

2. Fundamental laws

Everything surrounding us is made out of atoms. The smallest objects seen through a microscope and the biggest galaxies seen through a telescope – all are clusters of atoms. Every living organism, including us, is also a cluster of atoms. It's an indisputable fact. We are reminded of that in the words of the priest spoken at a funeral: „From dust you were made and to dust you shall turn” Each object, isolated to a higher or smaller degree, is built out of appropriately arranged, mutually interacting with one another atoms, and the sum of these interactions results in the properties of the given object.

2.1 Nature of things

We live on a planet which was called Earth by our ancestors, and which cyclically revolves around another object called the Sun. Rivers flow through „our” Earth, rain falls on it, there are earthquakes in some of its regions, volcanoes erupt, there are also many other so-called creatures living with us here: plants, insects, fish, mushrooms, birds, bacteria..... None of them wonders about the meaning of life – this is specific only to humans. Is it maybe this pondering which makes us blind to certain obvious facts? For is there any deeper meaning in the fact that a stone falls in the direction of the Earth with an acceleration equal to roughly 10 meters per second square? Is there any sense in the fact that the same stone, if it were on the Moon, would fall with acceleration seven times smaller? Is there any meaning in the existence of crystals? And what meaning does the water pouring out of the sink have? Maybe it simply “is” and we shouldn't look any deeper into it? Maybe instead of searching for the meaning of life we should simply think about why life is the way it is and about what factors cause that? We have discovered, familiarized ourselves and are successfully utilizing certain laws of physics, the law of universal gravity, for example, or Archimedes' law... But these laws do not explain the sense of everything that happens in the universe – they only explain why and how it happens.

The thing about „the nature of things” is that „it is the way it is”! And if „it is the way it is” this means that certain specific interactions, relations and processes take place, which we can define in the form of laws, and the fact that „it is the way it is” only reveals that that's the physics of that phenomenon. **A fact that something is beyond our comprehension does not mean that it is caused by some mysterious forces, and not by physical processes.** Only three hundred years ago, moving pictures on a wall would be considered works of some mysterious forces. If we showed a television set or cinema to a person from the XVIII century, he would be sure that he is dealing with some satanic forces, but nowadays it doesn't even surprise a child. We are not looking for some great master plan in the „nature of things”, but rather are trying to discover the way it works.

2.2 Axioms of the Physics of Life

We have discovered the law of universal gravitation because we noticed that apples fall to the ground and planets attract each other. Single atoms also strive to group. Every object with mass is subject to universal gravitation. Gravitation? Is it accurate to say that two particles gravitate if, in a distant cosmic emptiness, they happen to be close enough to one another that they start attracting each other? Maybe a better word to use instead of „gravitation” would be a more universal „grouping”, or „concentration” [...] *all that exists in this world (and in the whole universe) is subject to the objective, objectively acting, „law of*

concentration” – probably one of the „laws of nature” . It is a model of development, or rather a model of striving towards an explosion which is an immobile result of every type of concentration. [ISBN 978-83-7453-860-2, p. 235] Particles group in various ways, creating solid bodies, liquids, gasses, plasma, mixed bodies and alloys – generally speaking - physical objects with a certain chemical make-up, structure and properties. The most interesting group among this type of objects, at least for us, are living objects. Although they are characterised by a relatively small durability, their diversity is enormous. It is so because it includes a whole range of various objects, from relatively simple viruses¹, to very complex objects, like ourselves. So maybe instead of talking about a law of mutual gravitation, which manifests itself only through gravitational attraction and the character of which is defined with a simple formula, it would be more appropriate to talk about a law of universal concentration, which manifests itself not only through attraction, but also through such a complicated phenomenon like life itself, and the character of which is described by a rather large collection of various types of formulas and mathematical methods?

Let's start our journey by defining in the form of axioms² four fundamental laws, on which the physics of life will be based on.

2.2.1 Axiom of dualism of the nature of things

Molecules and atoms strive to group and create stable objects. But, do all of them do that and do they behave this way in all types of conditions? Generally speaking, they all group, but sometimes circumstances occur in which mutual inter-molecular relations could be described as ranging from extremely strong attraction to extremely strong repulsion. This observation is the **axiom of dualism of the nature of things**.

Let's consider children playing at a kindergarten playground. Some of them play in groups, some by themselves, but there are also those who play a little in groups and a little by themselves. Particles act in a similar way. If there was no attraction between particles, there would be no black holes³, on the other hand, forces of repulsion dominate cumulated matter, which led to the Big Bang⁴. Eighty kilometres above our heads, there are single particles moving around freely, in large distances from one another, as we noisily stomp upon a group of particles cemented with gravitational forces, our hard planet, eighty kilometres below. Between these two areas there is a zone which manifests the dualism of the nature of things in all of its glory. This zone is made up from two fluid oceans: one made of air and another of water, and there is where particles sometimes attract, and sometimes repel.

¹ Viruses (latin *virus* – poison, venom) – complex organic particles without a cellular structure, made out of proteins and nucleic acid. They contain genetic material in the form of RNA (retroviruses) or DNA. Depending on the accepted definition of life, they show traits of living organisms as well as non-living matter [Wikipedia, pol, 2008.11.12]

² Axiom (gr ἀξίωμα – conformity, certainty, obviousness) – One of the basic concepts in mathematical logic. Since the times of Euclid it was considered that axioms are sentences regarded as truth, which need not be proven in the given mathematical theorem. In modern mathematics, the definition of an axiom is slightly different: axioms are sentences distinguished from among all statements of a given theorem, selected so that all the remaining statements of this theorem result from them [Wikipedia, pol, 2008.11.12]

³ Black hole is *an area* (according to the English version of Wikipedia, a theoretical area) *in space, which has such a strong gravitational effect on the surroundings that nothing, not even electromagnetic radiation (including light), cannot escape it.* [Wikipedia, pol. ang. rus. 2008.11.12]

⁴ Big Bang is a model of the beginning of the Universe considered by modern cosmology as the most probable. According to this model, about 13,73 million years ago, the Big Bang occurred out of an incredibly dense and hot initial condition [Wikipedia, pol, 2008.11.12]

2.2.2 Material objects

Which laws of physics cause the creation of material objects? All those which are possible in the given external conditions. And those are not only interactions we described as gravitational, by also electromagnetic, chemical, van der Waal's, nuclear and those not yet understood by us. If the given external conditions make the creation of objects impossible - objects simply do not form. And objects, even those bimolecular, created as a result of grouping, have various types of properties.

2.2.2.1 Structure of material objects

Particles forming objects arrange in a certain specific way and it is their arrangement in relation to one another that we call the **structure** of an object. Let's notice that properties of an object consisting of particles A, B and C may vary, depending on whether they form into an object ABC or object BAC.

2.2.2.2 Duration of objects

One of the few properties, common for objects of any type, is duration, measured with the use of time. This will not be the last time I'll complain about the ambiguity of language which we must communicate in, but unfortunately, even in scientific language, we use the term "life" in order to describe this property. We talk about "life of planets", meaning of course the duration of their existence. In order to avoid double meanings, in our further discussion let's abbreviate the duration of an object's existence to **DOE**. The term "life" will be used to describe the DOE of objects which in a specific way... „duplicate" and „do something or other"⁵ in order to extend their DOE. As to the property of duration— it's not hard to notice that structures can come into being and, after a certain amount of time - Δt , fall apart. Depending on value of Δt , and on the observer's interpretation of Δt , we can talk about stable objects, unstable objects and, for example, objects which instantly fall apart. Of course, the adverb "instantly" relates to the observer's subjectivism, because the object called "mountain" lasts forever for the object called "human", and from the point of view of, let's say, Ararat, a human falls apart instantly.

2.2.2.3 Transformability of material objects

Another important property of objects is their **transformability**, meaning the ability to transform into new objects with new properties. The number of transformations depends on the number of particles making up the given objects. It is obvious that a higher number of transformations is possible when more particles make up an object. In case of a bimolecular object, it can fall apart into two particles – or merge with another object. For example, object **AB** can, as a result of transformation, form new objects: **A** and **B**, **ABFF**, **DDAB**, **ABFGHIJK**, etc.

In our everyday language, the process of falling apart of objects is describes as death. However, as a result of transformation, an object simply changes. Obviously, it can fall apart into single particles or objects consisting of few particles, or it can transform into another object or just alter some of its properties. Therefore, as with the word „life", we shall reserve the term „death" for living objects only.

⁵ As we will soon see, we are not talking only about the Darwinian „struggle", so the word „struggle" has been for now replaced with the phrase „do something or other".

Speaking of a life of a star or death of a piece of wood, which we have just burned in the fireplace, will be considered as logically erroneous by us from now on.

2.2.2.4 Criteria of objectivity

An object is a certain characteristic whole for as long as its DOE lasts. And the length of DOE depends only on how long an object remains as this „certain characteristic whole”. When a bimolecular object AB falls apart to form two objects A and B, it ceases to be the object which it was before, but if two particles break off an object made up of a decillion (10³³) particles, it would still be probably considered as the same object. The criteria, according to which we determine whether the considered object is still the same object or whether it has become a new characteristic whole, are called the **criteria of objectivity**. Of course, they possess no objective or universal traits – they are determined subjectively by the observer, and we may agree with them or make up our own.

If we were to consider whether a fence, after removing one of its boards, is the same fence as before, the answer will be determined by the criteria of objectivity. „No, it is no longer the same object, because the object about which we are talking about was securing the area from our neighbour's cat, which chose our children's sandbox as its bathroom”. Or „yes, it is still the same fence, because even without one board it still prevents big dogs from entering our garden.” If you wonder whether you are still the same object which you were in your mother's womb or when you were 11 years old, you will have to search for the answer through the criteria of objectivity. Traditionally, we say that we are always the same person that we were, but there's also a different opinion, which is based on the fact that the matter making up our bodies is completely replaced every 10 years or so. Therefore, whether something is an object or it has just ceased to be an object, depends only on the subjective criteria of objectivity. If we define them or accept one's defined by someone else, we will be able to determine, in their light, whether an object is still the same object or when it ceases to be that object and starts to be something else.

2.2.2.5 Causing factors

Which objects are the most stable? Most stable meaning lasting the longest. The answer to this question is trivially simple: those, which in the given circumstances last the longest. What guarantees stability of an object? Is there a single factor which affects it? Generally, no. Stability or instability can be caused by various factors: gravitational force, electromagnetic bonds, movement... generally speaking, by any physical phenomenon or a group of physical phenomena. In case of living objects, they can be as sophisticated as, for example: a cure, a lie, domination, work, theft government or random absence or presence in some location.

If an object was suspended in a vacuum, where no external influences would be affecting it, and there were no internal processes taking place within the object, it would remain unchanged eternally. If, however, the said influences did occur and had an effect on the object, they would be considered as a group of **causing factors**, and depending on the role they'd play, we could put them into one of the four categories: **initiators** – factors bringing an object to life. In case of our fence, those would be: a reason, which brought on the idea to build the fence, requirements, which it will have to fulfil, design, which describes how it will look and what it will be made of, as well as tasks related with the purchase of the

materials and work needed to build the fence; **constructors**, which extend the DOE, maintain the existence of the „certain characteristic whole” and cause that criteria of objectivity are fulfilled. If we are able to measure the fulfilment of criteria, they will be those factors, which increase their fulfilment. The constructors of the object „fence”, include not only the tasks of painting, conservation and repairs, but also searching for paint which will protect the boards better, etc.; opposite the constructors are the **destructors**, who do everything in their power to stop the object from being that „certain characteristic whole”. They cause that the criteria of objectivity cease to be fulfilled, and if we are able to measure the fulfilment of criteria, the destructors decrease their fulfilment. In regard to the fence, the destructors would be atmospheric factors, a child throwing a ball at the fence causing paint to chip, and an unreliable worker who's done a bad painting job; the last causing factors are the **terminators**, which cause that the object definitively ceases to be what it was. The decision about disassembling the fence and the disassembly itself are such terminators in the case of our fence.

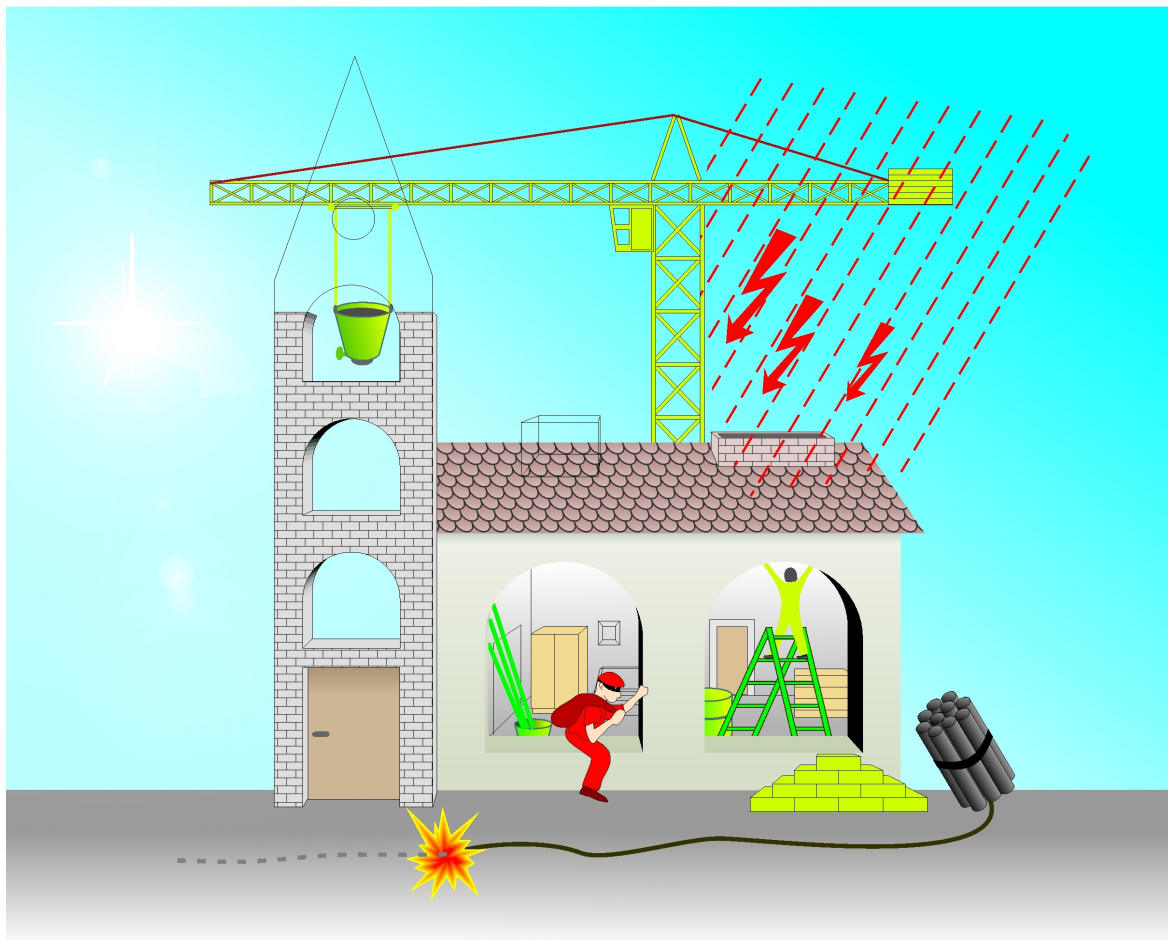


Fig. Object – criteria of objectivity and causing factors:

- white – initiators, e.g.: an idea for the construction;
- green – constructors, e.g.: bricks, crane, workers;
- red – destructors, e.g.: thief, rain;
- black – terminators, e.g.: bomb.

2.2.3 Axiom of mutual interference

The second axiom of the physics of life is the **axiom of mutual interference**, which states that: elemental particles, atoms, particles and objects interfere with one another.

I think that there is no need to dwell on this Axiom. Even if interference does not exist between given objects, it does exist from the mathematical point of view, but its value is equal to zero.

2.2.3 Axiom of variability

The third axiom – **the axiom of variability** – states: all objects are variable in time.

Objects, which appear invariable only seem this way. Each object and each phenomenon has different phases of existence. This axiom is elemental to the physics of life, since it forces us to examine all phenomena as processes, differentiate between its various stages and examine consequences.

This axiom could be undermined if we said that the speed of light, for example, is a constant. Even if it is, we can look at this issue from a mathematical point of view and say that this value is also variable in time, but its changes are small enough to be ignored.

2.2.4 Axiom of resultant property

The fourth axiom is the **axiom of property**. Each object's properties are a resultant of properties, behaviour and mutual interference of its components. Generally speaking we are talking about all atoms making up an object.

Content

2. Fundamental laws.....1
2.1 Nature of things.....1
2.2 Axioms of the Physics of Life.....1
2.2.1 Axiom of dualism of the nature of things.....2
2.2.2 Material objects.....3
2.2.3 Axiom of mutual interference.....6
2.2.3 Axiom of variability.....6
2.2.4 Axiom of resultant property.....6