Abstract Submitted
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A fiber-reinforced-fluid model of anisotropic plant root cell growth[1] OLIVER E. JENSEN, School of Mathematical Sciences, University of Nottingham, UK, ROSEMARY J. DYSON, Centre for Plant Integrative Biology, University of Nottingham, UK — We present a theoretical model of a single cell in the expansion zone of the primary root of the plant *Arabidopsis thaliana*. The cell undergoes rapid elongation with approximately constant radius. Growth is driven by high internal turgor pressure causing viscous stretching of the cell wall, with embedded cellulose microfibrils providing the wall with strongly anisotropic properties. We represent the cell as a thin cylindrical fiber-reinforced viscous sheet between rigid end plates. Asymptotic reduction of the governing equations, under simple sets of assumptions about fiber and wall properties, yields variants of the traditional Lockhart equation that relates the axial cell growth rate to the internal pressure. The model provides insights into the geometric and biomechanical parameters underlying bulk quantities such as wall extensibility and shows how either dynamical changes in wall material properties or passive fibre reorientation may suppress cell elongation.

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Oliver Jensen
University of Nottingham

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