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The Entropy of the Universe is a Constant – The Theory of Conservation of the Entropy

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Abstract: ***The entropy is a constant for our Universe. From this notion, the conservation of entropy will be established. The total entropy is a measure of total Universe's disorder or 'randomness'. The total 'orderliness' of the Universe is equal to the total entropy of the Universe. The entropy has equal and opposite 'orderliness' in the Universe. According to the second law of thermodynamics, the entropy of an isolated system is greater (or at least not smaller) at later times than it was at some earlier times. But any system is not a completely isolated system in the Universe. Even the Universe itself is not an isolated system. Any system, no matter how much isolated, interact with other systems more or less. Thus there is nothing called entirely independent system (an absolute system) but more or less all are interdependent systems. Because of the interactions with other systems, the entropy can be reduced or fluctuated at times for a particular system, which contradicts with the second law of thermodynamics. A zero is divided into one positive abstract quantity (orderliness) and equal negative quantity (entropy), no matter what procedure we adapt to measure for entropy. Total orderliness – Total entropy =0. Thus, there is nothing called order or disorder; it is purely psychological division only. But we have no other option but to analyze it within the limited psychological arena. So, the analysis will be based on some assertions of equality between two different things which are the basis of laws of physics.***

Keywords: The total entropy, total orderliness, psychological division, the second law of thermodynamics, isolated system

1. Introduction

According to the second law of thermodynamics, the entropy of an isolated system increases (or at least not decreases) with time [1, 2]. This is outstandingly true but not absolutely true as almost all the cases it is true with some but very little exceptions [3, 4]. The exceptions exist because all isolated systems are apparently isolated but not absolutely isolated [5, 6]. The system of concern of entropy interacts with the other systems to give and take order states [7, 8]. If the system (of concern) gives order [9], it attains lower order. We call it increase of entropy. If the system receives order, it attains higher order [10]; we call it decrease of entropy [11]. The laws of physics are basically based on assertion of equality between two different things. For example, the law of conservation of electric charge, of momentum, of total angular momentum [12, 13], Einstein's famous law as follows,

$$E = mC^2 \quad (1)$$

It asserts equality again of mass with energy, where the energy of a system is equal to the mass of the system multiplied by the square of the speed of the light. However, the second law of thermodynamics is not equality, but an inequality [14, 15].

2. Total Entropy of the Universe

The total entropy of the Universe is always a constant. The analysis of the early Universe predicts that the Universe was of zero size during the Big Bang with infinite density in it [16, 17]. The Big Bang Universe was in super order with equal amount of entropy in it. But the super order was explicit property of the Big Bang Universe, while the entropy was implicit property of it. The equal and opposite amount of entropy was present in the Big Bang Universe with respect to the super order of the early Universe. The enormous high entropy made the Universe to explode and as time progresses, the entropy is becoming more and more explicit as the super order contributing orderliness and stability of atom to become implicit, it is also contributing in space to be highly stable. Because the Universe is expanding, the orderliness is becoming more and more implicit to make extended space highly stable due to expansion of space in the Universe. Which allows the entropy to be more and more explicit, thus the entropy increases with time for any isolated system although the total entropy of the Universe is a constant – the theory of conservation of entropy.

3. On the Momentum of the Universe

The conservation of momentum predicts that the total amount of momentum of the Universe is a constant [18, 19]. It predicts that the speed of the zero sized Big Bang Universe had a very high speed to keep the momentum constant. After Big Bang, the Universe was in an inflationary phase [20] due to very high momentum of a small volume of the early Universe. In that phase the Universe was expanding in a very rapid rate. As the present state of the Universe has expanded enough, it is gradually slowing down to keep the momentum constant. This is the reason that the Universe is now expanding in a critical rate just to avoid collapse again. Nevertheless, the Universe is slowing down gradually to keep the conservation of momentum. The further the galaxy from us, it seems moving apart faster because the further the galaxy, the earlier states of the galaxy we see in time scale. The earlier the time, the higher the speed is of the galaxy because the Universe is slowing down.

4. On the Heat Energy of the Universe

The conservation of heat predicts that the total amount of heat of the Universe is a constant [21, 22]. It predicts that the Big bang Universe was super-hot because the total amount of heat is a constant and that heat was in a small area.

Because the Universe is expanding, the total amount of constant heat is roughly evenly distributed in the Universe. This is the reason the Universe is cooling down to become a cold, dark, boring place with background radiation that can heat up to three degree above absolute zero. Thus, the Universe is cooling down as the Universe is expanding to keep the conservation of heat energy.

5. On the Forward Arrow of Time of the Universe

As the total orderliness of the Universe is becoming more and more implicit and entropy is becoming more and more explicit, we see the entropy increases with time for any system in a general sense. The process that contains gradual decrease of orderliness and gradual increase of entropy is nothing but the forward arrow of time. As long as this process exists, the Universe will expand, the heat energy will decrease, the Universe will further slowdown, and there will be forward time arrow. Thus, it will look natural that an egg is rolling off a table, falling to the ground, and smashing. The reverse does not hold natural because it will never happen as long as entropy increases with time.

6. On the Reverse Time Arrow

If the orderliness of the Universe will be increasing and the entropy will be decreasing, the Universe will contract; the Universe will be hotter, the Universe will move faster, there will be time reversal of the forward time arrow as the total orderliness of the Universe will be more and more explicit and the entropy will be more and more implicit, we will see the entropy decrease with time for any system in a general sense [23, 24]. The process that contains gradual increase of orderliness and gradual decrease of entropy is nothing but reverse arrow of time. Then it will be natural that the egg is miraculously assembling, and it will be natural phenomena.

7. Why the Second Law of Thermodynamics is not Absolutely True

According to the second law of thermodynamics [25], the entropy increases with time for a closed isolated system. It is a general true for most of the system but not absolutely true, because some systems exist which have entropy that decreases with time. For example, we sleep to get higher order of thought process, thus entropy decreases in human brain while sleeping, although temporarily. It is because that nothing is a total isolated system. There is give and take of order with other systems with interactions. Although, throughout life, entropy will increase, but there are momentary fluctuations of entropy on day to day basis of human beings. Thus, at times, the entropy does decrease which is momentary violation of the second law of thermodynamics.

8. Conclusion

The second law of thermodynamics is valid because, the Universe is behaving like this to make gradual decease of orderliness to make it more and more implicit and gradual increase of entropy to make it more and more explicit although total amount of entropy of the Universe is a constant. The forward time arrow will exist as long as this process exists followed by Universe expansion, heat reduction. Thus, it is the natural behavior of the Universe, as it is behaving now. The reverse time arrow equally probable provided the orderliness increases and entropy decreases. Thus the conservation of entropy is established.

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References

[1] Roger P (2011), Cycles of Time, Vintage Books, London, pp. 1-24.
[2] Hawking S. (2011), A Briefer History of Time, Bantam Books, London, pp. 1-49.
[3] Hawking S. (2013), Black holes and Baby Universes and other essays, Bantam Press, London, ISBN 978-0-553-40663-4
[4] Hawking S. (2011), The Grand Design, Bantam Books, London.
[5] Hawking S. (2011), A Brief History of Time, Bantam Books, London, pp. 156-157. ISBN-978-0-553-10953-5
[6] Hawking S. (2013), The Universe in a Nutshell, Bantam Press, London, pp. 58-61, 63, 82-85, 90-94, 99, 196. ISBN 0-553-80202-X
[7] Hawking S. (2001), The Beginning of Time, A Lecture.
[8] Hawking S. (2000), Stephen Hawking's Universe: Strange Stuff Explained, PBS site on imaginary time.
[9] Gerald D. Mahan, "Many-Particle Physics", Third Edition, Springer.
[10] Uno Ingard K. (1999), Fundamental of Waves & oscillations", Cambridge University Press. P. 38, ISBN-0-521-33957-XOxford: The British Academy.
[11] Zee A. (2003), Quantum Field Theory in a Nutshell, Princeton University Press.
[12] McCall S. (1994), A Model of the Universe, Oxford: Clarendon Press.
[13] Callender C. (2002), Time, Reality and Experience, Cambridge, UK: Cambridge University Press.
[14] Callender C. (2002), Thermodynamic Asymmetry in Time, The Stanford Encyclopedia of Philosophy.
[15] McCall S. (1994), A Model of the Universe, Oxford: Clarendon Press.
[16] Poidevin R. and McBeath M. (1993), The Philosophy of Time, Oxford: Oxford University Press.
[17] Newton-Smith W.H. (1980), The Structure of Time. London: Routledge & Kegan Paul.
[18] Dainton B. (2001), Time and Space, Ithaca: McGill-Queen's University Press.
[19] Poidevin R. (1998), Questions of Time and Tense, Oxford: Oxford University Press.

[20] Nerhlich, G. (1994), What Space-time Explains, Cambridge: Cambridge University Press.
[21] Lawrence S. (1974), Space, Time, and Space-time, CA: University of California Press.
[22] Whitrow, G. (1980), The Natural Philosophy of time. Oxford: Oxford University Press, 2nd edn.
[23] Smart, J. J. C. (1964), Problems of Space and Time, London: Macmillan.
[24] Hawking S. (2011), A stubbornly persistent illusion- The essential scientific works of Albert Einstein, Running Press Book Publishers, Philadelphia, London.
[25] William L.C. (2001), Time and the Metaphysics of Relativity, Dordrecht: Kluwer Academic Publisher.

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