Chapter

Beyond the Chlorophyll Molecule, Are There Other Organic Compounds Capable of Dissociating the Water Molecule? New and Unexpected Insights

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Abstract

In the XVII century, researchers throughout Europe began to study the composition of the atmosphere, discerning its physicochemical properties and composition. Since then, it has been observed that the concentration of oxygen in the air around us is relatively low. Lavoisier and Priestley, in the middle of XVII century, observed that plants leaves could replenish oxygen in an impoverished atmosphere. They concluded that chlorophyll possessed the intrinsic property of dissociating the molecule from water. At the XVIII century, the systematic study of human physiology began to deepen, and it was found that the oxygen levels inside the human body were five times higher than those of the atmosphere. The explanation given was that the lung, by means of some unknown mechanism like those of the swim bladder of some fish, was able to concentrate oxygen from the atmosphere and introduce it into the bloodstream. But such a theoretical mechanism has not been found after 200 years of searching. However, there is no way to explain how the concentration of oxygen rises substantially in the tiny distance between the alveolar space and the blood capillaries of the lung. Circumstantially, we found the mechanism during an observational study about the blood vessels entering and leaving the human optic nerve: Our body has several molecules capable of dissociating the molecule from water, such as plants.

Keywords: photosynthesis, oxygen, hydrogen, water, sunlight, hemoglobin, melanin, lignin

1. Introduction

The life cycle is currently interpreted as the concatenation of two processes opposite each other, one is endergonic and the other is exergonic, in one, CO_2 is reduced to glucose; and in the other, glucose is oxidized to CO_2. One happens in the plant kingdom and the other happens in the animal kingdom. The products of the metabolic activity of plants (oxygen and glucose) are harnessed by the animal part (CO_2 and water) and vice versa.

The primary and secondary products of each part of the equation are reused by the other side of the reaction and thus are recycled indefinitely from the beginning of time. Therefore, we are facing a unique sustainability scheme that has allowed life to thrive over eons of years. Thus, photosynthesis and respiration are thus seemingly the reverse of one another [1].

It is postulated that the plant dissociates the molecule of water and obtains oxygen and hydrogen, which is called photosynthesis. Since the notable energy needed to break the water molecule is taken from sunlight because plants have chlorophyll, a molecule whose formula is known quite well, which, using the ends of visible light, collects the enormous energy required to convert liquid water into its gaseous components hydrogen and oxygen. The latter is expelled into the atmosphere for the benefits of living beings because they absorb it from the air that surrounds them through respiration, a process that implies that when expanding our thorax, the air penetrates through the airways, and once inside the lung's functional parenchyma, atmospheric oxygen passively passes through the lung tissues and reaches the blood circulation.

Such passive penetration through lung tissues is called diffusion. It is characterized because it does not require energy to be carried out as it happens spontaneously since the molecules naturally tend to occupy all the space that surrounds them, moving from the area of highest concentration to the one with the lowest concentration (of molecules).

It is important to note that diffusion does not expend energy, because if it were, the already committed theoretical calculations about the energy that our body requires and obtains from the environment to carry out its functions, would be even more confusing. So, let us go in parts. To date, it is not understood how oxygen from the atmosphere passes through the lung tissues and rises inside the body, for example in the blood; until a substantive difference in relation to the proportion of oxygen in the atmosphere is reached.

In the atmosphere, the partial pressure of oxygen is about 21%, but in the blood, saturation reaches more than 95%, and the explanation for this difference has been the subject of debate since the mid-eighteenth century [2].

2. Long-standing theories about oxygen transportation into blood

Transport of O_2 from environment to the mitochondrion is accomplished in an, exhaustively described but not yet well-understood, sequence of diffusive and convective steps [3]. Clinicians and researchers are greatly limited in their understanding of oxygen supply in health and under disease, mainly by technical difficulties to assess organ-specific cellular metabolism perturbations caused by O2 tissues availability, that ideally must be non-invasively methods.

Oxygen is present in alveolar air at about 14% and easily run down to 10 or even 8 percent [4]. There is evidence that the relation between blood supply and ventilation in individual groups of alveoli is not even one. In some alveoli, the oxygen runs down, and CO_2 accumulates faster than others. Hence the oxygen percentage of the mixed alveolar air becomes altogether deceptive as an index of the degree of oxygenation of the mixed arterial blood.

Oppositely, the CO_2 percentage remains a reliable index of the degree of saturation of arterial blood with CO_2 [5]. When the alveolar oxygen pressure reaches about 120 mm Hg, corresponding to about 17% of oxygen in the dry alveolar air, beyond which a further rise in alveolar oxygen pressure has no effect. The oxygen pressure in all the lung alveoli would be at equal high levels at the beginning of apnea but would fall at unequal rates in the different alveoli [6].

Our body seems to ignore oxygen and instead handles CO_2 in a very precise, very careful way, as if it were a life-or-death issue that it is because the high levels of CO_2 in the body quickly impoverish the ability of the cells to dissociate the molecule from the water, with which death happens in less than a minute.

Lung diseases compromise the available respiratory surface to gas exchange of CO_2, which is why they are so serious. Oxygen has no relevance because the cell gets it from the water it contains, like plants.

Interestingly, the alveolar CO_2 percentage goes up as the barometric pressure goes down, that is, during climbing; but the partial pressure of CO_2 remains almost the same in the alveolar air. Alveolar air, with breathing normal, contains about a third less oxygen than the inspired air. It follows that when the oxygen percentage will be reduced to about half, that is, from about 13% of atmosphere to about 6.5% [7]. Such a diminution corresponds to a saturation of about 80% of the hemoglobin with oxygen, and any further diminution will cause a rapid fall in the saturation.

Because that the concentration of oxygen in the air we breathe has a significant effect on CO_2 exchange, our body seems to respond to these fluctuations very precisely, but it is not so much oxygen but CO_2 that the body responds to.

3. Atmospheric oxygen cannot pass lung tissues and reach bloodstream

Oxygen, fortunately, is given by methods that are either ineffective or wasteful. A funnel over the patient's face, a rubber catheter into the patient mouth or nose, an anesthetic mask, etc. In any case, it would be undesirable to continue the administration of pure oxygen for more than a limited time [8].

With 2 liters, a minute the percentage of saturation of the hemoglobin that is, in pneumonia case, rose from 82 to 95%. With 3 liters a minute, the saturation rose to 97%. In the case of exercise, the alveolar CO_2 pressure has a well-marked rise when a little oxygen is added to the inspired air. So, the apparent benefit of oxygen in these cases is that it increases the efficiency of CO_2 expulsion.

So, how do you explain that oxygen rises in the blood by administering supplemental oxygen if since 1850 Ludwig, Bohr [9], Halender [10], and others, found experimentally that oxygen does not pass through the lung tissues, so it is not able to reach the bloodstream?

The answer is oxygen toxicity. For about 400 years, it has been observed that various poisons, such as arsenic, and others, when administered in minimum doses, can induce positive responses in the health of people, for example, elevation of blood oxygen levels. Therefore, when we administer supplemental oxygen, which is toxic and not absorbed, the tissues are harassed, and up to a certain limit, the tissues respond by increasing the rate of turnover of water dissociation. So, the increase in % SpO_2 that follows the administration of supplemental oxygen is oxygen that comes from the water inside the cells, not from the atmosphere [11].

Clinical observations in cases of CO poisoning, such as although the amount of oxygen transported by the blood is diminished, the oxygen pressure in the arterial blood remains normal. It is something difficult to explain, but if we start from the fact that hemoglobin does not transport oxygen or CO, nor CO_2, but hemoglobin is one of the molecules that the human body has that are able to dissociate the water molecule, then it is explained in a congruent, coherent way, without complicated mathematical models, such as Krogh's [12], which to top it off is totally theoretical, is completely imaginary, and handles theoretical concepts so far-fetched in its eagerness to explain the supposed transport of oxygen through the lungs, that it cannot even be contrasted experimentally. Considerable discrepancy was found between pO_2 microsensor data and results from that model (**Figure 1**) [13].

The cylindrical steady-state model developed by Krogh with Erlang has served as the basis of understanding oxygen supply in living tissue for over eighty years. It has been extensively used for situations such as drug diffusion, water transport, and ice formation in tissues. However, the applicability of the model to make even a qualitative prediction of the oxygen level of specific volumes of the tissue is still controversial, which is paradoxical because supposedly it was developed. And after more than 100 years and a myriad of equations that have been gradually added with the intention of making it functional or at least believable, the controversy continues about the fact that atmospheric oxygen passes through the lungs and reaches the bloodstream by simple diffusion (**Figures 2** and **3**).

The reason is that the mathematical model of Krogh-Erlang tries to explain something that is not physic-chemically possible, thereby is not real, but it is a very rooted dogma that cannot be even experimentally contrasted [15]. The mathematical and statistical models that are used to try to explain biological processes, such as gas exchange, usually do not work because in biology the variables are continuous random (nonlinear behavior) in nature.

If we applied the model of Krogh-Erlang to study the effect of acclimatization to high altitude, we have that at high altitude at rest, arterial carbon dioxide tension, oxygen saturation, and oxygen tension were significantly reduced due to several factors, for instance, the amount of light is diminished in extreme weather (cold) the capacity of human body to take oxygen from intracell location is impaired; and oppositely, the oxygen content is increased, given that hemoglobin concentration increase, recall hemoglobin dissociates the water molecule unreversible [16].

Notice the explanation: arterial oxygen content was increased because of an increase in the hemoglobin concentration, which reductionistic alludes to the fact that

$$[O_2] = \alpha P \quad Hb+nO2 \rightleftarrows kk'Hb(O2)n \quad S=K[O2]n1+K[O2]n \quad S=(P/P50)n1+(P/P50)n$$

$$O2+Hb4(O2)i-1 \rightleftarrows kiki'Hb4(O2)i,i=1,2,3,4 \quad S=(\sum i=14i[Hb4(O2)i])/(\sum i=14[Hb4(O2)i])$$

$$S=a1P+2a2P2+3a3P3+4a4P44(1+a1P+a2P2+a3P3+a4P4) \quad a_i = \alpha^i K_1 K_2 \ldots K_i$$

$$S = (S_m - S_o)\exp[-(R/K)\exp(-KP)] + S_o \quad P = \ln(R/K) - \ln(\ln[(S_m - S_o)/(S - S_o)])/K$$

$$O2+Hb \rightleftarrows kk'HbO2 \quad R = k'[O_2][Hb] - k[HbO_2] \quad ddt[O2]=-R,ddt[Hb]=-R,ddt[HbO2]=R$$

$$S=K[O2]1+K[O2] \quad k'=k1\alpha P(PP50)n \quad R=k[HbT](F(P)1-F(P)(1-S)-S)$$

$$Ri=ki'[O2][Hb4(O2)i-1]-ki[Hb4(O2)i],i=1,2,3,4 \quad Mb+O2 \rightleftarrows kk'MbO2$$

$$S=[MbO2][Mb]+[MbO2]=K[O2]1+K[O2] \quad j=-D\partial c\partial n \quad j = -D\nabla c \quad \partial c\partial t=\nabla D\nabla c+R$$

$$j = D_o\nabla[O_2] + D_{Hb}\nabla[HbO_2] \quad j = D_o\nabla[O_2] + D_{Hb}[Hb_T]\nabla S \quad j=(Do+DHb[HbT]dSd[O2])\nabla[O2]$$

$$1+DHb\alpha Do[HbT]dSdP \quad \nabla[HbO2]=[HbT]\alpha-1dSdP\nabla P \quad \gamma=(LL\beta)2 \quad c = 1 \text{ at } r = R_L$$

$$Pe(u\partial c\partial x+v\partial c\partial r)=\partial 2c\partial r2+1r\partial c\partial r+\partial 2c\partial x2 \quad c = 0 \text{ at } x = -1 \text{ and } x = 1$$

Figure 1.
A sample of the first 32 equations of already 120 described that have been implemented with the aim of building Krogh's acceptable theoretical (imaginary) model of oxygen transportation theory [14].

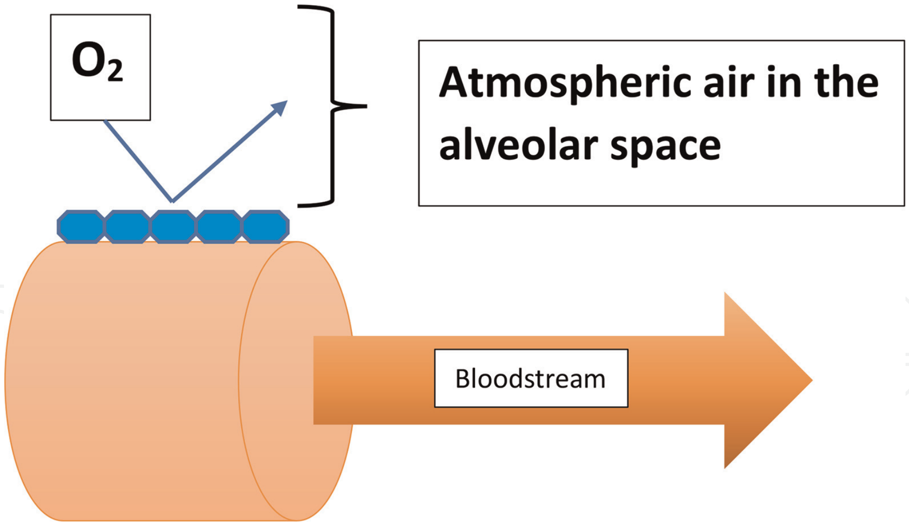


Figure 2.
⬣ *Represents pulmonary alveolar cells, with about 70% water, thereby oxygen from alveoli air is repelled and cannot reach the bloodstream.* ⬭ *Represents blood vessels.*

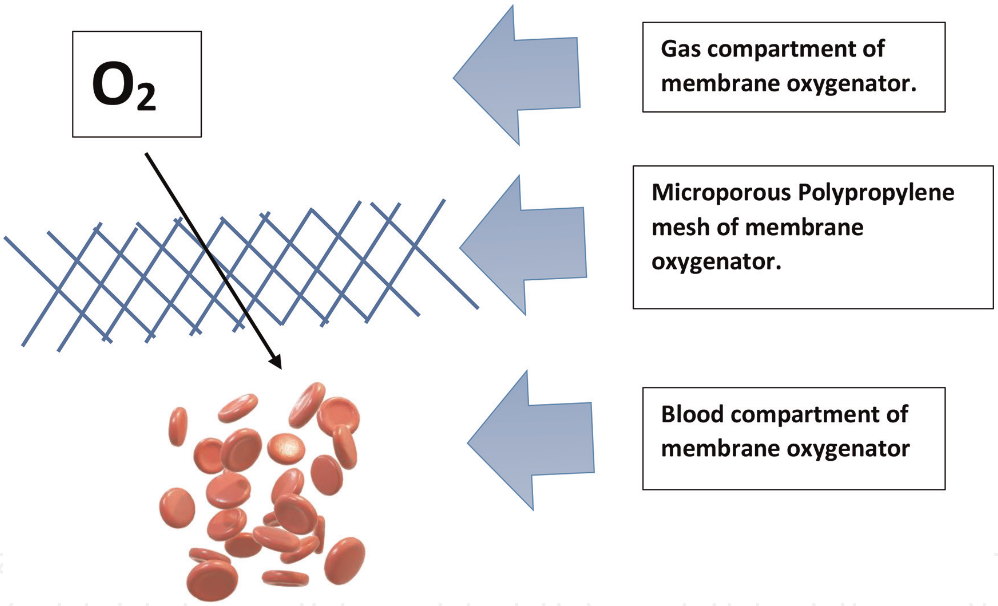


Figure 3.
In membrane oxygenators used for extracorporeal circulation, the story is different, because when the barrier that represents the intracellular water disappears, the oxygen easily crosses the microporous polypropylene mesh reaching the blood compartment.

there is more hemoglobin there is more oxygen transport from the atmosphere to the tissues, despite since the second half of the nineteenth century it was reported that it was not possible. So, if we interpret the results from our point of view which is that hemoglobin molecules possess the unexpected ability to dissociate the molecule from water, then the increase in hemoglobin concentration explains the increase in the body's ability to dissociate the molecule and therefore maintains blood oxygen saturation levels properly.

With the previous paragraphs we intend to demonstrate, although briefly, that oxygen from the atmosphere is not absorbed as it has been thought for at least three centuries. The high levels of oxygen normally present inside the body come from the water that the cells contain inside and not from the atmosphere that surrounds us. Therefore, we can discard the ancestral belief that plants expel oxygen into the atmosphere for the benefit of other living beings, because plants expel oxygen because they also take it from the water they contain inside, they use what is necessary for their metabolic processes and expel the surplus, given the significant toxicity of oxygen.

Once we are aware that we do not take oxygen from the atmosphere that surrounds us, but from the water that each cell contains inside, then we can move on to the following:

4. Glucose is not a source of energy

Following the scheme of the textbooks, it was thought that once the oxygen from the atmosphere was absorbed by the lungs and reached the bloodstream, then it was distributed to all the cells of the organism so that, when combined with glucose, in a kind of strange, graduated combustion, by which the body obtains energy in the form of heat, which is the most inefficient form of energy.

But just as oxygen transport was full of postulates and imaginary equations, we must do the same thing when trying to explain how our organism obtains energy from combining glucose with oxygen. To begin with, it is assumed that light energy is stored in the covalent bonds of glucose, which is indefensible, given that energy cannot be stored.

But if we ignore that small detail, then what follows, which is also another assumption about the eukaryotic cell, through an organelle called mitochondria, can recover the energy stored in the covalent bonds of glucose. Of course, it is also through mechanisms that are not understood, they are only imaginary.

Let us remember that the study of metabolism has a long history, the roots of which can be traced back to the year 1614 when Santorio Sanctorius published his results on body weight fluctuations during the course of a day [17]. Until today, the era of pathway databases are going through the realization in the nineteenth century that the reactions within a cell are the same as those studied in chemistry, the discovery that enzymes catalyze metabolic reactions, the first complete metabolic pathways (1930), among which the tricarboxylic acid (TCA) cycle or Krebs cycle (1937) [18].

5. The Krebs cycle is present in every cell that uses oxygen to produce energy [19]

From 1930 onwards, an increasing number of metabolic pathways have been unraveled but misunderstood because often studied in isolation. Pathways interact in a highly complex way and together constitute the metabolic network. This highly organized and complex network of reactions, astonishing can adapt to a constantly changing environment, through mechanism poorly understood, thereby, it is still a mystery.

Although the application of mathematical models to the study of biological phenomena has demonstrated time and again their futility, one of the ultimate goals is to construct the full metabolic network in all its detail so can be implemented a complete or almost complete mathematical model that can be used to generate experimentally verifiable hypotheses, perhaps identify potential drug targets, and ideally but very difficult to reach, to simulate the effect of network perturbations, such a loss of function [20].

But one of the problems faced by the promoters of the so-called metabolic pathway databases complexity of human metabolism is how to represent knowledge without affecting the ability of a pathway database to capture the biological complexity of human metabolism. For instance, which aspect of the metabolic network is important and to what detail it needs to be represented, which is furthermore complicated by the changing nomenclature of enzymes and metabolites in the course of time [21].

And worst, not every piece of the metabolic network, conclusive evidence is available, and some parts might still be subject to controversy. It is not easy to increase the awareness of the scientific community of the existing differences and biological inaccuracies within the descriptions provided by pathway databases, and the best way to resolve them.

One example is the description of TCA cycle as given by ten databases. None of these were entirely consistent with the literature, and the biochemistry behind the TCA cycle turned out to be not as clear-cut as one might expect. The various human metabolic networks described by these databases have not been systematically compared, nor has the extent to which they differ been quantified. So, it is no surprise that the degree of consensus among them is disappointingly low.

Reactions are not always balanced, especially with respect to electrons (e^-), protons (H^+), and water (H_2O) [22]. So, when we analyzed the Krebs cycle, already described in 1937, the consensus on reaction level is surprisingly low. The databases agree on 5 of the 30 reactions that mold up the Krebs cycle.

Therefore, it is not surprising the significant differences between the different biochemistry textbooks, since each author explains in his own way a theory that tries to explain how the cell obtains energy from its environment. But, if glucose were a source of energy, diabetic patients would be able to fly.

So, since it is not true that our body takes oxygen from the air, then it is also not true that our body takes energy from glucose. Our discovery that there are several molecules in our body capable of dissociating water [23], such as plants, also explains the hitherto mysterious origin of energy in eukaryotic cells.

6. When the water molecule is dissociated, energy is released

When energy is applied to a molecule, sooner or later, it breaks down. And in the case of water, the same thing happens. The dissociation of the water molecule is highly endergonic, that is, it requires a lot of energy. If we want to dissociate the water in the laboratory, we must heat the water to two thousand degrees celsius.

But nature carries it out in a very precise way and at room temperature through various molecules. The best known to date is chlorophyll, which dissociates the water molecule irreversibly, which is represented as follows:

$$H_2O_{(liq)} \rightarrow 2H_{2(gas)} + O_{2(gas)} \tag{1}$$

So, when our body dissociates the molecule from water in the exact way it has done since the beginning of time, it gets two fundamental elements, such as oxygen and hydrogen. And part of the energy that is released when breaking the water molecule is captured and transported by hydrogen, remember that this element is the main carrier of energy in the entire universe, so our body cannot be different.

So, by dissociating water, our body gets the two basic elements in the biochemical sequence of life. That is why the dissociation of water is considered the very first reaction of life in plants, and from now on, also in humans or mammals.

Of the several molecules that we have found in the human body that can dissociate irreversible the water molecule, we have hemoglobin, myoglobin, cytochrome P 450, and bilirubin; but the main one for us is melanin because until now it is the only one that dissociates and re-associates the water molecule using as a source of energy the sunlight. The reaction would be described as follows:

$$H_2O_{(liq)} \rightarrow 2H_{2(gas)} + O_{2(gas)} \rightarrow H_2O_{(liq)} + 4e^- \qquad (2)$$

For every two water molecules that are re-formed, 4 high-energy electrons ($4e^-$) are generated. The turnover rate of the process inside melanin is in the range of nano and picoseconds. The presence of high-energy electrons can be verified in relatively easy ways (**Figures 4** and **5**).

On the other hand, hydrogen generation from melanin can also be easily demonstrated (**Figures 6–8**).

Melanin molecule is the perfect candidate to be the much sought-after dark matter of the universe, as it meets the three main requirements: 1) extraordinary stability, 2) massive nature, and 3) absorption capacity of any form of energy (**Figures 9** and **10**).

1. Extraordinary stability - melanin is the most stable molecule known, proven 160 million years [24].

2. Both the formula and thereby molecular weight of melanin is unknown; however, the molecular weight is estimated in millions of Daltons [25].

3. Melanin is the darkest substance man has ever known [26] because it absorbs any type of energy and dissipates it in a unique way: dissociating the water molecule [27].

The first part of this work was about breathing with the intention of making the reader aware that our body does not take oxygen from the air around it but from the

Figure 4.
LED lights are energized with a melanin-based battery.

Figure 5.
Depending on the geometry of the melanin-based battery, we obtain direct current values such as the one shown in the photograph.

Figure 6.
Melanin of the skin, observed through light biomicroscope (5X).

water that our cells contain. A mistaken belief that has finally significantly disrupted the development of knowledge about mammalian biology.

Since the late nineteenth century, Christian Bohr, based on his own experimental studies, concluded that the oxygen we have inside the body did not come from the atmosphere by simple diffusion, but rather seemed a secretion of lung tissues [28].

This means that since then Christian Bohr inferred that we do not take oxygen from the atmosphere around us. He could not go further because apparently, at that time, there was no way to explain the origin of this oxygen. Fortunately, now we have the explanation about oxygen secretion in the lungs and all cells, which also explains the functioning of the swim bladder in fish.

7. Photosynthesis in plants

Currently, the most studied non-trivial quantum effects in biological systems are photosynthesis and the magnetic orientation of birds [29]. Quantum effects are often

Figure 7.
The melanin of the skin observed through a light biomicroscope with greater magnification (10X).

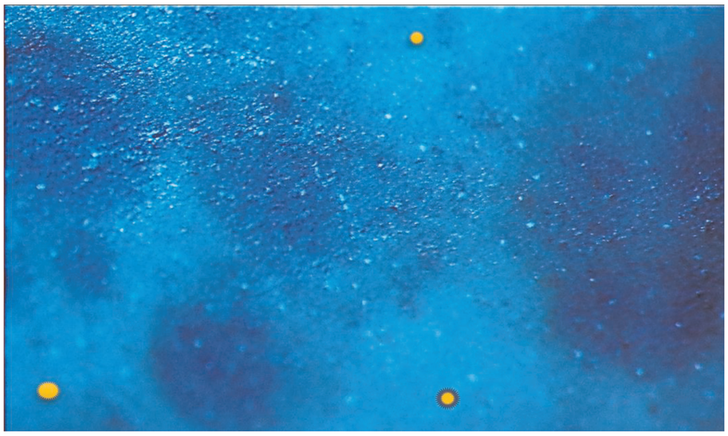


Figure 8.
By illuminating melanin with UV light (10–300 nm) hydrogen fluoresces (yellow dots). Oxygen does not fluoresce (10X).

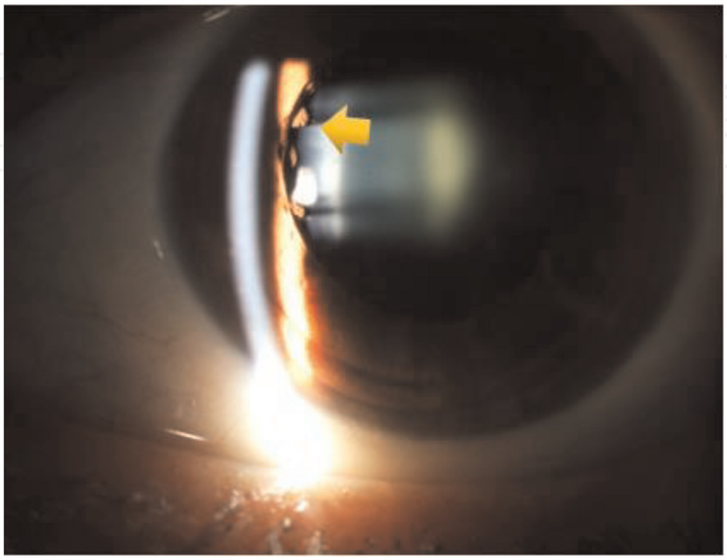
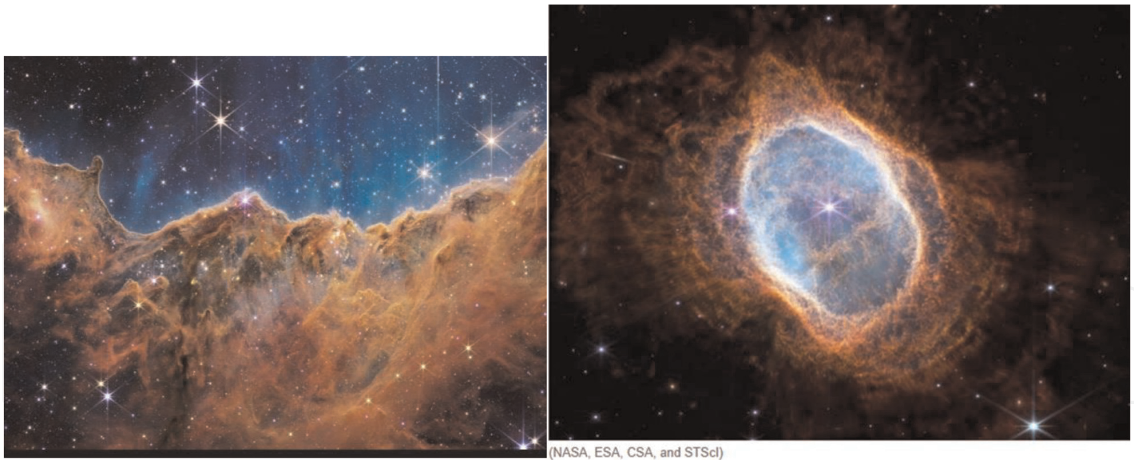


Figure 9.
In some patients, the pigmented cells (with melanin) tend to form sprout-like formations in the iris edge (yellow arrow).



(NASA, ESA, CSA, and STScI)

Figure 10.
The color of melanin hardly changes whether it is a few cm from us, as in **Figure 8***, or thousands of light-years away, for example, in stellar space.*

associated with paradoxes (Schrodinger's cat, Wigner's friend), but paradoxes are also present in the understanding of living systems (e.g., Levinthal's paradox). The question arises whether the solutions to paradoxes (unsolved problems) in biology may relate to quantum mechanics.

The non-trivial role of quantum mechanics in living systems can be applied to the subject of studies for those components of living systems in which these effects play an important role. These effects include photosynthesis, protein folding, molecular recognition, and others.

Every organism is a complex network of chemical reactions, the effective functioning of which is largely due to the transfer of electrons from one atom to another. In this sense, quantum mechanics always plays an important role in energy transmission and conversion in a cell [30]. Non-trivial quantum effects were not known for a long time. The most famous quantum effects are associated with quantum energy conversion in photosynthesis and in the magnetic orientation of birds. On the other hand, the efficiency of energy conversion and transport of substances in the cell is high, and this fact requires explanation, and the involvement of quantum models is necessary to explain this phenomenon.

Quantum mechanics in general is nonlinear. The problem of measurement in quantum mechanics. is the paradox of the collapse of the wave function. The linear Schrodinger equation is only an approximation, and such processes are described in which the fields are classical [31]. The linearity of quantum mechanics is the main cause of the paradox of the collapse of the wave function, taking account of nonlinearity eliminates the paradox.

Quantum coherence was found in the molecules that are directly involved in the process of photosynthesis. A protein antenna receives energy, and this exciton energy is transferred with high efficiency to the specific pigmented protein complexes. The essence of these effects is that a photosynthetic bacteria complex at 77 K showed properties of quantum entanglement under laser excitation. The authors concluded that the quantum effects could be observed at room temperature. These effects may increase the efficiency of energy conversion in photosynthesis [32].

The photosynthetic reaction center is considered a quantum heat engine. It is noted that the equations describing the operation of such machines are similar in many

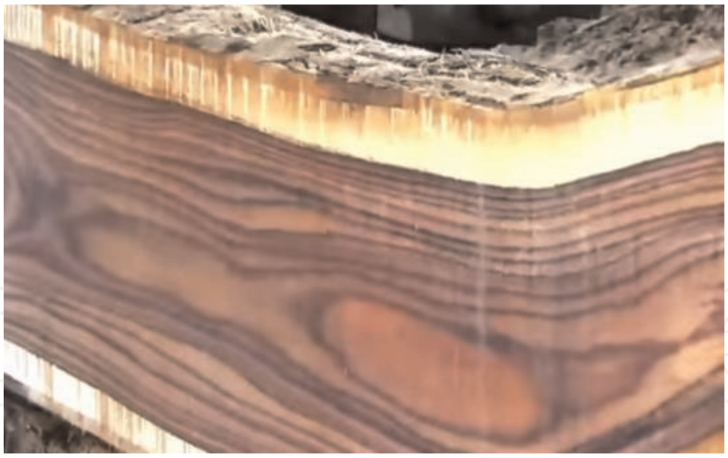


Figure 11.
Melanin is placed inside the trunk; it is called lignin. However, its function is the transduction of radiant energy to chemical energy through the dissociation and re-form to the water molecules. Thereby, this chemical energy transported by molecular hydrogen impels the growth of plant trunk.

respects to the equations for a laser. Coherence violated detailed balance, thereby increasing the efficiency of the process. A photosynthetic complex (quantum heat engine) converts high-energy photons to a low-entropy flow of electrons [33].

Disposition of melanin or any other photopigment in nature, inside of a cylindrical structure is quite frequently probably explained by the effect of cylindrical lenses that focused the light on form of line (**Figure 11**).

The union of two cylindrical flat lenses concentrates the luminous energy along a line that illuminates (energizes) the total structure, we can observe it from tiny structures such as mitochondria (A), the long bones that in this way illuminates (energize) the entire bone marrow they contain (B), and the blood vessels that when joining two flat-cylindrical lenses, they illuminate the entire path of the blood vessel, energizing the erythrocytes and other blood components (C). Something similar happens with the trunk of trees and the stem of plants because the area of greatest energy is precisely the center of the structure along its entire extension (**Figure 12**).

8. The problem of protein folding

Protein folding is one of the most important problems in molecular biology. This problem (Levinthal's paradox) has been discussed repeatedly [34]. However, despite a large number of publications on this issue, there is no agreement among researchers not only as to what the solution to the paradox is but even whether the solution exists. The first estimates by Levinthal (1968) [35], found that the average time of folding of a long protein molecule should be exponentially large because of the large number of conformational degrees of freedom. Levinthal concluded that a random search is not realized. What then is the mechanism of folding?

The total number of conformational states of a protein chain can be estimated according to (Berezovsky and Trifonov, 2002) [36]: 3^{N1} where N_1 is the number of protein domains. Here it is assumed that each protein domain has three different conformations. If we take the largest possible population of macromolecules (proteins) to be 10^{50} (the mass of these molecules is greater than the mass of earth).

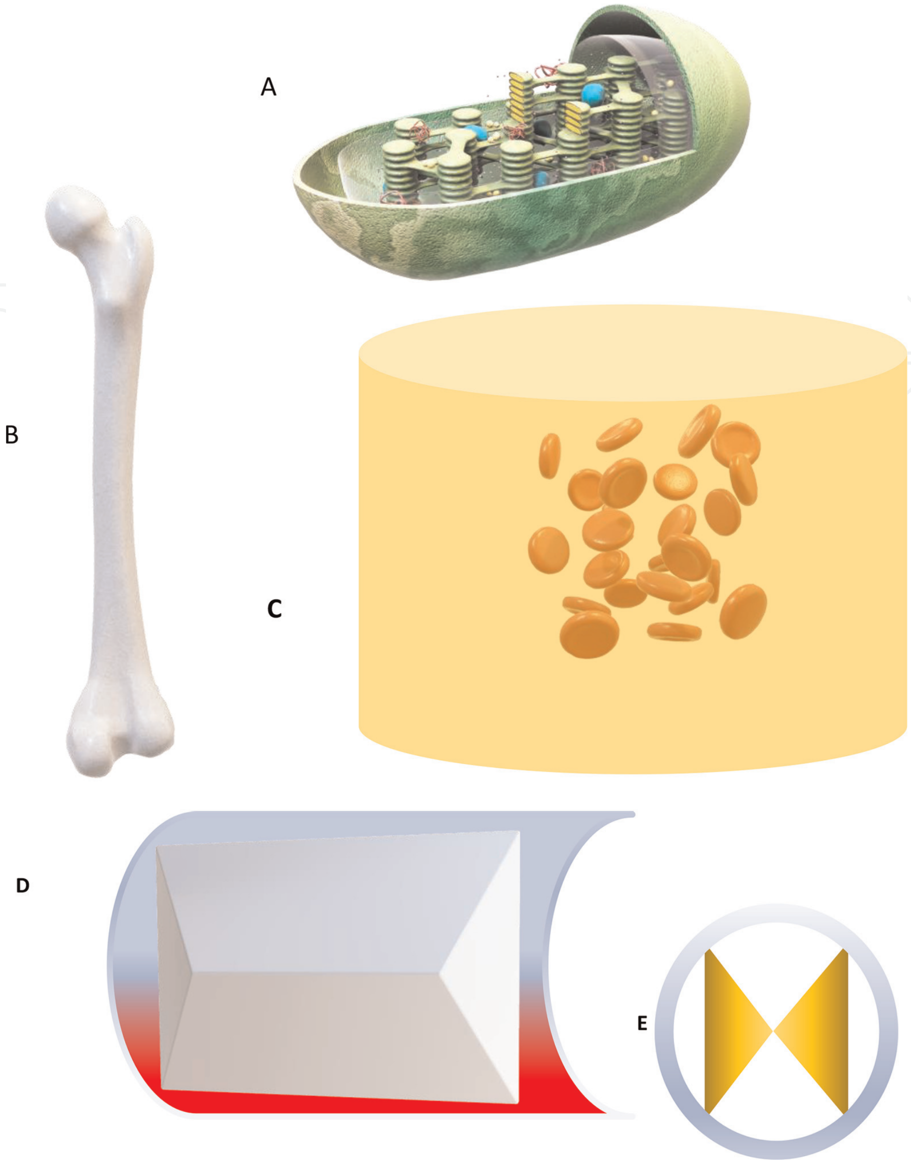


Figure 12.
The cylindrical shape can be interpreted as two flat-cylindrical lenses, which instead of focusing light on one point (like spherical lenses), form a continuous line along the entire cylinder (D, E).

One possible solution to the Levinthal paradox is the assumption of the existence of a funnel-like landscape of the free energy of the protein. This smooth landscape leads to the fact that the characteristic time of protein folding becomes small. Hamiltonian of the interaction between proteins domains contains mainly hydrogen bonding and hydrophobic interaction forces between atoms domains [37]. This model implicitly assumes the existence of a purpose of folding. The author argues that evolution has no goals, and therefore there are no right or wrong results [38].

Transport of molecules and ions is accompanied by processes like protein folding [39].

Recognition of molecules at their reaction sites inside a cell is essential for a cell's normal functioning. It is assumed that reactions between biologically important molecules obey the principle of "lock and key" (or "hand glove"). Otherwise, the stable and precise work of a cell would be simply impossible because of the large number of "wrong" reactions. During the reaction between the key and lock a molecular complex forms. We show that the problems arising in the formation of such a complex are directly related to the problem of protein folding. The formation of complexes may be useful as well as harmful to cells. In the first case, these complexes can serve to transmit energy (information) within the cells on the key-lock principle. In the second case, erroneously emerged complexes, on the contrary, will impede the normal functioning of cells.

It was shown that in the absence of special restrictions, the transport of proteins (and RNA) will be unstable with respect to their interactions with other proteins, etc. Even though most of the positive and negative ions in the cell are quite simple (e.g., sodium, potassium, chlorine), their transportation can also be unstable. Transport systems of any ions are proteins of sufficiently large mass. In this case, the problem remains: why does the transport protein with overwhelming probability transfer the ion from one side of a membrane to another (with the assistance, for example, of ATP) and is not involved in any other reaction? [40].

Experiments show that the effectiveness of the active transport of ions is high and is approximately 90%. The existence of a plurality of spatial structures of biologically important molecules, as well as many variants of chemical reactions between them, is one of the most important obstacles to the functioning of the cell. There must be some special mechanism that significantly restricts the choice of variants in such a system. Without this mechanism, we cannot speak about any significant effect of molecular machines.

One of the most important quantum effects in the interaction of biologically important molecules is the tunnel effect, which can accelerate reactions by orders of magnitude [41]. Thereby, quantum mechanics plays a nontrivial role in various life processes.

Electromagnetic potential may be present even if electric and magnetic fields are absent, but the converse is not true. This means that the system can affect the status of other systems through the electromagnetic potential. That is, such a system "feels" the environment through the electromagnetic potent.

The process of the evolution of life largely depends on the properties of atoms and molecules, which, in turn, are determined by the laws of quantum mechanics [42]. The probability of the evolution of a complex system that can reproduce is exponentially small [43].

9. There are substantial coincidences between plant and animal cells

As is known, the genetic code of all living beings is the same (although there are slight differences in the codes of mitochondria and chloroplasts). However, the mechanism of formation of a single genetic code is still not clear. Initially, it was thought that the genetic code is a "frozen accident"; in recent decades, there are more arguments that the code is the result of evolutionary optimization [44]. Quantum properties that accompany the transport and conversion of energy in electron transfer could occur in the earliest stages of evolution [45].

It should be noted that the creation of copies for a quantum system obeys certain restrictions. One of the basic properties of quantum information is that an unknown state may not be copied, that is, to produce an exact copy we must have complete information about the system [46].

It is not yet determined how important is quantum mechanics to biochemistry. It is possible that prebiotic reactions use quantum effects and then become part of the machinery of DNA [47]. Indeed, a better understanding of quantum mechanics will contribute to a better understanding of the origin of life. Quantum entanglement of protons and other components must be viewed in a broader context [48].

The mechanism of evolution requires the use of a priori information explicitly; otherwise, selection on the molecular level cannot be realized. The problem of measurement in quantum mechanics is still unsolved, and the role of the observer is still unclear [49]. Biology is fundamentally contextual: bio-systems adapt permanently their behavior to contexts.

There are significant similarities between plant and animal cells. Plant and animal cells are both types of eukaryotic cells, meaning they both contain a true nucleus as well as other membrane-bound organelles. The similarities between both are enough to make it believe that in both, the interchange and flow of energy with the surroundings is quite identical, that is, glucose is the source of energy. Undoubtedly, all cells need energy to grow and function, and animal and plant cells both obtain this energy from cellular respiration, a theoretical model. This imaginary metabolic process supposedly takes place in the mitochondria of plant and animal cells and involves the breakdown of glucose to release energy.

And although the chloroplast has been studied exhaustively, since it is considered the only place where the molecule of water dissociates irreversibly, to date, the mechanism by which water is separated into its gaseous components is not yet understood. A lot of emphases has been placed on the oxygen that cells get by dissociating water, which of course has very exact and complex functions, but the cell does not use it to combine it with the glucose because it would be a waste.

Even more so, if the cell gets hydrogen at the same time as oxygen. The energy that is released by breaking the water molecule is captured in some proportion by hydrogen to be transported throughout the interior of the cell. Gases do not combine with water, so both oxygen and hydrogen move through the cytoplasm of the cell, passing through it from where the water is dissociated, usually near the cell nucleus, and following the laws of simple diffusion, it goes to the areas of lower concentration, which in this case would be the periphery, that is, the cell membrane, which also requires the energy that hydrogen carries.

In their displacement from the areas of greatest concentration, that is, where they are produced (chloroplasts in plants, melanosomes in mammals) to the areas of lower concentration (the periphery of cells), the different molecules and intracellular components are capturing either oxygen or hydrogen, with their valuable energy load. What constitutes a very efficient system of both production and distribution of energy.

Remember that the dissociation of water is a process that requires a lot of energy (endergonic), that is two thousand degrees celsius in the laboratory. But this energy, for living beings, is free because they get it from sunlight. So, the very origin of life is blooped in three components: a continuous energy source such as the sun, a unique substrate such as water, and finally the presence of molecules to transduce light energy into chemical energy by dissociating water. Thereby, glucose can be considered the universal precursor of any organic molecule in both plants and animals, but it is not able to provide the energy that its own metabolism requires.

It is time to shake off dogmas that have prevailed for a century. The body does not use a process as crude as combustion or combination with oxygen to obtain energy, let alone heat, then the most inefficient form of energy.

Nature is much more subtle because it takes advantage of a form of free energy, such as sunlight, and transforms it into another form of energy that can be used by different cells than living entities. And the dissociation of the water molecule is by far, the main mechanism, we could say is the universal mechanism. **Figures 11** and **12**.

The molecular formula for Chlorophyll is $C_{55}H_{72}MgN_4O_5$ which astonishingly sums to 137 atoms (55 + 72 + 1 + 4 + 5 = 137). The chlorophyll molecule consists of a central magnesium atom surrounded by a nitrogen-containing structure called a porphyrin ring; attached to the ring is a long carbon-hydrogen side chain, known as a phytol chain. Chlorophyll is the major pigment used by plants for capturing light energy. A chlorophyll molecule consists of a porphyrin head (four pyrrole rings containing nitrogen arranged in a ring around a magnesium ion) and a long hydrocarbon tail.

Chlorophyll is related to human blood: Most chlorophylls are classified as chlorins, which are reduced relatives of porphyrins (found in hemoglobin or blood). This means that under a microscope, the mandala of the red human blood and green chlorophyll are identical except for their central atom. This is an incredible link we have to Plants.

Finally, to the various similarities between plants and animals, we must include the fact that we do not take oxygen from the air around us, but from the water contained in the cells that make us up, such as plants. This implies rewriting biochemistry, biology, physiology, medicine, etc., but we cannot ignore such a transcendent observation.

10. Conclusion

Plants, like mammals, do not take oxygen from the surrounding air, instead, they take the oxygen from water inside the plant. Thereby, the oxygen that leaves expel into the air, coming from intracellular water. The basic mechanism is like animal kingdom: dissociating the water molecule.

Chlorophyll is the utmost studied part of plants, believing that in that place the water dissociation takes place. However, in the trunk, occurs a more efficient form of

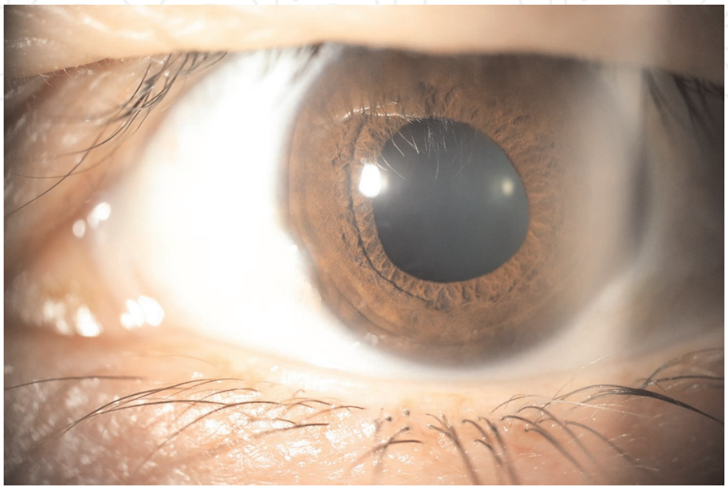


Figure 13.
The human eye contains 40% more melanin than the skin. The photograph shows the anterior surface of the iris, whose resemblance to the surface of some seeds, which also contain melanin, is striking.

Figure 14.
Peach seeds bear a huge resemblance to the anterior surface of the iris, both in shape and with melanin content. And the function of melanin is the same, transforming sunlight into chemical energy through the dissociation of water, which drives each one of the reactions that finally generate the hatching of the seed.

dissociation of water, this is, the dissociation and re-form of the water molecule, while in the leaves, water dissociation is irreversible, like in hemoglobin molecule.

Lignin is a kind of melanin placed in the trunk (**Figure 11**), and like melanin in mammals, has the unsuspected capacity to dissociate and re-form the water molecule. And this unsuspected source of energy and oxygen will allow implementing a better scheme for energy flow in the plants. The current metabolic schemes are biased in trying to frame the dogmas, for example, when the ATP molecule is formed, energy is released as in any molecule, and when the ATP molecule is hydrolyzed to ADP. energy is absorbed.

And yet, in biochemistry textbooks, it is described in the opposite way, which is contrary to reality.

Haldane, in 1913, postulated the controversial notion of the lugs as an oxygen-secreting organ. In that same year appeared mechanism, lie, and personality, in which Haldane declares that “The phenomena of life are of such a nature that no physical or chemical explanation of them is remotely possible” (**Figures 13** and **14**) [50].

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