

# Week 4 Lecture 2

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## 1 Administrative drivel

- Class avg on exam: about 53%.
- Exam will be passed back probably Monday.
- First paper submission is next Friday.

## 2 More on nucleic acids...

- Nucleic acids are used for energy storage: ATP
- This is for energy *transfer*, not really storage
- ATP: Adenosine Tri-Phosphate
  - energy is stored in the bonds (between 3 phosphate groups (alpha,beta, gamma))
  - breaking off the alpha group releases the energy by adding water, resulting in a Phosphate and Adenosine diphosphate (ADP)
    - \*  $\text{H}_2\text{O} + \text{ATP} = \text{P} + \text{ADP} + \text{ENERGY}$
  - The reverse process builds ATP
    - \*  $\text{ADP} + \text{P} + \text{ENRGY} = \text{H}_2\text{O} + \text{ATP}$
  - these 2 processes are carried out by enzymes
  - “money of matabolism”
  - has the same basic structure of a nuclic acid
  - sometimes the beta bond is broken, into AMP (Adenosine monophosphate), but much less often
- There is a process for breaking down glucose, and trapping that energy into the bonds of ATP
- clicker q: Of which polymer is a gene composed? DNA

Thus concludes the organic molecules.

### 3 Cells

Clicker q: What biological polymer is between transcription and translation?  
RNA

Polymer: a chemical structure made up of many repeating molecules (polymer means "many repeating units")

#### 3.1 Membranes

- Basic structure: Phospholipid bilayer
- Front (anterior) back (posterior)
- cells undergo cell division to multiply by splitting
- shows the example of a roundworm cell dividing into the full organism c-elegans
- endoplasmic reticulum: where RNA is turned into proteins
- Cells are structured!
  - phospholipid bilayer (see those notes)
- cells are water based!
- inter/intracellular liquid is mostly water
- see picture of cell
- All of the structures (organelles) in a cell are membrane bound in eukaryotes (not so in prokaryotes!)
  - organelle = "little organ"
- In the nucleus, DNA translated into RNA in DNA, RNA translated into proteins in the endoplasmic reticulum
- The Mitochondria makes ATP
- Solutions:
  - **Medium/solvent** (e.g. water, and is the main one)
    - \* water allows biochemistry to occur in most situations, except for lipids, which need help (from enzymes?)
  - **Solute** (e.g. salt, sugar, proteins, ions, hormones, etc)
  - **Concentration** = (amount of dissolved stuff) / volume
  - Within the solution, particles move at RANDOM
    - \* This process of random movement is called diffusion

- \* diffusion is good for transmitting molecules over short distances, but not over long distances
  - \* any organism bigger than a few centimeters need extra structures to overcome this
- Diffusion:
  - If particles are clumped in one area, their random movement will eventually distribute them evenly in the water (this is called **Diffusion**)
  - particles move from high concentration to low concentration
- Passive diffusion:
  - The phospholipid bilayer is permeable to some small molecules (most don't)
    - \* only really small things can get through
    - \* e.g. CO<sub>2</sub>
    - \* Fat soluble things can also pass through!
  - If there is a concentration gradient between the inside and outside of the membrane, molecules will pass through the membrane to get the concentration to be even using diffusion.
  - Since the membrane isn't all that permeable, the concentration gradient is never really even