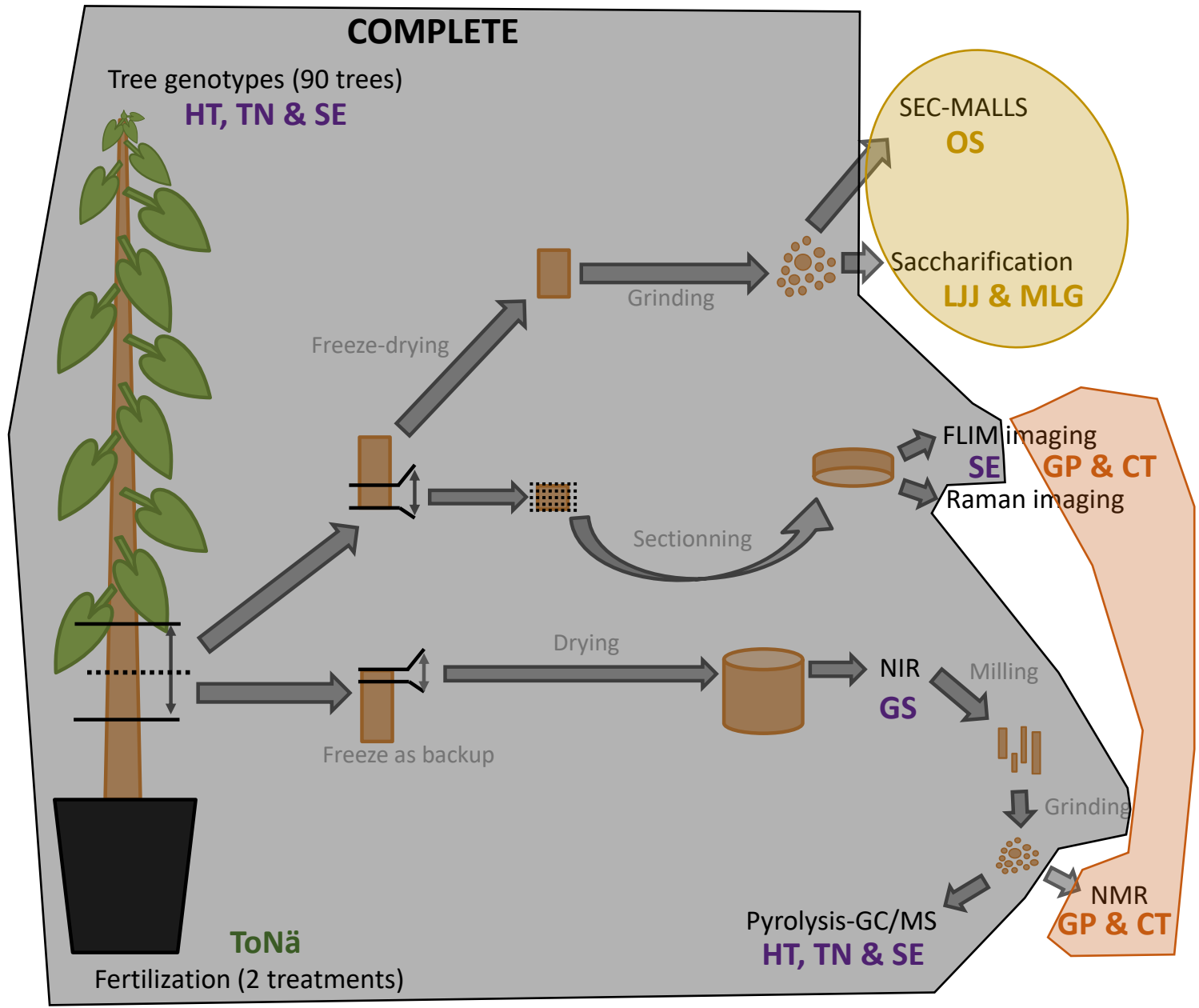
**Sacha Escamez (UmU & SLU)**

# Project progression: the experimental part is near completion





# Project progression: the experimental part is near completion



# Acknowledgements:

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Gabriel Paës

## PICT Imaging Platform, Reims Hospital, Reims university (France)

Christine Terryn

Umeå University,  
chemistry department

Leif Jönsson

Madhavi Latha Gandla

Ola Sundman

