Exam: Monday evening, 7:30-10 pm, McCosh 50  Open book, etc.

Review sessions:
Today:  5-6 pm   Rm 124 Frick
Sunday:  8-9:30 pm  Rm 324 Frick
Monday lecture  9 am, Rm 120 Frick

NOTE: Extra copies of the handouts, problem sets, and lecture notes are in the Resource Center, Rm 323 Frick. Let me know if they run out.

Polymerization of Bifunctional Acyl Derivatives:

Homopolymer:

Alternating Copolymer:

dielectrophile

dinucleophile

Example: A Polyester Copolymer  Dacron, Mylar
Example: Polyamide

a. homopolymer of $\alpha$-amino acids

Strong H-bonding between chains determines the structure (fibers, helical, etc) e.g.

The polymer of $\alpha$-amino acids is called a polypeptide; this amide bond is a **peptide** bond.

Large natural polypeptides are **proteins**

**Alternating copolymer:**

![Diagram of alternating copolymer]

- Hexamethylenediamine
- Adipoyl chloride

nylon 66
Reaction at the interface of the two immiscible solutions gives a layer of polymer. One can mechanically remove the layer as a strand by hooking into it and pulling up. As the polymer is pulled away, more forms at the interface and a fairly continuous rope of nylon is obtained.
Natural Carboxylic Acids: FATTY ACIDS

Always an even number of carbon atoms: biosynthesized from acetate (later)

Saturated fatty acids (no double bonds) can "pack" tightly in regular arrays through van der Waals interactions:
relatively high mp, solids at room temperature
Longer = higher mp

Unsaturated fatty acids pack together less well, lower mp.
Mp depends on number and configuration of double bonds.

[Blow-up of fatty acid conformations: p 2 of handout 1 on fatty acids]
Triglycerides are a primary energy storage form.

carbohydrate: \[ C_nH_{2n}O_n + nO_2 \rightarrow nCO_2 + nH_2O \]

fats: approx: \[ C_{10n}H_{20n}O_n + (n+x)O_2 \rightarrow 10nCO_2 + 10nH_2O \] More O$_2$ consumed, more energy out

Unsaturated fatty acids are more reactive: the alkene unit is a reactive center.

Good feature: easily metabolized
more soluble

**Oxidative instability of unsaturated fatty acids:**
Artificial Fats: Taste like fat but are not broken down to fatty acids and stored.
Prepared by synthesis: sucrose + fatty acids (natural ingredients)

Enzymes that normally break down fats cannot hydrolyze these esters.
**Phospholipids:** Polar "head groups" and hydrophobic (non-polar) "tail" (R₁, R₂)

In water, the polar head groups strongly associate with the water, but the non-polar ends groups are driven away, into interaction with themselves. A stable arrangement is a bilayer, with two polar surfaces and a non-polar inside of a "sandwich".

These provide structure for cell walls. More-or-less rigid depending on the frequency of unsaturated fatty acids in the mix. Also, cholesterol, a very rigid molecule, can be incorporated into the non-polar layer and add rigidity. The membranes can be modified by insertion of proteins which can provide "communication" through the cell wall.

The bilayer can fold onto itself, forming a spherical structure with a large cavity = vesicle. The inner core of aqueous solution can carry collections of proteins and other molecules from one location to another inside the cell or between cells. The membranes are permeable and also can "fuse" with other bilayer membranes to spill the contents.