



INCT
BIOETANOL

Science and Technology of Bioethanol

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MANAGEMENT OF NIST-BIOETHANOL

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Dra. Anete Pereira de Souza

Center of Sugarcane Breeding

Dra. Maria de Lourdes Polizeli

Center of Fungi Prospection for Glycohydrolase production

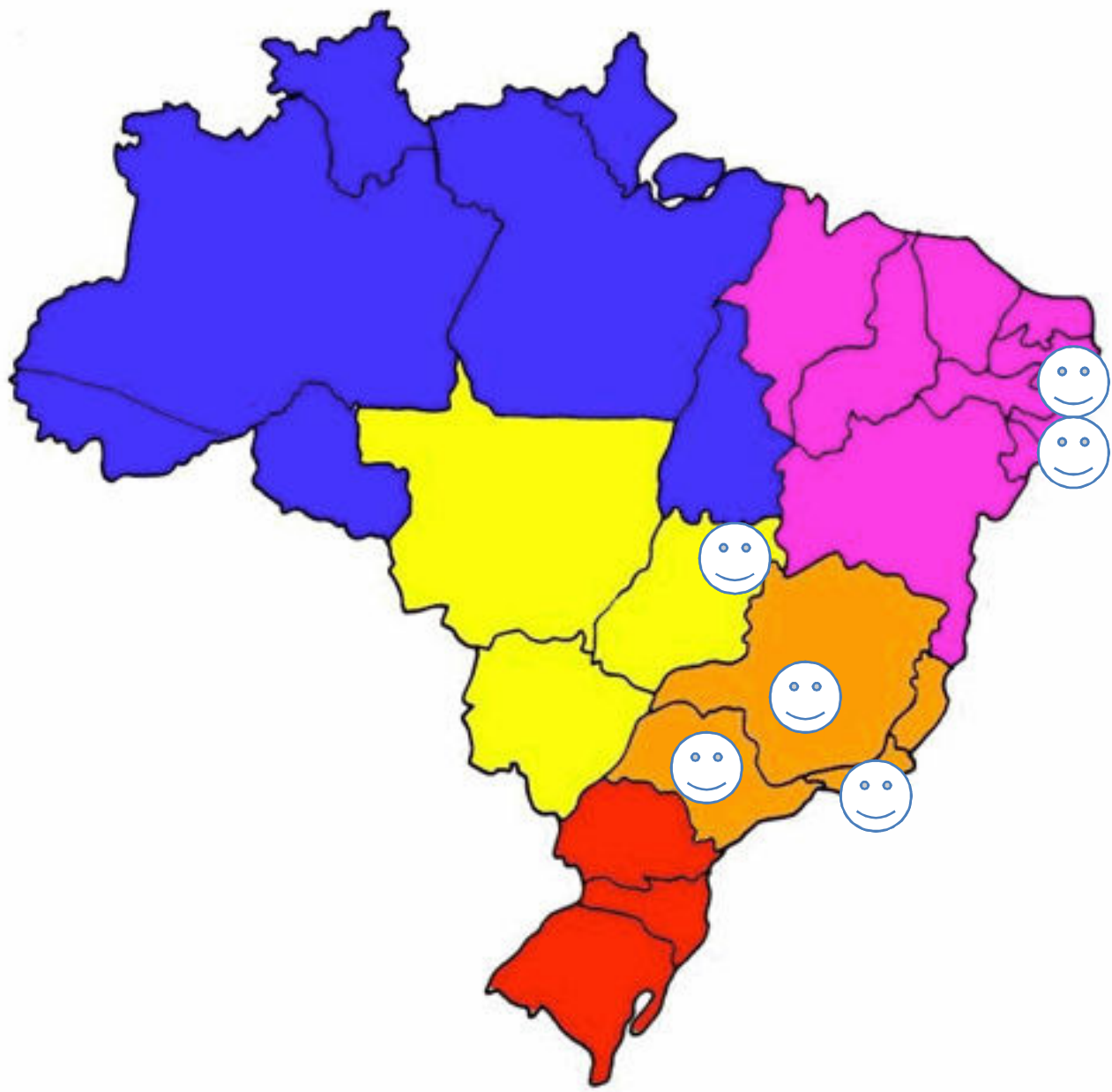
Dr. Igor Policarpov

Center of Enzyme Characterization and Process Engineering

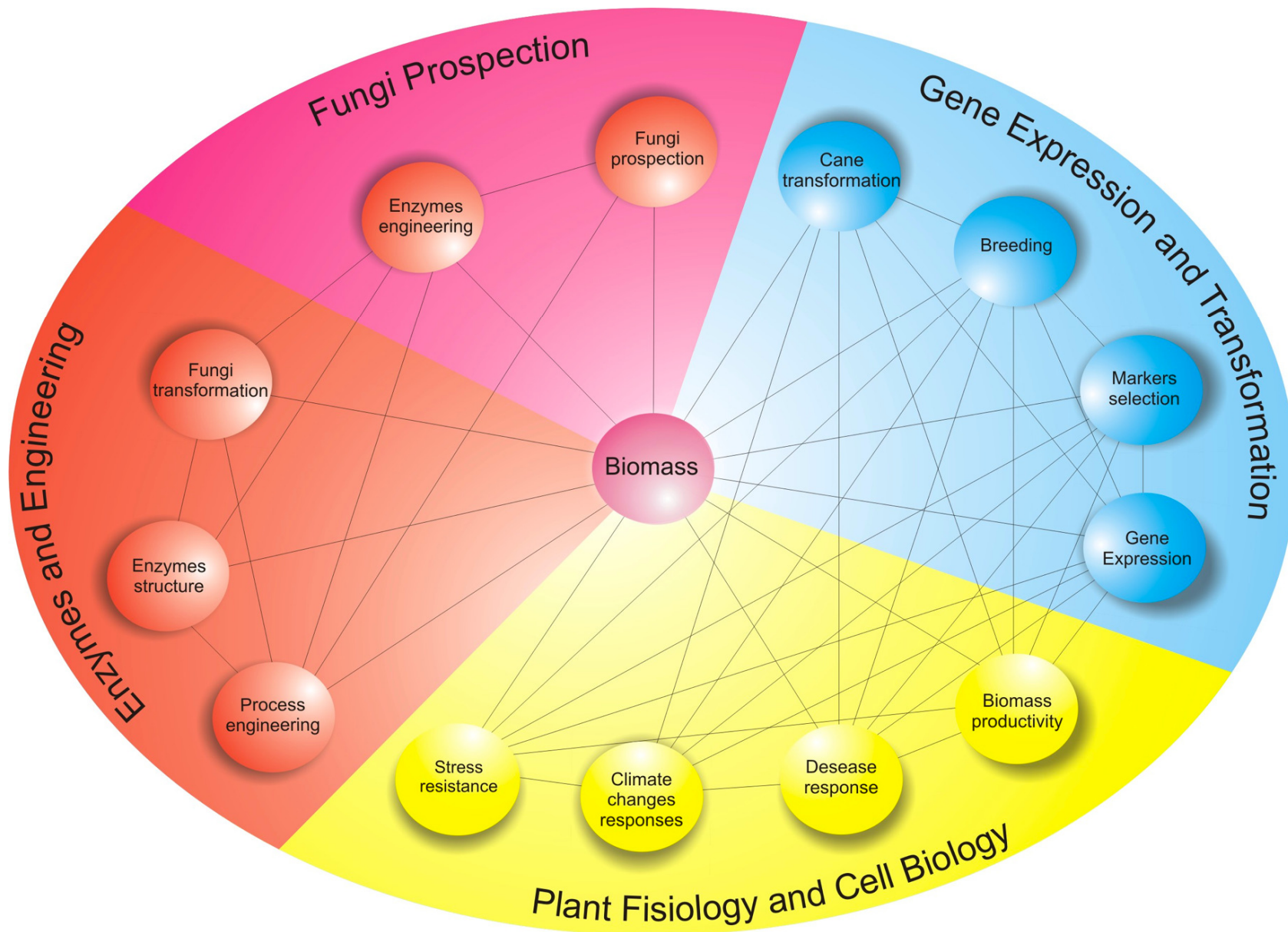
THE CHALLENGE OF NIST-BIOETHANOL

Provide the scientific basis for development of processes for production of bioethanol from biomass with emphasis on sugarcane.

29 labs in 6 states of Brazil



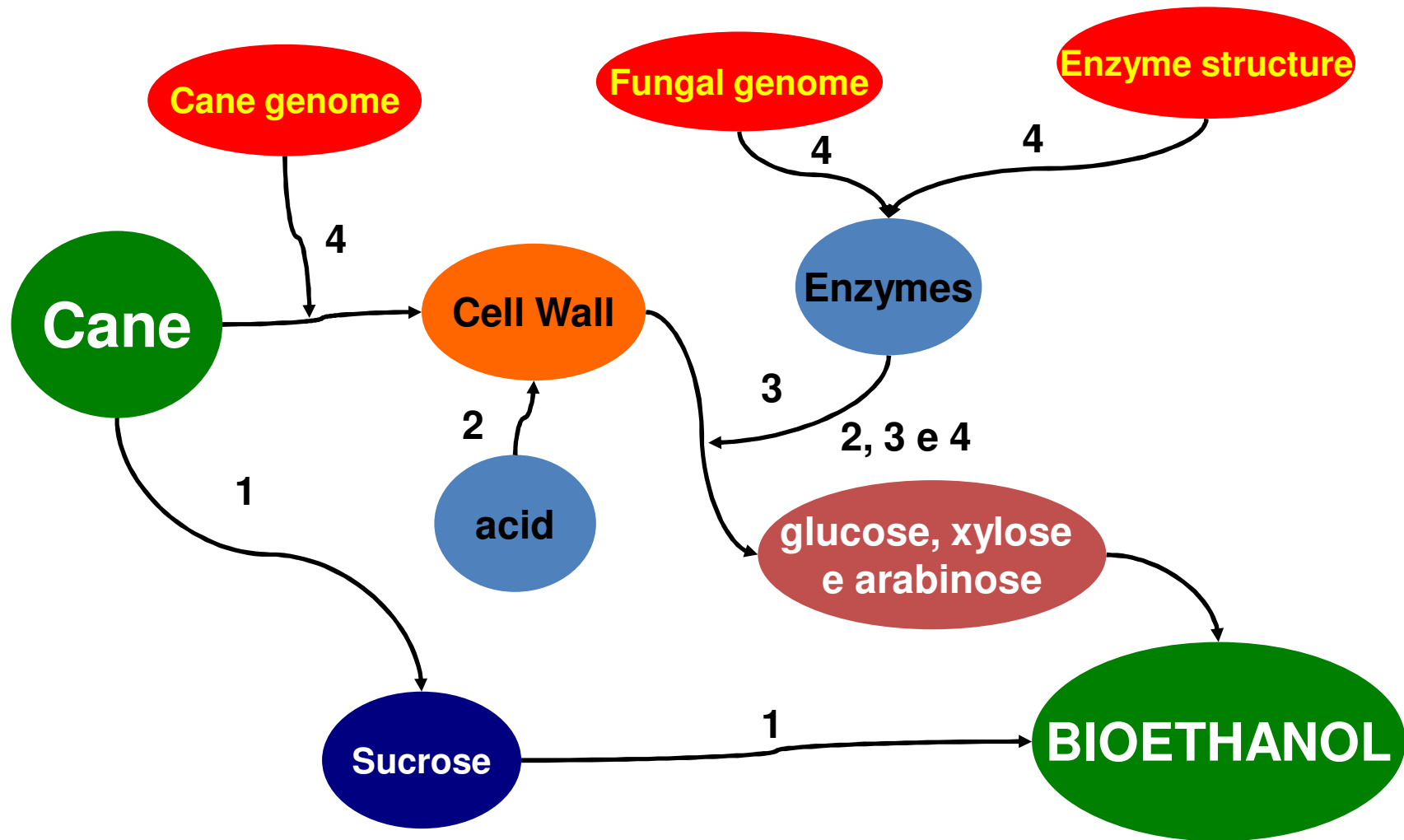
National Institute of Science and Technology of Bioethanol CNPq, FAPESP



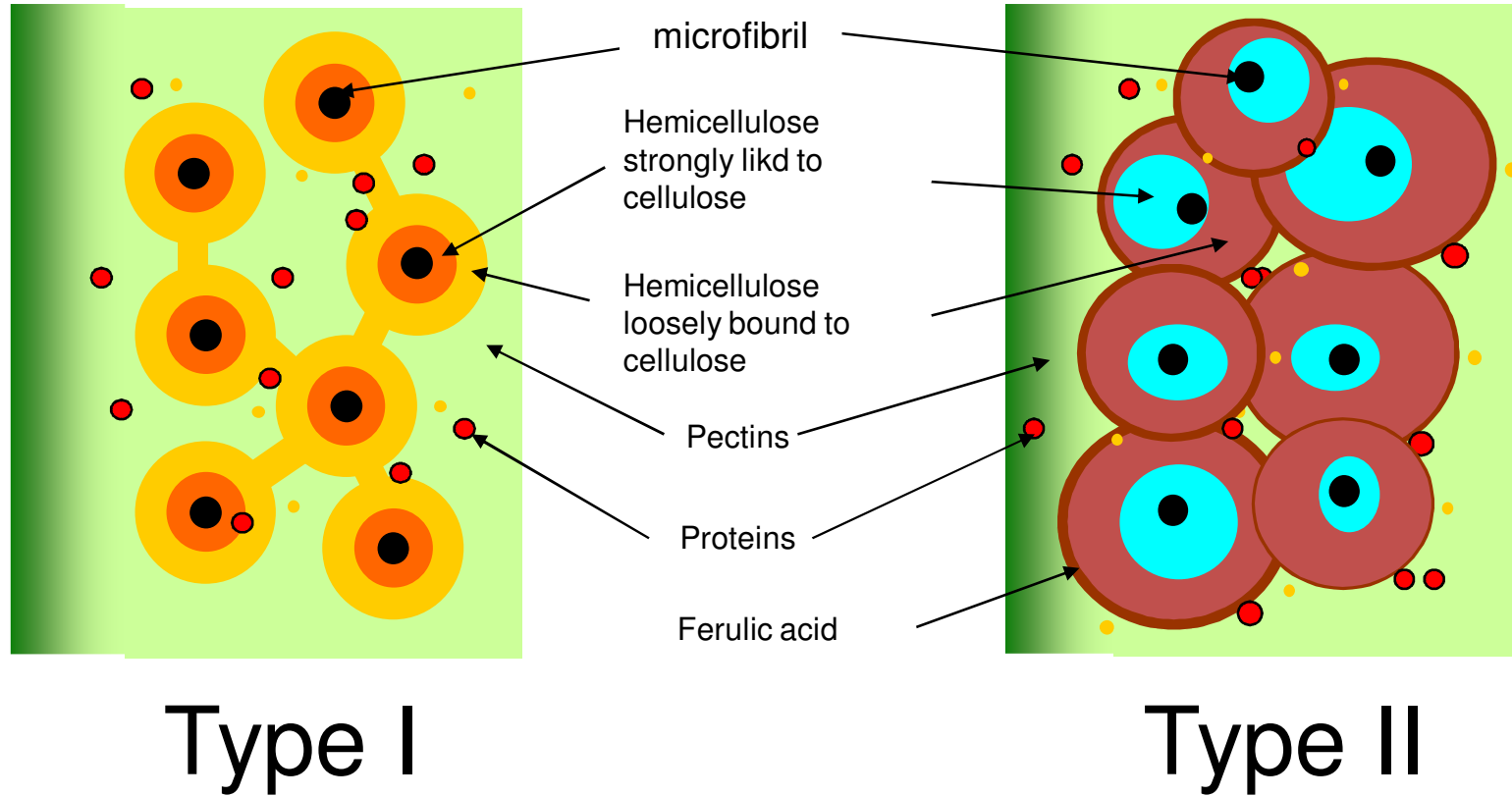
GENERAL OBJECTIVES OF NIST-BIOETHANOL

- 1.** Improve the productivity and stress resistance of sugarcane, giving emphasis to metabolism of photosynthesis, sucrose storage and cell wall production under high levels of CO₂, water and high temperature in order to prevent changes in climate and permit the expansion of sugarcane cultures to regions of sub-optimal climate while preserving/ increasing a high-productivity.
- 2.** To develop the theoretical and technological bases to obtain the expression of hydrolases and other cell-wall degrading enzymes *in vivo* and *in vitro*, in different biological systems and understand the action of these enzymes on cell wall polysaccharides.
- 3.** To produce microorganisms with improved productivity and high performance enzymes both for degrading cell wall polysaccharides and ferment free sugar as oligosaccharides and pentoses.
- 4.** Actively transfer the knowledge produced in the Institute through affirmative actions of communication with other INCTs, scientific community, industry and society, including by formation of specialists through scientific instruction of under graduation, post-graduation courses and technological broadcast through popular magazines, newspapers, books and websites.

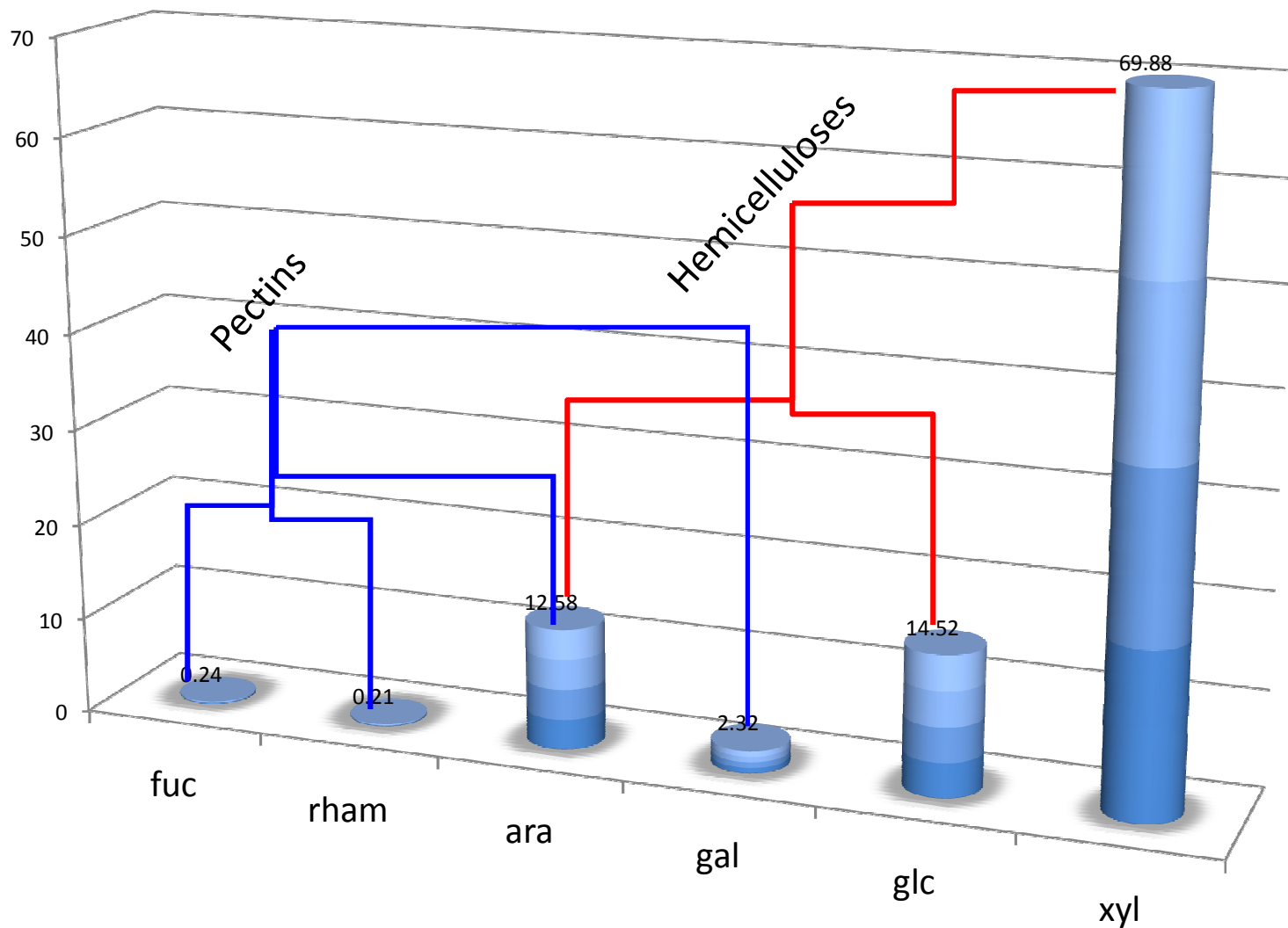
THE FOUR GENERATIONS OF BIOTHANOL



One of the targets in biomass is the cell wall from sugarcane



Sugar composition of non cellulosic polysaccharides of cell walls of sugarcane leaves



It is representative of most tissues of sugarcane, including culm, roots and flowers



Sugarcane Cell Wall

(Glucurono?) Arabinoxylans
and mixed linkage beta-glucan

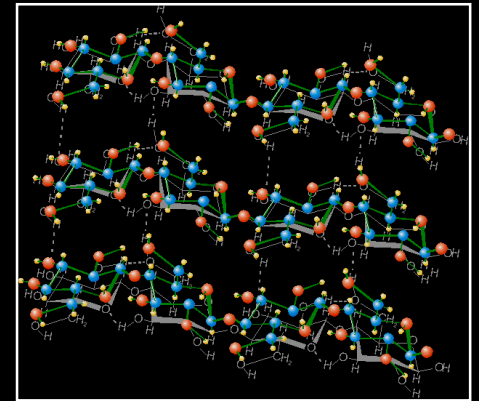
● Oxygen
● Carbon
● Hydrogen

Microfibrils

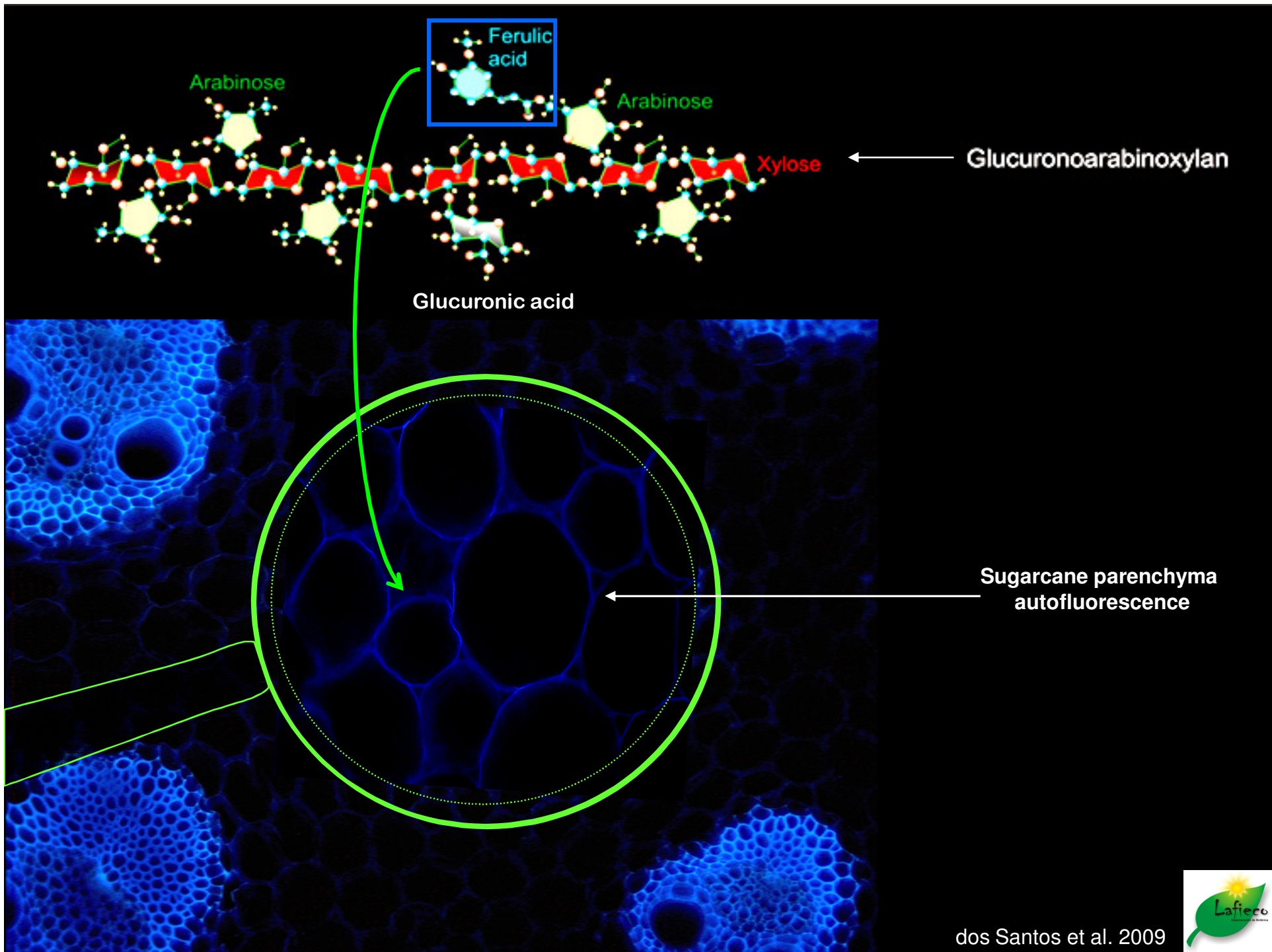
Cell wall

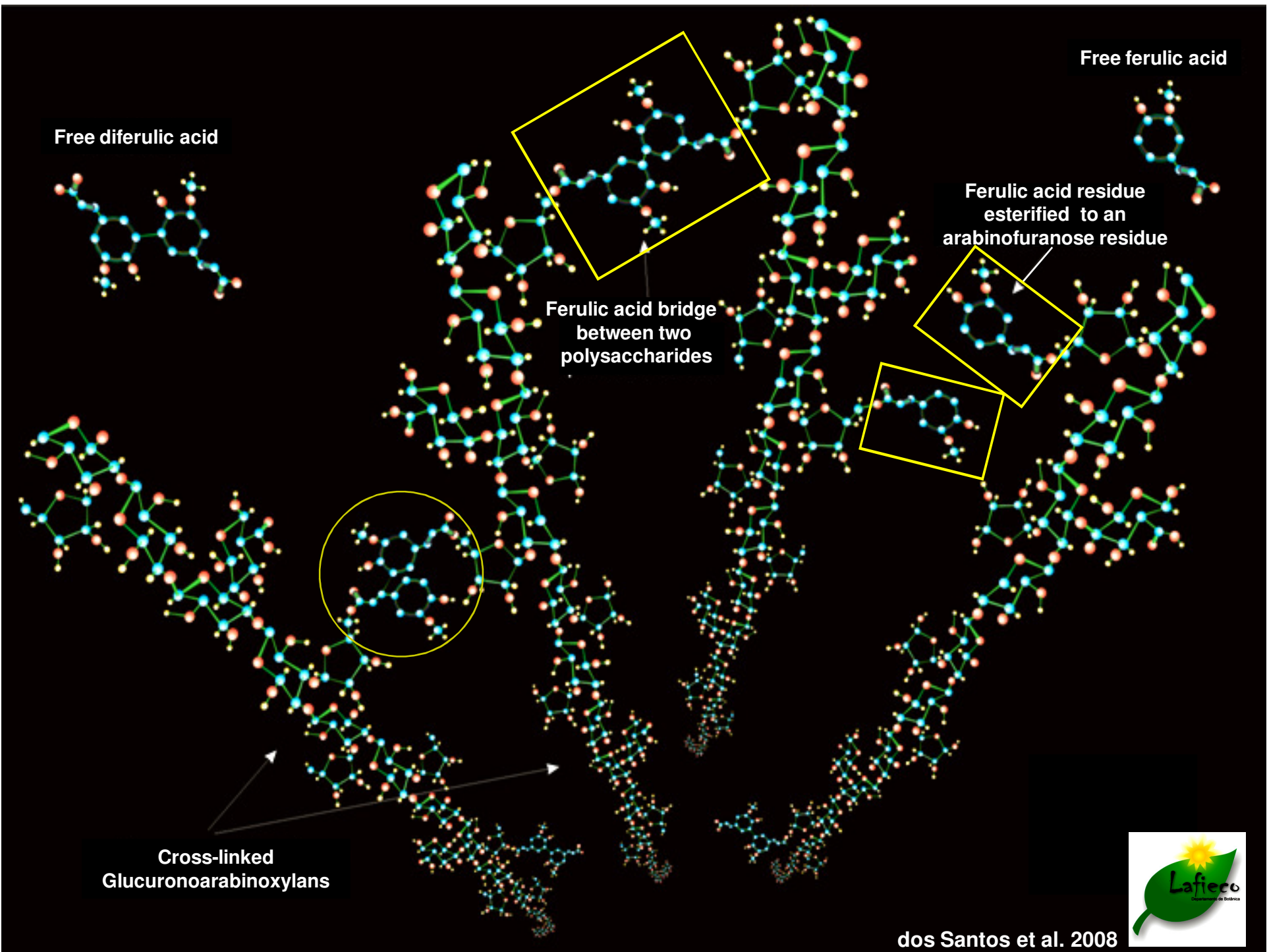
Microfibril

Cellulose



dos Santos, 2009





Free diferulic acid

Free ferulic acid

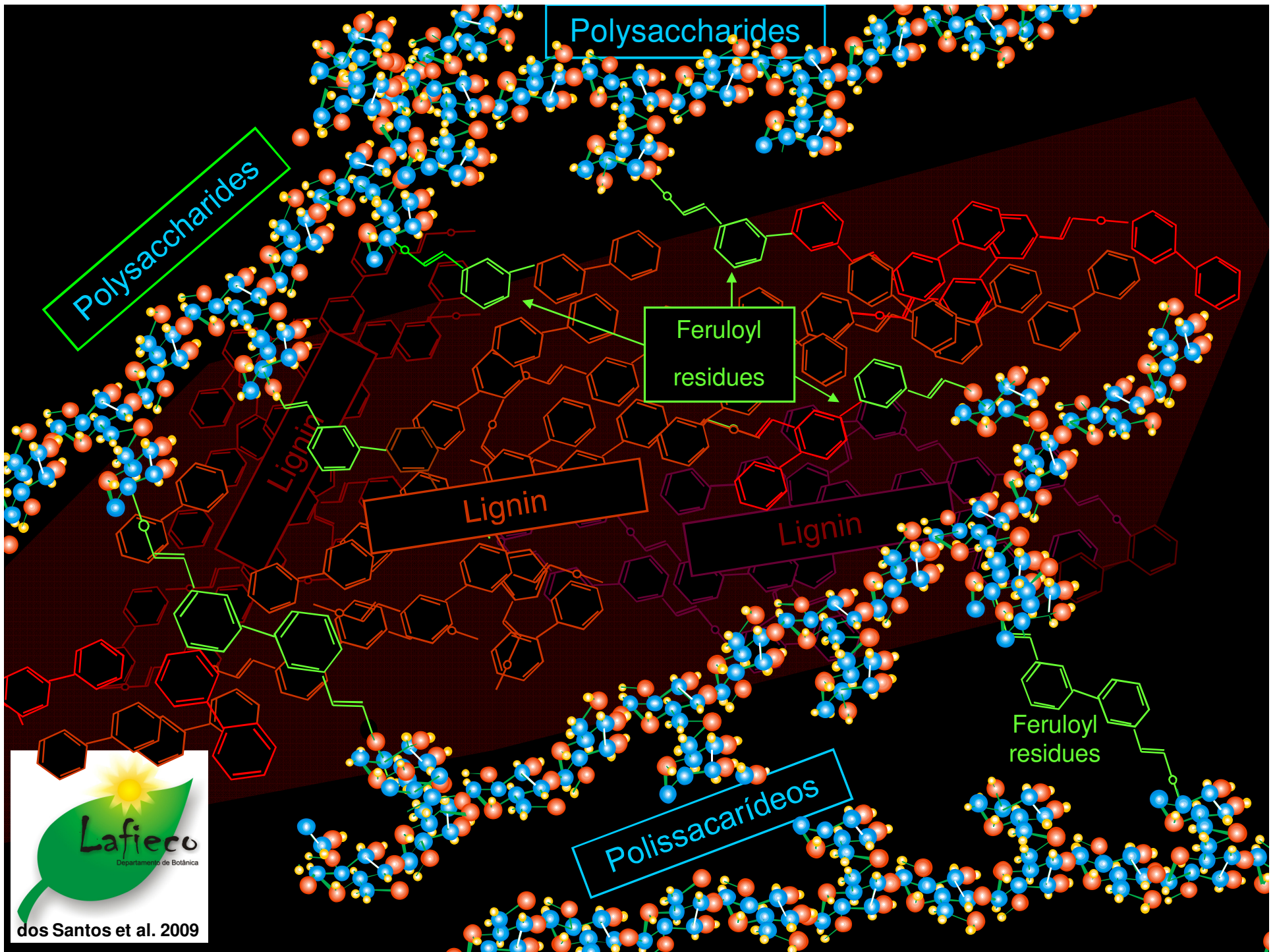
Ferulic acid bridge between two polysaccharides

Ferulic acid residue esterified to an arabinofuranose residue

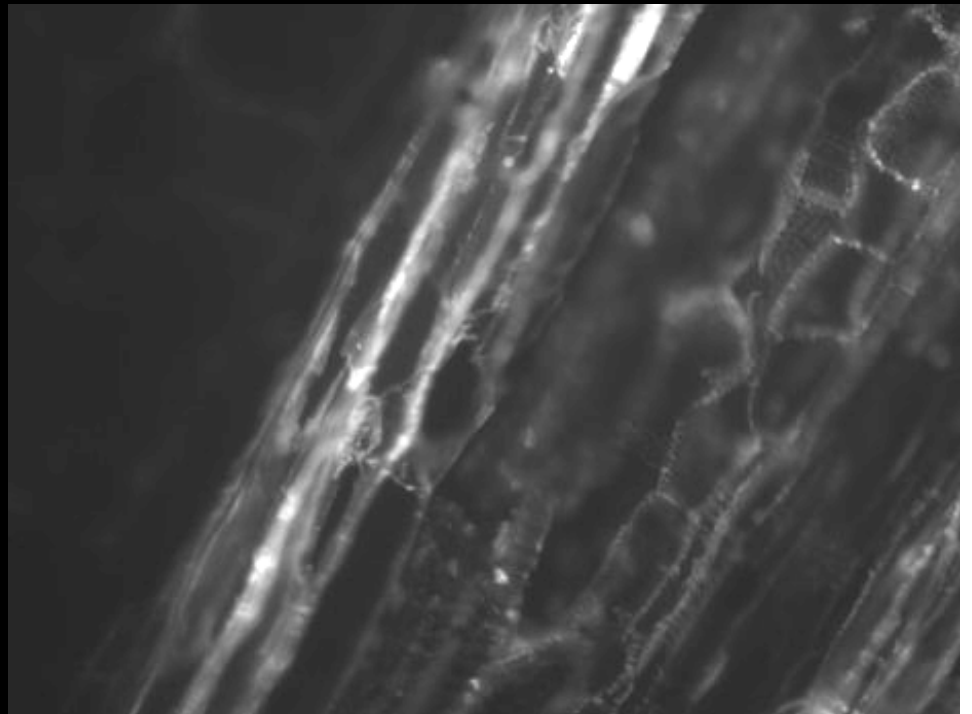
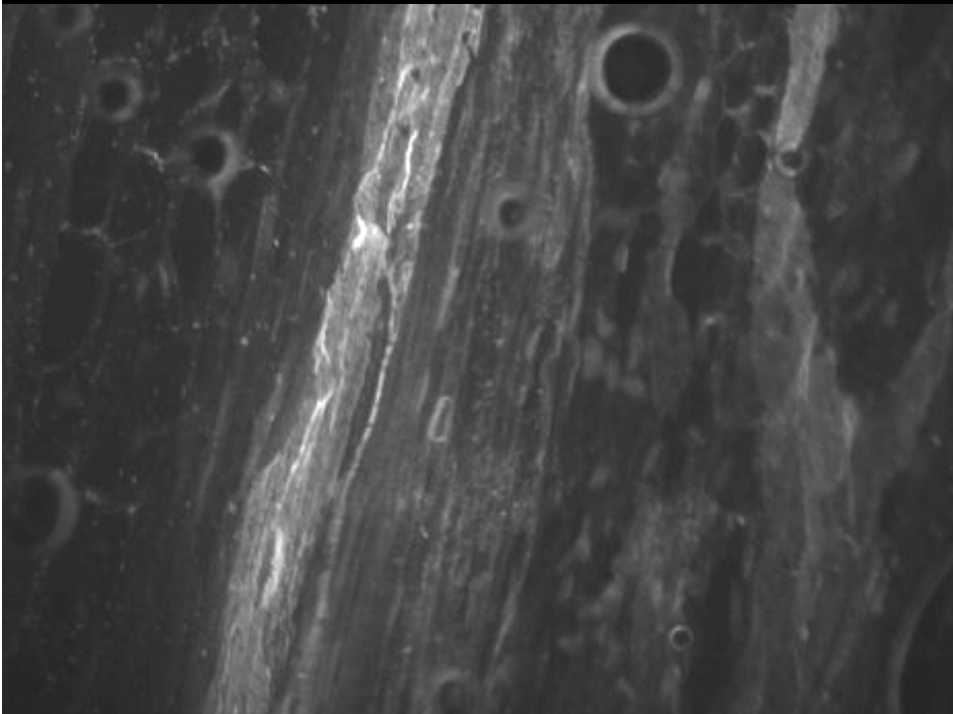
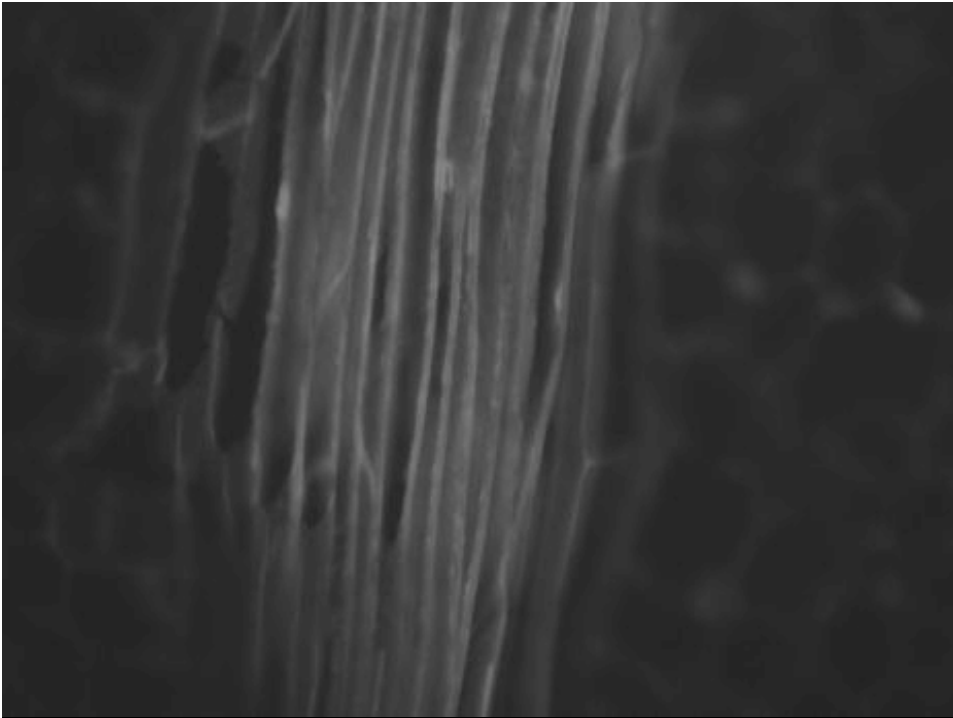
Cross-linked Glucuronoarabinoxylans

dos Santos et al. 2008





Immunocytochemistry



A stylized graphic of a corn plant with green and yellow leaves, set against a background of a bright sun and a blue sky. The text 'INCT BIOETANOL' is overlaid on the bottom part of the graphic.

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THANK YOU

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