# Actin as an intranuclear force generator?

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Nuclear reassembly after mitosis encompasses decondensation of mitotic chromosomes and is integral for establishing functional nuclear architecture. Live imaging as well as atomic force microscopy of mitotic mammalian cell nuclei revealed nuclear protrusions driven by transient assembly of actin filaments. Nuclear F-actin assembled during early G1 phase and is dynamically reorganized to facilitate nuclear volume expansion. Compartment-specific inhibition of nuclear F-actin assembly significantly impaired nuclear protrusions, volume expansion as well as chromatin decondensation, characterised by altered histone modifications, a higher degree of chromatin compaction as well as an increased proportion of heterochromatin. Failed chromatin decondensation due to a loss of nuclear F-actin after mitosis leads to decreased gene expression and proliferation upon cell cycle progression. Phalloidin-based mass-spec studies at mitotic exit identified the actin-disassembling factor Cofilin-1 as a nuclear F-actin-binding protein. Optogenetic analysis revealed a critical function of Cofilin-1 in regulating nuclear actin dynamics and volume expansion after mitosis.