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Dynamical Model of Pollen Tube Tip Geometry

We develop a simple, 2 variable differential equation model for tip geometry in a growing pollen tube to explore a possible mechanism for oscillatory behavior. For model parameterization we use Fourier transforms to determine the dominant frequency of tube growth rate oscillations, maximum overlap discrete wavelet transforms to clean up frequency domain data, and an analytic wavelet transform to determine signal mobility and stability. The model achieves a close fit with experimental data, preserves tip dynamics, and proposes that a moving point of maximal cell wall expansion may drive oscillations in tip shape.