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What is life?

Abstract

This article deals with the phenomenon of life, and shows how a different approach can change all that we know about it. Making the simplest and most objective assumption that the difference between earth and other planets is just that there is a huge number of chemical reactions near the surface of earth (even a stone travelling in the universe can admit that, because life means nothing for the stone). These chemical reactions, although partially (organism per organism) they seem to have self-sustaining and self-organizing properties that violate the laws of thermodynamics, when they are seen as a whole, they seem to be more random, and not violating the laws of thermodynamics. This is very difficult for a person to realize (especially if you are living in big cities), because we see things from inside the whole system, and so it is very difficult to judge objectively what is life.

article

When somebody is studying the phenomenon of viruses, he can see that when viruses are not coming in contact with a host organism, they are a sum of chemical compounds that do not fulfill the criteria to be considered as life. While on the other hand they start reacting with a host, or in other words they start making chemical reactions with the compounds of the host, they become alive. The same thing happens with prions, which are proteinaceous compounds that while they react with proteins of the host, they become alive in a way.....

Let's hypothesize that we make the hypothesis that: No living organism is possible to remain unchanged structurally. Let's hypothesize that this rule is principal in nature and nothing could go beyond it or prove that it is untrue.

What would that mean to the way that we see the world?

First of all let's make clear what we mean: An organism that would remain unchanged structurally during a very small period of time, would be considered as not living for that period. When we say unchanged we mean of course that there are not taking place chemical reactions inside it. Maybe there is a single cell inside an organism that is unchanged, but the rest of the cells are changing. We say then that this organism has a dead cell, but the organism as a whole is alive. Maybe this cell would be able to regain life if it reacts with the appropriate signals. But maybe not.

If we want to see the consequences of our hypothesis in the nature we meet the question: what is the least that can be considered as life? For example, a mitochondrion can be considered life according to what we said, but a simple chemical molecule cannot, unless it reacts with another molecule or substance. At the moment of the reaction these two substances are the least that is considered life. So, a simple chemical reaction as long as it happens, is the simplest form of

life, or else, the sparkle of life. That means that the superior organisms as well as all the organism is a summation of chemical reactions.

The advantages of the hypothesis that we made is that we can explain successfully the prions and the viruses.

Another important consequence of the hypothesis is this: Living creatures are the sum of their chemical reactions as we said. While they are getting older, they are suffering a process that is called aging. They are changing especially structurally. Obviously they are getting different. That means that the chemical reactions that are composing their body, are different from that that were before. If the chemical reactions were remaining unchanged forever, then the body would be the same, and that means that the body would stay forever young and forever alive.

Lets see now a simple chemical reaction  $A+B \rightarrow C+D$ . Lets consider that C and D are gases and are expelled from the place of the reaction. The quantity of A and B will get lesser and lesser because they are becoming C and D, Or else they are suffering a chemical transformation.

Lets see now another chemical reaction:  $A+B \rightarrow C+D \rightarrow E+F$

Lets consider that E and F are gasses. That means that the quantities of A, B, C, D will be lowering unless we put in the mixture exactly the quantities of A and B that is being transformed into C and D every moment. So there is an exact amount, as well as exact rhythm of adding A and B that would keep the reaction unchangeable. Lets consider now a very simple organism that is composed from the reactions:  $A+B \rightarrow C+D \rightarrow E+F \dots \rightarrow Y+Z$ . Lets say that A and B are food supplements and Y and Z are compounds expelled from the organism. Of course the real organisms are much more complicated. If that organism eat theoretically a certain amount of food in a certain way, then the reactions of this organism would remained the same forever. [C, D, E, F, ..... are all compounds of the organism.]. If we didn't give the exact food, then the reaction would change, dependently on the how far we are from that ideal food. In the same manner we can say that all living organisms are a sum of chemical reactions that start with digestion, and end with the waste products of metabolism.

As a result we can say that in a theoretical basis, if an organism eated exactly a certain amount, quality and quantity of foods in a certain way, then it could prevent the changing of its reactions and as a result it could prevent the aging process, expanding its lifespan. Of course this is something very difficult to happen in real life because there are numerous things that plays their role and of course things are not that simple.

One important clue that suggests that what we said is true, is the recent discovery that living organisms that follow a calorie restricted diet, can expand their lifetime, in some cases as long as 60 per cent. This is not a proof that what we said is true, but it is positive to find that the changing of caloric menu has as a result a change in the lifespan. Perhaps a certain diet causes an ever greater expansion. It remains to be proved.....

As we said, living organisms are a summation of chemical reactions. What happens now when they die? There is a disorder in a system of reactions (for example brain necrosis, which means that in a large number of neural cells there is a stop in the reactions that happen there) that lead in a chain reaction way to a disorder in other reactions and then in others and so on. The final result is that there is a necrosis in the whole body, in a chain reaction way.

What is the difference between a man that is alive and a man that is dead? In both cases the body is consisted from the same elements and compounds. But in the first case these compounds are reacting with each other and the structure of the body changes every moment. In the second case the chemical reactions of the body are lead to an equilibrium and so the composition of the body remains unchanged. The structure of a dead man cannot change if there are not microorganisms in its environment.

The new hypothesis also assumes that life existed before the first cell, in the form of chemical reaction.

Scientists have accepted that life was originated from a single cell, which was the first cell on earth, and composed the first thing that was a form of life. The evolution of this cell had as a result the formation of life the way that we know and see today. A problem with this idea is that, as we know, if we had just a single cell in earth right now, and out of it there was nothing, then not only this would not lead to the formation of more complicated forms of life, but this single cell soon would be dead. Despite of that, most scientists accept the single cell theory. The new theory that we introduced claims that it was not necessary to be a first single cell to start the evolutionary process that would lead to life as we know it today, but says that life preexisted, because even a single chemical reaction is a form of life. The creation of the first cell actually is the result of the existence of life.

Lets see now another problem: In the beginning, life on earth was simpler than today. That means that there was a system of chemical reactions that gave its place to a more complicated one. This sounds a bit strange because if a system of chemical reactions does not get energy from outside, leads to an equilibrium state. If we accept that our new theory is true, means that there had to be an external source of energy {probably the large quantities of energy that comes everyday on earth from the light of the sun that lead not only to the survival of the first forms of life, but also in their evolution.

Imagine that with the help of a source of light we cultivate in a way, some chemical reactions in a small place. After a period of time, they are getting more and more complicated. Lets hypothesize that someday the whole system becomes extremely complicated. We could not see nothing more but a mixture of colours and shapes. This is life. But human is a part of this complicated system which means that he sees things in a mirror like way, because he is in the system. So it is very difficult for him to see life in an objective way, because he is running inside the whole system. It is clear from this point of view that nature does not promote a certain form of life, but what we see, is the result of the sum of the reactions that happened through history. The complex organic compounds that are composing living creatures probably are the results of many years of

reactions, or else they are the fingerprints of the reactions from the beginning of all the reactions till today

The property of reproduction in living beings that are chemical reactions seems to actually be a result of the energy that forces the chemical reactions to continue happening. Life continues because chemical reactions continue. We, as an internal part of this system, see this as regeneration of the creatures, but it's only because we are running inside the system. Reproduction seems to be one of the most ancient properties.

#### The relativity of entropy

What happens with the entropy of living systems that are chemical reactions? The energy that comes externally on earth in the form of light could explain the lowering of entropy. However, if in the beginning there were 2 or 3 reactions and after a while there are more and more, and more complicated, seems that the entropy of the whole living system on earth or else nature, is raising. But remember that previously we said that human is not a neutral observer of things, but he is changing together with the system. This confuses him. What impact has that? It means that if human's entropy is raising slower than the whole living nature's entropy, he will think that his entropy is lowering. It's something like relativity of motion. One example is this: Imagine a large number of birds that are flying one next to the other to the same direction. If we tell them to fly one far from the other, so the group will start separating, the entropy of the system will start raising. Imagine also that there are three birds that are very close to each other, somewhere in the group. If they separate with less speed than the others and we consider these 3 birds as a system, the system's entropy will actually lower relatively with the whole system of the birds.

Living organisms normally are not dying because the chemical reactions that are composing them are continuing happening. If we analyze all these reactions we will have a very good view to their homeostasis and the way they sustain themselves. As we said we are seeing the world from the inside, or else in a mirror-like direction, because we ourselves are part of things, so we appreciate things from its results. We think that homeostasis and self-sustainability is a very magical and perfect mechanism, because we are the result of homeostasis, but the theory that we analyzed says that homeostasis simply is the catalogue of the chemical reactions that are still happening, and just because they keep happening, the organism is alive.

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Lets come now to the position to answer if the spores that some microorganisms forms(e.g. cryptobiosis,anhydrobiosis etc) are living forms.If their metabolism is not zero, if it exists but it cant be detected because it is so weak, then they don't differ in anything from the other organisms.If their metabolism is absolute zero, then the answer gets more complicated.The fact is that it doesnt matter what it is, because the question is useless.Life as we see it is simply the result of the chemical reactions on earth.As we said ,we are part of the system and we dont realize it, but if we were alien forms of life for example, and we were watching the earth from outer space, then we would see only a very complicated network of reactions that are becoming more and more complicated because of the energy of light.This system would have different structural forms, colours, etc.So, what happens with the spores is that because they face very unfriendly conditions ,the certain chemical reactions stop happening or they are lowering their rate.According to our definition, they are not life, but what is life?Life seems to be more an invention of us,or else a term that we use to describe anything that looks like us.There is not such a thing as life, its an illusion.An organism is the reactions that we see, and we think they are something amazing because we see them separately from all the other reactions that are happening in the world.We judge them from their result, which is that they become like us.We are a part of the reactions that are happening as well, and while we see organisms that look like us, we think they are independent creatures, but actually they cant be separated from the whole soup of reactions.The spores are becoming as they were before because their reactions start happening, and they start looking like us.There is not such a thing as homeostasis.So the existence of their reaction gives the illusion that we called life.

Of course, when we are talking about chains of chemical reactions, we do not mean it in the simplistic way, that they are in a chain, and everything is happening in an order, where the formed substance goes to the next position to react with the next substrate etc. Things in nature are much more random, and it is difficult sometimes for us to detect which is the next step.One of the major difficulties are some passive phenomena that happen, such as plasma flow, passive diffusion through membranes because of differences in concentration, or electrical gradients, excretion throught ducts, etc.The latter are phenomena that happen passively ,due to the laws of nature and are not defining life, the way the chemical reactions do. To be more symbolical, they play the role that scientists play in a chemical lab:they transfer the substances from one tube to another, arrange the conditions, etc.But the chemical reactions are the big difference. Of course , if these movements that we are talking about were not there, we would not be the way we are.We are the results of all these , and so it is normal to think that if something was not the way it is, WE would not be there, the way we are!So we think that they are essential for us and everything was arranged perfectly, and if something was a bit different ,we would not be there, but as i told everything depends on who is the observer.We are a changing complex, and everything that happens lead to us.We see things from the opposite side though.It is like we are in a moving ship, and so we realize things differently from someone who is standing in the port.Most of all we dont have a good sence of our

own movement. If we were not in the living system, we would not find any reasoning for all the creatures on earth. Even if we were tables for example, we would think that the most perfect creatures are the tables. All depends on what is the observer.

In this point, someone would ask: Why are the forms of life the way they are today? In other words, what gave them their shape, and their characteristics? How can simple reactions lead to the complicated forms we see today? The answer is that the forms we see today are the result of what had happened, so we (the results), see ourselves as the most capable to survive, which is true, because that's what happened. One way or another, the results (the final reactions) survived a procedure, and so, for their own eyes, they are the most capable to survive. Every single characteristic has its meaning. This is true not only for characteristics of the body, but also for properties such as calculations, moving, spatial ability, travelling, etc. The fact that we went to the moon, has a meaning only because we are human, but we achieved so accurate calculations and went there as a result of our surviving ability.

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