

Addendum' to the Article: 'A Phenomenological Relation for Decay Times'

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When consistently considering the existence of such a principle of least action, or in other words, '**The Smallest Space Action**', several important unanswered questions in physics acquire a much more plausible explanation:

The first, and perhaps the main point, is the discrepancy between the mass of the discovered Higgs boson and the 10 to the power of 17 heavier predefined particle or the Planck mass. In fact, if I add the Higgs particle to the top of the list under 'particles' in Table 1 (page 154 of my article), with the decay time of ten to the power of minus 22 sec., I note that I require precisely the Planck mass here (ten to the power of 26 $h/2\pi$), as the particle that causes the decay of the Higgs boson (within the principle of least action).

This would also be the answer to the hierarchy question.

Other points are:

The reason for the existence of a specific **quantisation** in nature, and therefore the reason why particles have the mass they have.

The existence of the fundamental constants of nature (or independent free parameters) that are not prescribed by any theory: i.e., the question of how we can adjust the standard model in such a manner that **fine-tuning** is no longer necessary. The 'Smallest Space Action' could form the necessary mathematical pattern, with which the 'Standard model' should also comply.

The existence of '**entanglement**' and 'quantum communication' becomes more obvious, because particles in a state of entanglement (or that have been entangled) must also continue to comply with the (regularity of the) 'Smallest Space Action' together, as a group. Quantum communication cannot only depend on a mechanism that is incorporated in each particle, but must have something to do with a mechanism (or effect) that is spread over the entire universe. The 'Smallest Space Action' could be considered to be such a mechanism, as decay can take place every time the principle of least action (or the Smallest Space Action) has been met. This also applies to particles that decay in cascade. But the same also applies to the '**tunnel effect**' and to the concept of '**strangeness**'. The space that must be bridged plays an essential role each time, or, therefore, the space that is available to the particle that causes the decay is of crucial importance.

This sheds new light on the existence of '**isospin partners**'. During the decay of the hydrogen atom, in which the electron is the particle that causes the decay, a virtual particle is created during the decay time, and this particle corresponds to an electron neutrino, i.e., the isospin partner of the electron. During the decay of the Higgs particle, on the other hand, we find that, within the realisation of the Smallest Space Action, the Planck mass is required to cause the decay. In the meantime, a virtual particle that corresponds to the electron is created during the very short decay time!

The necessity for the existence of the 4-dimensional (virtual particles) or '**instantons**' in the 'Standard model' thereby gains more interpretation. In the description of the interactions between elementary particles, there are still many significant phenomena that are currently not fully understood. The phenomenon of 'quark interlocking', i.e. quarks that cannot be separated from each other, is known within the standard model, for example. Many physicists believe that instantons form the key to the solution of this mystery. Instantons are elusive in the conventional approach to quantum physics, however. Edward Frenkel postulated a new approach, in the hope of better understanding the powerful effects of instantons: 'Idealized interacting theory in which the instantons are present from the beginning' / Instantons as special solutions of the theory minimizing the action' and his 'Instantons Beyond Topological Theory I' article. It may be said to be particularly remarkable, however, that the above-mentioned 'Smallest Space Action' can be considered to be a four-dimensional virtual particle that links all quantum mechanical events together.

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It is known that **'enzymes'** are among the most indispensable elements required for life. But there is also no doubt that the **quantum tunnel effect** plays a major role in the functioning of enzymes. This quality is said to be due to the wave particle duality: thanks to their wave properties, electrons and protons are able to seep through an energy barrier (an insurmountable area of space) into enzymes. Any vital activity is, in fact, accelerated by enzymes, whereby the extraordinary catalytic power arises from the ability to align (choreograph) the movements of fundamental particles to each other. In my opinion, this possibility is due to the existence of the 'Smallest Space Action', in other words, suitable space plays a very specific role. As soon as this is met, both the tunnel effect and the catalytic action can continue. In fact, this also applies to the formation of chlorophyll during photosynthesis.

The problems encountered regarding **'dark matter' and 'dark energy'** thereby appear in a different light: kinetic energy (relative to the speed of light) is actually affecting space contraction itself (and not mass).

One of the major mysteries remains the mechanism that drives **consciousness**. A conscious system cannot consist of virtually independent parts, however. The proposed principle of least action, or Smallest Space Action, can be seen as a mechanism that really links everything to everything, and this across time. It may therefore lie at the basis of the phenomenon of consciousness, and to the fact that we can assign a meaning and sense to things and events.