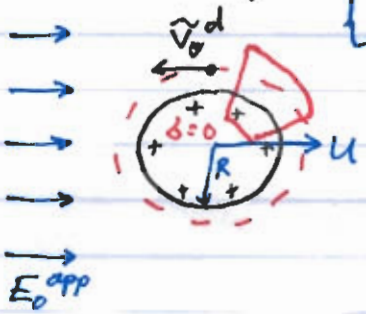
Today: Ⓘ Recap & Interpret Electrophoretic Mobility $\equiv \frac{U}{E_0}$ 12/6

Ⓘ "DLVO" double layer interactions
(Derjaguin, Landau, Verwey, Overbeek) 40's 50's

- Applications: Tissue-Level Swelling (edema)
  Nano-molec. level: DNA, protein folding, cytoskeletal rheology; extracellular matrix

Ⓘ E.P. Mobility: $\boxed{\left(\frac{U}{E_0}\right) = \frac{\left(\frac{\varepsilon\zeta}{\mu}\right)}{\left[1 + \left(\frac{\kappa}{6}\right)\left(\frac{2\zeta_{Gouy}}{\zeta}\right) + \cdots\right]}}$ (Levich model: $R \gg 1/\kappa$)



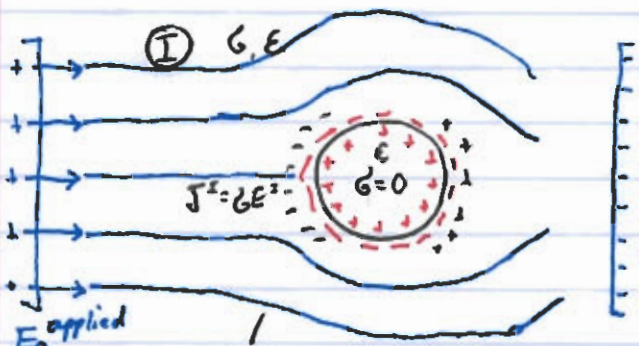
(1) Stoke's: $\boxed{0 = (4\pi R\mu \tilde{V}_\theta^d - 6\pi R\mu U)}$
where $V_\theta(r,\theta) = \tilde{V}_\theta(r)\sin\theta$

(2) $\boxed{\tilde{V}_\theta = -\left(\frac{\varepsilon\zeta}{\mu}\right)\tilde{E}_\theta}$ (finite slip)

(3) $\underline{n}\cdot\left[\sigma\left(-\frac{\partial \Phi^I}{\partial r}\right)\right] + \nabla_\Sigma K = 0$

$\left(-\frac{\partial \sigma_s}{\partial t}\right) \to 0$

So: to write (3), need to solve for $\Phi^I(r,\theta)$



$\Phi = Ar\cos\theta + \frac{B}{r^2}\cos\theta + \frac{C}{r^3} + \cdots$
$A = -E_0^{app}$

$\underline{E}^{tot} = \Sigma$ uniform applied E_0 + induced dipole
(not connected to double layer)