Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Motion of single MreB bacterial actin proteins in *Caulobacter* show treadmilling in vivo[1] W.E. MOERNER, SOYEON KIM, Stanford University, ZEMER GITAI, Princeton University, ANIKA KINKHABWALA, HARLEY MCADAMS, LUCY SHAPIRO, Stanford University — Ensemble imaging of a bacterial actin homologue, the MreB protein, suggests that the MreB proteins form a dynamic filamentous spiral along the long axis of the cell in *Caulobacter crescentus*. MreB contracts and expands along the cell axis and plays an important role in cell shape and polarity maintenance, as well as chromosome segregation and translocation of the origin of replication during cell division. In this study we investigated the real-time polymerization of MreB in *Caulobacter crescentus* using single-molecule fluorescence imaging. With time-lapse imaging, polymerized MreB could be distinguished from cytoplasmic MreB monomers, because single monomeric MreB showed fast motion characteristic of Brownian diffusion, while single polymerized MreB displayed slow, directed motion. This directional movement of labeled MreB in the growing polymer implies that treadmilling is the predominant mechanism in MreB filament formation. These single-molecule imaging experiments provide the first available information on the velocity of bacterial actin polymerization in a living cell.

[1]Supported in part by DOE Grant No. DE-FG02-04 ER63777 and NIH Grant No. 1 P20 HG003638-01.

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Date submitted: 02 Dec 2005 Electronic form version 1.4