In some other courses or references, you may see the first law of thermodynamics written as E=Q-W, i.e. the sign of work may be different. This is still the same First Law of Thermodynamics/Law of Conservation of Energy that we are talking about here. The difference is one of perspective. In this class, we are considering energy flowing into the system as positive and energy flowing out of the system as negative. This convention matches our convention for heat Q as well as matching our definition of work from mechanics W=Fd which considers only external forces. Physically, we are thinking about work done *on* the system by *external* forces.

To understand the E=Q-W formulation, you need a bit of history. The Laws of Thermodynamics were formulated during the Industrial Revolution as people were studying the properties  of steam engines and the like. When studying the performance of a steam engine, the interesting quantity is not the work done *on* *the system by* *external* forces, but instead the work done *by the engine on its environment*. Stated another way, the developers of the Laws of Thermodynamics were not using our idea of object egoism! Instead of thinking about Fenvironmentengine, they were thinking about Fengineenvironment. Now by Newton’s Third Law, these two forces are equal except for a negative sign. Thus, when you think about work done *by* the engine instead of the work done *on* the system, work flips sign and you end up with E=Q-W instead of E=Q+W.

In this class, we will stick with E=Q+W, i.e. we will use the same definition for work we have been using. The takeaway from this section is that you may see the First Law of Thermodynamics written with a different sign for work. Different fields use different conventions (it would be nice if we could agree, but oh well). Therefore, you should be aware that writing it as E=Q-W is just a different perspective born out of the historical development of science. This quirk with the sign of work is a great example of the impact that history and all of its associated socio economic factors can have on the history of science. One wonders what other ideas could be expressed more coherently? What scientific questions have not been explored because the people in power doing the research did not value them?