# Role of intermediate filament networks in compression stiffening of cells and protection of nuclei

Paul A. Janmey[1]

[1]*Institute for Medicine and Engineering, University of Pennsylvania, Philadelphia PA, USA*

Networks of stiff or semiflexible polymers become stiffer when deformed to increasingly large shear strains, but these networks generally soften in uniaxial compression, as stiff filaments buckle. This feature was first observed for the extracellular matrix networks formed by fibrin or collagen, but it also occurs with crosslinked networks of F-actin or microtubules. Intermediate filament networks, however, stiffen with both increasing shear and compressional strains, consistent with the expiation that IFs are too flexible to undergo bucking transitions in networks of the mesh size present in vitro or in the cytoskeleton. As a result, normal fibroblasts containing vimentin IFs stiffen when compressed, but vim -/- fibroblasts do not. These results emphasize the unique role of IFs in protection of cells and their nuclei from uniaxial compressive stresses.