Thermal physics

Thermophysics is a field of physics that deals with how heat, temperature and pressure are related. Historically, thermophysics was developed to explain how steam locomotives worked in the 19th century - and how to make them as efficient as possible. Thermophysics essentially consists of two fundamental laws: (1) that energy is conserved and (2) that the total entropy in the universe always increases. The first law is the most well-known, and tells us that energy can never arise or disappear, but only change into other forms. An example of this is precisely how burning coal releases heat energy that can be used to drive a steam locomotive. The second law of thermophysics tells us that even if we can utilize the energy in, for example, coal, there is a limit to how efficiently we can do this. This is governed by the requirement that the "entropy", i.e. the total disorder, in the universe always increases. In an unburnt lump of coal there is a lot of concentrated energy associated with low entropy. When this energy is released into the air as heat, it contributes to a lot of disorder, high entropy. Since we produce entropy, we can use some of this energy to do useful work, e.g. operate a steam locomotive.