Mechanics of cytoskeletal networks and implications for cell motility

<u>Luca Cardamone</u>, **Antonio De Simone** and **Alessandro Laio**

SISSA, Via Bonomea 265, 34136 Trieste

Actin networks are remarkable biological structures essential for the mechanical stability of eukariotic cells and for many of their vital functions such as mitosis, cytokinesis, and motility. They are formed by oriented and branched actin fibers capable of producing compact and relatively stiff two-dimensional structures such as lamellipodia. The protrusion of these flat structures is one of the key ingredients in the motility of crawling cells, which advance thanks to a cycle of protrusion-adhesion at the leading edge and detachment-retraction at the trailing edge.

We show that a simple model based only on the mechanical interactions between cytoskeletal actin network and plasma membrane is able to reproduce several of the features observed in experiments: a growth velocity initially insensitive to the external force up to a critical value (stalling force) beyond which growth is impossible; the capability of the network to organize its orientation; a load-history-dependent growth velocity.