

Abstract Submitted
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The growth and form of plant shoots RAGHUNATH CHELAKKOT, SEAS, Harvard University, L. MAHADEVAN, SEAS, Department of organismic and evolutionary biology, Harvard university — Growing plant stems and shoots exhibit a variety of shapes that embody growth in response to various stimuli. We provide a quantitative biophysical theory for these shapes by accounting for the inherent observed passive and active effects: (i) the passive elastic deflection of the shoot due to its own weight, and (ii) the active controllable growth response of the shoot in response to its orientation relative to gravity, and (iii) proprioception, the shoot's growth response to its own observable shape, which is itself determined by its elasticity and weight. A morphospace diagram in terms of two dimensionless parameters representing a scaled local active gravitropic sensitivity, and a scaled passive elastic sag shows how a variety of observed transient and steady morphologies with effective positive, negative and even oscillatory gravitropic behaviors arise in a sentient growing filament naturally, without the need for ad-hoc complex spatio-temporal control strategies.

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