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Molecular and computational aspects of neuronal motility

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ABSTRACT OF THE TALK

Polymerization of actin filaments is the primary source of motility in lamellipodia and is controlled by a variety of regulatory proteins. The underlying molecular mechanisms are only partially understood and a precise determination of dynamical properties of force generation is necessary. Using optical tweezers we have measured with msec temporal resolution and pN sensitivity the force-velocity (Fv) relationship and the power dissipated by lamellipodia of dorsal root ganglia (DRG) neurons. Our results clarify the dynamical properties of force generation: i - force generation is a probabilistic process; ii - underlying biological events have a bandwidth up to at least 10 Hz; iii - fast growths of lamellipodia leading edge alternate with local retractions. We argue also that neurons not only process sensory signals, but also solve mechanical problems throughout their entire lifespan, from the early stages of embryogenesis to adulthood and therefore it is necessary to understand mechanical computation in neurons.