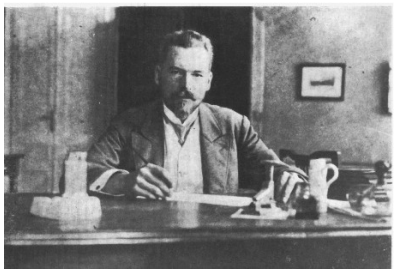

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Modeling cellular spreading and motility on curved surfaces

Tuesday, 28 September 2021 18:12 (3 minutes)

Cells often adhere and migrate on curved surfaces, such as the fibers of the extra-cellular matrix (ECM), cylindrical protrusions of other cells etc. However, most of the cell biological studies examine cell migration mechanisms using cells on flat surfaces. We study the spreading and migration of a cell-like vesicle on curved surfaces, such as cylinders, sinusoidal surface etc. The vesicle is composed of curvature-sensitive proteins, that diffuse on its surface, and also recruit actin polymerization, which applies an active protrusive force. We note that on the outside of a cylinder, the vesicle coils or migrates circumferentially, rather than axially. For a cylinder of smaller radius, however, they prefer not to coil or migrate, but spreads weakly. In contrast, inside a cylinder, the vesicle prefers to elongate or migrate along the axial direction. On a sinusoidal surface with alternating dips (minima) and peaks (maxima), the vesicle behaves in similar way as inside and outside of a cylinder, respectively. The vesicle prefers to stay in the dip and align axially. However, if placed on the peak, it prefers to slide down to the dip. While migrating from one dip to another, it crosses the peak at higher angle and larger speed. Our results are in agreement with experiments, and offer an explanation for some of the observed curvature-sensitivity of cell migration patterns.

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