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**Mechanics of an Ultrafast Cellular Contraction** GAURAV MISRA, RICHARD B. DICKINSON, TONY LADD, University of Florida — *Vorticella Convallaria* is one of a class of fast-moving organisms, traversing its body size in less than a millisecond. It has two main parts, the cell body and a stalk, which attaches the cell body to the substrate. The stalk houses a slender, elastic structure called Spasmoneme, which winds helically inside the stalk and generates a strong tensile force in response to Calcium signaling. We are developing numerical simulations of the collapsing stalk to quantify the magnitude and time scale of the force generation. We have coupled a Kirchhoff model of an elastic rod (representing the stalk) with an embedded helically wound filament (representing the Spasmoneme). Contraction of this assembly is driven by a constant velocity Calcium signal that induces a state of tension in the Spasmoneme. Depending on the speed of the Calcium signal, we observe different mechanical responses from the contracting stalk, which we compare with experimental observations. We follow the interplay of contraction, twist and bend to explain some unexpected features of the retraction process. Two different macroscopic models have been proposed to explain the time-dependent velocity of the cell body; we compare the predictions of these models with the dynamics revealed by our filament model.

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