



Titre : Relationships between wood functions in the living tree and wood industrial qualities: what can we learn from tree biomechanical research?

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In order to predict wood technological properties in the context of growth and yield studies, wood variations have been investigated by forest science from several decades. Typical patterns have been defined concerning the effects of cambial age or tree ring width on some wood structural, physical or mechanical properties, in wide ranges of genotypes and site conditions. Complementarily, dendrochronology paid interest on wood density variations with the year climate, independently to silviculture. Many statistical data and models are then available, based on observed variations of wood quality without referring to wood functions in the living tree. Recently, ecology has paid more and more attention to wood adaptations and acclimations linked to climate change or to species history of life. Wood density is for instance a key variable involved in complex trade-offs and associations, because of its different meanings: it is a proxy of construction costs and of wood mechanical or hydraulic performances, it plays a role in the tree mechanical load and in the carbon stored in the forests. Many other wood features are involved in wood functional properties from partitioning among cell types and tissues, to cell wall properties as microfibril angle or pit features. Moreover, basic processes of wood formation (division, enlargement, and thickening) mechanistically constrain wood structure and then wood properties.

Is there any reason to promote more interactions between wood quality and wood ecology or biophysics? Our experience in tree and wood biomechanics demonstrated that starting from technological questions – how to solve technological problems due to reaction wood formation and to increase the tree resistance to strong winds – could stimulate questions to tree ecology and physiology. On the opposite, we will discuss how functional and mechanistic views of wood variations could provide new hypotheses that potentially support the design of more robust statistical models, still parsimonious and adapted to silvicultural and dendrochronological questions.