Stress Generation by Actin-Myosin Networks and Bundles[1] AN-
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ment of Physics — Forces and stresses generated by the action of myosin minifila-
ments are calculated in idealized computer-generated actin networks and bundles.
The networks are generated as random collections of actin filaments in two dimen-
sions, and bundles are obtained by constraining the filament orientations. The actin
filaments are crosslinked and attached to two fixed walls. Myosin minifilaments are
placed on actin filament pairs and allowed to move and deform the network so that it
exerts forces on the walls. The vast majority of simulation runs end with contractile
minifilament stress, because minifilaments rotate into energetically stable contrac-
tile configurations. This process is aided by the bending of actin filaments, which
accomodates minifilament rotation. Stresses for bundles are greater than those for
isotropic networks, and antiparallel filaments generate more tension than parallel fil-
aments. The forces transmitted by the actin network to the walls of the simulation
cell often exceed the tension in the minifilament itself.

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