

Membranes: Separating Inside from Outside

Mark Arnholt

Ruth Hutson

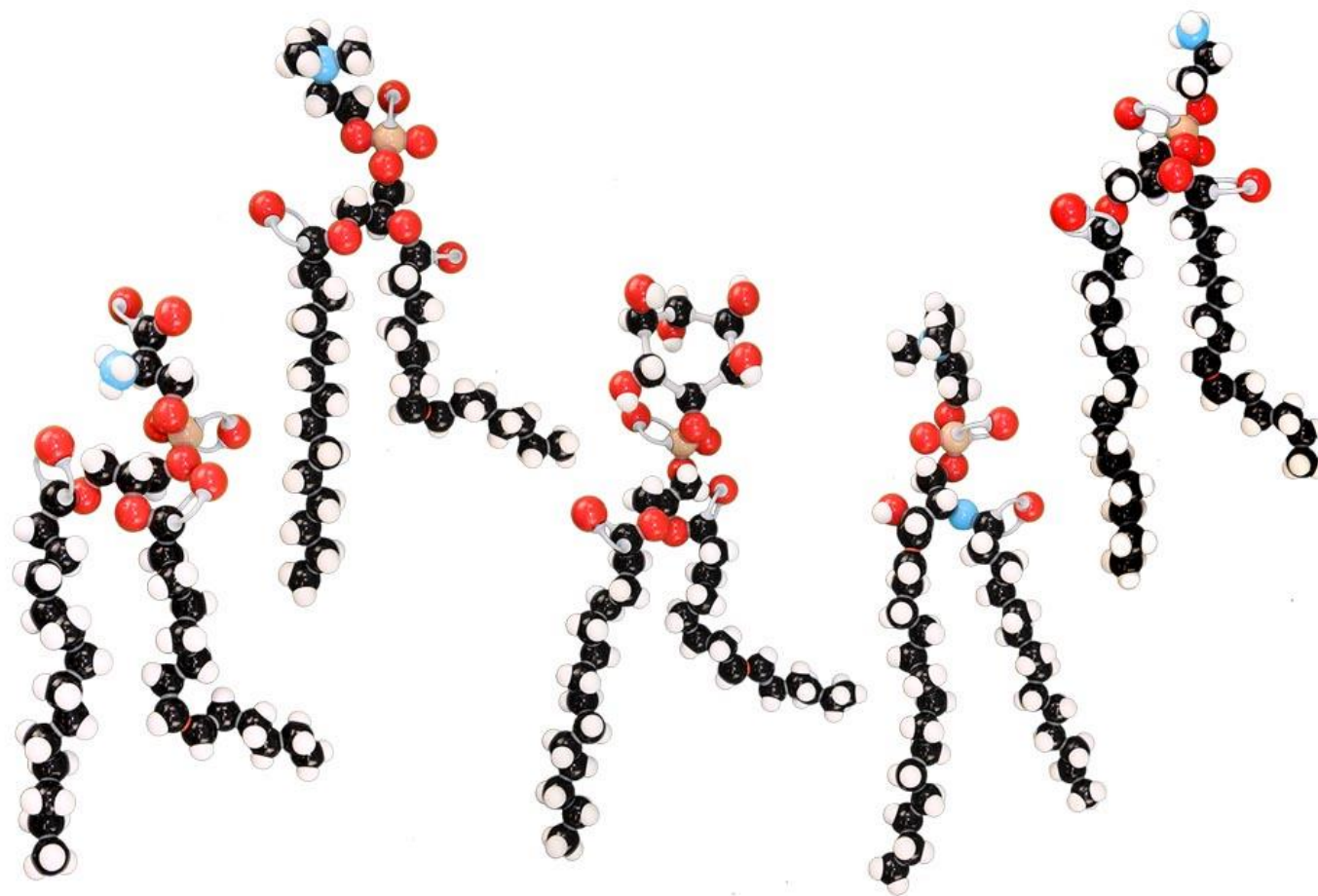
The Bubble Lab

Using your bubble film, model the following:

- A fluid and flexible membrane
- A self-repairing membrane
- A membrane within a membrane
- A channel within the membrane
- A junction between the membrane of two bubbles
- Dividing a bubble into two



A Close Examination of Phospholipids



Getting Through the Cell Membrane



Examine the phospholipid model at your table.

- Describe the overall structure of your model
- What atoms are present? What colors represent these atoms?
- What are two questions you have about your model?



Getting Through the Cell Membrane

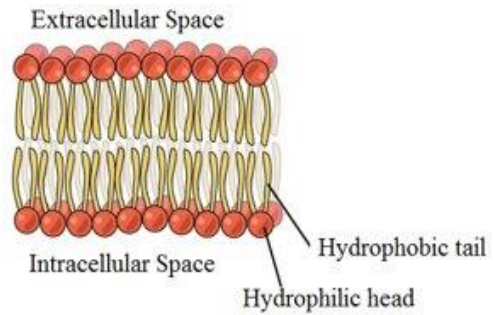


Compare and contrast your group's phospholipid to another group's phospholipid.

Speculate why a cell membrane would have different phospholipids.



Focus on Phospholipid Heads



Phosphatidylcholine



Sphingomyelin



Phosphatidylethanolamine



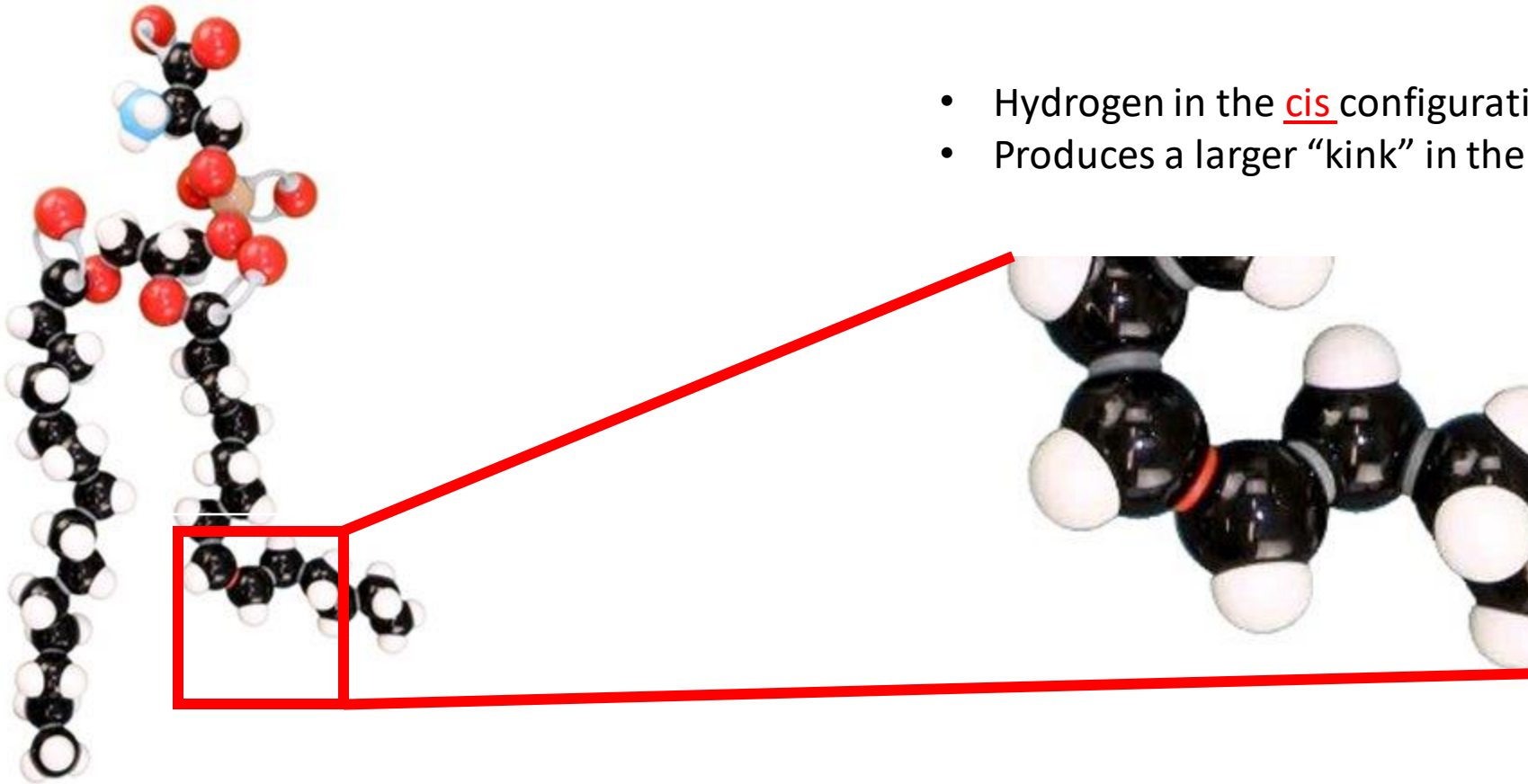
Phosphatidylserine



Phosphatidylinositol



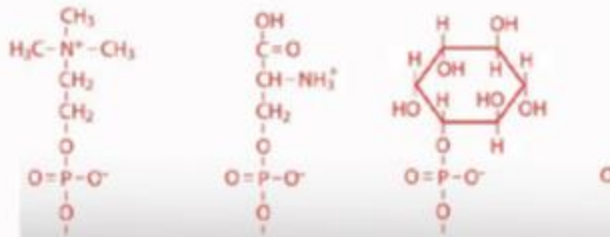
Focus on Phospholipid Tails



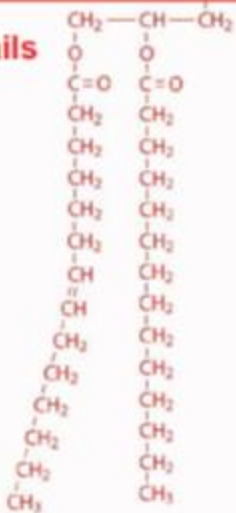
Modeling the Membrane: Phospholipids

Hydrophilic Heads

Phosphatidylcholine Phosphatidylserine Phosphatidylinositol



Hydrophobic Tails

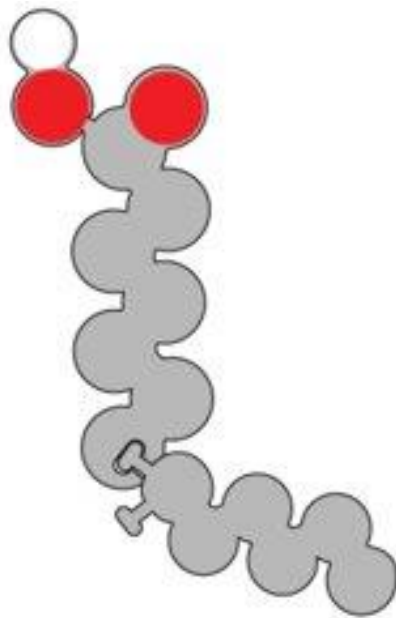


Using multiple models help explain nuance in the phenomena we are trying to explain.

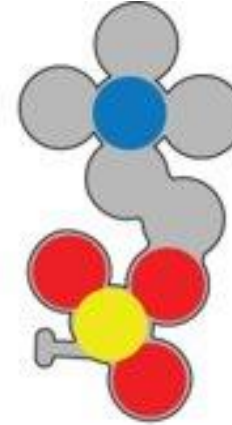
Constructing A Phospholipid



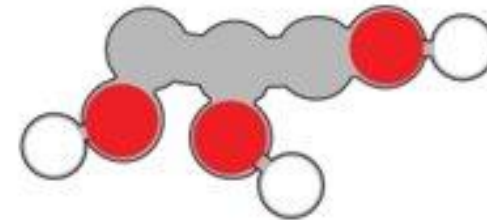
saturated
fatty acid



unsaturated
fatty acid
(cis configuration)

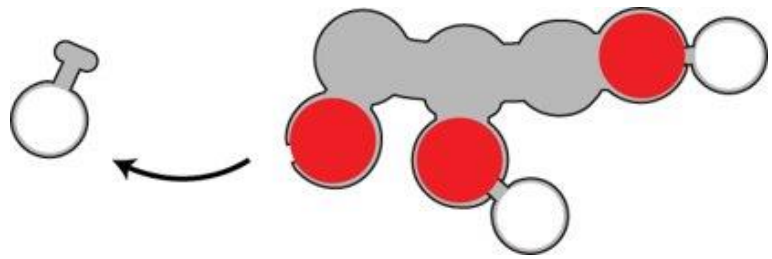


phosphate
head

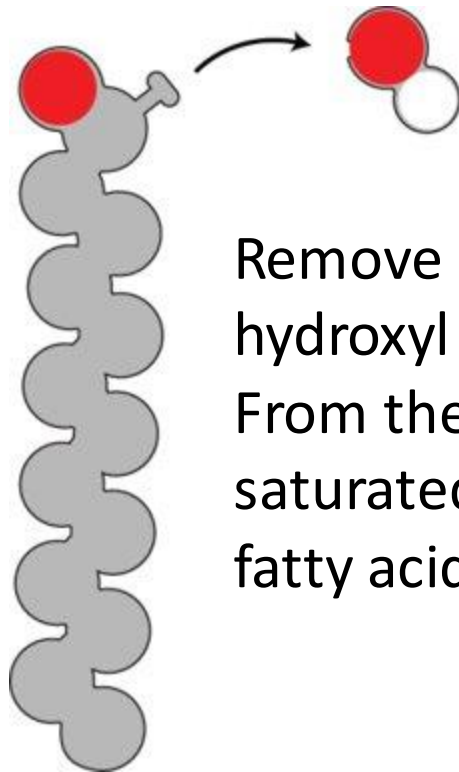


glycerol
backbone

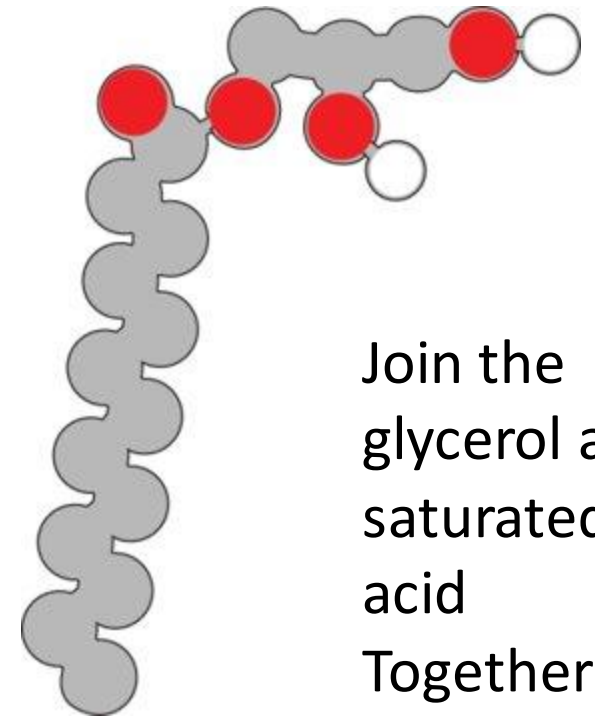
Constructing A Phospholipid



Remove a hydrogen from the glycerol backbone.

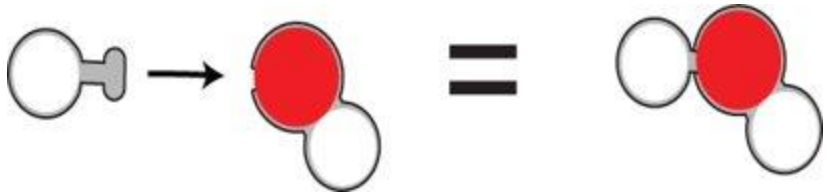


Remove a hydroxyl From the saturated fatty acid.

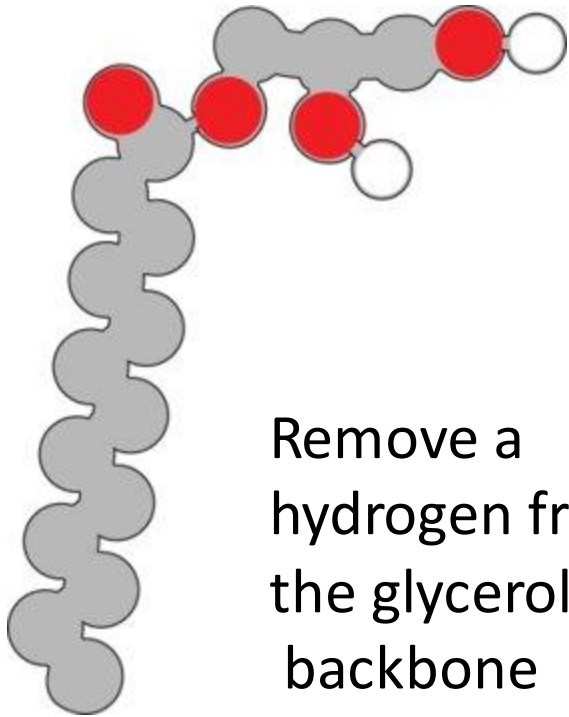


Join the glycerol and saturated fatty acid Together.

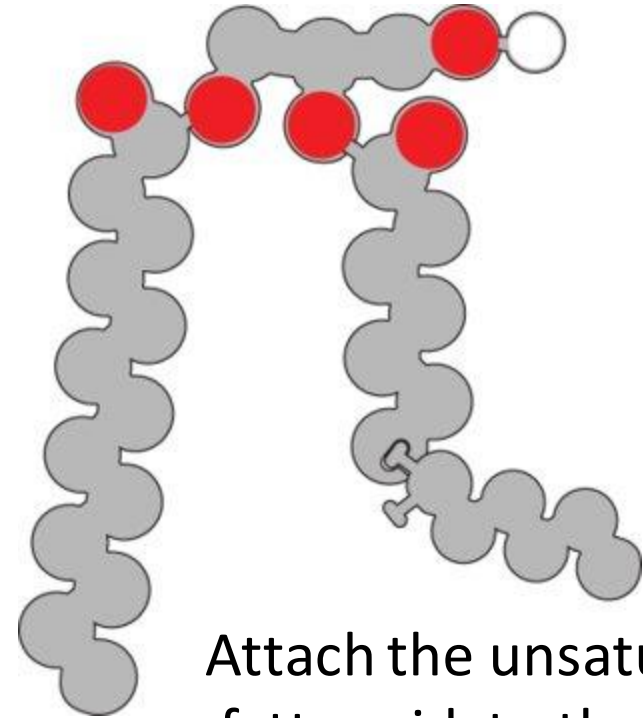
Constructing A Phospholipid



Join the hydrogen and the hydroxyl group to make water.



Remove a hydrogen from the glycerol backbone



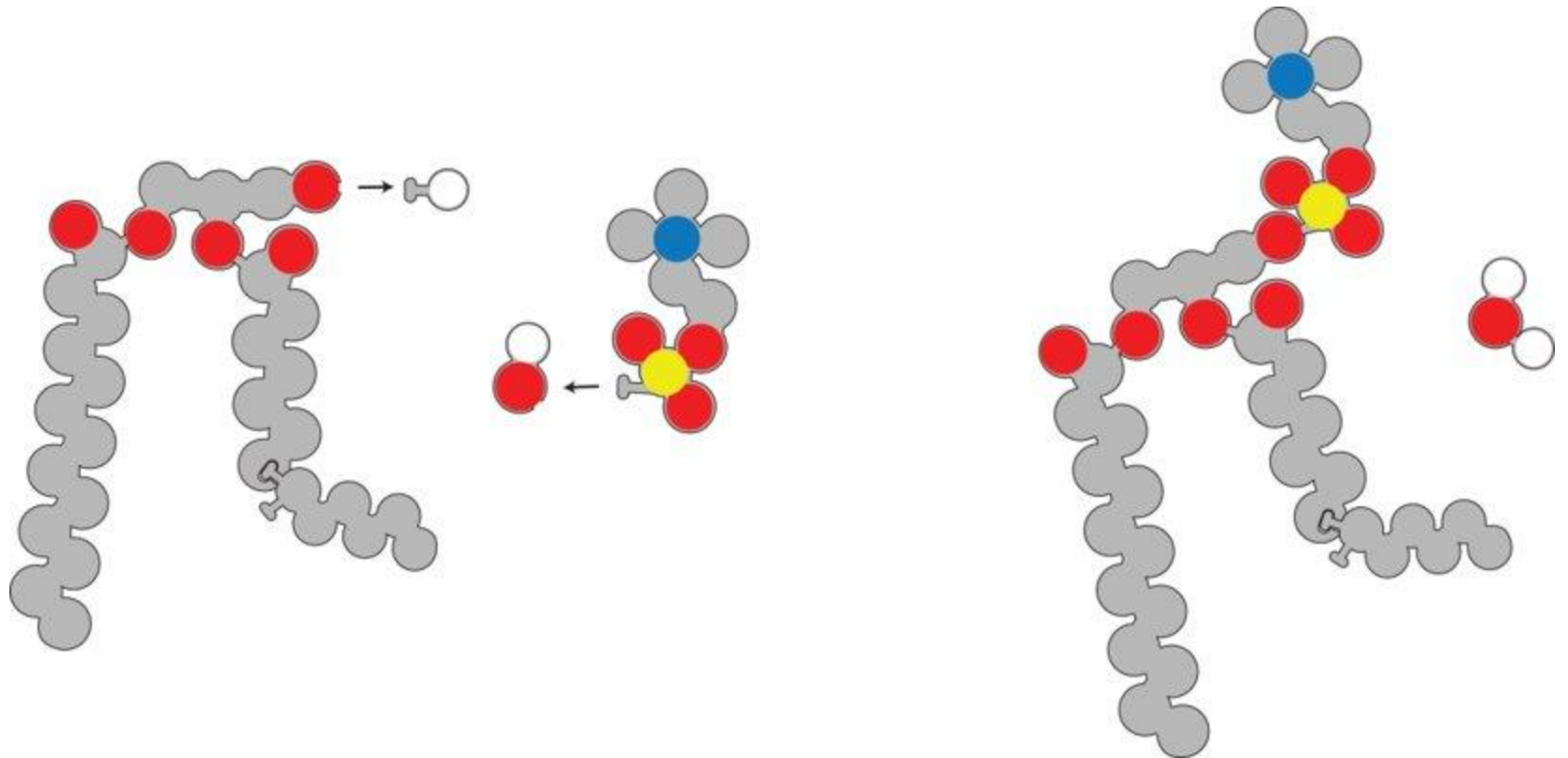
Attach the unsaturated fatty acid to the glycerol backbone



Constructing A Phospholipid

Remove a hydrogen from the glycerol backbone and attach the phosphate head.

Join the hydrogen with a hydroxyl group to make water.



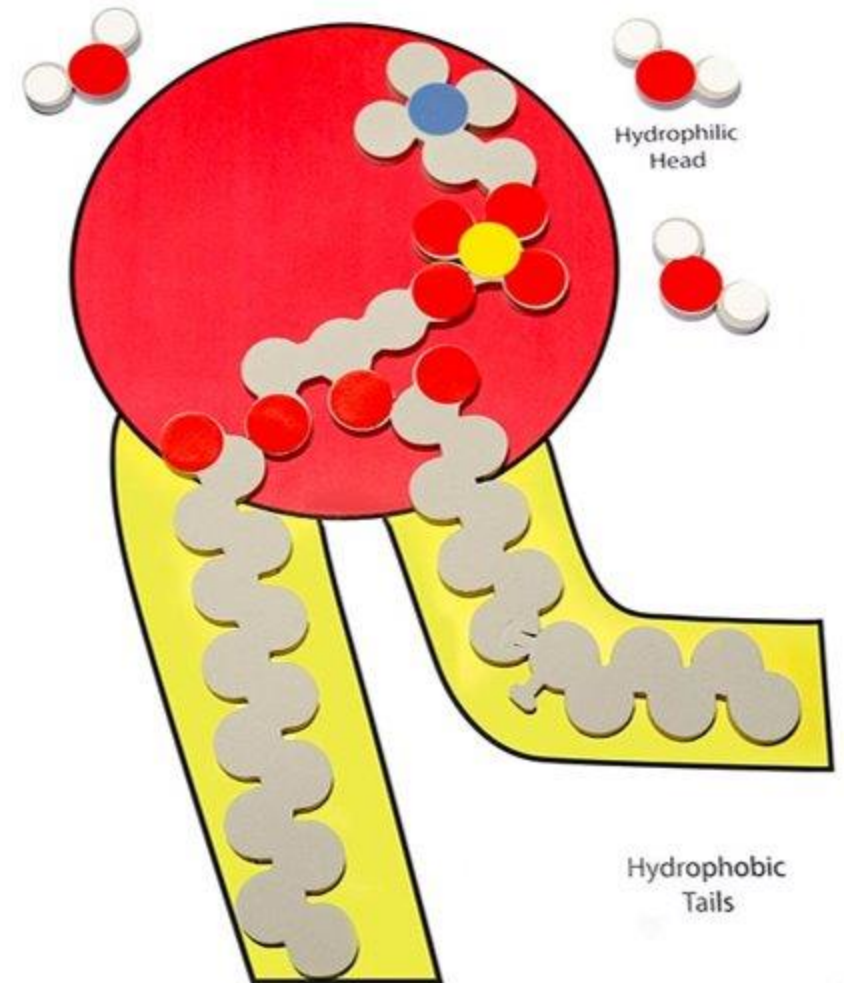
Constructing A Phospholipid



What do all three models have in common?

How are the models different?

Why is it important to use multiple models to represent the same structure?



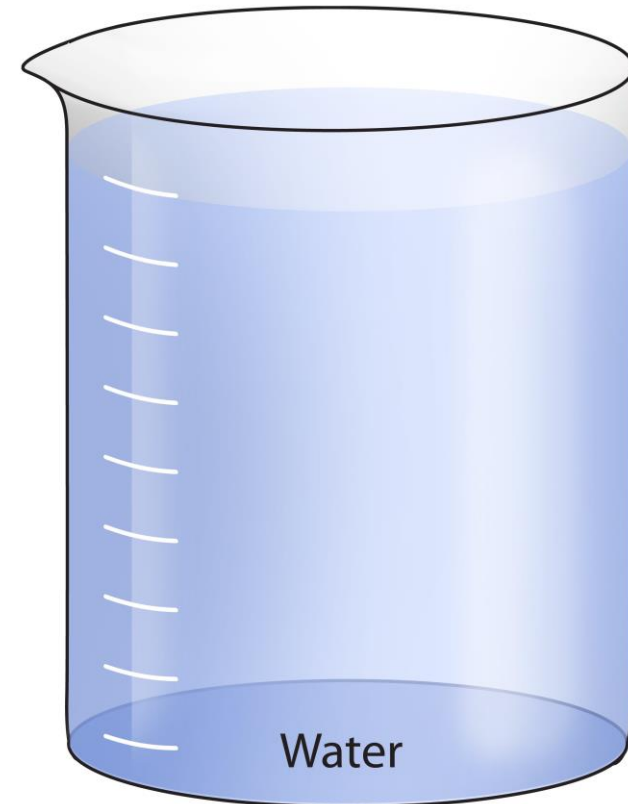
Building a Cell Membrane



How would ten phospholipids arrange to form a film on water?

How would ten phospholipids arrange to be submerged in a beaker of water?

How would phospholipids be arranged to be both submerged and contain water.



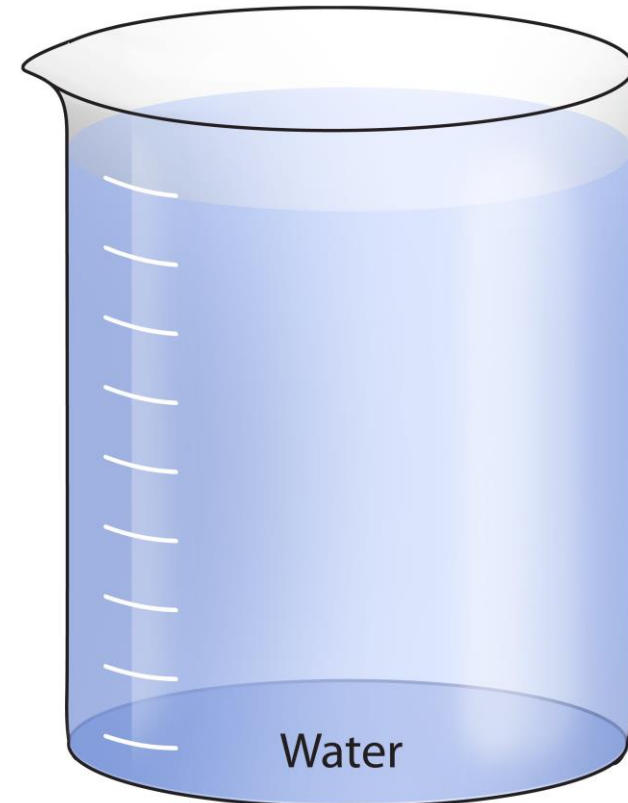
Back to the Bubble Lab



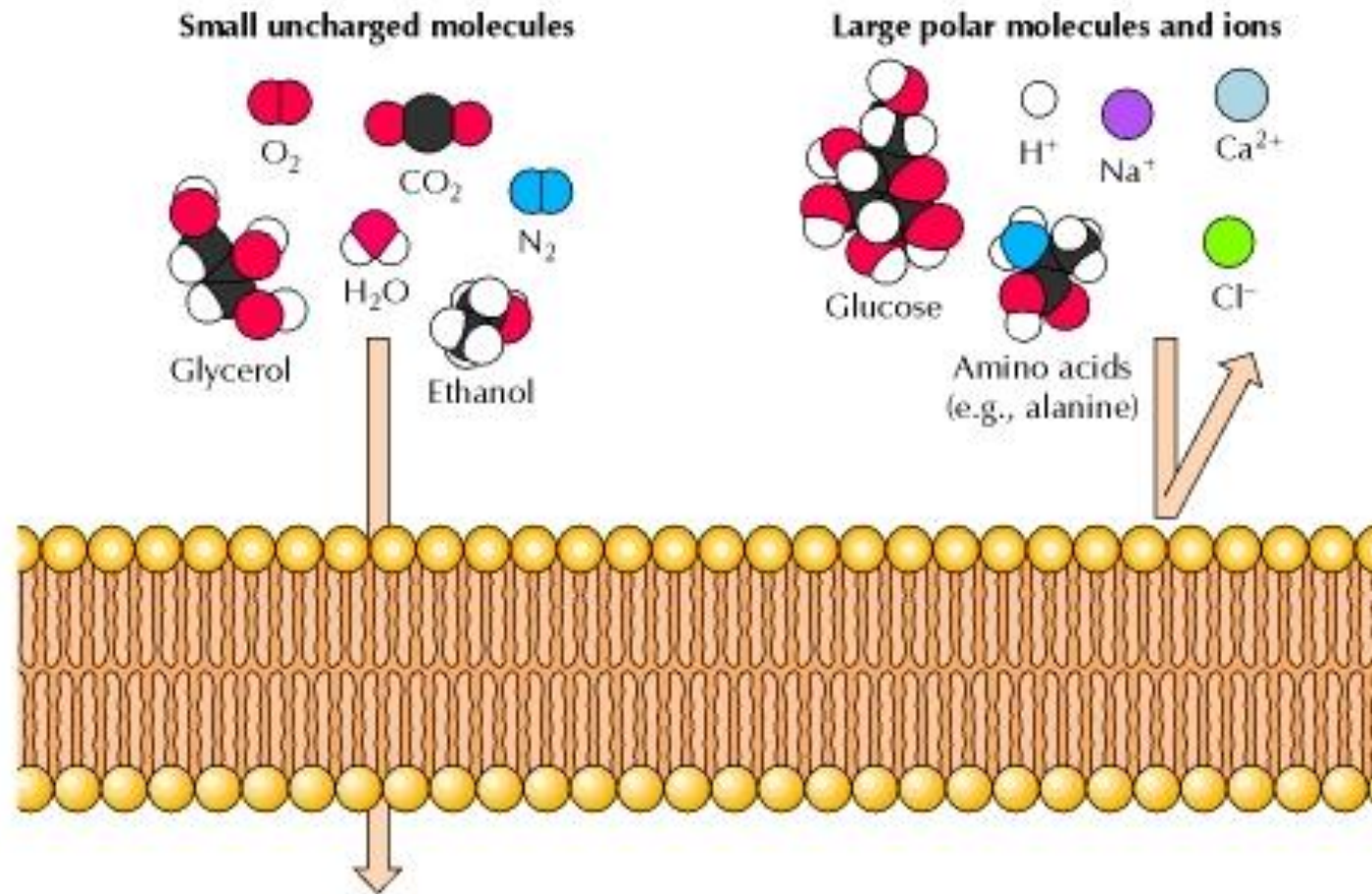
Comparison with the Cell Membrane

Using your phospholipid molecules, model the following:

- A fluid and flexible membrane
- A self-repairing membrane
- A membrane within a membrane



The Problem...



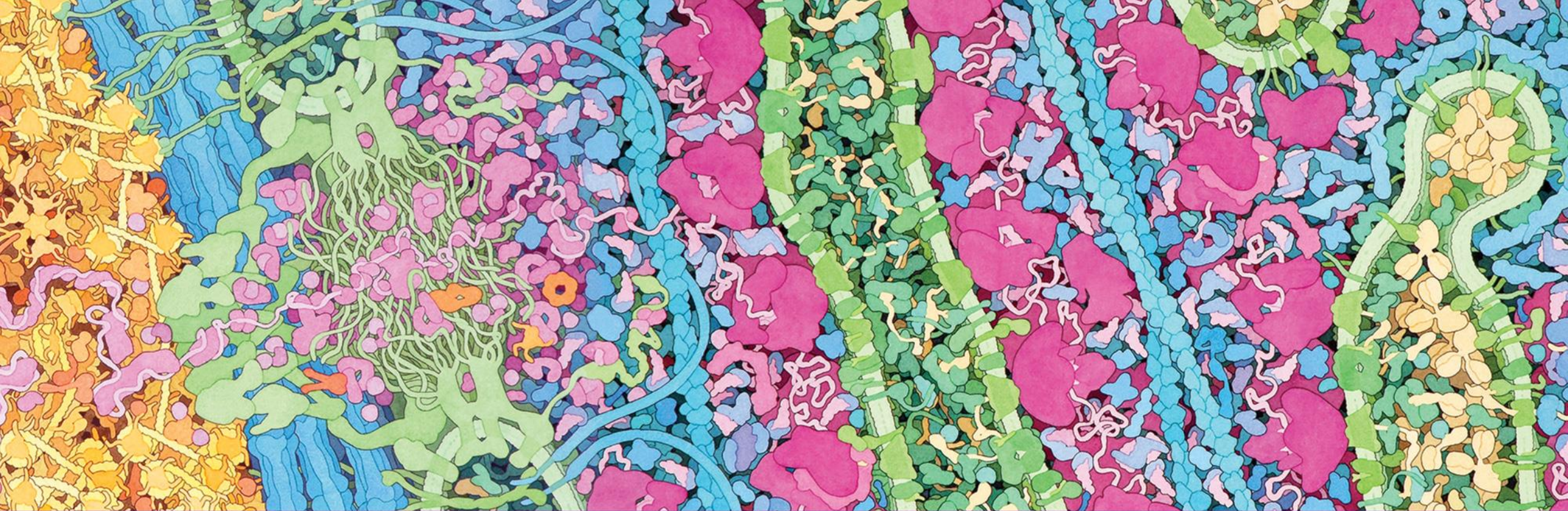
Reflection time



3
2
1

- Take 5 minutes to think about what you've learned today...
- What are three ways that you adapt the activity for your students? Where would you place it in your curriculum?
- What are two questions you still have?
- What is one question that your students would have at this point in their learning?





3d molecular
designs

Transforming Science Learning