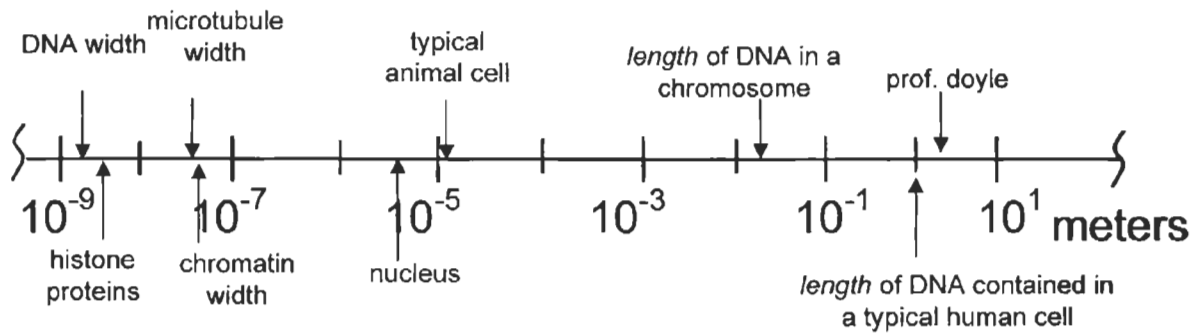


Typical Length Scales in Biology

$$1 \text{ \AA} = 10^{-10} \text{ m}$$

$$1 \text{ nm} = 10^{-9} \text{ m}$$

$$1 \text{ \mu m} = 10^{-6} \text{ m}$$



Central Dogma:

DNA → RNA → proteins → organelles → cells → tissues → organs → organisms

Images removed due to copyright considerations.

See Chapter 2, pp. 70-72 in [Alberts-ECB].

Alberts, B., et al. *Essential Cell Biology*. New York: Garland Publishing, 1988.

WHY DO WE CARE ABOUT
"WEAK" INTERACTIONS?
↳ $E_{\text{interaction}} \leq E_{\text{thermal}}$

Image removed due to copyright considerations.

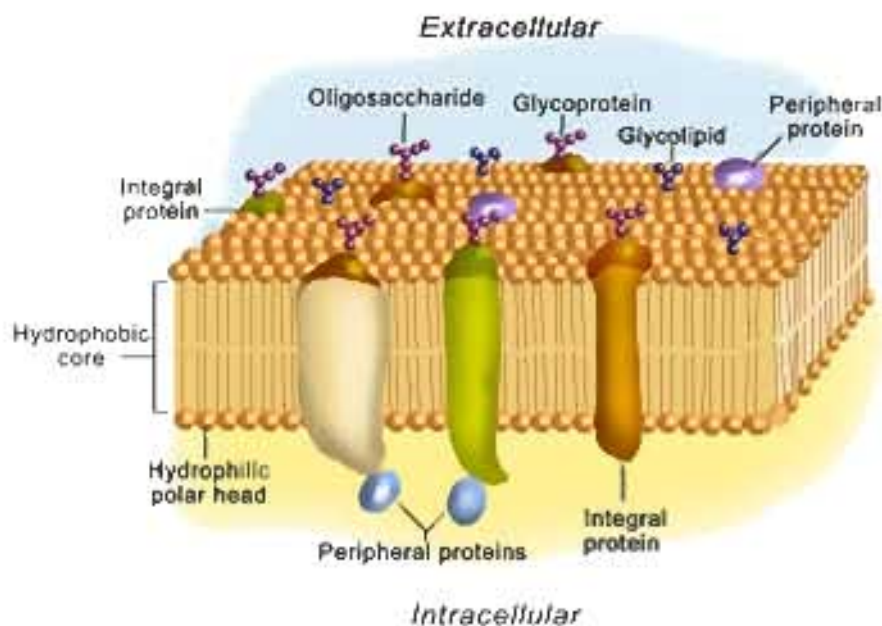
See Figure 2-17 in [Alberts-ECB].

Diagram of a pair of hypothetical proteins linked by two ionic bonds, one hydrogen bond and one large combination of hydrophobic and van der Waals interactions.

- MANY TOGETHER → STRONG
→ SPECIFIC
- TRANSIENT / STATISTICAL
- MOLECULAR CONFORMATION (DNA, Titin etc....)

Image removed due to copyright considerations.
See page 101 in [Alberts-ECB].

Lipid Bilayer



Model as a 2-D Elastic Plate

bending & tension scaling arguments

Comparison to Aspiration Experiments

E. Sackmann

R. Lipowsky

Structure in Self-Assembled Peptides

Images removed due to copyright considerations.
See Kamm, *Nanoletters* **2** (2000) 295-299 and
Kamm, *J Chem Physics* **118** (2003) 389.