Biological Building Blocks II

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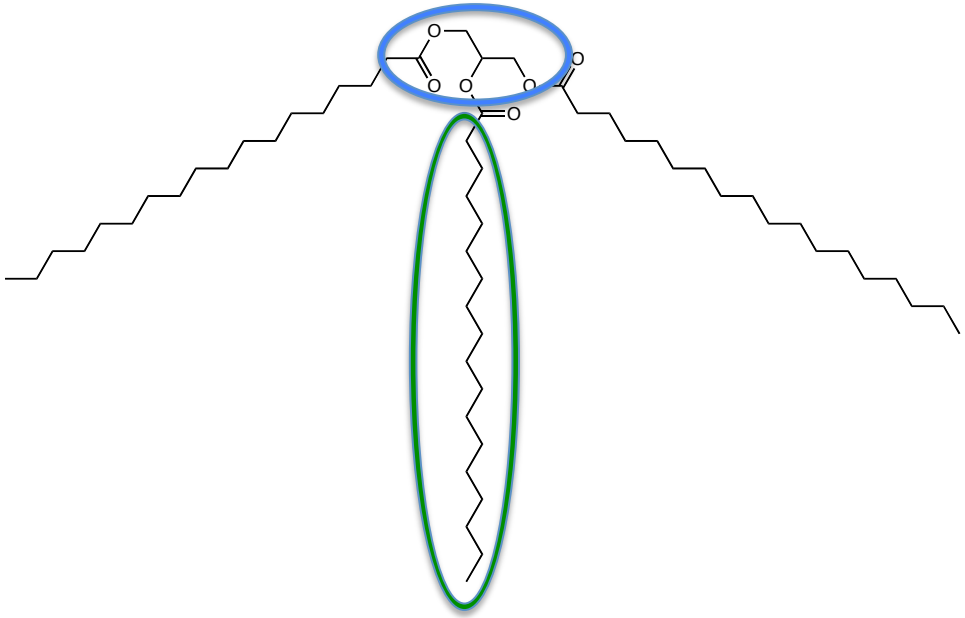
What are we made of?

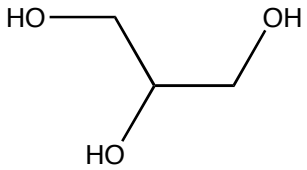
- Chemical Bonds
  - Covalent and Ionic
- Important Biological Molecules
  - Carbohydrates
  - Lipids: Fats and Membranes
    - Energy storage and compartmentalization
  - Amino Acids
    - Building blocks of proteins/enzymes
  - Nucleic Acids
    - Building blocks of DNA and RNA

Anatomy of Fat

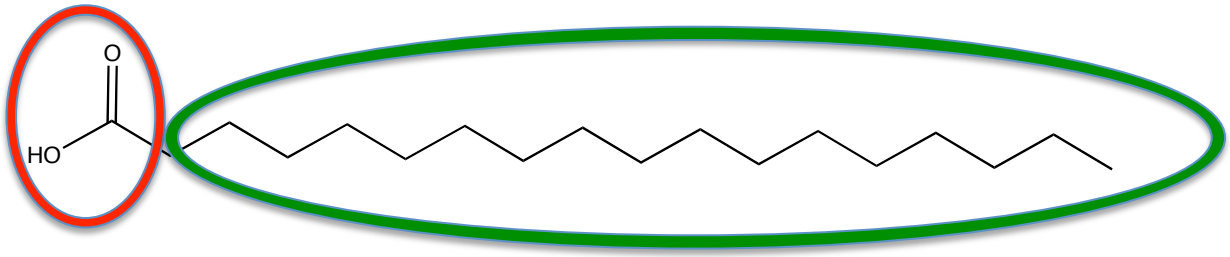
- Triglycerides
  - A type of lipid



- Glycerol



- Hydrocarbon Tails
  - Each from a fatty acid



Observations

1. Oil (a fat) and water do not mix

2. Fats can be liquid or solid
   - Butter vs. Olive oil at room temperature

3. Soap can be made from fat, but mixes with water

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Why don't they mix?

1. Water likes to make "hydrogen bonds" with itself
   - Non-covalent
   - Weaker interaction than covalent bond

2. Hydrophobic Effect
   - Non-polar atoms stick together

Non-covalent interactions

- Water molecules interact by Hydrogen Bonds
  - Polar interaction

- Hydrocarbons interact by Van der Waals forces
  - Also called London Dispersion forces
  - Non-polar interaction

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Solid vs. Liquid

- Solids: molecules are tightly held together
  - Intermolecular forces strong
- Liquids: molecules are still attracted to each other, but can flow
- Gas: molecules have enough energy to break free from each other

Melting points of Fatty Acids

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What happens chemically to fats when turned to soap?

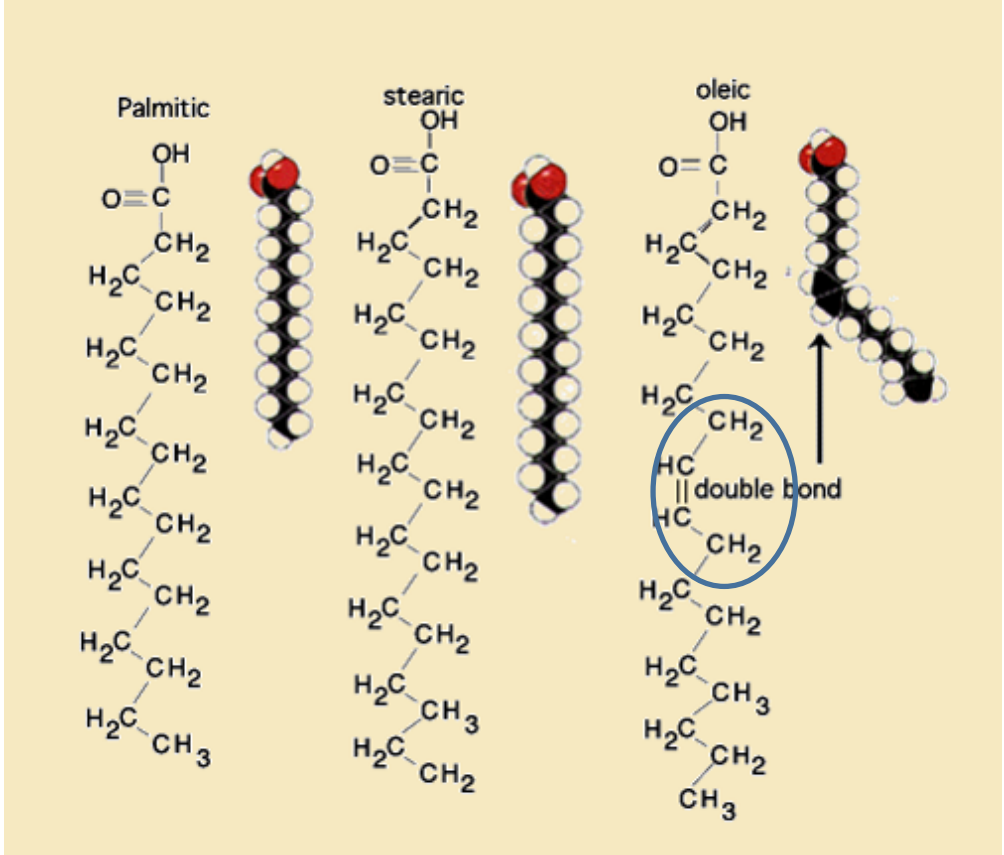
- Saponification
  - NaOH added to triglycerides

- Reaction frees fatty acids from glycerol

- Fatty acids are the key component of soap

Fatty Acid Structure

- Fatty Acids are made up of
  - an acid group(-COOH)
  - a hydrophobic group (C_nH_m)
  - Makes these molecules:
    - Amphiphilic

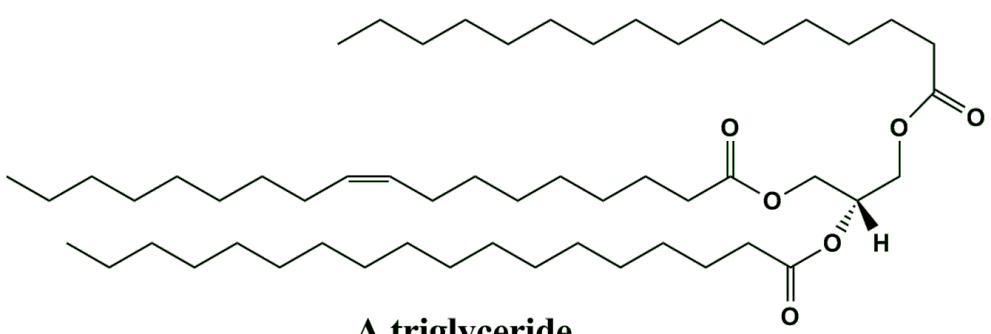


Fatty Acids in Water

Fatty Acids with oil and water

Lipid Membranes

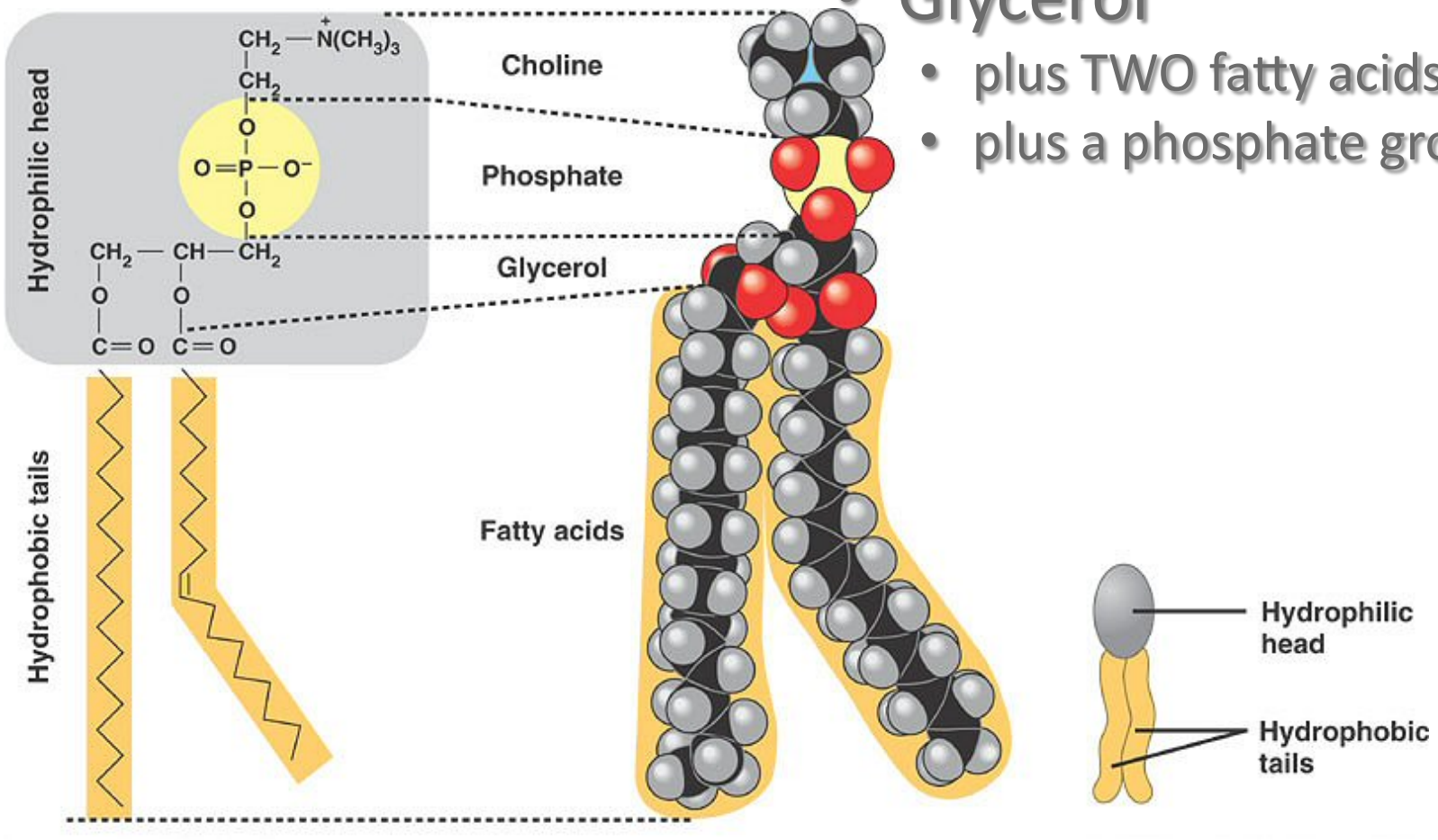
- Composed primarily of phospholipids



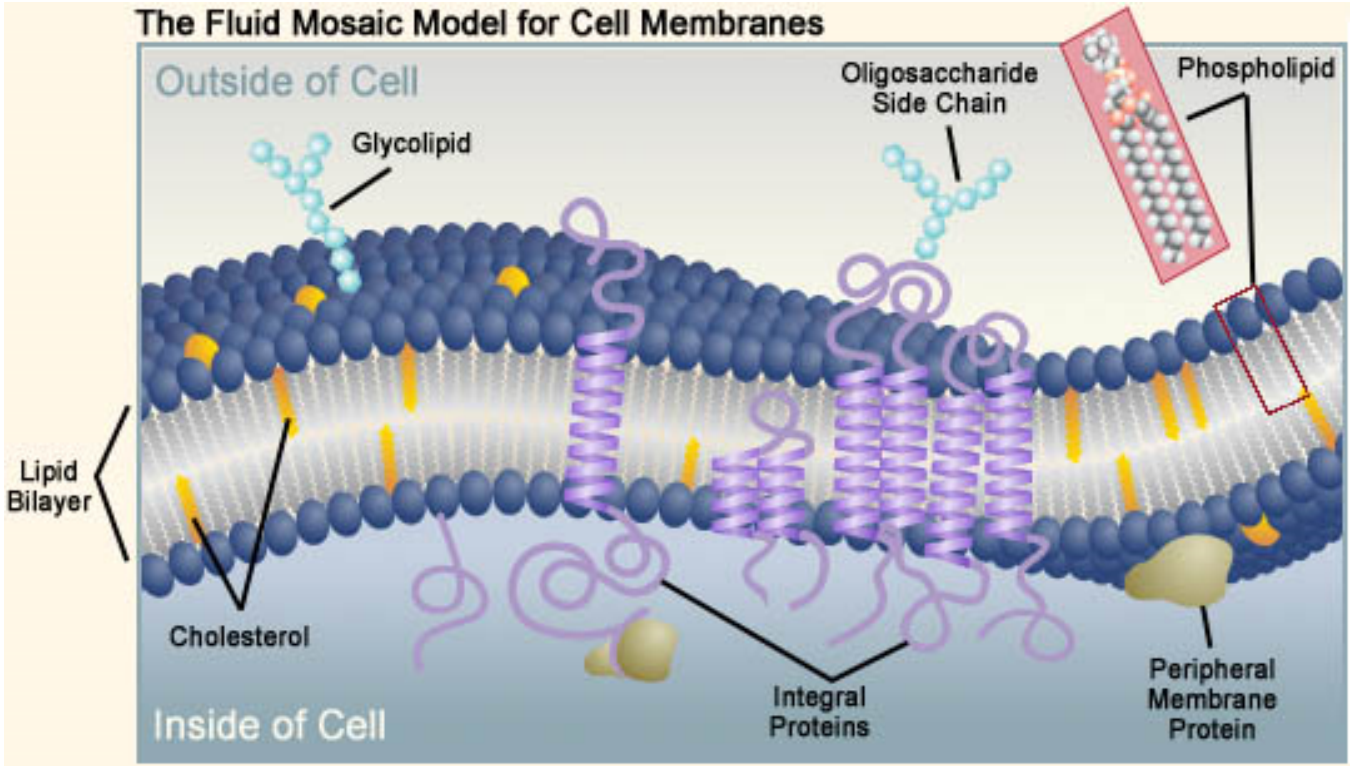
A triglyceride

Fatty acids are used to make Phospholipids – components of cell membranes

- Glycerol
  - plus TWO fatty acids
  - plus a phosphate group

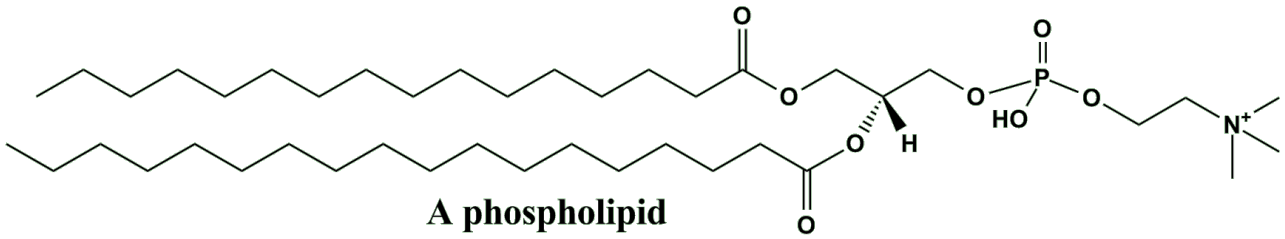


Plasma Membranes are made of phospholipids

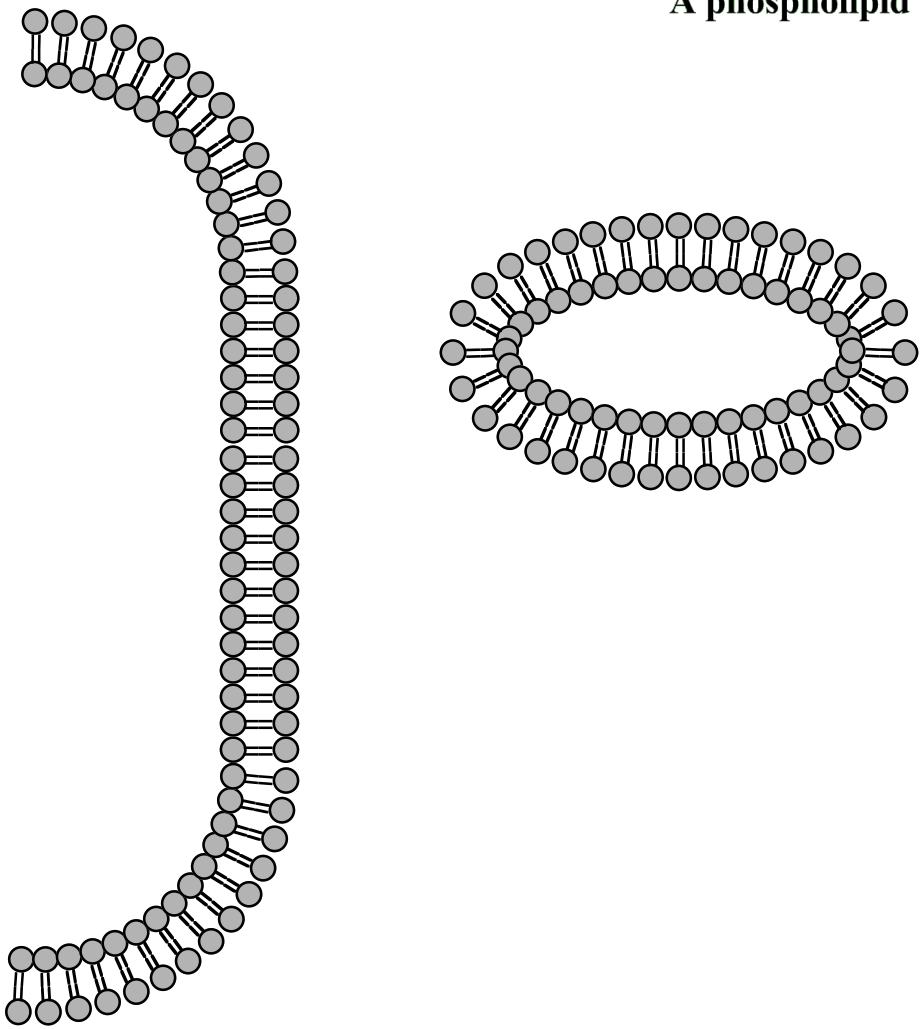


- Phospholipids: form a bilayer to make cell membrane
- FLUID MOSAIC MODEL: Lots of things are embedded in membrane
- http://www.youtube.com/watch?v=Qqsf_UJcfBc

Phospholipids in water



A phospholipid



- http://www.youtube.com/watch?v=ULR79TiUj80