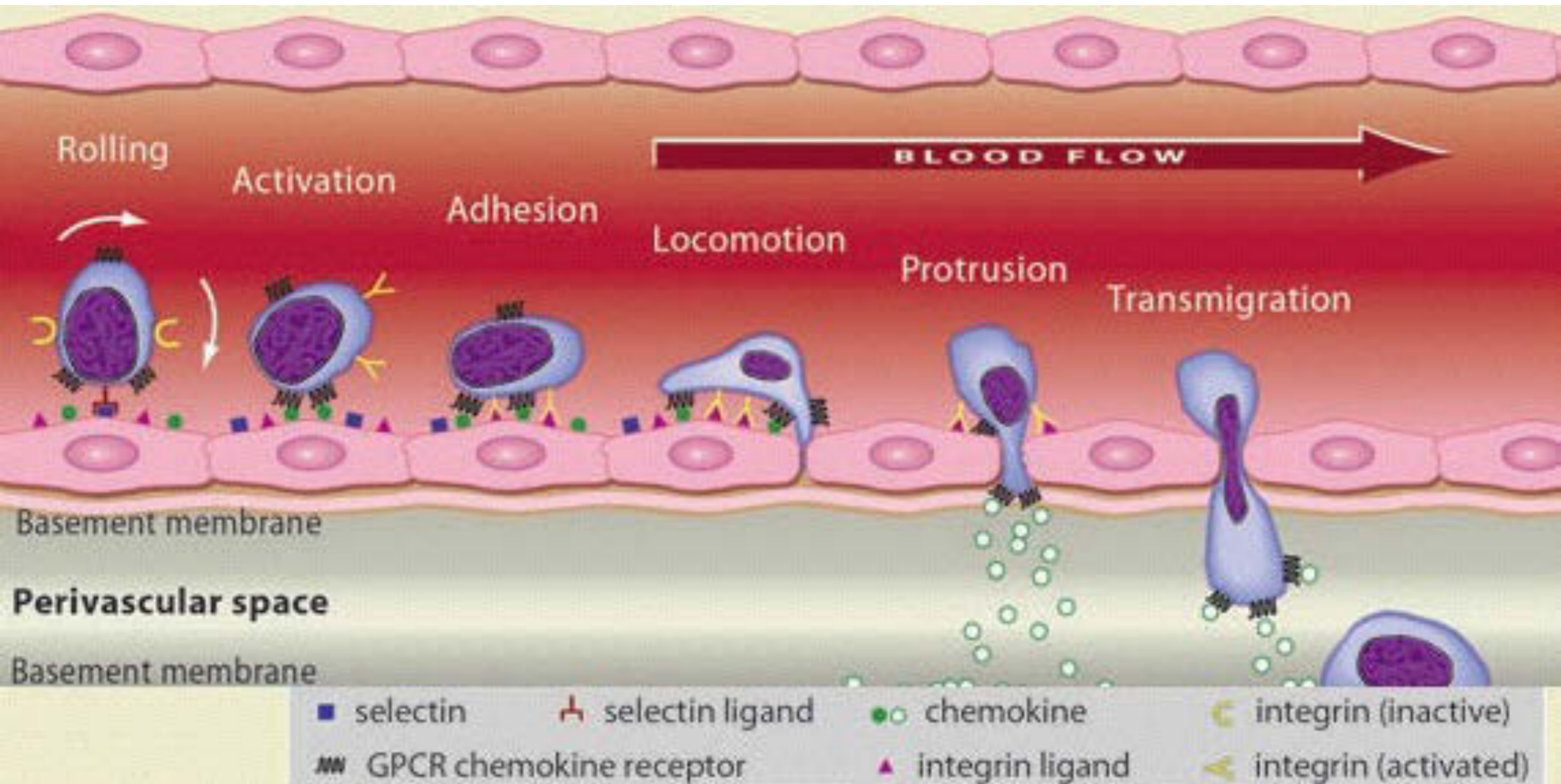


White blood cell (e.g., neutrophil) scavenging: rolling, adhesion, and extravasation



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 Source: Man, Shumei, Erobohene E. Ubogu, and Richard M. Ransohoff. "Inflammatory cell migration into the central nervous system: a few new twists on an old tale." Brain Pathology 17, no. 2 (2007): 243-250.

Modeling leukocyte adhesion and rolling: What are the forces?

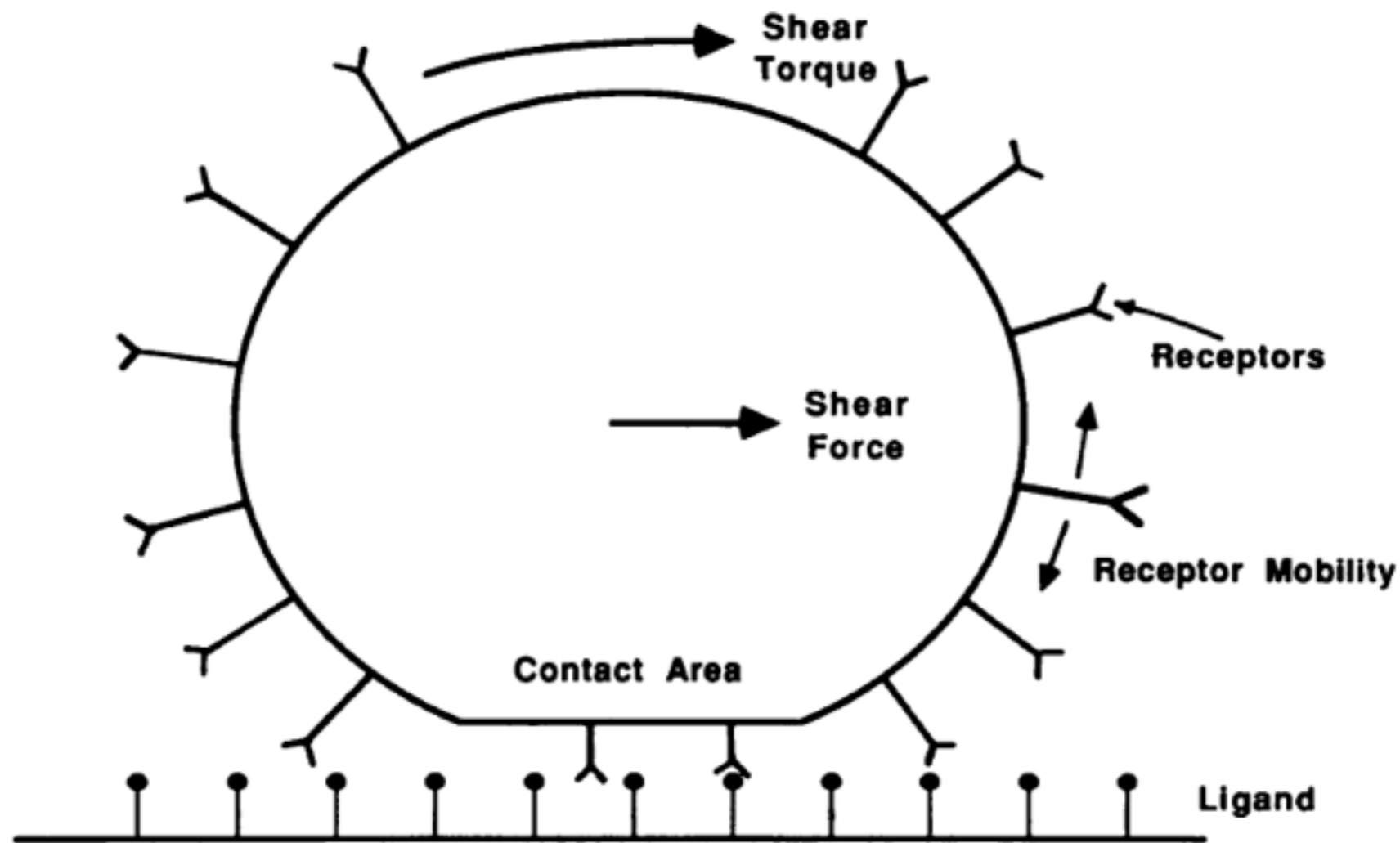


FIGURE 1 Quantities expected to influence the receptor-mediated cell adhesion to a surface include receptor number, the density of complementary surface ligands, the force and torque transmitted to the cell by the passing fluid, the mobility of receptors in the plane of the membrane, and the contact area in which cell to surface bonds may form.

Hammer & Lauffenburger, *Biophys J* 1987

Text and photo from "[G. I. Taylor](#)" article on wikipedia removed due to copyright restrictions.

<http://web.mit.edu/hml/ncfmf.html> 5:39–7:40

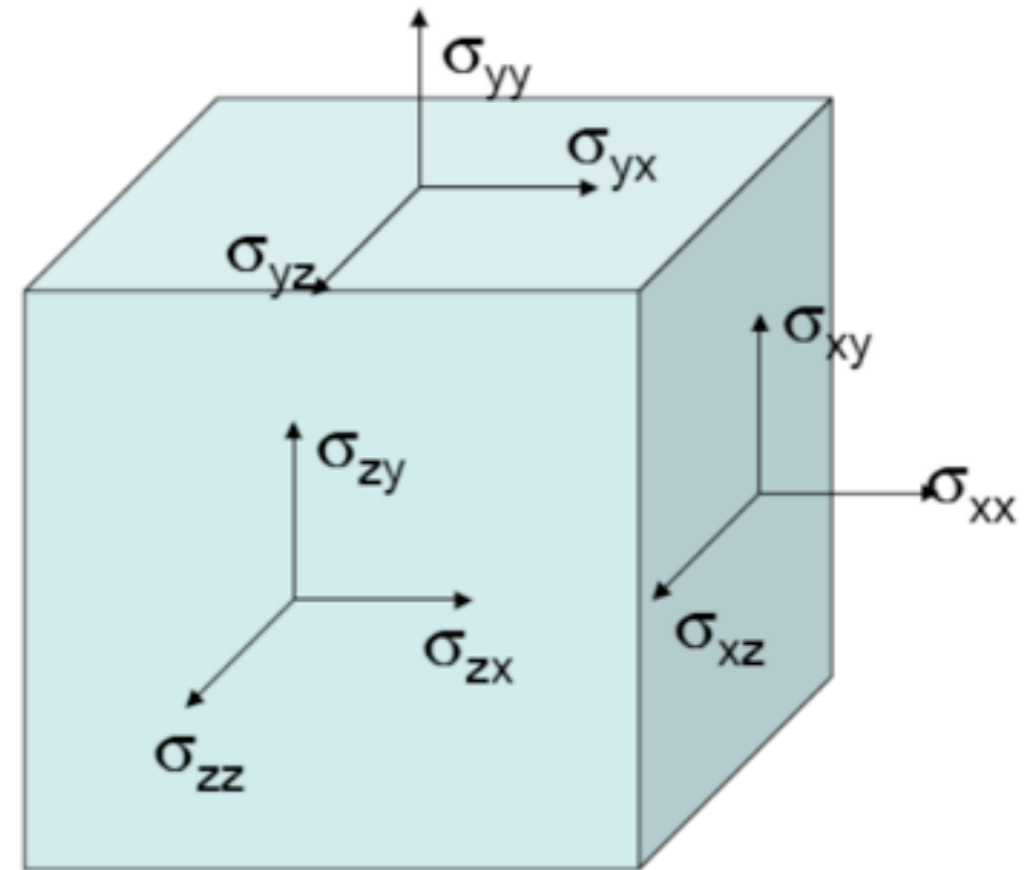
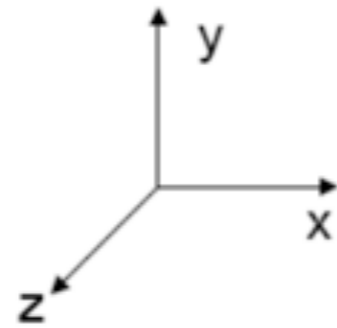
http://www.youtube.com/watch?v=51-6QCJTAjU&list=PL0EC6527BE871ABA3&index=7&feature=plpp_video



7. Low-Reynolds-Number Flows

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Stress Tensor: Surface Forces on a Fluid Element



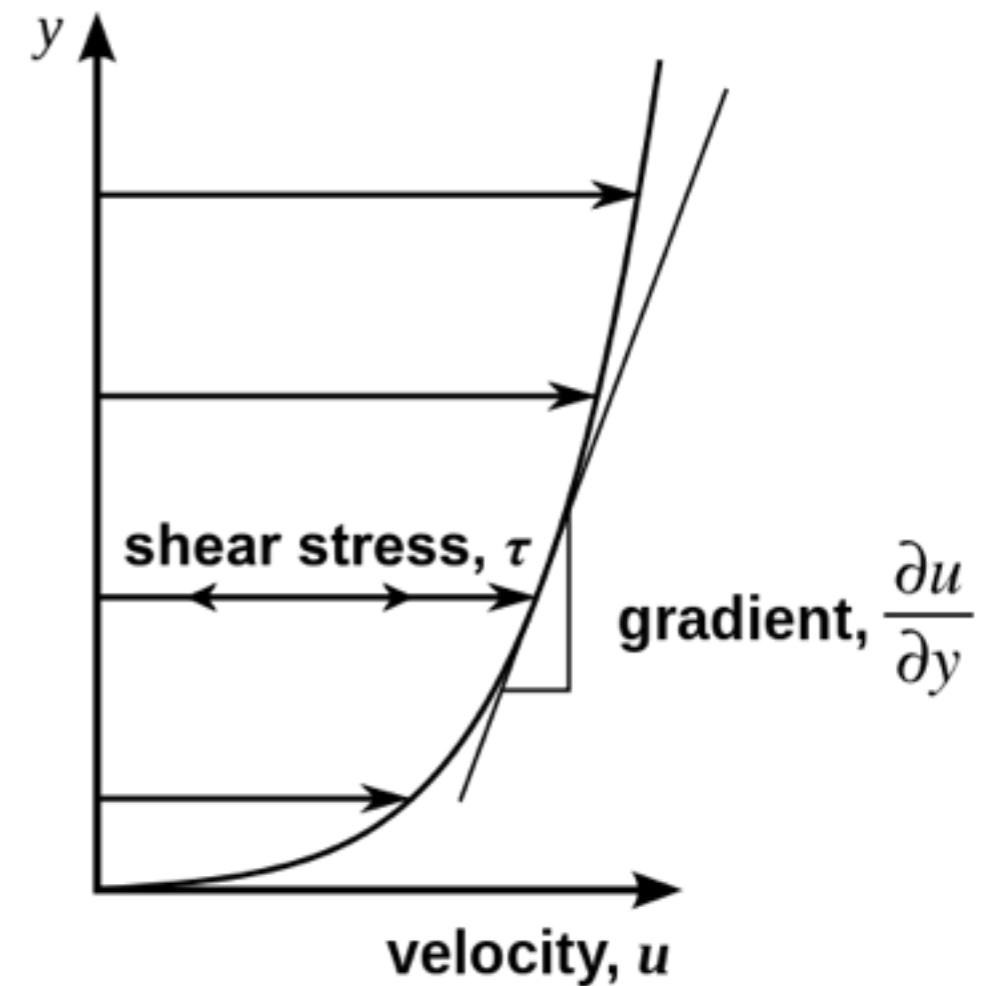
$$\sigma_{ij} = \begin{pmatrix} \sigma_{xx} & \sigma_{xy} & \sigma_{xz} \\ \sigma_{yx} & \sigma_{yy} & \sigma_{yz} \\ \sigma_{zx} & \sigma_{zy} & \sigma_{zz} \end{pmatrix}$$

$$\sigma_{ij} = \sigma_{ji}$$

Newtonian Fluids and Viscosity

$$\tau = \mu \frac{du}{dy}$$

Figure of [laminar shear in a fluid](#) from "Viscosity" article on wikipedia removed due to copyright restrictions.

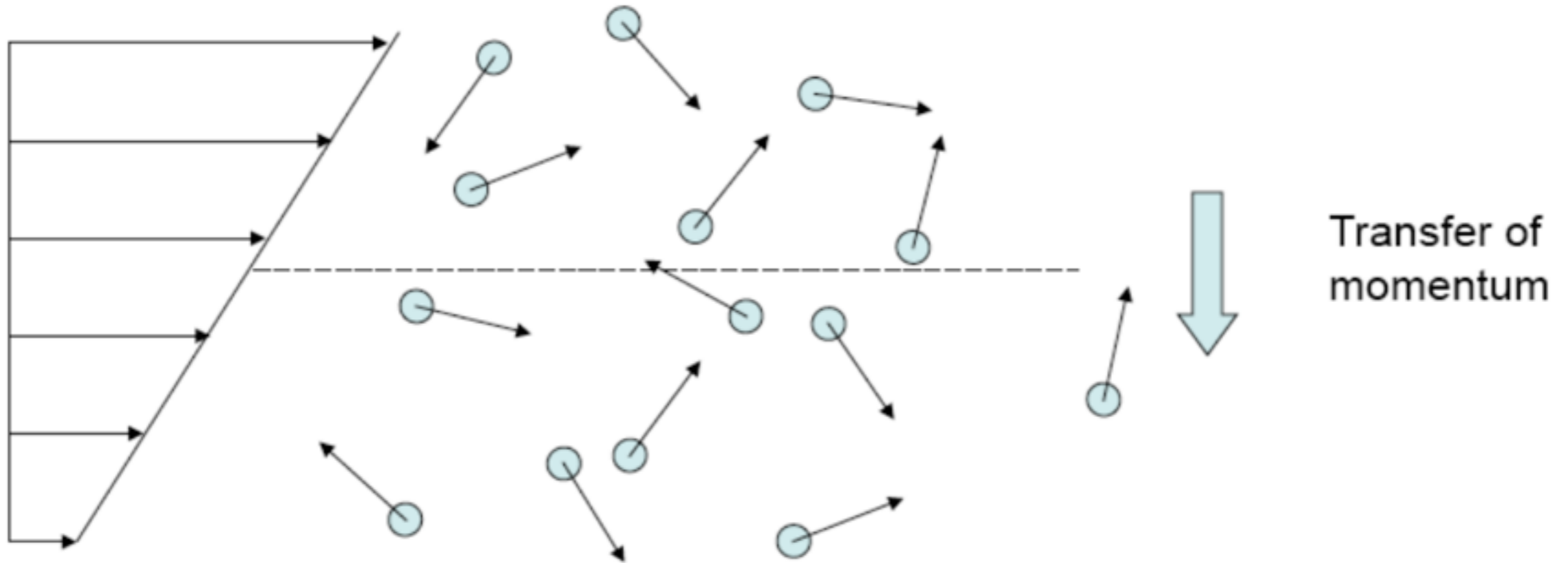


[Image](#) in the public domain.

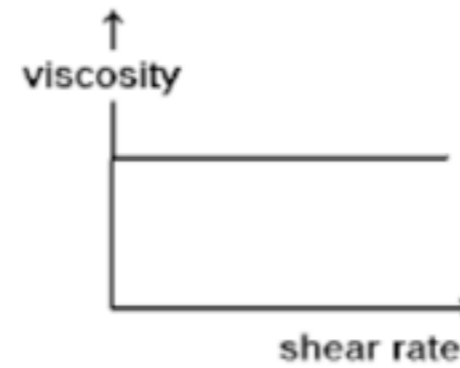
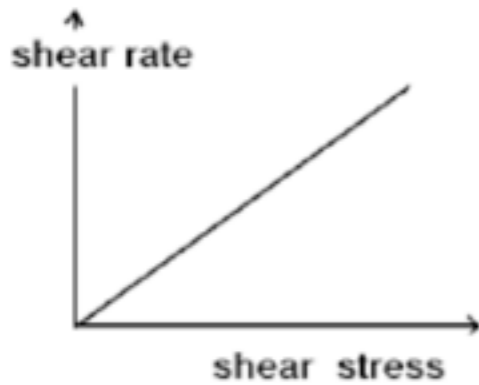
<http://en.wikipedia.org/wiki/Viscosity>

http://en.wikipedia.org/wiki/Newtonian_fluid

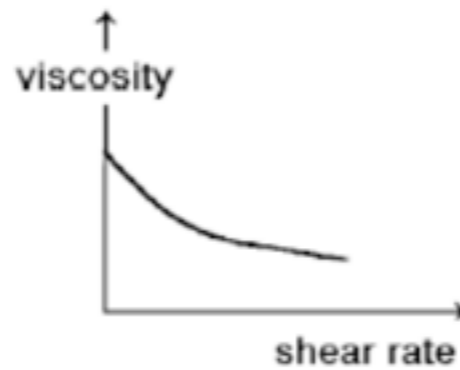
Molecular origin of viscosity



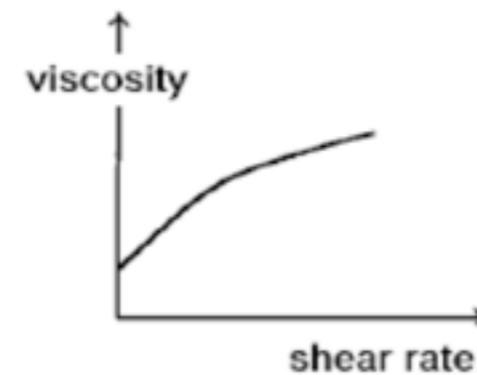
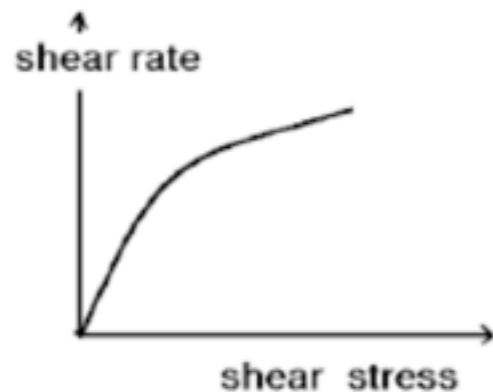
Different rheological behaviors of complex fluids



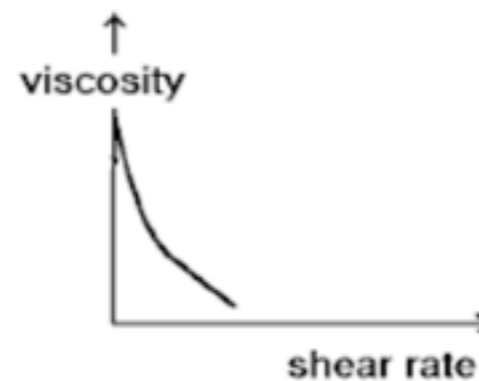
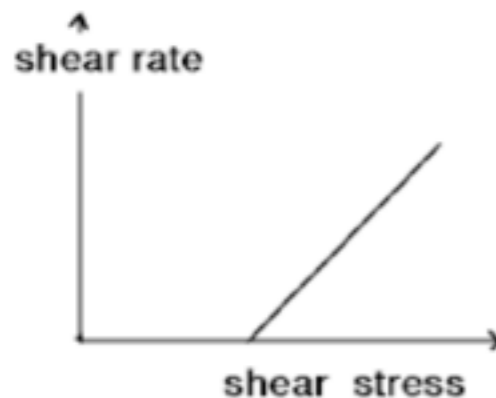
Newtonian fluid



Pseudoplastic or shear-thinning
(blood, paint, molasses)



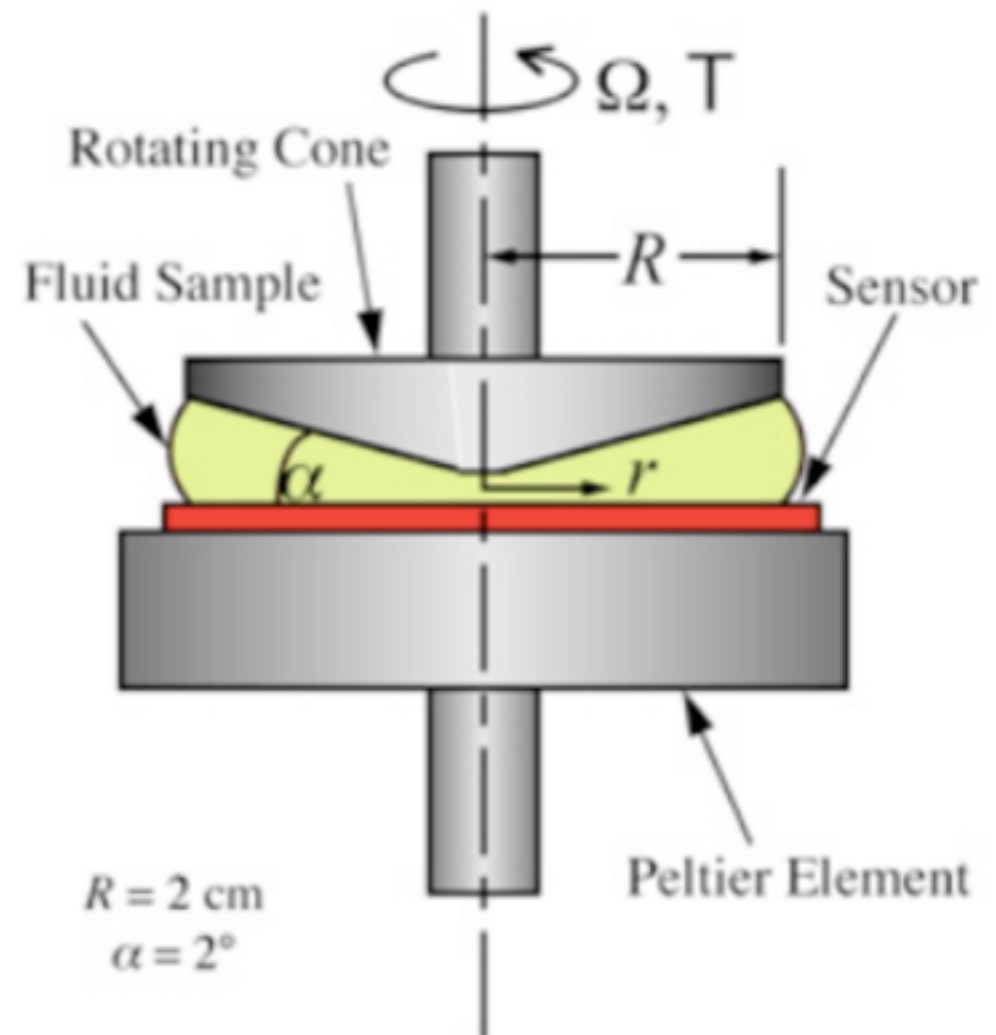
Dilatant or shear-thickening
(corn starch, water)



Bingham plastic

Measuring viscosity using a cone-and-plate rheometer

- Measure τ and Ω
- Calculate σ and $\dot{\gamma}$



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