11. Entropy and Complexity

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One of the most impressing things, here on Earth, is the degree of complexity matter has reached by itself. Although it is possible that higher life forms are normal in the universe and this universe may be particularly predestined for life, we do not know of any other planet with simple or more highly developed life. So far we do not receive any other signals of foreign intelligence from outer space. Nothing indicates that life is widespread. But even for the case that we are the only ones, the physical laws by which we describe the world must be designed so that higher life is also possible, even if the probability therefor is extreme small.

But is that really the case? Do our basic laws of physics and our knowledge on the structure of matter really include the possibility that simple basic elements can lead to more complicated connections? Connections, that networks more and more by itself, which can grow to even larger and more complex forms? Connections which come to life, which achieve immense interconnections and nevertheless retain control over the individual pieces? For us, the sum of the individual components seems to form a unit, which conveys consciousness and intelligence. As if we are just one closed ego.

We believe that the laws of physics are not doing like this.

The physical laws are not complete. Although Newton´s Mechanics, together with the natural constants, creates the basic conditions that also apply to higher forms of life, they alone are not sufficient to initialize a movement that makes matter itself more and more complex. What is missing is an impulse-giving moment that drives the process forward. The conditions for a further development to the higher, in general, can be extremely favorable and yet matter will always run only like a computer program.

Matter will precisely do the compounds and reactions that are possible. But without any interest in making it to something more than an ordinary process. Without an intrinsic need of matter itself to evolve, the state of the connections always stays exactly where it is. Why should molecules, microbes or simple cells combine just because they can? Why should they

want to develop further if no external impulse is anchored in the system? Only because conditions are favorable could other more complicated forms occur. But if this happens only in an irrelevant way, if no inner impulse pushes the development forward, not the maximum, but only the maximum ordinary will occur. If the conditions change a little, then the fragile structures dissolve immediately, without any regret. The only thing that then remains as an explanatory pattern is that of the multiverses. After that, if there is a possibility to come to life, it will happen in one of billions of Universes.

But we do not believe that this would be possible at all, even with infinitely many universes, if the laws are exactly as they are assumed at the moment. If we simply hammer on the keyboard without thinking, we would never get a thriller.

The laws of the smallest are determined by quantum mechanics. It describes the world of particles as purely statistically and independently. As if each single particle has a freedom and each particle were individual and almost alive. The position, or the further behavior, can only be determined with certain accuracy at the same time.

It is impossible to observe a particle without changing it and influencing its course. Quantum mechanics gives the individual object its freedom back. But it makes no statement about large interconnected particle systems and whether this could result in more than just sober compounds that react separately to each other. Their strength lies in the description of individual particles and not in the question, whether in the connections lies more than the ordinary.

If at all the only theory in physics that occupies with order systems is the thermodynamics, also a statistical description of matter. Here too, we are dealing with an unmanageable number of individual objects, in which we hope that they behave as it the mathematical theories of statistic pretend.

Thermodynamics introduces the concept of entropy, which deals with the possibilities of states in a closed system. According to this, energy is also released when the number of possible states can be increased in a system consisting of many microsystems. A closed system always decides spontaneously to increase the number of possibilities, never to reduce them. In addition to energy conservation, entropy increase is the second major law of thermodynamics that has universal

significance. All other disciplines must subordinate themselves to this.

This means that spontaneously in a closed system, without energy supply, entropy cannot decrease in order to assume higher structures. However, in an open system with energy supply, locally higher order structures can result and more stable, higher levels can be achieved if entropy increases overall. Physics has thus exhausted its statements on life. It can be realized locally if there is an energy source and entropy as a whole increases.

In principle, it also seems to work in the same way on our Earth. We are in the energy stream of the sun, which produces gigantic amounts of entropy, so that a small destruction of entropy is not noticeable at all. But only because something is possible, will it also happen? Will the conditions on Earth change automatically to a higher level if they are able to do so?

That is the question. If it is only a matter of simple connections, like a toy car blown by the wind onto a hill and thus reaching a higher level, then this can happen spontaneously and also happens. The play of possibilities can very well be influenced under certain conditions and in this way take on higher order structures. But does this also go as far as living, highly complex structures with a division of labor, for which death is not indifferent and which always want to develop further? Are only large quantities of energy and an open system sufficient for this?

If particles really only behave as physics allows them to behave, then there would never have been any living structures of higher life. It is impossible that even with any available time, huge particle collections, which only move sluggishly according to Newton´s laws and react with Action equal Reaction like billiard balls with each other, would have developed complexity. Even not, if one would still use the four basic forces and the laws of conservation and extremely fine-tuned natural constants. Isolated particles interacting with each other are not evolving into complex networks. Networks are created through networking and networks that develop further must as a minimal driving force know, who was connected to whom and when. There must be something like competition or a community that belongs together. One needs a kind of storage of the connections, which are redeemed again

and again at certain times. Gravity creates very efficient conditions for large particle accumulations from distant regions. Via the electrical charges, enormous structures and links can develops. And even atomic nuclei can be connected in the stars via the strong interaction force to stable compounds. However, these are always only huge accumulations of similarly arranged particles, which are caused by the external boundary conditions. The external pressure leads to long connections of very many particles, which stand only in a trivial way to each other. It never is more than a mathematical game of coincidence, which can be from the now.

But if atoms are not only arranged next to each other, held by the interaction forces, but if each compound is stored, if the particles somehow remember with whom they had contact, then there is for each individual particle its own selection to other particles. Which ones belong to their network and which ones they have never been connected to, regardless of the external force imposed on them. A second level of cross-linking which is also their inertia and which does not allow the particles to rest. This second, much more far-reaching and comprehensive network, which does not reveal any obvious order structure is, if at all, one that has a tendency towards complexity. That at any price, if the conditions are favorable, will try to reach the highest possible level in order to find stability against external fluctuations. It is what is recorded in the information field. The information about who got together with whom and when. This kind of connection can go beyond the ordinary.

The Big Bang creates entropy. It creates huge amounts of entropy, just because space opens up tremendously. During inflation, it literally explodes. This means that the number of possible states increases dramatically and the particles spontaneously accept the possibilities. But the Big Bang model offers no possibility for complexity. It creates large ordered structures, an accumulation of the many. But the objects in it have too little to do with each other, they only react to each other. Space exists independently of the particles and the particles each react individually. Each particle in itself is almost statistically free, almost as if it were individual, but not communal. Gravity and charge create concentrations of masses and particles, but they do not create a selection of specific, cross-linked particles among themselves.

Both models are open models, but there will probably be no turning back in the Big Bang model. As long as entropy increases overall in both models, we also have a clear forward direction of the time axis. That, however, by irreversibility is also a symmetry break. In our model, the universe is supposed to be self-contained and at some point it should be reverse in a way that all the original positions of the particles have to be taken up again in order, to be able to erase itself with the opposite particle. We thus have a reversal of entropy as a whole. At some point it will decrease again instead of permanently increasing and thus cause a reversal of the time direction. Everything that has been going on until now will be reversed and taken back. In addition, all possibilities were and are never exhausted, but by saving a selection are always made, which can later be undone. Thus the rapidly exploding number of possibilities is limited to what is feasible and what has been realized.

Whether a basic structure, in which the particles memorize themselves through the shift of planes and the interplay with the whole with whom they had contact, is sufficient to be able to develop and explain higher stages of development, is not sure. But networking the parts with each other is a basic prerequisite for something higher. Without there being an inner effort of the particles themselves to always want to develop further, even under the best conditions one could wait forever for something to happen.

Until now, entropy has only been used to determine that the statistics of possible states change. This means that higher, ordered states can spontaneously only decrease in closed systems. What seems to have no meaning in this is that as entropy increases, we gain more diverse arrangements. Precisely because the number of the unknown possible increases so much, we can usually only describe the system statistically. Although no unknown energy or free basic size was added we lose our original state of order, but we gain an increasing exchange of particles among each other. In our model these contacts should not only be local short events, which refer exclusively to the two exchanging bodies. Although, as said no unknown energy or free basic size was added.

Physics should not be limited to the classical, to receive impulse and energy and beyond that to fulfill their quantum mechanical states but otherwise to be free. In the present

understanding, the universe seems to be subject only to a mathematical statistic, which by the increase of the entropy gives time a direction, which is irreversible. On the other hand, according to our ideas, space is self-contained. Every movement in it is deterministically fixed. It is supposed to contract again sometime and thus reverse the entropy process. The particles will then no longer exchange each other and store tiny energy impulses, but all packages will be returned. The stored compounds are dissolved. This causes the layers to move away from each other again, resulting in reversed movements. So, gravity becomes repulsive and this in the course of time from inside to outside. The particles gradually break down their network again and approach slowly over the billions of years to its origin places. They actually seek out their original order structure again, thus destroying all entropy ever created at the expense of networking and complexity. This happens until the particles at the edge meet again the corresponding opposite particles inside and destroy each other. Not only does a particle meet its associated antiparticle again and energy remains, no, nothing remains during this extinction process, the energy also disappears again. Now it is a real annihilation process.

Order states and networking belong together. An order scheme that is abandoned can only achieve this with increasing networking. Networking itself does not yet have any additional value, but large networked systems can develop into a higher complexity. This too is not yet a value in itself. If, however, we place a value in our forward-looking time axis that strives for connection, then complexity, as long as the time arrow points forward, has a higher value than the simple disordered isolated. Our future is then complexity and is the interwoven patterns of order. As long as we strive for a future, everything is woven through by networking. So that matter intrinsically tries to reach higher levels of complexity. And this then applies to every single particle. The individual particle wants to combine, wants to develop into increasingly complex patterns with others. It will do so immediately when the opportunity presents itself. The increase in entropy is still the great antagonist that prevents matter from complicating itself, but at the same time the density of cross-linking increases with entropy. If by chance the conditions should be locally favorable somewhere, matter will not only behave indifferently, statistically randomly, but out

of itself will further connect with others in the best possible way.

The conditions to let network become intelligent are probably only rudimentary. We have the increasing cross-linking density, the storage of the contacts and an outer evaluation system, however in connection with incredible times and numbers of particles, complex systems up to conscious thinking humans could result.

As long as the universe enlarges, time moves forward, entropy increases with increasing interconnectedness. If time reverses at some point, the entropy decreases accordingly. Then, all connections dissolve again, bit by bit. It is possible, that the ratio of the decrease of the state of order and the increase of the cross-linking is constant. And the energy, which is drawn from entropy and which seemed to be lost to us statistically, is being used in the increasing network, is stored. It can be processed again from the inside until the particle is back in its original state at the end.

It is also possible that in this interaction of increasing ignorance and disorder on the one hand and increasing cross-linking on the other hand, viewed over time, there is an optimum. Too many ordered structures mean standstill and too many networked connections mean chaos. Then we are with our earth temporally perhaps just exactly in the range of the optimum.