Trees are long-lived organisms that usually reach large sizes and they had to evolved a sophisticated system for short- and long-distance communication that integrates functioning of the whole organism. A particularly important tissue in this context is secondary xylem (wood), that is responsible for the transport of e.g. water, mineral salts and phytohormones. Due to the complex wood structure, the presence of both dead and living cells, transporting processes that occur within this tissue are highly complicated. Molecules are transported in wood in two directions, i.e. axially, from roots to trees' canopy, within dead tracheary cells called vessels; and radially, over short distances, via living cells of wood called xylem parenchyma, linking, therefore, internal and external regions of the stem.

For decades scientist have been mostly interested in long-distance axial transport in trees, whereas mechanisms of radial communication have been underappreciated and poorly examined. However, recently, general interest in radial short-distance transport and relevance of xylem parenchyma cells is increasing. Importantly, the comprehensive understanding how varied mechanisms of transport in secondary xylem interact with each other and how they change during tissue development is still missing.

Therefore, presented project aims to carefully examine mechanisms of intercellular transport in wood, using poplar, that is the model tree species. We plan to apply specific markers to visualize and identify transporting pathways in wood and additionally utilize inhibitors to block one, specific mechanism to assess interplay between varied transporting processes in secondary xylem. An important part of the research are analyses at the molecular level, that will determine genetic regulations of transporting processes in poplar wood.

We believe that implementation of this project will verify whether mechanisms of intercellular transport changes during wood development. Additionally we aim to determine whether varied transporting processes act simultaneously in secondary xylem and they are strictly interdependent. Overall obtained results allow a better understanding of intercellular communication mechanisms in poplar wood, that are responsible for proper functioning of the tissue and the plant as a whole.