

Energy Conservation Law via Art

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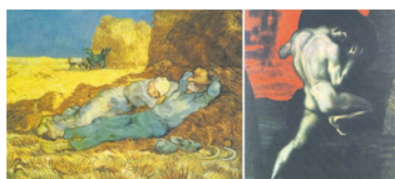
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One of the basic concepts in thermodynamics is the concept of energy. Its activation makes it possible to do work and to perform a variety of processes. The artworks in the first line demonstrate different energies the values of which are equal or greater than zero.

Two artworks demonstrate the energy of work, W : the two images of Van Gogh (1853-1890) on the left demonstrate zero work in contrast to Sisyphus seen pushing a stone up the hill in the artwork of the German artist Von Stuck (1863-1928) (Figure 1). After the stone reached the top of the hill it rolled down, and Sisyphus had to push it again. From here comes the concept of syzyfical work, namely, non-useful work.

The two trumpets demonstrate the heat energy, Q : the burning trumpet of the Belgium surrealist Rene Magritte (1898-1967) that emits heat to the surroundings due to temperature gradient is an exact demonstration of the heat energy definition. On the other hand the temperature gradient between the "flowered" trumpet and the surroundings is equal to zero, which demonstrates a situation of no heat transfer (Figure 2).

The internal energy, U , is related in thermodynamics to the internal



$W = 0$ $W > 0$
Figure 1: Energy values.



$Q = 0$ $Q > 0$
Figure 2: Heat Energy.



$U = 0$ $U > 0$
Figure 3: Internal Energy.

properties of matter and is demonstrated by the two artworks on the top right. In the right artwork by Magritte, the internal content of the dress is reflected which might demonstrate the case where $U > 0$, while the empty dress on the left demonstrates the situation where $U=0$ (Figure 3).

The first law of thermodynamics which is an energy conservation law was stated at about 1850. It is based on the Law of Conservation of Matter stating that in a closed system the total amount of energy remains unchanged. In other words, energy can be transformed from one form to the other but cannot be formed from nothing, or



sun energy is transformed to work of the farmer and so heat and internal energy of the body

Figure 4: Energy conversion.



work is transformed to potential energy

Figure 5: Potential energy.

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disappear. The above is demonstrated by the artworks on the second row. The artwork on the bottom-right is a combination of a sowing farmer by Van Gogh and woman's picture of the Polish artist Tamara de Lempica (1898-1980) (Figure 4). The radiating sun relates between the two pictures: on the right picture there is an impression that the sun's energy is transformed to work energy of the farmer, where without any intention Van Gogh brings to the attention of the reader a technological process which due to space shortage will not be explained here. On the left-hand sun energy is transformed into internal energy of the woman, thus her body is warming.

An additional example of the law is shown on the left down in the artwork of the French artist Signac (1863-1935). The woman invests work energy and increases the potential energy of the jar, namely the energy stored in it due to its position. Simultaneously she raises also the kinetic energy of the jar due to its motion. And finally, an interesting question is whether Signac painted his artwork in 1892, namely, about 40 years after the law was stated, indeed meant to demonstrate it by his artwork? To Signac answers (Figure 5).