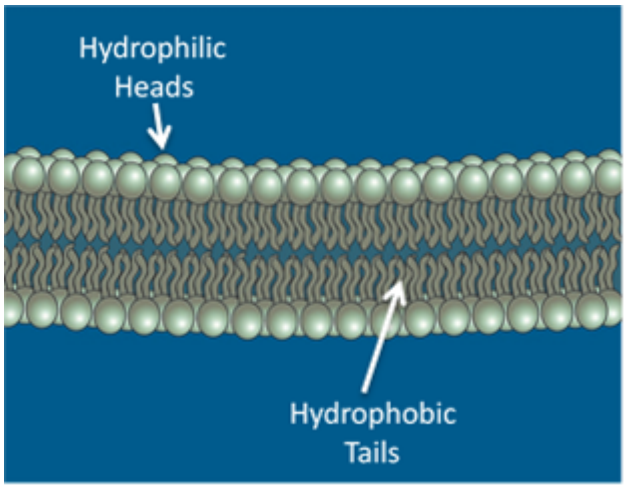
5.1.2

Membrane Phospholipids

A key component of the membrane is a double layer of phospholipids, the **phospholipid bilayer**. This bilayer forms the scaffolding into which the other components of the membrane are housed. Recall phospholipids are composed of a hydrophilic head containing a phosphate group and two hydrophobic tails composed of long chain fatty acids. This bilayer has a central hydrophobic region and two outer hydrophilic sections, one facing the aqueous interior of the cell and one facing the aqueous extracellular space (see figure below).



Phospholipid Bilayer. *Image created by BYU-IU student, Hannah Crowder 2013*
In water, phospholipids can form a bilayer. The hydrophobic fatty acid tails turn away from the water, and the hydrophilic phosphate heads turn towards the water.

The hydrophobic core of the membrane creates a barrier, preventing hydrophilic substances, such as ions and large polar molecules, from moving across the membrane. Hydrophobic (lipid soluble or lipophilic) materials, on the other hand, typically move readily across the membrane. Because some things easily pass through the membrane and others do not, we describe the membrane as being **selectively permeable**. The following link may help you better understand the concept of selective permeability:

https://books.byui.edu/-Waot (Transcription Available)

In addition to the phospholipids, another important lipid found in membranes is cholesterol. Cholesterol is a hydrophobic molecule and resides among the fatty acid tails of the phospholipid bilayer. As mentioned above, the membrane exhibits fluidity, allowing movement of components within the membrane. Cholesterol plays an important role in regulating the fluidity of the membrane across a range of temperatures the body is exposed to. While it is true that our core body temperature remains fairly constant, temperatures in our extremities may vary considerably. Think of the range of temperatures the cells in your hands are exposed to. At high temperatures, cholesterol enhances the interactions between phospholipid fatty acids and prevents destabilization and melting of the membrane. At low

temperatures, cholesterol prevents phospholipid tail groups from interacting too strongly with each other, a condition which would stiffening the membrane and decrease fluidity. Thus, without cholesterol the membrane might be compromised leading to impaired cellular function. Together, phospholipids and cholesterol comprise nearly 50% of the membrane.