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Cell-Surface Protein Dynamics Due to Exocytosis-Driven Membrane Flows[1] BEN GROSS[2], OTGER CAMPAS[3], UC Santa Barbara — Living cells constantly regulate the protein composition of their surface (plasma membrane) by adding and removing proteins through exo- and endo-cytosis. The spatial localization of exocytosis on the cell surface reduces the local membrane tension and, together with tension-dependent endocytosis, generates plasma membrane flows that advect proteins. These emergent flows depend on the geometry of the cell and compete with protein diffusion to specify the steady-state protein distribution on the cell surface. Inspired by the case of walled cells, such as fungal, bacterial or plant cells, we study the protein dynamics and steady-state distributions generated by advection-diffusion in fixed, compact cell geometries. Given an exocytosis spatial distribution set by the cell, we determine the resulting membrane flows on the curved surface (plasma membrane) and solve for the dynamics of proteins that emerges from diffusion and advection. In addition, we study how cell size, cell geometry and the properties of the emergent flows affect the steady-state protein distribution on the cell surface.

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