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Cooperativity and redundancy in the mechanics of compositely crosslinked branched anisotropic cytoskeletal networks J. M. SCHWARZ, TAO ZHANG, Syracuse University, MOUMITA DAS, Rochester Institute of Technology — At the leading edge of a crawling cell, the actin cytoskeleton extends itself in a particular direction via a branched crosslinked network of actin filaments with some overall alignment. This network is known as the lamellipodium. Branching via the complex Arp2/3 occurs at a reasonably well-defined angle of 70 degrees from the plus end of the mother filament such that Arp2/3 can be modeled as an angle-constraining crosslinker. Freely-rotating crosslinkers, such as alpha-actinin, are also present in lamellipodia. Therefore, we study the interplay between these two types of crosslinkers, angle-constraining and free-rotating, both analytically and numerically, to begin to quantify the mechanics of lamellipodia. We also investigate how the orientational ordering of the filaments affects this interplay. Finally, while role of Arp2/3 as a nucleator for filaments along the leading edge of a crawling cell has been studied intensely, much less is known about its mechanical contribution. Our work seeks to fill in this important gap in modeling the mechanics of lamellipodia.

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