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SOME MATHEMATICAL ASPECTS OF ABIOGENESIS

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Abstract

In this paper, we try to modestly, but strictly, using a mathematical approach, show that life was created with a certain goal and that the possibility of accidental origin of life is equal to zero. To calculate the probability of accidental creation of only one protein molecule, the basic building block of living systems, we selected a hemoglobin molecule that, because it is well studied, has become the standard for protein research. For comparison, together with this calculation, we also made a calculation of the probability of the systematic stacking of chaotically scattered playing cards from a certain height on a certain surface, a probability that is generally accepted as - improbably!

Keywords abiogenesis; probability; proteins; haemoglobin; amino acids;

1. INTRODUCTION

The physical constants and fundamental forces of nature are selected and fine-tuned to enable life in the Cosmos; in case of minimal deviations in their values life would not be possible. In the last few decades, science has made great strides in researching the secrets of life at the molecular level, many secret cells have been discovered that point to the unequivocal conclusion (which some rank as one of the greatest achievements of science!) That life was created, that there is a Creator. Still, the Theory of Evolution, according to which all living forms originated from a single source derived from an inorganic, inanimate form, still dominates school systems, although it is unable to explain the orderliness, purpose, and objective of the entire Cosmos. Most of the scientific community today accepts the theory of evolution as true, but not on the basis of scientific discoveries, but because of books and papers that depict evolution as a correct scientific explanation. Its explanation is based on chance, it is, in fact, the belief of evolutionists in the correctness of their view of the world. Opposite to it exist Creationism, a theory according to which the Cosmos was not created by chance, by itself, but was created by the Creator, God, the Great Intelligent Designer with purpose and goal, and arranged it in a manner that life would be possible. After numerous important scientific discoveries in molecular medicine and biochemistry, the structure and built elements of living organisms are quite well known to us. What remains a controversial point is: how life began? Is living matter created or originated by chance? Let's follow the concept of chance and present mathematically that there is no possibility that a living cell, infinitely complex and perfectly designed, can be created by chance. Let us show this by the example of



the accidental formation of only one, characteristic molecule, from the millions and millions of molecules that make up living beings. The basic building blocks of every living cell are proteins, formed by the binding of amino acids in long chains. In humans, protein chains contain from 50 to several thousand amino acids, of which 20 are different. By replacing the location of only one amino acid in that chain, it becomes a useless array of amino acids. We will calculate the probability of the random, spontaneous formation of just one molecule of hemoglobin, a protein that is taken as the standard for protein research .

2. METHODOLOGY

The cell is the basic structural unit of all living organisms. The cell consists of biogenic elements, water, organic compounds, carbohydrates, lipids, proteins, nucleic acids. There are 10^{14} cells in the human body (of which about 200 are different), which perform many diverse, infinitely complex functions [9]. By uniting cells according to a specific law, the basic tissues of the organism are formed, and by connecting basic tissues, again according to precisely defined and increasingly complex laws, organs are formed, functionally connected into organ systems that build the organism and perform necessary functions for life. It is difficult to accept that more complex molecules that are important for living organisms (proteins, enzymes, DNA) could have formed by chance, and the random formation of a cell, with all its incredibly complex and perfectly arranged systems, *is completely improbable* [10,11].

One of the best studied proteins is hemoglobin, a protein found in erythrocytes that is responsible for transporting oxygen from the lungs to the tissues as well as expelling carbon dioxide from the body. As the most researched protein, hemoglobin has become a model for studying protein biosynthesis and structure. Let it serve as a standard for our calculations.

The adult human hemoglobin molecule is made up of 574 amino acids (2 polypeptide chains with 141 amino acids and two chains with 146 amino acids). Some proteins contain thousands of amino acids, which would further strengthen our conclusions! All amino acids that create proteins are of L-type, arranged in a strictly defined arrangement and all are connected to each other only by peptide bonds. The order of amino acids is determined by the DNA genetic code in which complex programs are found [13]

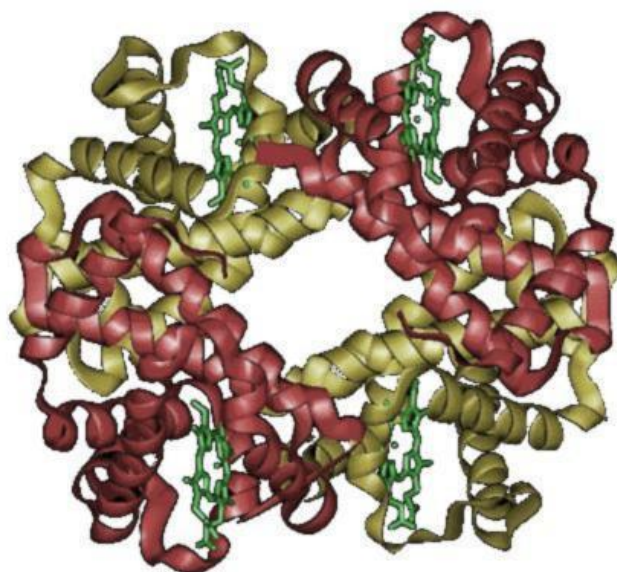


Fig. 1: Three-dimensional structure of hemoglobin
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If we wanted to write instructions for that program contained in *one DNA molecule*, we would need 1000 books containing 600 pages each! [14]

In short: to build just one molecule of hemoglobin (protein in general) three conditions must be met:

1. Proper amino acids distribution
2. Formation of L-amino acids
3. Formation of peptide bonds between amino acids

Every second our body produces billions of hemoglobin molecules. If any of the above three conditions are not met during the construction of the hemoglobin molecule, we will get a useless, non-functional series of amino acids.

3. RESULTS AND DISCUSSION

3.1 Probability of the 1st condition

Let us calculate the probability that only *one molecule* of hemoglobin is formed by chance, or that 574 amino acids (20 of which are different), are randomly, spontaneously, arranged themselves to form a molecule of hemoglobin [14]. Since the proteins of the human body are made up of 20 different

amino acids, the probability that the corresponding amino acid is positioned in the first position is $\frac{1}{20}$.

The probability of the corresponding amino acid appearing on the second position is $\frac{1}{20} \cdot \frac{1}{20} = \frac{1}{(20)^2}$,

on the third $\frac{1}{20} \cdot \frac{1}{20} \cdot \frac{1}{20} = \frac{1}{(20)^3}$ etc. The probability of random formation of a whole sequence of

574 amino acids is

$$w_1 = \frac{1}{(20)^{574}} = \frac{1}{\left[(10)^{1,301}\right]^{574}} = \frac{1}{10^{747}}.$$

In addition to the proper arrangement of amino acids in the chains, two other conditions must be met: the probability of L-amino acid selection and the probability of binding by peptide bonds.

3.2 Probability of the 2nd condition

L- and D-amino acids have the same chemical composition, but different spatial structure. The proteins of all living things are made up of L-amino acids, and if only one amino acid in a protein is of D-type, it would no longer be a functional protein. The probability that L-amino acid is represented from two types of amino acids is $\frac{1}{2}$, and in the hemoglobin chain which contains 574 amino acids the probability is

$$w_2 = \frac{1}{(2)^{574}} = \frac{1}{\left[(10)^{0,301}\right]^{574}} = \frac{1}{(10)^{173}}$$

3.3 Probability of the 3rd condition

Amino acids form different bonds with each other, but in a protein molecule they must be bound exclusively by peptide bonds. It was experimentally determined that the probability of amino acid binding by peptide bonds is 50% ($\frac{1}{2}$). The probability that 574 amino acids in a hemoglobin molecule are linked by peptide bonds is

$$w_3 = \frac{1}{(2)^{574-1}} = \frac{1}{\left[(10)^{0,301}\right]^{573}} = \frac{1}{(10)^{172}}$$

3.4 Total probability

The total probability of accidental formation of only one hemoglobin molecule is:

$$w_{\text{tot}} = w_1 \cdot w_2 \cdot w_3 = \frac{1}{10^{747}} \cdot \frac{1}{10^{173}} \cdot \frac{1}{10^{172}} = \frac{1}{10^{1092}} = 10^{-1092}$$

W

e conducted the calculation of the accidental formation of a hemoglobin molecule in simplified manner (which will not reduce the strictness of the conclusions!) only for globin chains, omitting the fact that 4 pyrrole rings and iron are required for the formation of one hemoglobin molecule, and that this spatial structure must be accurate, defined in advance. Taking these requirements into account, the probability of accidental hemoglobin formation would be far, far less.

To get an idea of how large this number is, let's make a comparison with the following example: Suppose we throw a deck of cards from the minaret of the Bey's mosque in Sarajevo into the mosque courtyard. The cards will, at random, be scattered all over the yard, falling on the face or on the back; it will rarely happen that one card touches another. Imagine someone telling you how he managed to throw the cards so that they fall on top of each other, all 52 cards, exactly matching, and so that they are all turned to face, with so arranged that first 4 aces, then 4 on them deuces with the same arrangement of color and sign as aces, then 4 triples, and so on until, finally, with 4 kings. At the end we have an initial, nicely stacked, deck of 52 cards. There is no one of us who would believe this story, who would allow a doubt of such a possibility, even assuming that there have been billions of throws through billions of years! *Simple: it's impossible!*



Fig.2: Chaotically scattered cards

Let us now approach this problem of throwing a deck of cards mathematically; let us calculate the probability that the cards will fall after being thrown from the minaret so that they satisfy all three conditions:

1. condition - that the cards fall exactly on top of each other,
2. condition - that all cards landed face upward,
3. condition - that the cards are arranged in order: aces, deuces, threes, ..., kings, by suits.

3.5. Probability of condition 1a.

Let the area of the courtyard of the Bey's mosque is 300 m^2 , and the surface of one card $30 \text{ cm}^2 = 30 \cdot 10^{-4} \text{ m}^2$. The probability for the first card, which determines the position of all the others, is $w_1=1$ (the first card can fall anywhere in the yard). The probability that the second card falls exactly on top of the first is

$$w_2 = \frac{30 \cdot 10^{-4} \text{ m}^2}{300 \text{ m}^2} = \frac{10^{-4}}{10} = \frac{1}{10^5}$$

The probability that the third falls so that it coincides with position of the first two is

$$w_3 = \frac{1}{10^5} \cdot \frac{1}{10^5} = \frac{1}{(10^5)^2}$$

and so on until the end. The probability that all the cards fall on top of each other, exactly matching, to the millimeter, is

$$w_{52} = \frac{1}{10^5} \cdot \frac{1}{10^5} \cdot \dots \cdot \frac{1}{10^5} = \frac{1}{(10^5)^{51}} = \frac{1}{(10)^{255}}$$

3.6. Probability of condition 2a.

Each card has a face and back: the probability of each card falling face-up is 50% ($w = \frac{1}{2}$). The probability that the second card will fall face-up is

$$w_2 = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{(2)^2}$$

and so on for each card. The probability that all the cards will face-up when they fall

is

$$w_s = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \dots \cdot \frac{1}{2} = \frac{1}{(2)^{52}} = \frac{1}{[(10)^{0.301}]^{52}} \approx \frac{1}{(10)^{16}}$$

3.7. Probability of condition 3a.

The probability that the cards are lined up in order from ace to king (first 4 aces, then 4 twos, then four threes, ..., then 4 kings) and by suit is

$$w_o = \frac{1}{52} \cdot \frac{1}{52} \cdot \frac{1}{52} \cdot \dots \cdot \frac{1}{52} = \frac{1}{(52)^{52}} = \frac{1}{1.7 \cdot 10^{89}} = \frac{1}{(10)^{0.231} \cdot 10^{89}} \approx \frac{1}{(10)^{89}}$$

3.8. The total probability of stacking cards

The total probability that all three conditions will be met is

$$w_{tot} = w_{52} \cdot w_s \cdot w_o = \frac{1}{(10)^{255}} \cdot \frac{1}{(10)^{16}} \cdot \frac{1}{(10)^{89}} = \frac{1}{(10)^{360}}$$

$(10)^{360}$ is a huge, incomprehensibly large number, a number that is written as 1 and 360 zeros! We don't have a name for this number, and we never encounter it. This is exactly in line with our perception of this example: it is not possible that cards stack into a deck when throwing a card, even if we do it billions of times a day (10^9), billions of years (10^9).



Fig.3: A stacked deck of cards

However, this number $(10)^{360}$, which we agree represents the *improbability* of spontaneously stacking cards, is incomparably smaller than the number $(10)^{1092}$ which expresses the probability of spontaneous formation of only one hemoglobin molecule.

Let us note, that for any sense of comparison of these numbers that e.g. the number $(10)^{1092}$ is one hundred times larger than the number $(10)^{1090}$, and $(10)^{732}$ (1 and 732 zeros!) times greater than the number $(10)^{360}$!

To understand this number to some extent, let us use a comparison: it is estimated that the entire Cosmos, the visible and invisible part, contains the so-called Eddington number of particles $N_E = 1,3 \cdot 10^{81}$, and its age is 15 billion years ($15 \cdot 10^9$ years = $4,73 \cdot 10^{17}$ s), that 7 billion people live on Earth ($7 \cdot 10^9$), it is estimated that 100 billion people have lived on Earth since the beginning of the World (10^{11}). All these numbers are negligible in relation to 10^{1092} . In mathematics, it is considered to make some sense to talk about probabilities of $1:10^{50}$, and that probabilities with a larger exponent in the denominator must be considered improbable. We obtained the probability of random formation of only one hemoglobin molecule expressed by a number $1:10^{1092}$. The human being has $6 \cdot 10^{21}$ (6 thousand millions of millions of millions) of identical hemoglobin molecules, and every second is destroyed $4 \cdot 10^{14}$ (400 millions of millions) and replaced with a new ones [14]. At random? By chance? Is absolutely impossible!

If we have mathematically proved that the spontaneous formation of just one protein molecule is unbelievable/impossible, then for the spontaneous formation of one human cell, consisting of 200,000 different types of proteins, where they would have to spontaneously combine in a specific manner, this improbability is for unthinkable number of times increased and has only one name: *improbability* [15,16].

4. CONCLUSIONS

The development of science and technology has made it possible for us to „peek“ into the structure of the basic building block of living beings - living cell and determine that *"the simplest living cell mechanism is unimaginably more complex than any machine ever conceived and constructed by man"* [16]. The cell contains factories in which energy is produced for its needs, other factories produce the necessary hormones and enzymes, safes for data storage in which all production instructions for cell factories are written, complex networks of transport systems and routes by which the produced material is delivered, sophisticated laboratories for the conversion of external raw materials (food) for the substances that body can use, specialized protein-guards that control the entry and exit of substances into the cell. Its complexity is best evidenced by the fact that, despite the strong development of science, no cell has ever been produced in a laboratory.

Even more interesting is the fact that even the building blocks of cells - proteins, could not have formed by chance. We have shown that the probability of random formation of amino acids for the formation of only one protein molecule (hemoglobin) is $1:(10)^{1092}$, which is an *improbability*.

The organized order and formation of proteins is done according to strict laws written in DNA, and DNA can never be formed without previously formed proteins!?

"The probability of life occurring by chance is comparable to the probability of a tornado sweeping through a scrap metal yard and constructing a „Boeing 747“ from rusty junk thrown in there." [17].

"The probability of the spontaneous formation of life from inanimate matter is $1:10^{40\ 000}$ (one versus a number containing 40,000 zeros behind number one)... that's enough to bury Darwin and the whole theory of evolution." [18].

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