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Dislocation dynamics and bacterial growth ARIEL AMIR, DAVID NELSON, Harvard University — Recent experiments have revealed remarkable phenomena in the growth mechanisms of rod-shaped bacteria: proteins associated with the cell wall growth move at constant velocity in circles oriented approximately along the cell circumference (Garner et al., Science 2011, Domínguez-Escobar et al., Science 2011, Deng et al., PNAS 2011). We view these dislocations in the partially ordered peptidoglycan structure, and study theoretically the dynamics of these interacting dislocations on the surface of a cylinder. The physics of the nucleation of these dislocations and the resulting dynamics within the model show surprising effects arising from the cylindrical geometry, which are predicted to have important implications on the growth mechanism. We also discuss how long range elastic interactions affect the dynamics of the fraction of active dislocations in the environment.

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