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**Soft valves in plants**<sup>1</sup> KEUNHWAN PARK, Tech Univ of Denmark, AUDE TIXIER, University of California, Davis, ANNELINE CHRISTENSEN, SIF ARNBJERG-NIELSEN, Tech Univ of Denmark, MACIEJ ZWIENIECKI, University of California, Davis, KAARE JENSEN, Tech Univ of Denmark — Water and minerals flow from plant roots to leaves in the xylem, an interconnected network of vascular conduits that spans the full length of the organism. When a plant is subjected to drought stress, air pockets can spread inside the xylem, threatening the survival of the plant. Many plants prevent propagation of air by using hydrophobic nano-membranes in the pit pores that link adjacent xylem cells. This adds considerable resistance to flow. Interestingly, torus-margo pit pores in conifers are open and offer less resistance. To prevent propagation of air, conifers use a soft gating mechanism, which relies on hydrodynamic interactions between the xylem liquid and the elastic pit. However, it is unknown exactly how it is able to combine the seemingly antagonist functions of high permeability and resistance to propagation of air. We conduct experiments on biomimetic pores to elucidate the flow regulation mechanism. The design of plant valves is compared to other natural systems and optimal strategies are discussed.

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