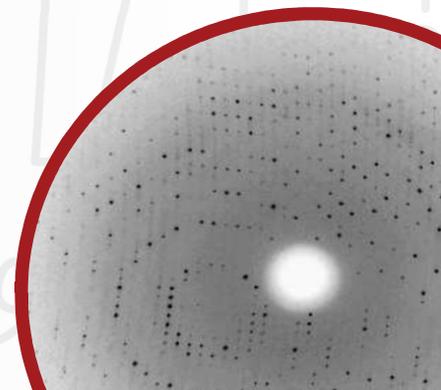


Enzymes decoupling lignin from polysaccharides

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Johan Larsbrink



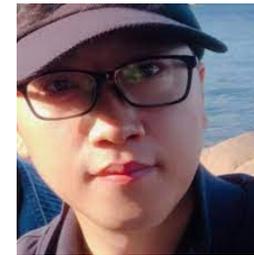
Scott Mazurkewich



Jens-Christian N. Poulsen



Zhiyou Zong



Chalmers University of Technology

Jenny Arnlind Bååth
Dan Krska
Andrea Seveso

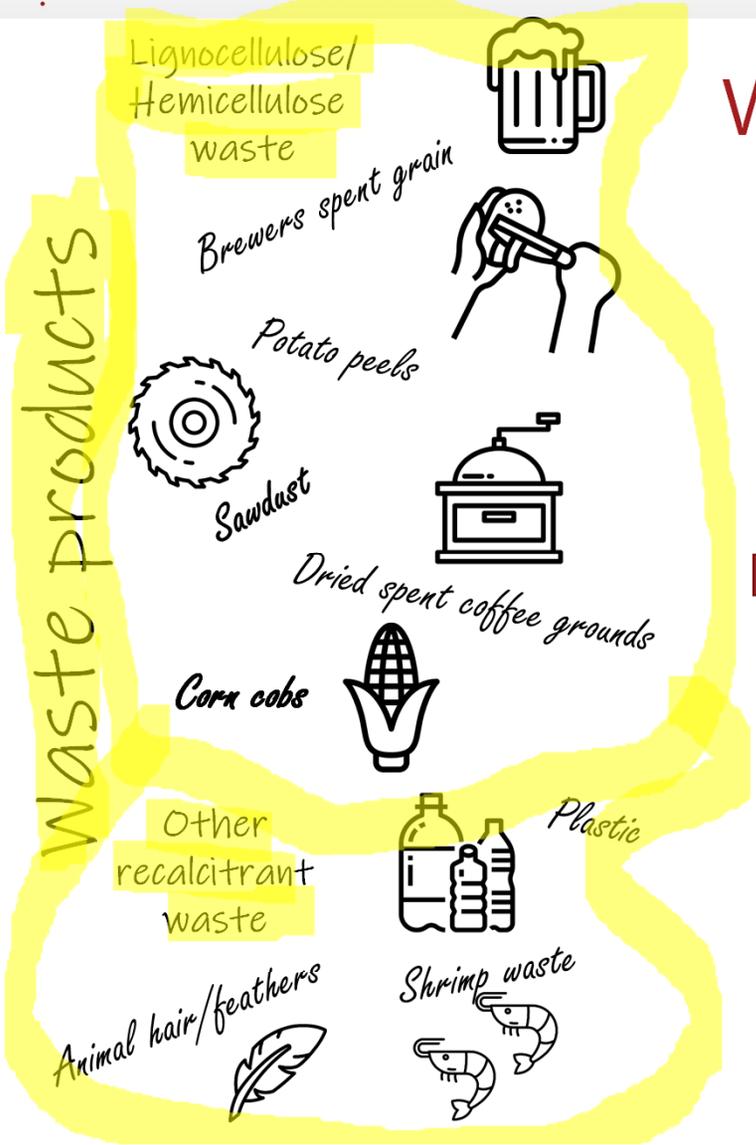


Zhiyou Zong
Rasmus Meland Knudsen
Qian Huang
Yusuf Theibich
Rikke Hjort Brusck
Karoline Scholzen

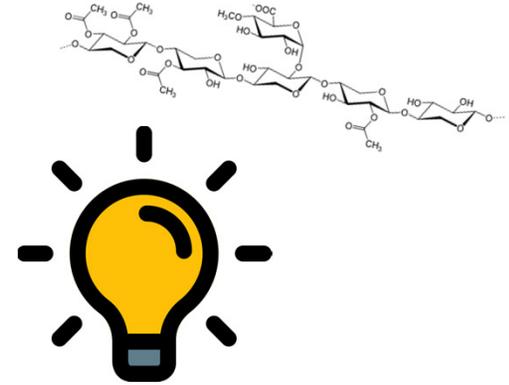


novo nordisk fonden

Follow up project:
lignin-polysaccharide
decoupling enzymes

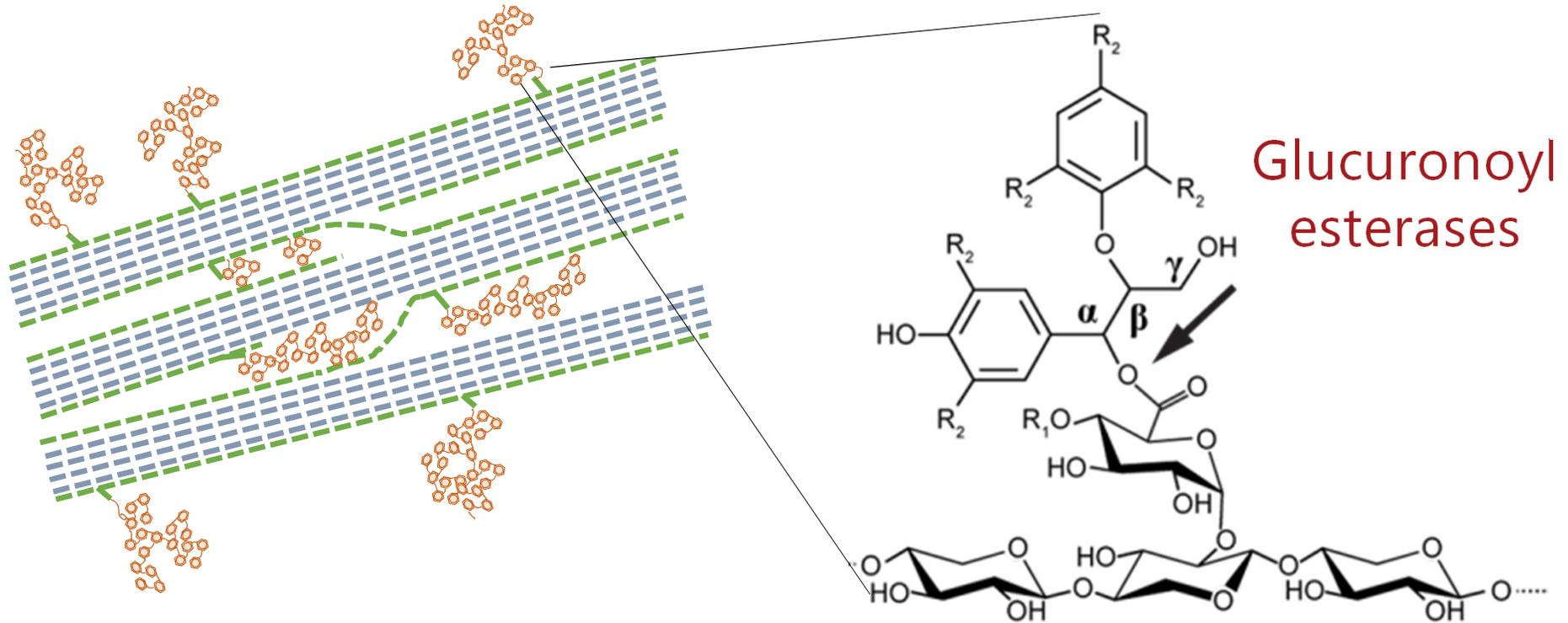


Waste (bio)mass



Useful stuff

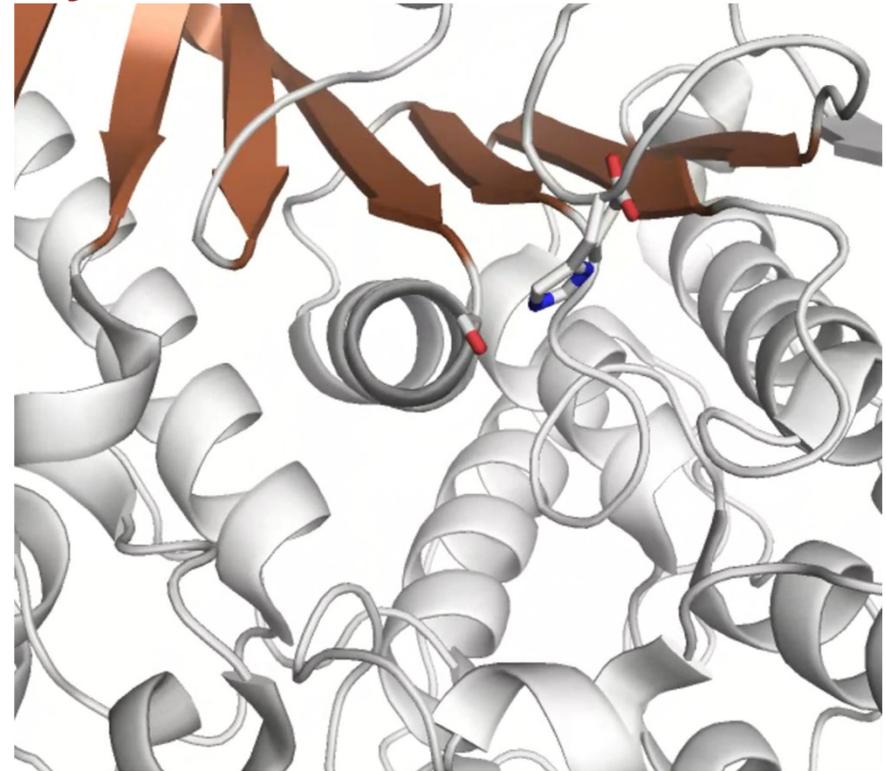
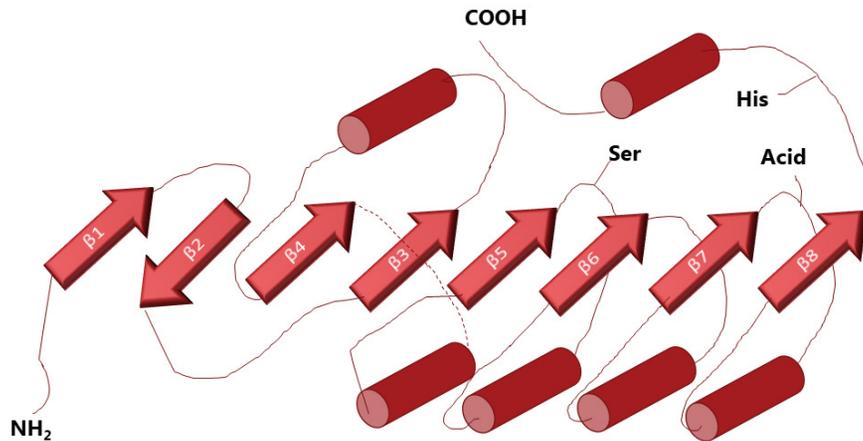
Plant cell walls are complex, diverse and recalcitrant



Glucuronoyl esterases are Carbohydrate Esterases CE15 in CAZy and α/β hydrolases

PDB 4G4G
StGE2

Conserved catalytic triad

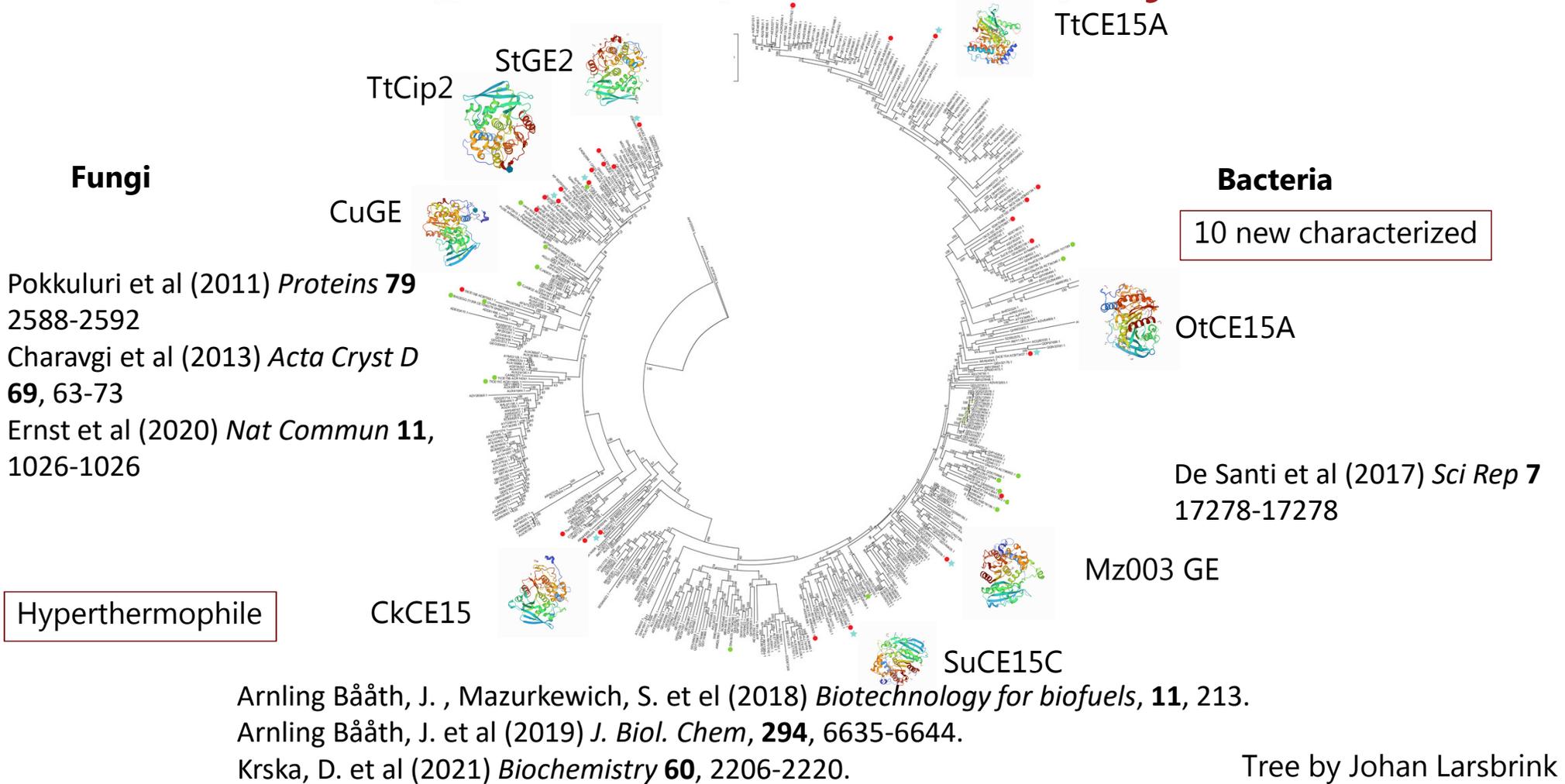


Ollis et al (1992) *Prot. Eng.* 5, 197-211

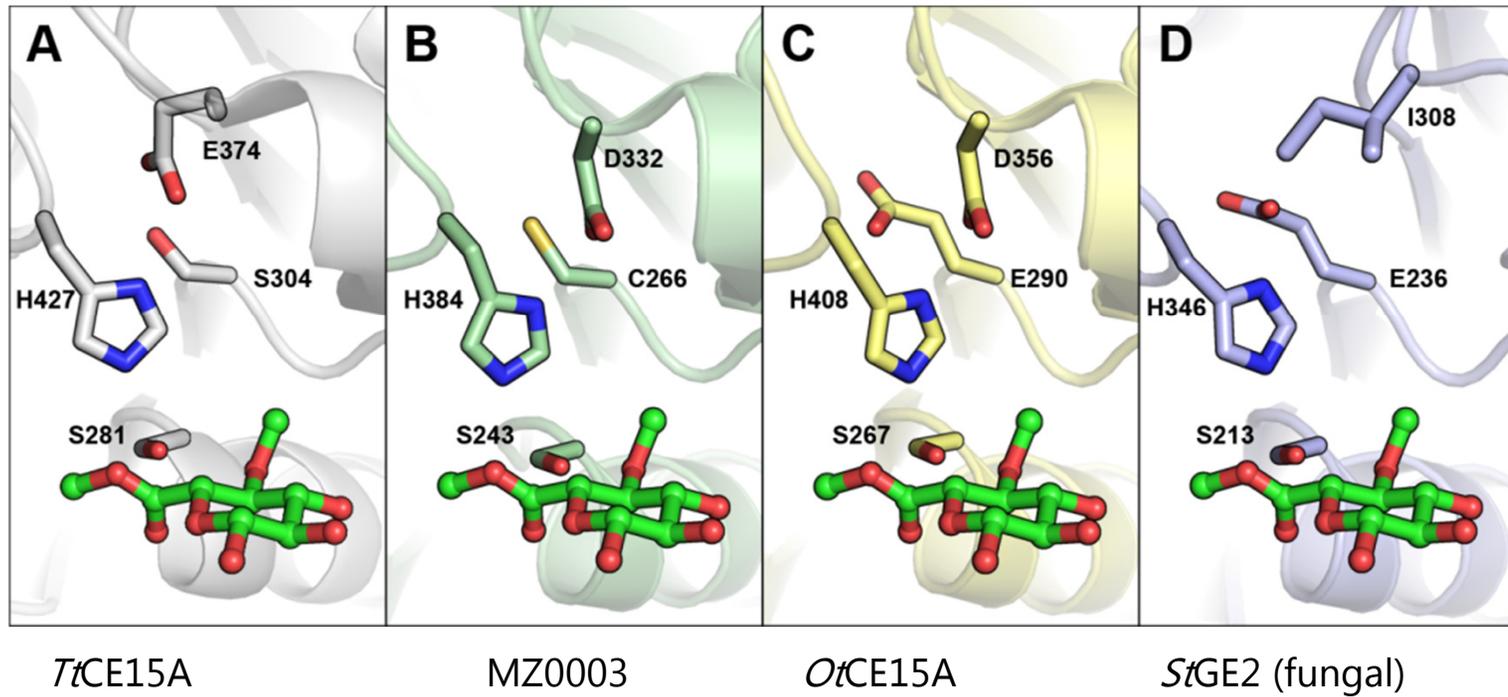
Nardini M. and Dijkstra BW (1999) *Curr. Opin. Struct. Biol.*, 9, 732-737.

<http://www.cazy.org/>

The CE15 glucuronoyl esterases project



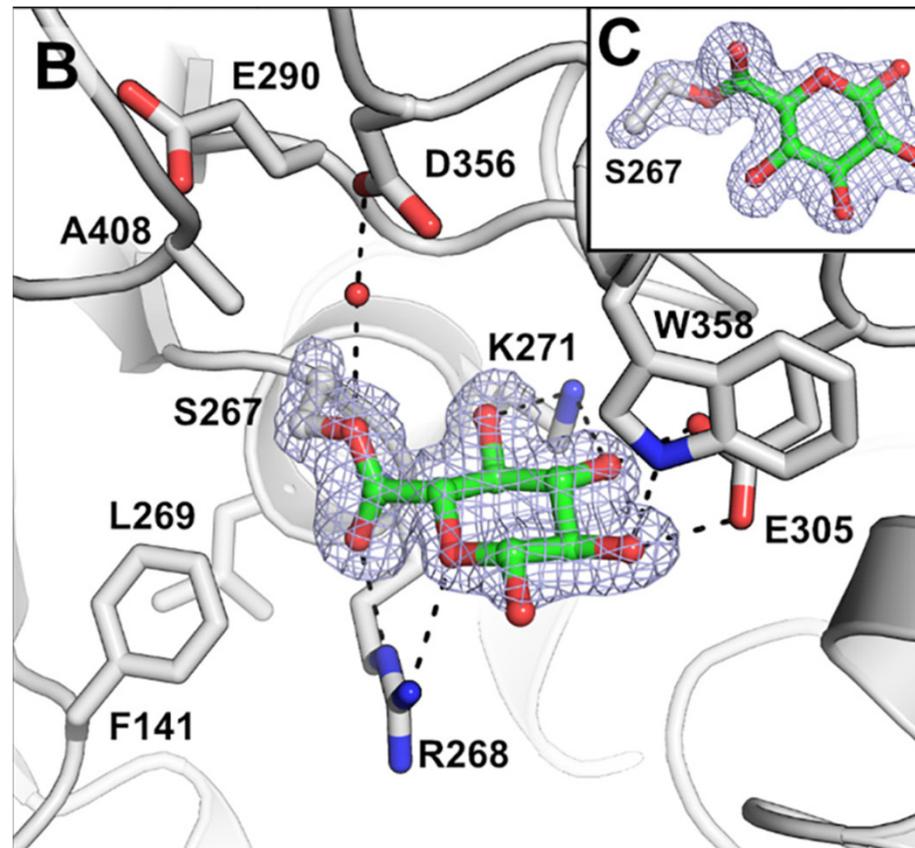
The evolution of CE15 active sites



Canonical

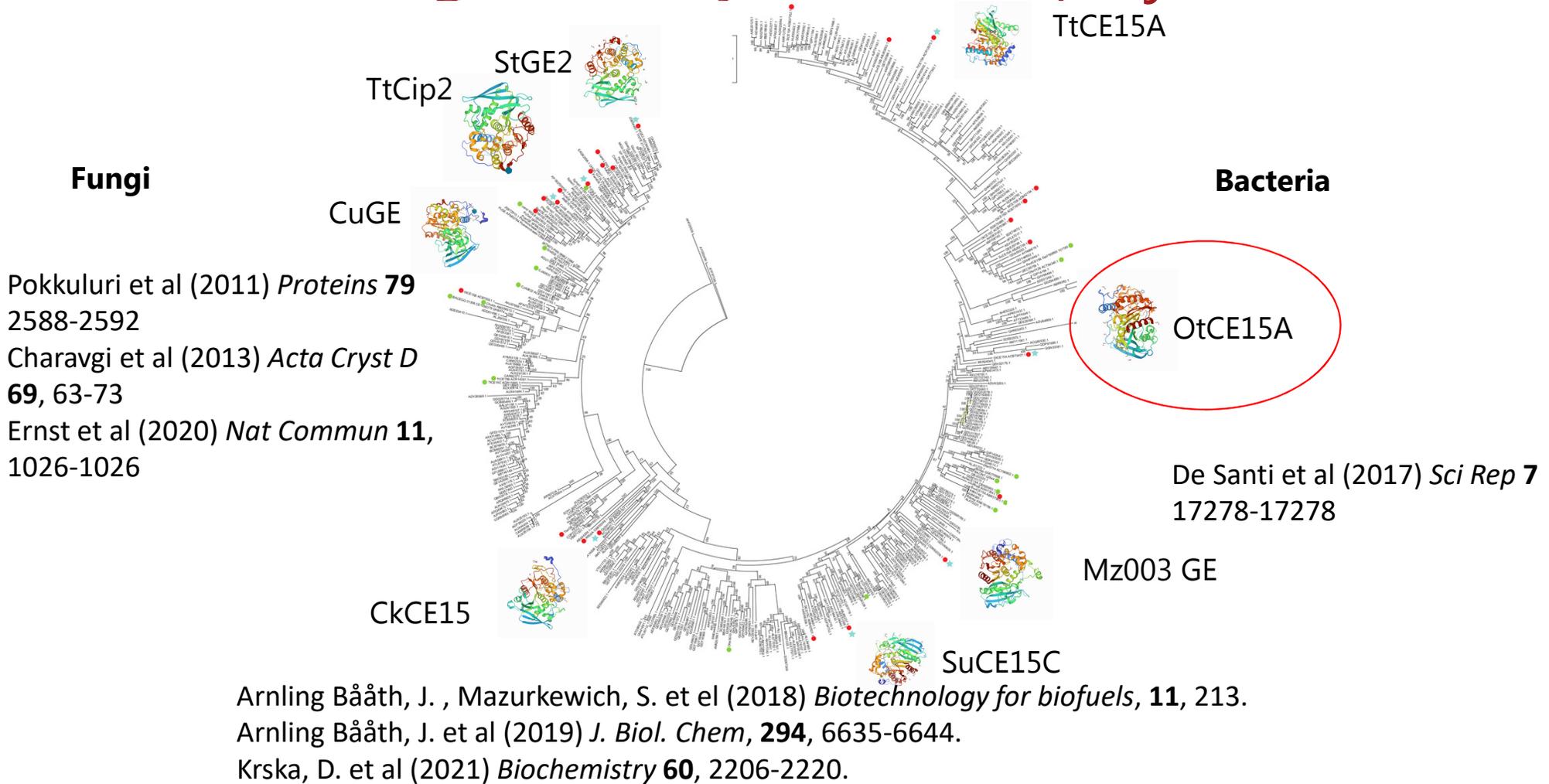
Arnling Bååth, J. et al (2019) *J. Biol. Chem.*, **294**, 6635-6644

Covalent intermediate

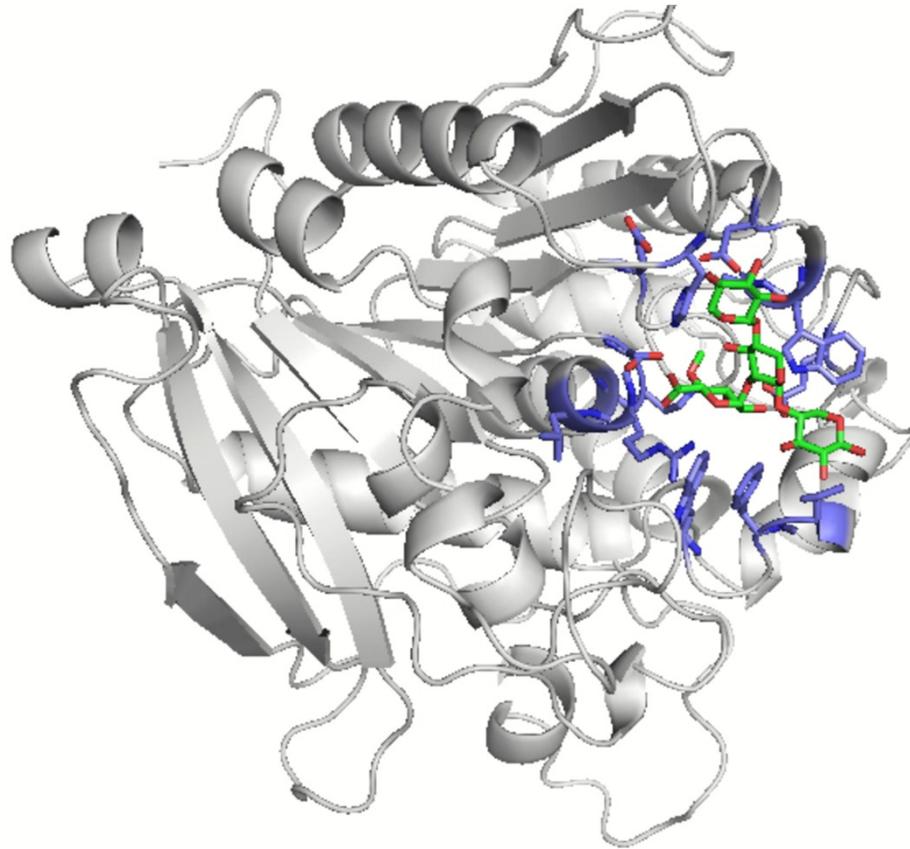


Mazurkewitch et al *J. Biol. Chem.* (2019) **294** 19978 –19987

The CE15 glucuronoyl esterases project

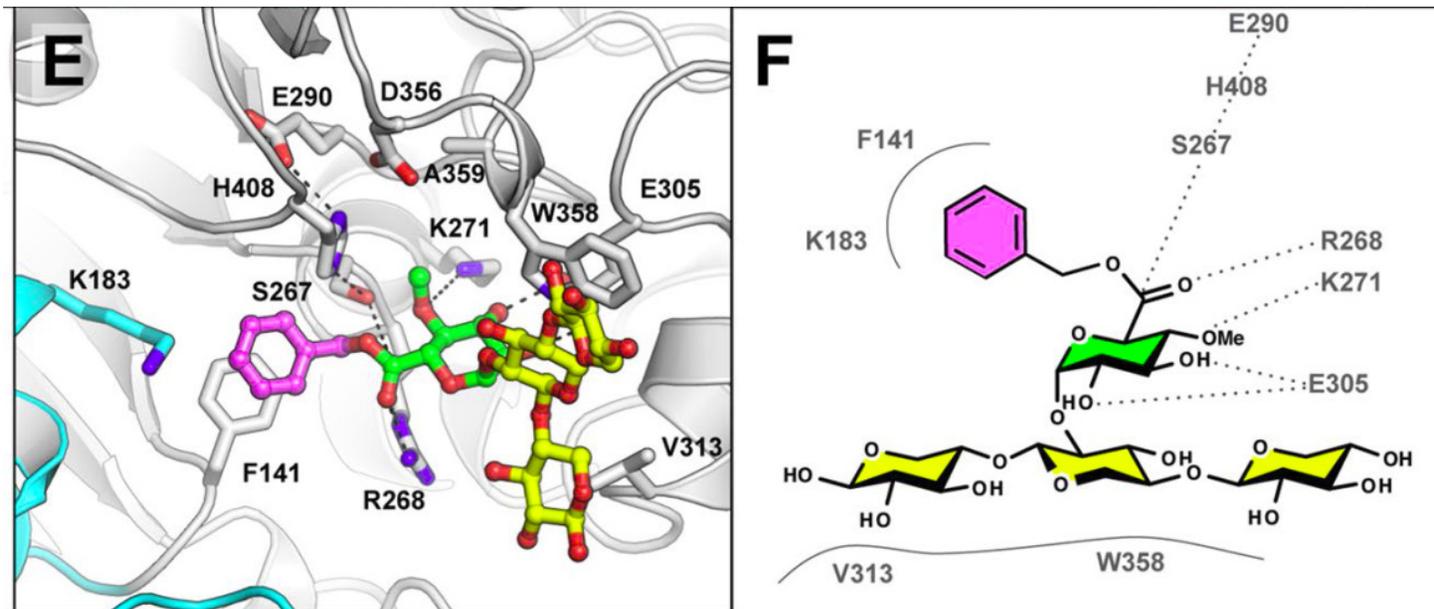


Substrate interactions: extended xylan chain



Mazurkewitch et al *J. Biol. Chem.* (2019) **294** 19978 –19987

Substrate interactions: lignin?

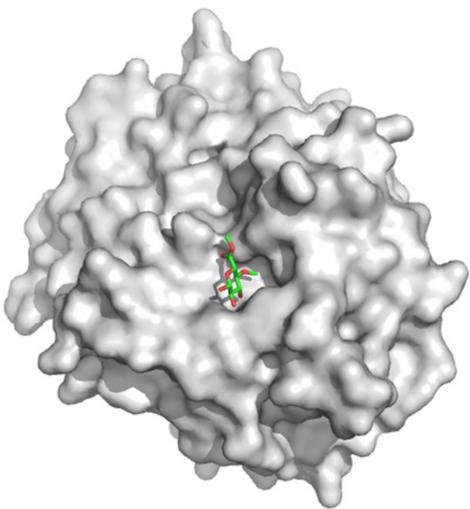


Docking studies –generation of hypotheses -> mutagenesis
 But no MM complex

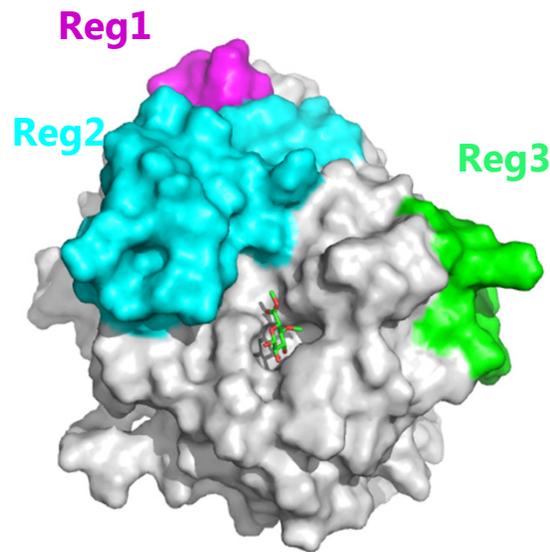
Arnlung Bååth, J. , Mazurkewich, S. et al (2018) *Biotechnology for biofuels*, **11**, 213.
 Arnlung Bååth, J. et al (2019) *J. Biol. Chem, J. Biol. Chem*, **294**, 6635-6644

Overall shape differences

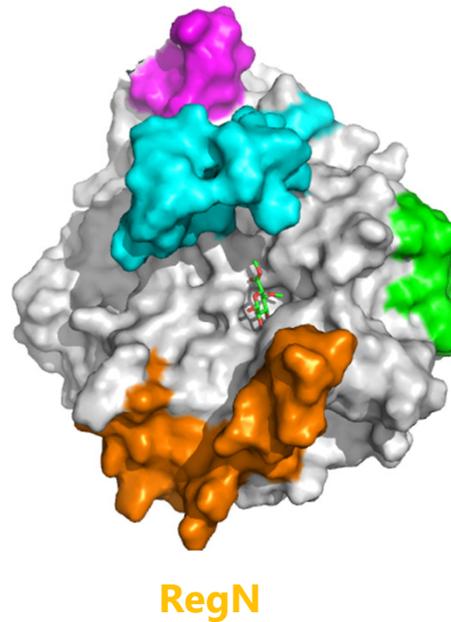
StGE2



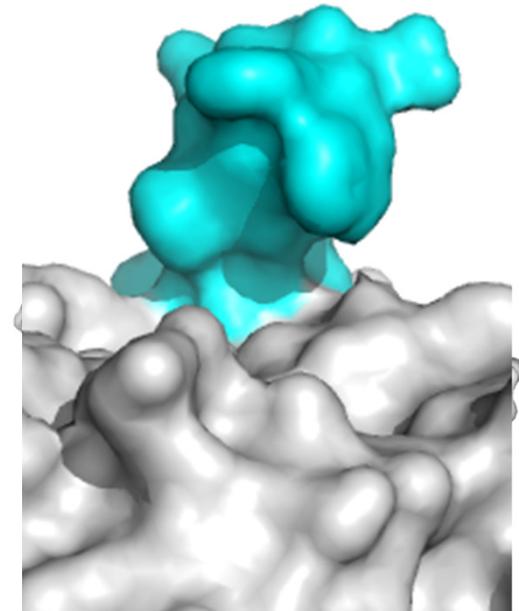
O. terrae
CE15A



T. turnerae
CE15A



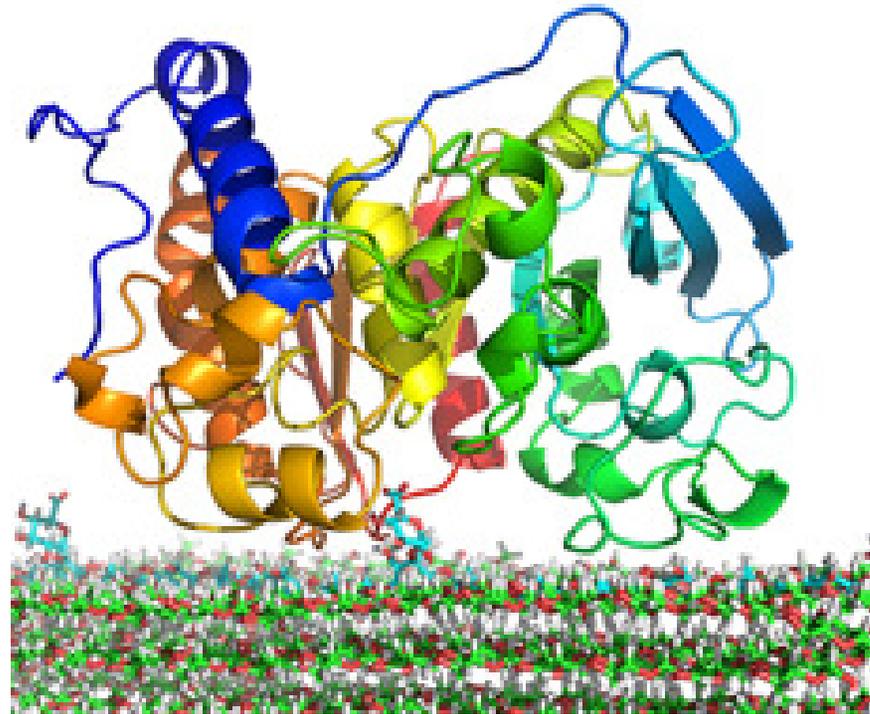
C. kristjansonii
CE15



Arnling Bååth, J. , Mazurkewich, S. et al (2018) *Biotechnology for biofuels*, **11**, 213.
Arnling Bååth, J. et al (2019) *J. Biol. Chem*, **294**, 6635-6644
Krska, D. et al (2021) *Biochemistry* **60**, 2206-2220



Substrate interactions: biomass?



Zhiyou Zong, unpublished

The present and future

- Structural basis of GE specificity on biomass
- Improvement of stability
- Different enzyme activities for decoupling lignin from polysaccharides

Check out this for a longer version of the story

- CHEM talks series Leila Lo Leggio <https://youtu.be/vOZVEz81zCE>