

Questions for Discussion Split 23-28/08/2021

1]- An alternative definition of Entropy

$$\int dx f(x, t) = 1$$

$$S(t) = -k \int dx f(x, t) \ln f(x, t)$$

Consistent in equilibrium but constant in time (for Hamiltonian mechanics)...

2]- From Ben Naim in Wikipedia

i) First, there is no relationship between either entropy or the [second law of thermodynamics](#) and the so called [arrow of time](#). This false association between the Second Law and [time](#) was first suggested by [Arthur Eddington](#). Also the Boltzmann's [H-Theorem](#) is not about the time dependence of the entropy, but the time dependence of the Shannon's measure of information. In this respect Boltzmann erred in interpreting his (-)H function as entropy.

ii) Second, the application of the concept of entropy to the entire universe is unwarranted. This association has its origin in [Clausius'](#) statement that the entropy of the World always increases. Clausius, who is credited for the formulation of the second law, did not and could not understand the molecular interpretation of entropy. Unfortunately, the application of the concept of entropy to the entire universe features in many textbooks and in popular science books. This erroneous application is discussed in great detail in Ben-Naim's recent books: *The Briefest History of Time, Entropy, the Truth the whole Truth and nothing but the Truth*, and in *Information, Entropy, Life and the Universe*.

iii) Third, the application of entropy and the Second Law to living organisms is totally unwarranted. The most famous statement about entropy and life was made by [Erwin Schrödinger](#), in his book *What is Life?*. In this book, Schrödinger not only discusses entropy and life and associates entropy with disorder, he also "invents" the concept of "negative entropy," which was later renamed [negentropy](#) by [Léon Brillouin](#). This erroneous application is further discussed in Ben-Naim's books.