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Tensile Force Generation by Actin-Myosin Networks ANDERS CARLSSON, Washington University in St. Louis — Tensile force generation by the actin-myosin system is a crucial factor in many cellular processes, including the function of the contractile ring in cytokinesis. Calculations of such tensile forces have often been based on specific one-dimensional models of the structure based on parallel overlapping filaments, sometimes in sarcomere-like structures. However, the detailed arrangement of the actin filaments is not known in general, and it is likely to be disordered. For this reason we have developed a general theory of force generation by myosin in actin networks, based on treating the myosin motors as external forces in a viscoelastic medium. The analysis is based on two ingredients: the strain field of a force dipole in a homogeneous medium, and a correction for the inhomogeneity of the actin network. We obtain a simple expression for the tensile stress induced by the myosin motors in terms of the density of motors and the average actin filament length. This formula is used to relate the force that can be generated by a contractile ring to the actin network structure.

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