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Structure at the Leading Edge D. A. QUINT, J. M. SCHWARZ, M. C. MARCHETTI, Syracuse University — The leading edge of a crawling cell is propelled forward by a polymerizing network of branched actin filaments. This emergent structural array seems to be rigid enough to support and push against the cell membrane within the appropriate time scales under which cell motility can be realized. We seek to understand how such a network can optimize its structure to generate the rigidity required, particularly focusing on the role of branching in the network. For isolated elastic beams, which model semiflexible polymers, the critical buckling load is enhanced when branched supports are included. Therefore, we conjecture that an optimal branching angle is found by looking at the competition between branching providing collective structural support, which results in polymerization with a component perpendicular to the direction of motion, and polymerization along the direction of motion. To partially test this conjecture, we simulate a directed, branched network in the absence of forces. Preliminary results indicate a lower bound on the optimal branching angle of approximately 40 degrees (to be compared with the observed 70 degree branching angle). Studies of a directed, branched network with forces will also be addressed.

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