

**Big Idea: At the molecular level, biology is based on three-dimensional interactions of complementary molecular surfaces.**

Other important concepts:

1. All molecules are 3D objects (2D is just a representation).
2. Structure of a molecule enables its function.
  - a) Structure is a combination of the 3D shape of the molecule and the chemical identities of the different parts of the domains of the molecule.
3. Interaction between molecules happens by shape matching/fitting with the use of chemical entities in the faces of the interacting molecules.
  - a) Molecules that seem to differ in very minor ways (e.g. different carbohydrate linkage) can have drastically different properties.
4. All interactions in a cell happen because of a combination of molecular forces.
5. Many of the physical properties of water are due to hydrogen bonds.
  - a) Hydrophilic molecules can form hydrogen bonds with water, thus becoming part of the network.
  - b) Hydrophobic molecules need to "hide" from water, which is looking to displace them in order to resume the hydrogen bond network and increase entropy.
  - c) Amphipathic molecules have both hydrophilic and hydrophobic characteristics. This duality allows them to form vesicles and membranes.
6. Membranes separate inside from outside, making existence of cells possible.