



Some Thoughts on Thermodynamics and Its Consequences

Let's assume, for the sake of argument, that the universe is an [isolated system](#). That is, let's assume from the point of view of natural philosophy that the universe is all that there is and that it can have no interaction with any non-natural system. In other words, we disallow the notion of supernatural influences on the universe. What might the consequences of such a world view be?

One of the properties of an isolated system is that certain mechanical properties of the system, in this case certain mechanical properties of the universe, [cannot change](#). From this scientists have deduced three conservation laws which can be thought of as principles of nature that are not violated. For the purposes of this discussion, I'm interested in the principle of the [conservation of energy](#), which can be expressed mathematically as the [first law of thermodynamics](#). Essentially we can understand the first law of thermodynamics to mean that in an isolated system the total amount of energy is a constant, or put another way, energy can neither be created nor destroyed in an isolated system.

This does not say that energy cannot be converted from one form to another. In fact, energy and matter are equivalent to one another according to Einstein's [general theory of relativity](#). A good example of the conversion of matter to energy is the nuclear or thermonuclear bomb. A more everyday example is the nuclear power plant. Perhaps the one we are most familiar with is our sun. The fact that energy can be converted from one form to another will prove to be important in a moment.

One consequence of this view seems rather straightforward to me. If the total amount of energy in our universe is a constant, then the universe has always existed. Otherwise there would be a time when the total amount of energy in the universe was different than it is now. In other words, either the universe is eternal, or the total amount of energy is not a constant.

This is, of course, assuming that the universe is an isolated system. Of course, it might be more straightforward to say that the assumption that the universe is an isolated system, on

naturalism, implies that the universe must be eternal.

What other conclusions can we draw from the premise that our universe is an isolated system? Well, let's look at the [second law of thermodynamics](#). We can state this one in a [qualitative way](#) by saying that in an isolated system, entropy will increase with time. Another way of saying this is that the amount of energy available in an isolated system to do work will decrease as time passes. Assuming that the first law of thermodynamics is inviolate, and that the second law of thermodynamics is also inviolate has profound consequences for our view of the universe.

First of all, we can clearly see from the state of the universe today that there remains energy available in the universe to do [work](#). Clearly we can apply energy to objects in our universe and cause a displacement of those objects. Examples might be using the chemical energy stored in gasoline to move a car. What's the point? Well, if there is still available energy in the universe to do work, and if the second law of thermodynamics is true, then our universe is not eternal. After all, if the universe were eternal then an eternity of time would have already passed, and there would be no more energy available in the universe to do work.

Now we have a contradiction. The first law of thermodynamics applied to an isolated system, our universe, implies that the universe is eternal. The second law of thermodynamics applied to the same system implies that it is not eternal. The universe cannot be both eternal and not eternal. If both the first and second laws of thermodynamics are true, there must have been a time when the universe, and time itself, did not exist. But, if there was a time when the universe did not exist, it cannot be an isolated system.

If there was a time when the universe did not exist while clearly the universe exists now, then an external system must have interacted with it at one time to have caused it to come into being. Whatever that external system was, it wasn't a part of the nature of the universe.

In other words, it must have been supernatural. But that contradicts the premise of natural philosophy, doesn't it?