The Reversible Thermodynamic Process and its Place in Physics

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Most scientists have, in some quiet moment, reflected on the nineteenth century understanding of the Second Law of Thermodynamics, and asked: Why… if everything in our universe is continually going over into disorder … why is the universe still here? And, how is it that it remains so ordered?

This paper begins by discarding what we think we know about the reversible thermodynamic process, in favour of a fresh view that draws on discoveries and understandings that did not exist in Carnot's, Clausius', and even Planck's world. It draws on biology, chemistry, and physics for its insights, and begins in the manner of all good scientific inquiry, with a question:

Can a reversible process exist in nature?

This presentation concludes that reversible processes do occur in nature, and then goes on to identify four reversible processes that are common in nature and essential to the continuance of our universe.

There are three characteristics that all reversible thermodynamic processes have in common. First and foremost, it is a physical process. This means that it has at least two states and at its most fundamental description these are cyclic. Secondly, because it is a process, all reversible processes do produce a work product. And third, the reversible process differs from any irreversible process because it operates at the very limit of the Second Law of Thermodynamics where no entropy is produced as a result of its operation.

The first of four reversible processes in the natural world is the process that facilitates the **covalent bond**. It is reversible because it exhibits the salient characteristics of reversibility:

- It is a process with two states: the electron's association with each nucleii.
- It exhibits no entropy increase during its operation, and in this regard it is perpetual untill it is disrupted. It reequires no refueling, and expells no exhaust.
- It maintains a work product: the union of two atoms. I want you to see in this example how the *reversible covalent process* is distinguished from the *covalent bond* itself.

The other three reversible thermodynamic processes in nature are:

- **Light in a vacuum** is a reversible thermodynamic process. The process is the alternating sinusoidal conversion of electrical and magnetic energy in accordance with Maxwell's equations. The cycle repeats over and over. It produces a work product: the movement of electromagnetic energy in space-time.
- **Gravity** is a reversible thermodynamic process. Its work product is mass transport in space-time. However, its underlying states and mechanism have not yet been discovered.
- **The stable atoms form and** function, where the reversible process is the force, or system of forces, that maintains the stable atom's form and function in opposition to electro-static repulsion. The work product here is a stable atom.

This paper then goes on to describe what I call the **obligate reversible process** which creates an artificial environment that is suitable for reversible process dynamics. However, in this case, *entropy production occurs in the forcing function that produces the reversible process environment*, and that environment sustains reversible process dynamics where no entropy production occurs. It is proposed that the cold fusion process operates according to these principles.