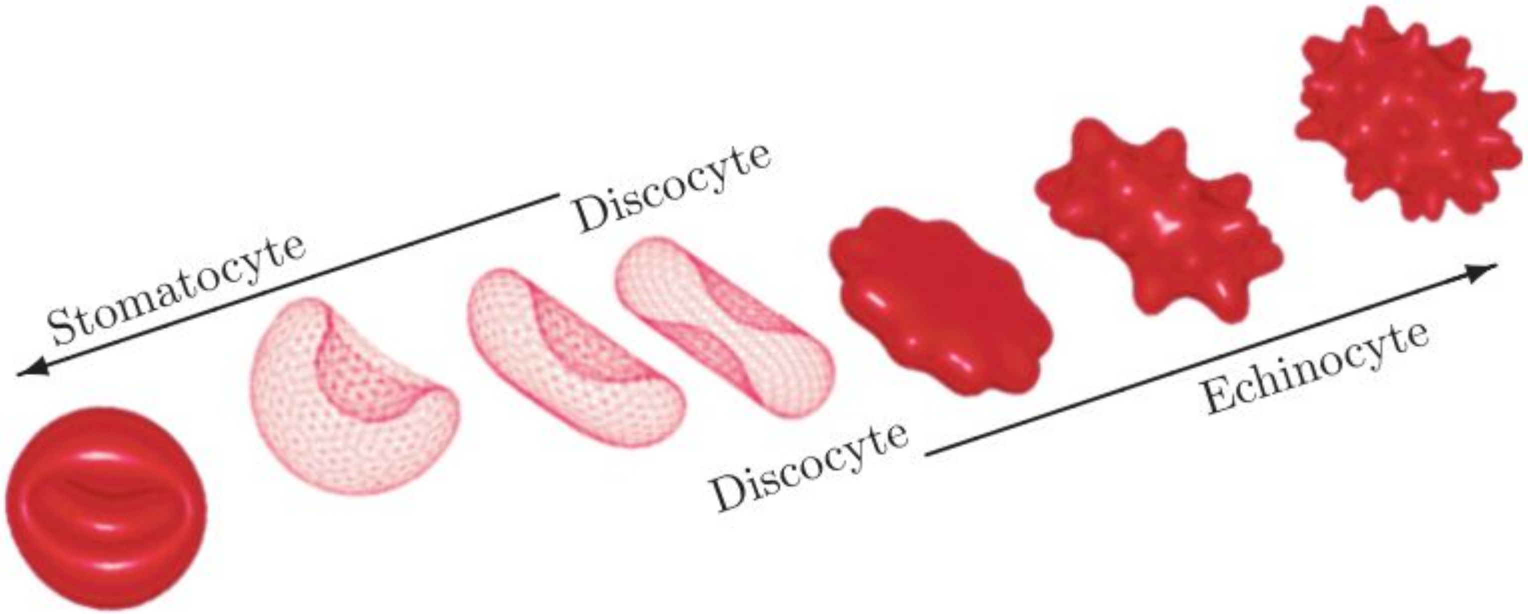
APPLICATION OF THE HELFRICH ELASTICITY THEORY TO THE MORPHOLOGY OF RED BLOOD CELLS

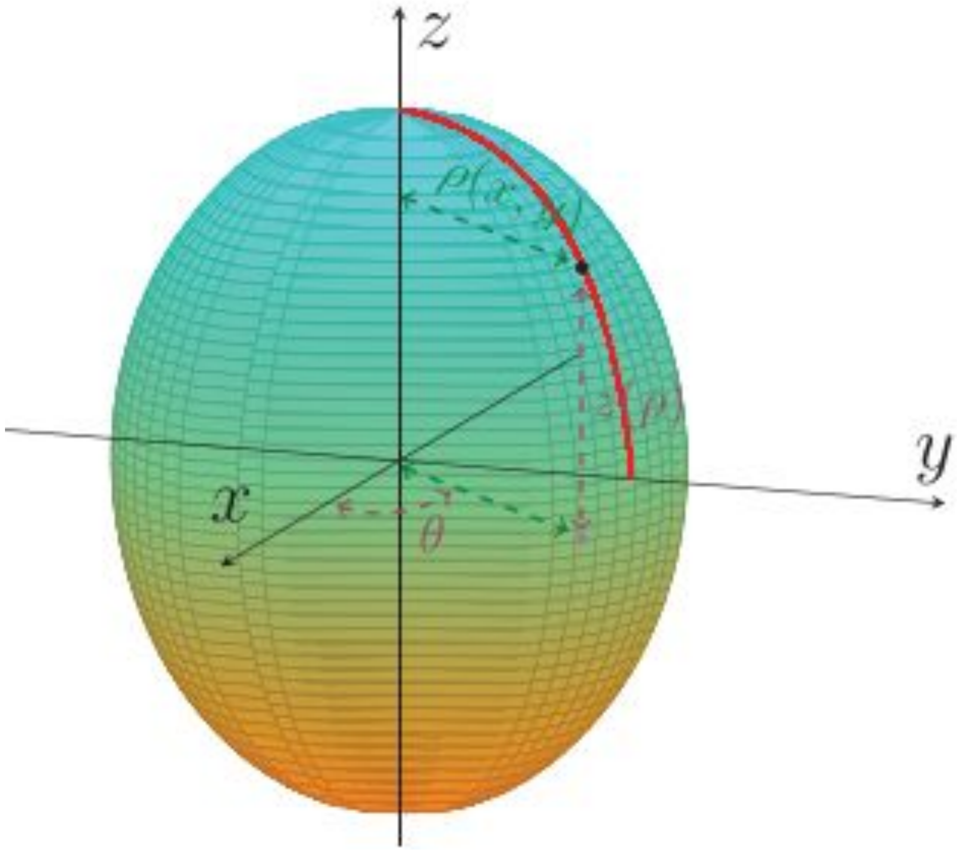
RED BLOOD CELLS



$$e = \frac{1}{2}\kappa(2H - c_0)^2 + \bar{\kappa}K + \gamma,$$

$$2H \equiv c_1 + c_2, \quad K \equiv c_1 c_2.$$

Shape Parameterization



$$g_{\rho\rho} = |\vec{X}_\rho|^2 = 1 + \tan^2\psi = \sec^2\psi,$$

$$g_{\rho\theta} = \vec{X}_\rho \cdot \vec{X}_\theta = 0,$$

$$g_{\theta\theta} = |\vec{X}_\theta|^2 = \rho^2.$$

$$g = \det(g_{ij}) = \rho^2 \sec^2\psi$$

ENERGY AND ITS MINIMIZATION

$$S(z) \equiv \frac{1}{4\pi R_0^2}\int_z^{z_{np}} 2\pi\rho\sqrt{1+\left(\frac{d\rho}{dZ}\right)^2}\, dZ.$$

$$\delta\left\{\frac{\kappa}{2}\int (c_1+c_2-c_0)^2 dA + \Delta p \cdot V + \lambda \cdot A\right\} = 0,$$

$$2\frac{\lambda}{\kappa}R_0^2 = 2c_1^*(0.5)\left[c_0^* - \Delta c^*(0.5)\right] + \Delta c^{*2}(0.5) - c_0^{*2} - \frac{\Delta p}{\kappa}R_0^3\frac{1}{c_1^*(0.5)},$$

$$f^*(0) = 0; \quad \Delta c^*(0) = 0; \quad f^*(0.5)\left[c_1^*(0.5)\right]^2 = 1.$$


THANK YOU FOR
YOUR ATTENTION