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Determinants of Bacterial Cell Shape

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We determine intergenerational shape dynamics of single Caulobacter crescentus cells. We use imaging techniques that enable us to study ¿100 cells across ¿4000 total generations to achieve high statistical precision. Our data show that constriction initiates early in the cell cycle and that its dynamics is controlled by the time scale of exponential longitudinal growth. Furthermore, we find that the division plane location is inherited from the previous generation. Based on our observations, we develop a minimal mechanical model that quantitatively accounts for the cell shape dynamics and suggests that the asymmetric location of the division plane reflects the distinct mechanical properties of the stalked and swarmer poles. Generalization of the model can provide a common framework for understanding bacterial cell shape.