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Mechanical forces in the development of leaf venation networks FRANCIS CORSON, AREZKI BOUDAOUD, MOKHTAR ADDA-BEDIA, Laboratoire de Physique Statistique, Ecole Normale Supérieure, Paris, France — Leaf venation patterns, like leaf shapes, are extremely diverse, yet their local structure has been shown to satisfy a simple, universal property: the angles veins form at junctions are related to their diameters by a vectorial equation analogous to a force balance. This structure is the signature of a reorganization of vein networks during the development of leaves, a process we investigated numerically using a cell proliferation model. Provided that vein cells are given different mechanical properties, tensile forces develop along the veins during growth, causing the network to deform progressively. The statistics of the patterns obtained in these simulations are in good quantitative agreement with observations on leaves, supporting the notion that the local structure of leaf venation networks reflects a balance of mechanical forces.

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