Friction

Friction

- Friction exists between two solid surfaces because even the smoothest looking surface is quite rough on a microscopic scale.
- As we try to slide an object across another surface these microscopic bumps impede the motion.

- At the atomic level, the atoms on a bump of one surface come so close to the atoms of the other surface that the electrical forces between the atoms can form chemical bonds, as a tiny weld between the two surfaces.
- Sliding an object across a surface is often jerky due to the making and breaking of these bonds.

Kinetic Friction

- This sliding friction is called **kinetic friction**.
- For given surfaces, experiments show that the frictional force is approximately proportional to the normal force.
- The frictional force seems to have nothing to do with the amount of surface area in contact.

Kinetic Friction

$$F_{fk} = \mu_k F_N$$

- Where μ_k is the coefficient of kinetic friction.
- μ_k depends only on the nature of the two surfaces involved.

Static Friction

- Another type of friction is called **static friction**.
- Static friction refers to a force parallel to the two surfaces that can arise even when they are not sliding.

Static Friction

- Suppose an object such as a desk is resting on a horizontal floor.
  - If no horizontal force is exerted on the desk, there also is no friction force.
  - If you exert a force on the desk and it doesn't move, then the friction force is equal to the force that you are applying.
  - If you push with enough force, then the desk will start to move and kinetic friction takes over

Static Friction

- At this point, you have exceeded the maximum force of static friction, which is given by:

$$F_{fs} = \mu_s F_N$$

- Where μ_s is the coefficient of static friction.

One last note about friction

- You may have noticed that it is often easier to keep a heavy object moving than it is to start it moving in the first place.
- This is consistent with the fact that μ_s is generally greater than μ_k.