

The Universal Law of Efficiency

Jonathan Berman, M.S.

^aMaster of Statistics, Faculty of Sciences, University of New Mexico, USA.

^bBachelor of Mathematics, Faculty of Sciences, Sonoma State University, USA.

Maryam Bibi, M.S.

^cMaster of Sciences, Department of Physics, Faculty of Sciences, University of Sialkot, Pakistan.

^dBachelor of Sciences, Department of Physics, Faculty of Sciences, University of Punjab, Pakistan.

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ABSTRACT

The laws of science are statistical statements about the nature of the universe. The Laws of science are statements about physical systems while the Universal law of Efficiency (ULE) is a statement about both physical (atoms) and non-physical systems (societies). This paper discusses a recently discovered, mathematically proven universal law that is a fundamental property of the universe and all of the laws of science. The Universal Law of Efficiency (ULE) states that "All systems function most efficiently without unnecessary resistance". Because the ULE has been proven with mathematical proof, it is an irrefutable universal law that is more immutable than the empirically derived laws of science. The ULE is unique in that it is the only universal law that has been proven using mathematical proof. The importance of ULE can be understood by its implications for human health, equality, justice, democracy, and universal peace.

1 Efficiency Theorem

The ULE has been proven by the Efficiency Theorem (ET). (citation) The ET states that all systems function most efficiently without unnecessary resistance.

The resistance that can reduce the efficiency of a system is the negative resistance. Efficient functioning is inversely proportional to the negative resistance.

$$\text{efficient functioning} \propto \frac{1}{\alpha} \text{ negative resistance} \quad (1)$$

The proof of ET uses a proof by contradiction. A proof by contradiction assumes the opposite of what one is trying to prove and shows that the assumption leads to a contradiction. (28)

The proof of the ET is as follows:

Assume that there exists some system that functions most efficiently with unnecessary resistance. But then it would not be unnecessary.

To prove ET, we assume that (1) Systems exist. (2) Systems function more or less efficiently from a frame of reference.

Before understanding the efficiency theorem, we have to understand the definitions of system, unnecessary resistance, necessary resistance, and inherent resistance. System: a set of causal relationships or causal interactions (3-4). Unnecessary resistance: resistance in a system that reduces the efficiency of a system. Necessary resistance: resistance in a system that is required for the optimal efficiency of a system. Inherent resistance: resistance in a system that cannot be eliminated from the system. Total resistance is the sum of necessary, unnecessary, and inherent resistance.

$$R_t = R_u + R_n \quad (2)$$

An example will help to demonstrate that all systems function most efficiently without unnecessary resistance and illustrate the assumptions and definitions.

Suppose someone is riding a bicycle uphill and the goal is to get up the hill as quickly and easily as possible. Putting the brakes on is unnecessary resistance. Conversely, if someone is riding a bicycle downhill toward a cliff and does not want to die, putting the brakes on is necessary resistance (1-2). The system also has inherent resistance, such as friction in the bearings. Resistance can only be classified as necessary, unnecessary, or inherent from a frame of reference.

Efficiency theorem can also be proved with the help of Constant work-time relation (29). According to Constant work-time relation

$$\text{Constant work} = \text{efficiency} * \text{time}$$

By applying the unnecessary resistance, the time taken to complete the constant work increases so efficiency of the system decreases.

In equation 1, efficient functioning/Efficiency is denoted by 'E' while negative resistance is denoted by R_n . When we proceed, there will be a constant called Berman's Constant 'B', named in honour of the eminent physicist Dr Alan Berman.

$$E = \frac{B}{R_n} \quad (3)$$

Negative resistance is the sum of unnecessary resistance and inherent resistance.

$$E = \frac{B}{R_u + R_i} \quad (4)$$

As efficiency is dimensionless quantity so it has no units (5). So Berman's constant should be a resistance. Efficiency is the ratio of output by input (18). So 'B' is the inherent resistance of the system. Inherent resistance is a constant quantity called Berman's constant. The percentage efficiency can be denoted as

$$\%E = \frac{B}{R_u + R_i} * 100\% \quad (5)$$

For all ideal systems, the unnecessary resistance is equal to zero to get 100% efficiency (19). So for an ideal system

$$R_u = 0 \quad (6)$$

From Carnot Theorem and 2nd law of thermodynamics, we came to know that ideal systems exist only in theory (20). In practice, we use real systems. For real systems, efficiency is always less than 100% or 1 (21). Efficiency is always in between 0 and 1. For real system, negative resistance is greater than the inherent resistance

$$R_n > B \quad (7)$$

So for all systems either real or ideal

$$0 > E \leq 1 \quad (8)$$

Inequality is for real systems while equality holds in ideal systems.

2 Universal law of Efficiency

The Universal Law of Efficiency (ULE) states that all systems function most efficiently without unnecessary resistance. Because the ULE has been proven with mathematical proof, it is an irrefutable universal law that is more immutable than the empirically derived laws of science. The ULE is unique in that it is the only universal law that has been proven using mathematical proof. The ULE is based on the assumptions that systems exist and that systems function more or less efficiently from a frame of reference.

Proof: ULE is true for all systems

A categorical syllogism can be used to demonstrate how the ULE applies to human beings. A categorical syllogism is an "argument consisting of exactly three categorical propositions (two premises and a conclusion) in which there appear a total of exactly three categorical terms, each of which is used exactly twice"

The syllogism that relates the ULE to human beings is as follows:

- 1) All systems function most efficiently without unnecessary resistance.
- 2) All human beings are systems.
- 3) Therefore, all human beings function most efficiently without unnecessary resistance.

The first premise is the ET. Since it was proven, it must be correct. The second premise is correct by definition. The definition of a system is "a set of connected things or parts that form a complex whole. Physiology – the human or animal body as a whole". Since the first two premises of the syllogism are true, the following conclusion must be true: All human beings function most efficiently without unnecessary resistance.

This paper distinguishes between physical systems such as atoms, as described by the laws of physics, and non-physical systems such as societies and mathematics. While the laws of physics are statements about physical systems, the ULE is a statement about both physical and non-physical systems. Although the ULE has profound implications for both physical and non-physical systems, this paper primarily discusses how the ULE applies to physical systems.

Because the law that all systems function most efficiently without unnecessary resistance has been proven with

mathematical proof, it is a universal law and it is more immutable than empirically derived laws such as the Law of Gravity (5). This is true because mathematics can prove things to a level of certainty that is unachievable using the empirical methods of science. For example, assuming the limiting assumptions of Euclidean geometry, it is impossible to empirically prove with absolute certainty that the sum of the interior angles of all triangles is 180 degrees because it is impossible to measure all of the infinitely many triangles to an infinite degree of accuracy. Mathematics however has proven it (6).

The empirical methods of science cannot absolutely guarantee that the laws of physics are exactly the same in all known corners of the universe. If there is an alternate universe there is no guarantee that the laws of physics or geometry are the same as in this universe (7-8). However, in all universes that have systems, or the possibility of having a system, the law that all systems function most efficiently without unnecessary resistance would uniformly hold.

The law that all systems function most efficiently without unnecessary resistance is a universal law because just about everything (if not everything) in the universe is a system and thus the ULE governs just about everything in the universe. The universe is a system. Atoms, bridges, human bodies, societies, governments, and religions, all are systems (9).

The laws of physics are empirically derived statistical statements about specific properties of physical systems and thus the ULE is an underlying property of all the laws of physics. Because all physical systems function most efficiently without unnecessary resistance and the ULE governs all physical systems in the universe, the ULE fundamentally determines all of the physical actions and interactions in the physical universe from subatomic particles to the motion and properties of stars.

The law that all systems function most efficiently without unnecessary resistance has profound theoretical and practical implications and represents a global paradigm shift in how we view the universe similar to Galileo's discovery that the earth orbits the Sun (10-13). Since systems exist in both classical and quantum physics, the ULE holds in both classical and quantum physics (14). The discovery that all systems function most efficiently without unnecessary resistance may change our understanding of the beginning of the universe.

Science is the study of the properties, actions, and interactions of systems. Science can be defined as the search for and study of causal relationships or causal interactions in systems (15). A system can be defined as a set of causal relationships or causal interactions (3-4). There are at least two properties that are required for the existence of both systems and science. Those two properties are change of state and causality respectively. If those two properties did not exist, systems would not exist as defined above. Moreover, if a change of state and causality did not exist, science as we know it would not exist. It is impossible for science to exist without a change of state and causality. If changes of state did not exist there would be no properties or effects for science to study and measure. If causality did not exist, nothing could be predicted. A ball thrown forward might move forward on one throw and backward on a subsequent throw. God would truly be "playing dice with the Universe" (16-17).

It is not a coincidence that both the laws of science and systems require the properties of change of state and causality. All systems require the properties of change of state and causality and science is the study of systems. Science as we know it would not exist without systems.

The laws of physics are empirically derived statistical statements about specific properties of physical systems. The laws of physics are statistical statements about the properties of the universe because of the N-body problems and the Butterfly Effect. N-body problems state that it is impossible to predict

with absolute certainty all of the motions and interactions in a complex system (18-19). The Butterfly Effect states that small perturbations in a system can have non-linear impacts on complex systems (20-21). Because the N-body problems and the Butterfly Effect make it impossible to predict all motions and interactions with absolute certainty in a complex system, the laws of physics can only be statistically determinative. There is a qualitative difference between the empirically derived statistical statements that are the laws of physics and the mathematically proven ULE.

Because the ULE governs all systems, and the laws of science are statements about systems, there is no law of science that would have the properties it does unless all systems function most efficiently without unnecessary resistance, thus following the ULE. The Law of Entropy states that systems go from higher order to disorder (22). The Law of Entropy would not have the properties it does unless all systems function most efficiently without unnecessary resistance. Einstein's Theory of Relativity is a theory about physical systems and as such (could not have the properties it posits unless all systems) tacitly assumes that all systems function most efficiently without unnecessary resistance (23). The ULE is a meta-law of all of the laws of science.

As stated above, a system can be defined as a set of causal relationships or causal interactions. Assuming only physical systems, it is clear that there are exponentially more systems in the universe than there are particles in the universe. Assume that there exists a universe with only three atoms and that the Law of Gravity applies. The atoms are labeled A, B, and C respectively. The Law of Gravity states that every particle in the universe attracts every other particle in the universe (24). Since the Law of Gravity applies in this example, the individual atoms are systems because the Law of Gravity guarantees that there are causal relationships or causal interactions within each atom. Thus, each atom is a system. In addition, each pair of atoms (AB, AC, BC) are a system, and the three atoms (ABC) are a system. It may be argued there is a minimal attraction between two particles ten light-years apart. While the attraction between two particles ten light-years apart is minimal, the Law of Gravity states that the attraction is non-zero and therefore two particles ten light-years apart are a system. Assuming no dark matter (An estimated 85% of the universe's mass is assumed to be made up of dark matter, a hypothetical kind of stuff. Because it does not seem to interfere with the electromagnetic field—that is, it does not absorb, deflect, or emit electromagnetic radiation—dark matter is referred to as "dark," making it challenging to detect), it has been estimated that there are almost 3.28×10^{80} subatomic particles in the observable universe (25-26). By this reasoning, there is an almost limitless number of systems in the universe. Given the vast number of systems in the universe, it makes sense to define the laws that govern systems.

3 Implications

The ULE has many implications for human beings and other systems. These implications include bio-mechanical, medical, and psychological applications and how we relate to one another in relationships, families, communities, and societies. It also has implications for the next step in human evolution and our view of the nature of reality.

There are innumerable instances in which removing all of the unnecessary tension from the body can be helpful. Most people are unaware of how much tension they have in their bodies, nor how their lives could improve without it. Improved physical and emotional health, clearer thinking, and more compassion for ourselves and others are some of the benefits of removing the tension, sadness, and anger from our bodies. Holding tension in the body requires energy that could be better used for other operations such as fighting disease. There are many methods to release tension such as yoga, tai chi, massage, some forms of exercise, stretching, and meditation.

The progression from optimal health to death can typically be graphed as a sigmoidal curve. Figure 1 above shows an idealized graph of the progression of a disease, assuming no intervention. In real life, the graph of a disease may not be symmetrical and the distribution of T_1 through T_4 may be unequal. T_1 represents the onset of a disease. During nascence, maintaining homeostasis does not require substantial extra energy. During T_2 the rate of growth of malignant cells increases exponentially. At this stage the body needs substantially more energy to successfully fight off a disease. During T_3 the rate of growth of malignant cells slows and the defenses of the affected part of the body are almost fully overwhelmed. By T_4 the bodily functions start to shut down and death occurs.

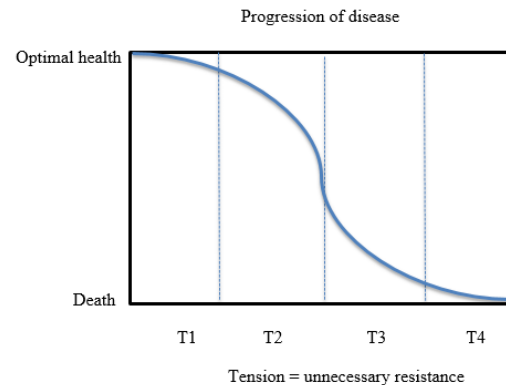


Figure 1: ULE and Health implications

There are times when treating a disease or injury may initially require the techniques of Western medicine, but by incorporating ULE methods in order to release negative emotional tension, an individual's recovery period could be shortened and the need for heavy medication could be reduced. In this way, ULE helps psychological and physical treatment plans.

The ULE applies to all systems. Since societies are systems, societies function most efficiently without unnecessary resistance. The goal of all societies, religions, and spiritual practices is to operate most efficiently from some frame of reference. While some people or organizations may concentrate purely on the betterment of a small group, enlightened self-interest suggests that working toward the betterment of the global society would most effective in creating a peaceful and cooperative world. Because the ULE is a universal law, we can all agree on its validity. Regardless of whether one is an atheist, Buddhist, Christian, Jew, or Muslim, one cannot realistically dispute the ULE. Focusing on our commonalities rather than perceived differences will bring the human race closer together.

Table 1: ULE implications

system	Unnecessary resistance	Inefficient functioning
Human beings	Tension	Leads to death
Societies	Race	Leads to war
Machines	Resistance between parts	Reduce life time

4 Conclusion

ULE is just not a statement about physical and non-physical systems but it is a universal truth about the relationship of negative resistance and efficient functioning of all the systems. By applying ULE to physical systems (atoms, robotics,

buildings, human beings etc) we can improve the efficiency of these systems, we can reduce tension in human beings and can improve their health. By applying ULE to non-physical systems (societies) we can bring human race close together. Once we understand the underlying principle of the ULE, we will soar into a better world.

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