



Colloquium

Institute Colloquium: The rise and fall of the sap: Mechanisms of fluid flow in trees

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Host:

Plants have highly effective vascular systems, which can transport fluid over large distances. The xylem system carries water from the roots up to the leaves and the phloem system carries sugar solutions from sugar sources (leaves) to sugar sinks (roots, fruits etc.) and thus provides the necessary material for growth. There are many important fluid dynamical problems connected with these flows, and I shall discuss some of them. In the 1920ies, Ernst Münch proposed that sugar transport in the phloem is driven by passive osmotic pressure gradients generated by loading and unloading sugar into the phloem tubes (sieve elements) of the leaves. It has been strongly debated whether this hypothesis can actually account for long distance translocation, e.g., all the way from canopy to root of a large tree. In the lecture, I will argue that optimization of the efficiency of the sugar transport leads to a universal scaling of the width of the phloem tubes with the loading (leaf) length and the translocation (stem) length in plants. These predictions have been tested for plants ranging from 10 cm herbacious plants to 60 m trees - both hardwood and conifers - and provide the first quantitative test of Münch's ideas. For both the xylem and the phloem, the leaves provide the driving force for the sap flow, and I shall discuss current ideas how this complex feat is accomplished.

Monday, January 20, 2014 04:30pm - 05:30pm

Raiffeisen Lecture Hall, Central Building



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