

During growth and morphogenesis plant cells undergo dramatic changes in size and shape. The obvious example of such alterations is morphogenesis of epidermal pavement cells. Initially small and frequently dividing isodiametric cells of young leaf epidermis, in later developmental stages cease to divide and start to expand up to several dozen times their original size in the fully mature leaf. The process of maturation of pavement cells results in the appearance of large cells with interlocking shapes, similar to pieces of a jigsaw puzzle, commonly called - jigsaw puzzle-shaped cells. Because all plant cells are tightly joint by their walls the process of complex jigsaw pattern formation results from coordinated growth of adjacent cells, in particular, of their anticlinal walls (perpendicular to the leaf surface). Although a lot is known on tuning of growth between adjacent cells from empirical (molecular, structural) data and computational modeling, the interplay between periclinal (parallel to the leaf surface, i.e. walls that separate a cell from external environment) and anticlinal walls of individual cells remains elusive.

In this interdisciplinary project we will involve a wide range of research approaches, starting with gene level (defining gene expression patterns), through analysis of growth and mechanical properties of the wall, up to computer simulations, all in order to explore regulatory feedback loops underlying of intricate cell patterning and cell shape formation. This way we will aim at answering a fundamental question in developmental biology.