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Fiber plucking: large emergent contractility in stiff biopolymer networks PIERRE RONCERAY, PCTS, Princeton University, CHASE BROEDERSZ, LMU Munich, MARTIN LENZ, Univ Paris-Sud, Orsay — The mechanical properties of the cell depend crucially on the tension of its cytoskeleton. Contractile stresses in this fiber network originate from the forces exerted by active motor proteins. Importantly, experimentally observed cell-scale stresses are much larger than would be expected from linear elastic transmission of the molecular forces. We have recently proposed a mechanism for this nonlinear stress amplification, involving extended filament buckling in the network[1]. We propose here an alternate mechanism: when active forces are exerted transversely on a filament, they induce a nonlinear tension in the plucked fiber. The resulting contractile response in the far-field can overwhelm dramatically the linear stress prediction. Importantly, such a *plucking* force amplification relies on the surrounding network to be stiff and only moderately stressed. These conditions compete with those required to observe amplification due to fiber *buckling*. Fiber networks thus provide several distinct pathways for living systems to amplify their molecular forces. Their relative importance in biological relevant situations could be assessed using experimentally testable scaling laws.

[1]Ronceray, Broedersz and Lenz, Proc. Nat. Acad. Sci. USA, 113, 11, 28272832 (2016).

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