Week 4 Lecture 0

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September 22, 2021

1 Administrative drivel

- Clicker scores cannot be directly uploaded to Canvas, so they'll be manually entered as a sum every so often.

2 More on biochistry: the chemistry of life

2.1 More on Protiens

- Polypeptides fold along
  - polar locations (usual cause)
  - sulfer forming covalent bonds
- two kinds of sheets:
  - beta-pleated sheet
  - alpha-helix
- Variety in R groups gives each amino accid unique properties
  - Charge
    - diffferences in carbon chain, different hydrogen chunks, etc.
  - Hydrophobicity
  - etc.
  - these also determine the folding
- all protiens that start as the same polypeptides fold into the same shaped structure. If they don't the protien doesn't function the same way.
- There is a huge variety of possible protiens built from the 26 amino acids (26! ?)
- Clicker q: What is the basic subunit of a protein? Amino acids

2.2 Necleic Acids

Final basic biomolecule type!

- Include DNA (in nucleus), RNA, others
- Most nucleic acids store or transfer *information* (genetics!)
- living things organize their genetic material into chromosomes
- DNA stores your genetic code.
- RNA helps produce proteins from the information encoded in DNA
  - basically transfers the information stored in DNA around
- Most DNA codes for making protiens
  - info in DNA is transfered to protein factories via mRNA
- Some nucleic acids provide short term energy storage – on the order of less than a few hours, to as short as a milisecond
- primary energy acid: ATP
  - refered to as the energy currency in organisms
- there are others energy nucleic acids, but we'll focus on ATP
- Basic components (3):
  - Phosphate attached to a central deoxyribose or ribose sugar attached to a nitrogenous base (since it has at least one nitrogen)
    - 5 bases varieties: A, G, T, C, U
    - no 'T's in RNA (U replaces T in RNA)
  - genes are made up of sequences of these 5 base varieties
  - bases are polar and forms hydrogen bonds with other bases
  - The sugar kind determines whether it's RNA or DNA (ribose or deoxyribose respectively)
    - deoxyribose is just ribose missing an oxygen (bottom right one)
- Two categories of bases:
  - Pyrimidines: C, T, U
  - Purines: A, G
- DNA and RNA occur as *polymers*
  - DNA polymers found in antiparallel helix
  - double stranded

  - one goes up the strand, the other goes down

- DNA is the longest molecule in the body, and every cell has it (that are human cells)
- All cells have the same DNA
- DNA is "as tall as you"
- until DNA was understood, we didn't know how inheritence was transfered. Watson and Crick and Franklin figured out the structure, and confirmed that DNA was the information source. circa 1958-9
- **Bases pair as**:
  - T pairs with A (or U with A in RNA)
  - C pairs with G
  - based on the distancdes between things
  - pair as hydrogen bonds
- These pairings allow for parity in the information in the oposing strand, allowing for errors to get caught in copying
- Definition: A *gene* is a segment of DNA that codes for a protein
- there will be a sequence of nucleic acids that says "this is the start of the gene" and another that says "this is the end of the gene!"
- e.g. insulin gene has 1431 base pairs. First to be sequenced!
- process of producing a protien:
  - DNA (double stranded) transcribed into mRNA (single stranded)
  - mRNA is transfered out of the nucleis into the gulgi aparatus that translates the mRNA into the polypeptide that then folds into a protein
  - transcription to translation to protein
- RNA is temporary, DNA is forever (at least your lifespan)
  - RNA is only kept as it transfers information, then is chopped up an recycled.
  - they last maybe a matter of seconds
- Every 3 nucleic acids , a **codon** codes for a specific amino acid
  - e.g. the final amino acid sequence of the final peptide that is produced (110 amino acids)

  - this is how we go from 4 'letters' in nucleic acids to 26 'letters' in amino acids
  - e.g. ACG codes for some specific amino acid
  - at the end of the day, this allows for 64 amino acids to be coded for, so some aminno acids can be produced by more than one codon.

- Genes code for specific protiens!
  - Each gene will be a sequence in the long DNA molecule
  - each gene is tacked onto the next
  - the DNA is folded up into **chromosomes** for tight storage, held together by protiens