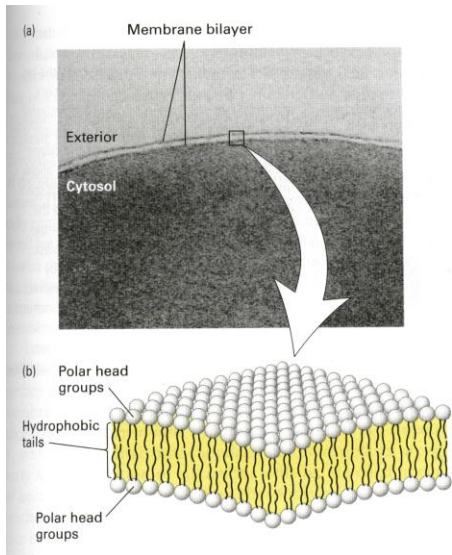


## CELL MEMBRANES

We first thought that cell membranes were just lipid bilayers. Here we have a picture of a cell membrane taken with an electron microscope (called an electron-micrograph). The thickness of the membrane in the little black box is about 5 nanometers or 5 billionths of a meter thick!

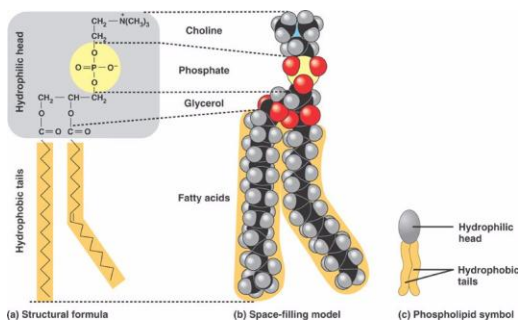


A schematic of how the lipids are arranged in the membrane is shown enlarged below the electron-micrograph.

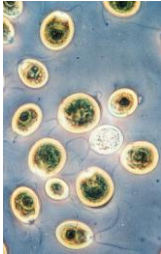
As the schematic shows, the polar heads of the lipids line the outer sides of the membrane and the hydrophobic tails are on the inside.

Before we go further let's be clear about the structure of the lipids in the membrane. Membrane lipids are most often phospholipids.

Phospholipids have hydrophobic tails and hydrophilic heads--meaning that one molecule can have two ends with very different properties (neat!). The picture below shows three different ways to represent a phospholipid (some more complicated than others). The polar head of a phospholipid is made of a charged (and therefore polar) phosphate and charged (and therefore polar) choline. To simplify drawings of membranes scientists typically draw phospholipids with a round head and a few short squiggly tails.

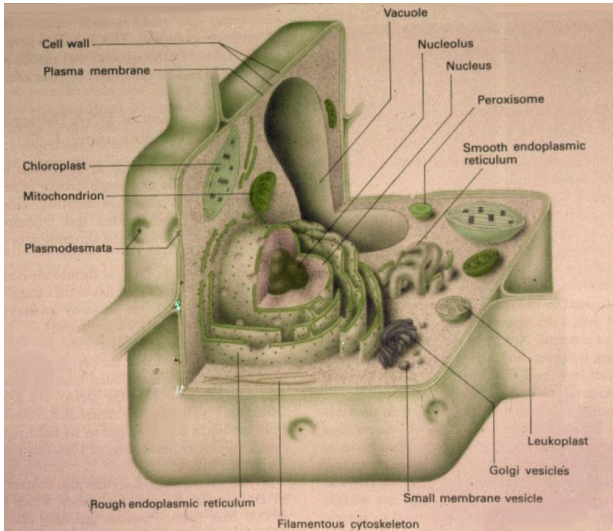


All life on Earth is made of cells and every cell has a membrane that surrounds the cell and keeps its insides in and the outside out. It's kind of like the definition of a hole...nothing with something around it. Below are images of various sized cells. The small ones on the left are bacteria. Then an animal cell and then some phytoplankton and then a paramecium. All these cells have a cell membrane.

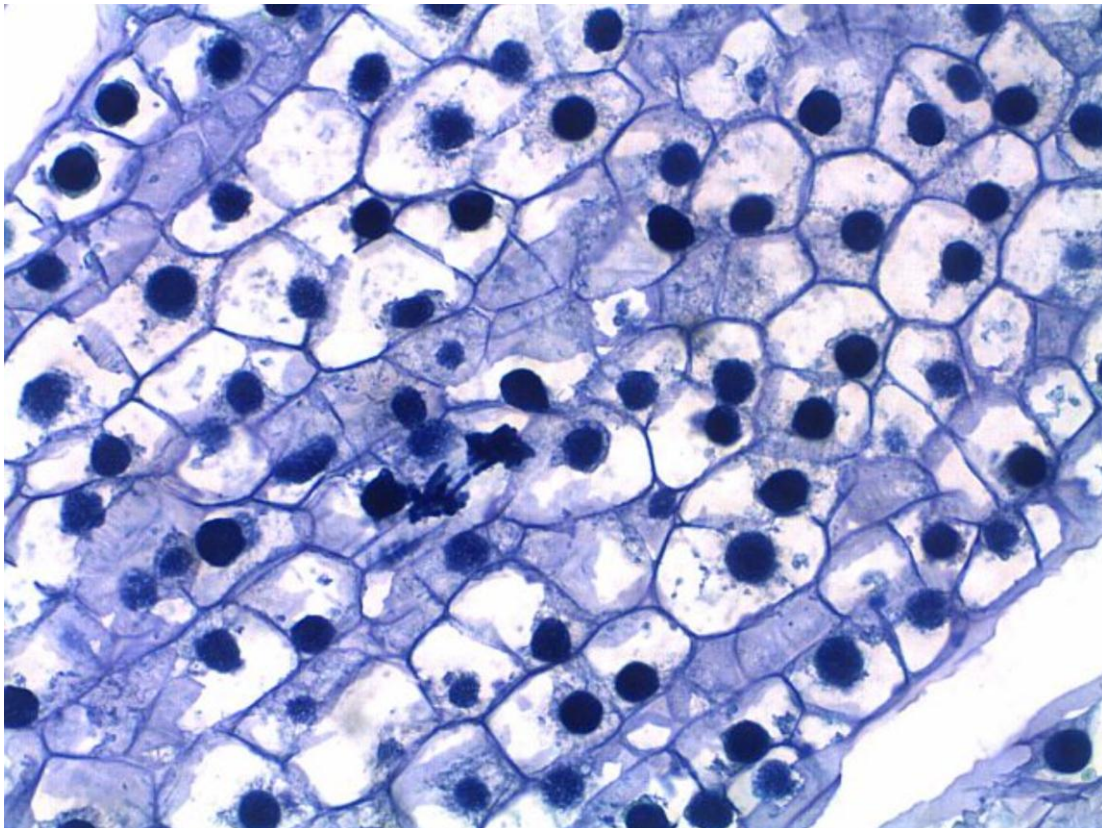


**THE CELL MEMBRANE HAS MANY FUNCTIONS BUT THE MOST OBVIOUS IS TO SEPARATE THE INSIDE OF THE CELL FROM THE OUTER WORLD**

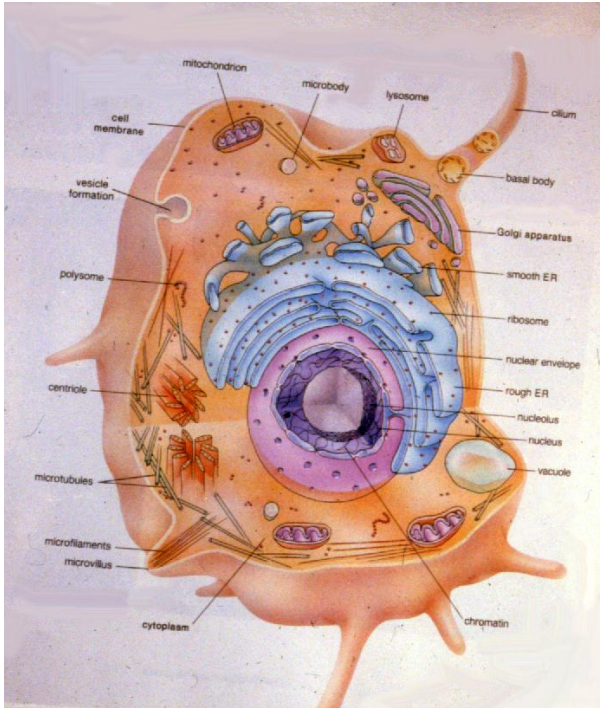
Plant cells have a cell wall on the outside of the cell membrane. Animal cells do not. Since the cell wall is rather ridged, plant cells are firm and animal cells are squishy. Cells have structures inside of them that are surrounded by membranes.



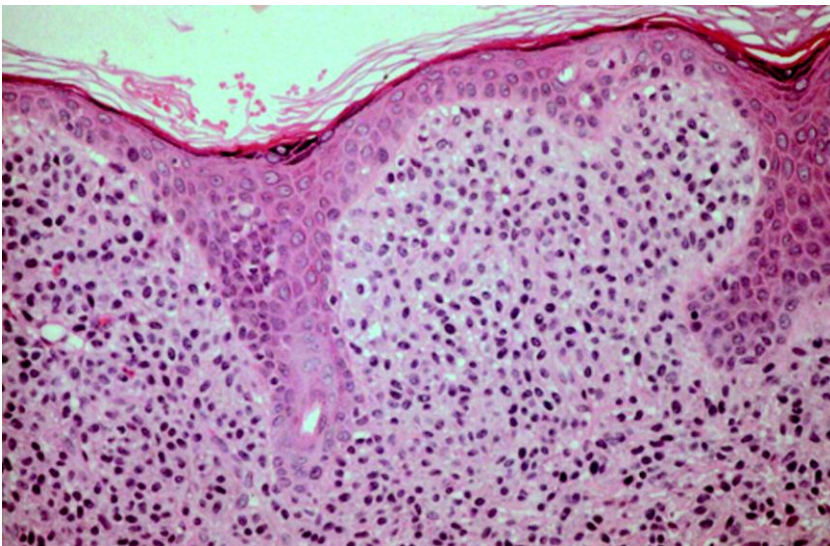
Above is an illustration of a plant cell and below is a micrograph of about 100 lady's slipper plant cells. The dark purple round structures are nuclei. Each cell is rimmed by a thin, purple, line that represents the cell wall.





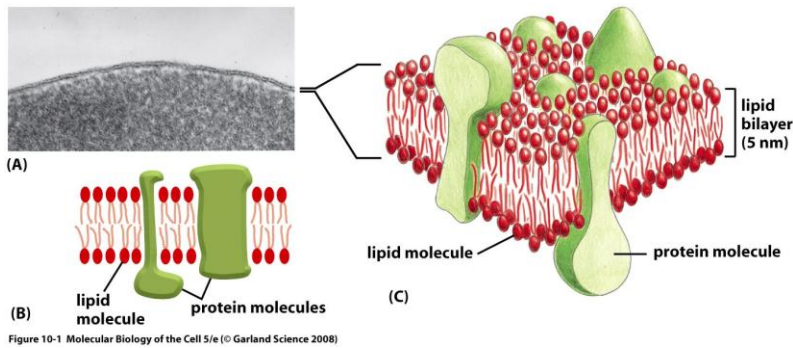


**Above is an illustration of an animal cell. Below is a micrograph of human skin...unlike plant cells, finding where one cell meets another is difficult...why?**

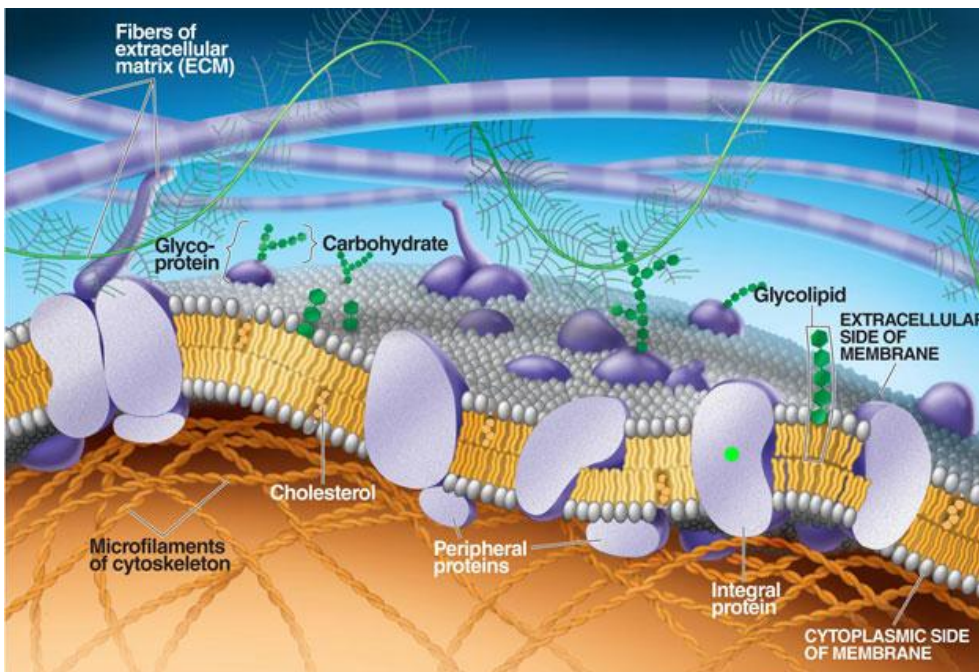


The problem with the simple lipid bilayer that we started with, is that it is hard to account for all the variety of functions that the cell membrane accomplishes...how does this bilayer allow charged molecules that are large to pass through it; how can sugar molecules get in; how do hormones signal the cell to make changes in the inside and how do molecules from the inside of the cell get out? It is mostly because there are proteins in the membranes also.

Here is an up to date illustration of a cell membrane. This is quite simplified.



A little more complex



Yikes...this is more complicated than I hoped...it gets worse. Let's take a look at a simplified diagram of a single trans-membranel protein.

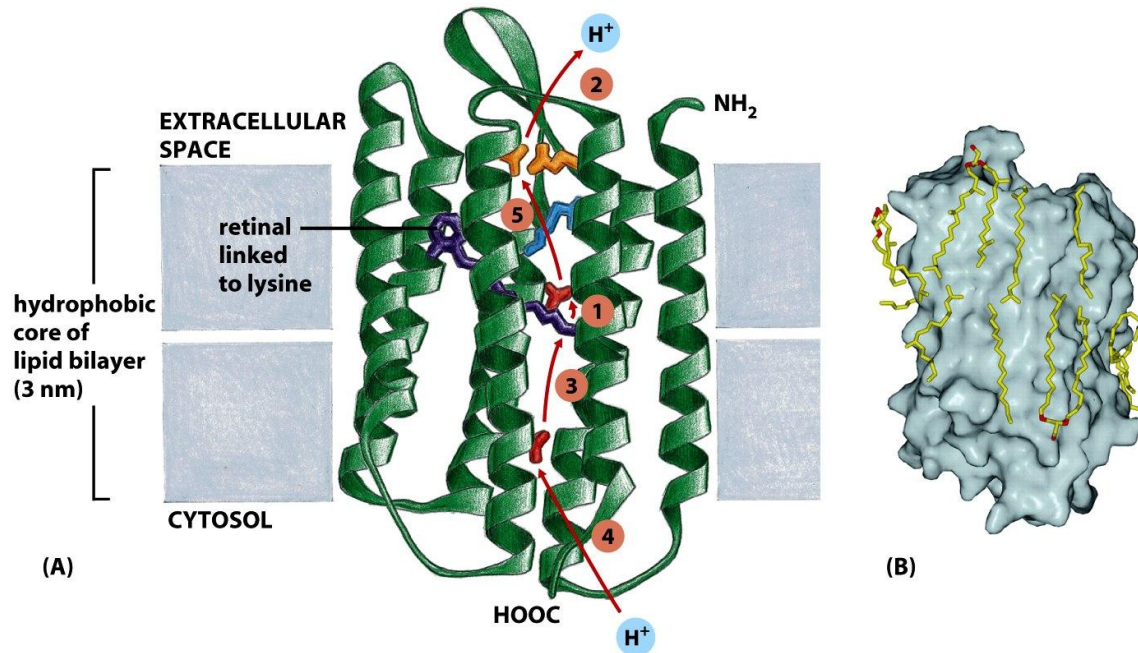


Figure 10-33 Molecular Biology of the Cell 5/e (© Garland Science 2008)

This is a trans-membranel protein found in the retina of the human eye. The green ribbon-like twists are made of many amino acids (all proteins are made of amino acids). This protein helps produce vision by allowing hydrogen ions to pass through the membrane.

The lesson we take home is that the cell membrane is very complex. It is made of a lipid bilayer with proteins embedded in the bilayer. The proteins allow charged molecules to pass through the membrane but this is regulated to some extent.

Osmosis is the movement of water across the cell membrane in response to different concentrations of dissolved substances in and outside a cell. If something like sucrose cannot pass through a membrane, and its concentration is higher outside the cell than inside the cell then water tries to make the concentrations equal by moving out of the cell. In our experiment with dialysis tubing, this is why a tube filled with 10% sucrose in a jar of water loses weight since water diffuses out of the tube and into the jar of water. This diffusion is a basic property of nature...trying for equilibrium.

One last note — although water is polar it is so small that is can pass through the cell membrane lipid bilayer. Water does not need a protein to pass through the membrane... You are now ready to watch and take notes on the following video:

<http://www.youtube.com/watch?v=moPjkCbKjBs>