This is excerpt, a chapter, from my essay "I am 80 to-day" (the only chapter with pieces of fantasy, but the fantasy I believe). I would like to state that all my knowledge on the life of cells I used inside is from my discussions with my friend, Professor of Medicine Elena (Lena) Vladimirskaya.

LIFE and CONSCIOUSNESS

Whatever I had chance to recently read on cells leads me to the following (conjectural) principle:

LIFE = CONSCIOUSNESS

(i.e., there is no living object that does not have its own understanding/consciousness).

Of course, consciousness of a specific form of life may be drastically different from what our consciousness may imagine. A lot of parameters influence it. Say, the period (timing) of the life (from possible minutes till hundreds of years, or even much longer); the level of independence (from being a cell of multicellular body, or a life in a large community, to relatively individual life); the level of dependence on other kind of living being; the form and way of multiplying themselves, i.e., reproduction; and many many other parameters.

But consciousness may also "get elevated" growing into a "consciousness of a city" or "consciousness of a country", also, a consciousness of some group of individuals. (During my time in Israel I observed that the consciousness of the Department of Mathematics of Hebrew University in Jerusalem is very different from the consciousness of its many individual members; when the same person represents the Department, this person is ready to do things, much less honest, than I could ever expect from the same person individually).

Then among others, a very important kind of consciousness to consider is the "consciousness of the species", or subnations of the species (we can easily observe this kind of consciousness among humans). That is, consciousness may be changing its "societal" levels down to the level of cells, microbes, viruses and, perhaps, even lower.

I plan to offer some examples, but I will first demonstrate one case of miraculous cleverness of a cell within multicellular living being.

One of the most fantastic discoveries made some 25/30 years ago was the discovery of APOPTOSIS. Again, all of my knowledge about it comes from our discussions with Lena. So, apoptosis is the program inside a cell which is activated to kill it. That is, a cell may receive an order to die! This, of course, is a necessity based on survival "instincts" of a multicellular body, e.g., such is a protection from a quick cancer related death, which will most likely occur, if cells are allowed to perform uncontrollable divisions. In fact, the regulation of how cell dies should be very strict. Fantastic thing is that such program is, actually, permanently activated in cell, it is always ready to act. The only way for a cell to continue living is in performing certain job, which it is supposed to keep performing. Then the action of apoptosis is being delayed up until the cell is performing something else.

I will now illustrate how clever a cell is by demonstrating some of its actions. Sure thing, I will simplify the reality. My apologies for this. So, on its surface a cell has numerous receptors, they may account, probably, for hundreds of thousand, but also may count below hundred. To help us see the picture, let's imagine a cell rescaled to the size of a town like Ramat-Hasharon is (I lived in it recently). Then the receptors would be some structures of the size around 3 to 5 floors on its side surface. (Let's remember that cells are 3-dimensional, not 2-dimensional, like we may percept a city on the surface of Earth.) Then let's imagine a molecule approaching the cell. It contains some information and, maybe, in it is an order for the cell to carry out some action. It may enter the cell ONLY through these constructions-receptors (whether this is a physical intrusion, or some message is being carried in). Relative size of the molecule in this chosen scaling would be as a person.

Not every receptor is ready to accept every molecule-messenger - receptors are molecule-specific. And there may be no receptors at all on the given cell for some molecules. So, these ones are not allowed in and, so, they do not carry any deliverable to this cell information. But let's assume, that there is a receptor, and a molecule arrived to the receptor that is suitable for it. Now the receptor should carry a decision to let it in (molecule or information).

Stop! not so quickly. One single receptor will NEVER carry a decision. It will either call a similar receptor located not far, so, that this receptor may move to it, to the original receptor, or it will create near by the same kind of a receptor (double itself). Now, these two receptors will jointly carry the decision.

Again, Stop! Not so quickly. Such a schema is for some "simple" decisions. If the molecule carries such a crucial order as to start the apoptosis, then two receptors will not be considered good enough. Depending on the form of apoptosis there will be needed at least three receptors, but may be even 6 of them. Speaking roughly, there are two types of apoptosis: a slow one, which will last many hours, and which may be stopped and reverse during its development, and another one, very quick, immediate apoptosis, which is after its start cannot be stopped. The first, the slow one, is initiated inside the cell. It is exactly like this, the inside the cell order to die, to commit suicide, due to something wrong that happened in the cell (the risk of uncontrollable division is the highest danger for the body, in which this cell is an integral part). This is a very interesting process, which I will again explain in a very simplified way. There is certain gene in the cell that "observes" the scene. If it is noted that something is wrong it immediately stops all activity of the cell letting it to repair the system and return to normality. If this does not happen during some period, this gene (experts call it: the "night guard") activates the family of genes (which I will call "jury" as it plays this role), all together 16 such genes, 10 of them are always pro-apoptosis (let's associate with them "+" sign), and 6 are against apoptosis (I will associate with them "-" sign). These genes produce some molecules that are involved in some activities that end in joining these molecules into pairs. There may be pairs of (+,+), or (+,-), or (-,-) types, although, some may remain single. Now, happens computing of "votes", through which the "lonely" (not paired) molecules are not being computed (they "did not come to vote"), just as well as the "indecisive" (+,-) pairs don't (it is abstained vote), while, of course, (+,+) is being "voted" for, and (-,-) against the apoptosis. The majority decides the fate of the cell. (If I am asked regarding what happens, if there is an equality; well, I don't know! But I suspect it is the same as no apoptosis vote). There may be noticed more substantial problem: the a priory prevailing of the pro-apoptosis molecules, one may think, may mean the predetermination the pro-apoptosis decision. However, there is another parameter involved. These genes (16 genes of the "jury") produce molecules with different ability to join another molecule from this family. Every of them has regions responsible for the ability to join another molecule. Among 6 of anti-apoptosis ("-" sign), 4 have 4 such regions, and the remaining two - 3 regions. However, among 10 molecules of pro-apoptosis ("+" sign) only three have 3 regions (no molecule has 4 regions!), one more - 2 such regions, and remaining 6 have each only one such region!! So, they have very weak ability to co-join. And this creates the balance!

If the apoptosis is chosen, the other gene is activated, and a very interesting next step starts: the real gene-"killer" is activated, which does the job (also very interesting). However(!!), there are some proteins that may block the action of the killer. For the whole body of cells this is a very bad sign, since in this case the "unleashed" cell will start uncontrollable division (cancer). I will drop this part now. But what will happen, if the made choice was against the apoptosis? Then the cell continues performing its job, the one it should be doing and was doing, when it was stopped, and everything then looks normal, yet, our major "judge", the "night guard" may restart the process and call again for the above described family of 16 for making one more "vote", if something, still, worries it.

Quick apoptosis also may be stopped, but on a very preliminary stage of its development, the stage, when the order just came in. I am not sure whether this is also programmed in the incoming order that the cell receives from the outside. So, not having any scientific justification, I will call such quick apoptosis "(a)-apoptosis", while the unconditional order to die - "(b)-apoptosis". Maybe you have already

guessed what I am going to say now. I don't know whether this is, indeed, so, and/or maybe it is already known to be true, but I think that for an (a)-apoptosis to start it is enough to have the decision made by the only 3 receptors. But for a quick (b)-apoptosis 6 receptors are called to jointly decide!

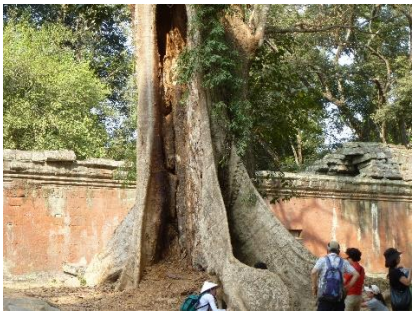
And in any case, wouldn't you agree that cells act in much more clever way, than we, the humans, do?

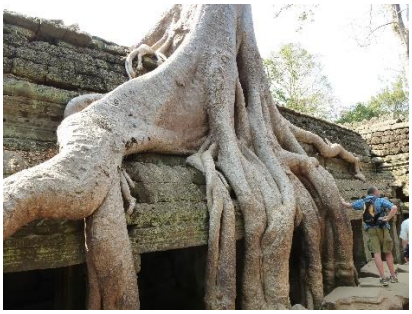
I think I should feel pity for you, if you, still, don't note "consciousness" in such behavior.

I will provide some additional information later. But now I would like to change "the scale" of our discussion and discuss "consciousness"/"thinking" of some huge living objects that even someone very much "pro"- my general philosophy may not expect. I will talk about trees. Of course, in general trees are to such an extent different species that we are unable to recognize their traces of "thinking" or "consciousness". But there are two very different kinds of trees that both make these signs readable for us. I personally had chance to observe both of these kinds, one in the jungle of Amazon, and another - in Cambodia. Perhaps, there are much more, but I had observed only these two.

One of these kinds is a "walking tree". These are the trees that move (walk) along the earth surface. Not quickly, around, say, 5 meters per year. Whoever did not know this and does not believe me, search Google for "walking tree" and see hundreds of pictures, including those that show the very process of this "walk". By the way, these are very big and high into the sky reaching trees with large trunks. Around 2 meters from the ground, such trunk is being divided into lots of "branches" going down. One may think of them as roots that hang a couple of meters above the earth level. So, to move in specific direction, a tree sends from its trunk above the earth new roots in the chosen direction, and, when these roots firmly settle inside the soil, some roots from the opposite side, the no more needed ones, die, and, hence, the whole trunk (thus, the tree) shifts in that direction. Think, what kind of coordination there should be in place so that the trunk remains stable and "looking up", not falling! And where is that "brain", which regulates this? So, our belief that a brain is absolutely needed to "compute" and decide how to perform some clever action is wrong. This may be done without it. Making a choice of direction, in which to move, may be easier to explain. I read that, perhaps, the tree needs more sun. These trees live in tropical jungle of South America. At least I saw them there, and the direction it chose to move in was obvious. From what I saw, it looked like it was trying to escape falling into a deep ravine, perhaps, the result of the recent rain season.

The second kind of "thinking trees" we met in Cambodia, this was the so called giant Strangling Trees. These are huge, tremendously big trees, living around thousand years or more, which completely covered, fully destroyed the old cities of Cambodia. It was believed here that without any war the whole citadels and residencies of very power kings were suddenly left, and the nation went to build the new citadels somewhere else. These trees "eat" other trees. I witnessed this. The process starts with what looks likes not dangerous lianas use the trunks of the other trees for a support, and climb around them and up. When such a "liana" firmly establishes itself around a neighboring trunk, it starts joining with other "lianas" turning into one formation that becomes another trunk around the trunk of this tree's "dinner-tree". Gradually, it is all over the "dinner-tree", and it strangles and eats it. I think that at the previous stages of its growth it used to receive its food from the tree it invaded. I have photos of all the stages of this process. But these giant trees had also destroyed the buildings and huge structures in a more complicated way. I have difficulties to explain this in writing, though (see photos: on the top photo you can see another eaten tree).





If we started to accept this point of view on some other, then us, forms of life possessing consciousness and knowing how to "think" making conscious decisions, then having this view in mind we are ready to zoom out and widen the scale of living objects.

I'm returning to us, humans within the world of animals. It is very well known that we are not independent in our surviving needs. Our stomach is full of micro-organic living objects, our microflora. It is very much needed for digesting the food, and in many other processes (say, creating some vitamins we need).

Also some of our own cells, like cells in blood, have semi-independent life. Our microflora does not know about our existence, they live their own life and have their own consciousness. We may influence their existence by regulating our food, water and possibly some other supplies. We also "defend" them from changing conditions outside our body. They live in very stable conditions. But they also may influence our life developing some sicknesses, or extracting some products which may strongly influence our mood and behavior. We want to live in harmony with them, but we do not always understand how to do this (well, rather it is very seldom that we understand this).

Now, some curious "measurology" (I created this word joining "measuring" and "astrology", because, of course, the measuring I present does not prove anything, but, I hope, you will find it curious). Let's compare data on microbes from our microflora with respect to us, humans, being the place of their living, with the data on us with respect to the Earth, our place of living. The size of individual typical microbe is smaller, than the size of a typical individual person, almost exactly the same as our size is

smaller, than the size of Earth! So, we live on the Earth with the same space as "they" live inside us. (One may start to worry about differences in the size of populations; however, there are billions of different type of living forms on the surface of the Earth as well as millions, if not more type of microbes living inside us).

[Computation: the typical microbe is 1/10 size of our typical cell of the body which is around 1 micron = 10^(-6) of a meter, one over a million, i.e. for a microbe it is 10^(-7) of one meter. Our side is around 1,7 of a meter. So, by increasing it 10^7 times we will have 17.000 km. But the diameter of the Earth is close to 13.000 km. The microflora of whales or elephants has even much more space inside their hosts for living than these animals have on the Earth.]

And now about living periods, the timing of our life. I mean how many generations of "our" microbes change inside us during our life. An average microbe divides every 20 to 30 minutes. Of course, for some it may take longer. And our own cells living much longer life; say, erythrocytes live around 90 days, but then they die, not divide. So, we have around 3 (or, say 2,5) generations per hour, and around 70 per a day. Therefore, for one year inside us passed around 25.550 generations, and for 80 years (it is my 80-th anniversary now) we have around 2.044.000, roughly 2 million generations! To how many years this could be compared in our presence on the Earth? Truly, neither of these two questions have any sense from any point of view. However, I am interested in the psychological factor - the "feeling of time" of our species compare to what could be "reasonably" considered "the feeling of time" for microbes inside of us.

For instance, the notion of "generation" is different for us, then for microbes, who are "dying" (better to say, disappearing), when creating the next generation. While, if to consider for the length of time of one "generation" simply our life expectancy, i.e., this time around - 80 years, we could say that it would take 160 million years for humans to live on Earth for as many generations as our microflora changed inside of us. However, if a "generation period" is around 25 years (the expectation of age of the first child born), then the figure would be around 50 million years. Figures are relatively comparable. In any case, the life of our microflora inside of us by some objective parameters may be considered "comparably about the same", as our life on Earth, or at least, acceptably similar.

Why do I discuss it? To state that the life on Earth may have its own consciousness. Moreover, it should have it! Of course, it should be a huge intellectual power, so great that we cannot comprehend it from our very low intelligence. (Can a microbe inside us understand our existence?) This approach helps to answer many wildly open questions about life. But it also creates very many new questions. I engage now in briefly looking through some number of problems it would solve. And then I will list some questions it creates; some of them really worry me.

It seems obvious to me that even, if a microbe from our microflora would know that it lives inside highly intelligent body it would be not able to establish a contact with us. At the same time, our micro/nano sciences are moving ahead very quickly, and, it looks like we would be able to establish contact with our microflora, and even with an individual microbe. The same, a human being and even all our humanity, I think, is unable to establish a contact with the super-intelligence of the life on Earth (assuming my conjecture is correct, and it exists). However, I think that superintelligence may establish such contacts. I, actually, think it observes us (as a whole) and helps. For example, we like to complain how unstable our weather became recently (actually, only very slightly unstable). As to me, I had been always on the opposite side, surprised regarding how our living conditions on Earth ARE STABLE.

Once in France (I forgot the year) suddenly from the North had broken winds, and they rushed through Paris and down to Mediterranean regions. It started with no warning, and went through with the speed above 200km per hour. Old huge trees had fallen down. People could not go out. Everything happened within a very short period of time, but forests and parks along the route of the winds suffered significant damage, often were completely destroyed. We tried to come to IHES in Bures-sur-Yvette - it stays in the park, and we could not enter. It was impossible to pass through the fallen trees were. Never before and after the event I had encountered such a destruction; on top of this the whole damage was

done in a very short time. The question is: how come this happened only once? Why not every year, many times per year? The difference in temperatures between, say, Norway and Algeria is 20-30 degrees C most of the summer. So, where are those terrible winds that should be expected acting in order to equal these temperatures?

I always have this feeling that weather is under some strange control. And not only the weather. Say, twice, when Russia was under deadly attacks and people were sure it will fall, in 1812 by Napoleon and 1941 by Hitler, Moscow (and Russia) was saved by enormously cold weather. It is usually much cooler in Moscow than in Western Europe, but those years it was especially cold, unbelievable even for Russia.

Or consider the Gulf Stream in Atlantic Ocean. How such a miracle, the warm huge "river" inside the Ocean that moves tremendous amount of warm water from Mexican Gulf to the North of Europe started? Science may explain why it is stable, and why it exists. But not how it started. This happened around 15 - 20 thousand years ago and warmed the Europe. Ice fields retreated from Europe to provide the space for humans to develop and grow our intelligence.

So, I would think, the stable weather is one of the proofs of higher intelligence control.

And now the main point. How new species appear? How we, humans, appeared on Earth? Darwin!? Undoubtedly, natural selection and all the developed forms of Darwinism, do, indeed, influence development of species, "polish" and "perfect" their appearance and adjust them to the World conditions. But these processes don't create new forms, the completely different from those existing forms of living things, the new species! The probability of such creation through some "random events" is 0 (zero!); it is so small that trillions of years would not be enough to succeed, while our Universe exists only some (not quite established, yet) number of billions years. To state that it could happen randomly is the same kind of nonsense, as to state that randomly joining some blocks (even assuming such blocks do already exist) one may build a modern laptop. What an idiot would suggest this? But humans are much more sophisticated and very precisely acting creatures, that accurately coordinate their activities.

So, the only possibility that comes to mind is that some higher intelligence created some (originally rough) copy of us and then let the methods described in Darwinism to polish us and improve. (So, there is a room for Darwinism, too).

Yes, it looks more like the standard religious "creation by God", than by the methods of "scientific Darwinism". However, I see creation standing infinitely far from being based on religious explanations. For example, I don't think that, if we pray, anyone will hear our praises and requests, and/or will pay any attention to them. I actually think that thousands years back our prophets maybe had understanding of this, and as the outcome was born genius idea of the single God. Yes, our Earth has a single life system, meaning a single superintelligence. But, as passing through the "middle ages", through the periods of falling our human intelligence, the only thing that was offering a hope of preserving intelligence was the great idea of a single super-intelligence that was primitively turned into the notion of God dwelling almost in human form (thus, bringing the better level of acceptance by primitive people).

I will call this single intelligence the "Creator", as it created us, and the other living forms on Earth.

But NOT the Earth itself! And not all other objects outside Earth, or, at least, outside its neighborhood.

And what about the life in other places of the Universe? For me this is a very easy question. I think, the same mechanism creates conscious systems on every suitably located planet around any star. And then this conscious (=living) system (=object) will create life of its own "microflora", i.e. living things on its territory. So, such living planets (or life on the planets) should be everywhere. We don't know about them similar to how our microflora does not know about other microflora.

Also note, our microflora cannot feel that we, sometimes, try to help its. Indeed, remember the timing of life for microbes: around 20 min. It means that from the moment my doctor will tell me that I should help my microflora and take some specific tablets to the moment I, assuming to be a good patient

and doing things quickly, take these tablets, a few days will anyway pass, i.e. 100 - 200 generations of microbes will be gone (!).

How similar should we expect it be, the life on other planets to our life on Earth? Well, how much differs life on different continents of our Earth? Say, how much differ souvenirs we buy in India and in Russia? They are different, not similar. However, serious stuff, like, say, cellphones, although produced in Korea, Japan or US, are quite similar.

Why is this important? Because I would expect these superintelligent systems on planets to be in contact with each other, so that to exchange important ideas. Souvenirs reflect taste and local understanding of beauty, and this may be circumstantially very different for different intelligence. But the essence of important discoveries is of common interest. So, animal life may be looking very differently, while the top achievements, although may slightly differ, are similar (compare Australian mammals, kangaroos and other marsupials with North American and EuroAsian mammals). Top achievements of life, like human being, should be very similar. We are very well done!

A question that seriously bothers me in this schema is why we, the humans, were created? And why now? The major difference between us and many other species is NOT a level of our intelligence. It is quite likely that some dolphins are not less clever, than us (or, perhaps, elephants?), and definitely many birds have a better built brain: it is much smaller than the brain of us, humans, but it is known to do fantastic things and has fantastic active memories.

The main difference between us and any other life object on Earth is the ability to build, to construct. The language is also crucially important, but it on its own could be developed within application of the Darwin Theory methods of evolution, these would be enough.

But the combination:

i) legs to walk
ii) hands to build
iii) the structures of "production of sounds" for developing of speech, and, of course,
iv) high intelligence,

is unique and it is created only now!

So, why such species (as us) appeared only now?

Also scientific and technological developments are not uniform in time. After some very significant step made and, sometimes, even a real jump, we observe a long period of stagnation. To be able to absorb the jump.

What does surprise me in this? However, during the last 30 - 40 years that progress accelerates. Before that we observed the progress, to which there had been attached periods to absorb it, to get used to. But now we already have no time for absorption.

It looks like "someone" is in a hurry.

My questions now are: what for are we created? why such a hurry?

There are two directions of thinking along these lines. One is with worries regarding the danger to come. Perhaps, our Earth's life-system, this superintelligence, needs our technological abilities, our help in saving ourselves and the Earth's life.

The other direction is optimistic, and starts with the question: How is being created a new planet with a life-system on it ("living planet")? Here's one scenario. Some already existing life-systems may take care of reproduction that will create life on a suitable planet that is is not, yet, made alive. Such planet may be located around some star on a not too big distance from, say, our Sun.

Let's for the sake of argument say the distance to such planet is below two light years from us. We may assume that reasonably soon there will be discovered the way of travelling in Cosmos with the speed of, say, 1/20 of the speed of light. Humans work on this right now. Then through us our Earth will be able to send to such planet its own life system, the Earth's life system, that will arrive there in around 40 years. Presumably, some other living planets in the same neighborhood will do the same. Our cosmic

ships with our messengers will meet on that planet and, mixing genes, there will be formed new life-system based on the life-systems of all the arriving ships. This way the new life-system will start on the targeted planet. Of course, arrived living beings will need to work very hard during very long time in order to achieve this (long from our perspective). Many generations will pass before the planet will be filled with life of all arrived forms. The mixture of different genetics will help creating new stable forms, and gradually it will become the new alive system, new intelligence with its own interests and life. (And who care now on such "small" details as compatibility of different genetic, let you recall that spermatozoids of one person are coming to a completely different person and not killed there; some well known mechanisms stop non-compatibility effects; but discussion of this will take me to a few more pages of miracles).

So, perhaps, we, humans, will play role of "spermatozoids" on our living planet, on our Earth!

PS. To imagine the size of events, let us again compare "the birth of a new living planet" with the birth of a human child. It takes 270 days for a child to be born which means, perhaps, many hundreds or a thousand of generations (divisions) of cells, which in the end build our body. Similarly, from the start of the process of creating life on the new planet, many hundreds of generations of arriving astronauts should pass, i.e., tens of thousands of our years! Very slow (for us, humans) process, but very short for the life-system on the planet that is getting ready to exist for over half billion years.