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DARWIN'S THEORY OF BIOLOGICAL EVOLUTION SEEN FROM THE POINT OF VIEW OF MODERN PHYSICS

1. Introduction

Darwin's theory of biological evolution is the most spectacular theory explaining the origin of species by the process of natural selection. It seems to be good to explain the mechanism of the biological origin of species. In the light of classical physics and Newton's mechanics the gradual process of evolution proposed by Darwin is possible. According to the classical view, Newton's physical time is an absolute physical value and flows independently of space and matter. Each particle of the matter is independent of each other. The situation emerging from quantum physics and Einstein's theory of relativity is different. According to the theory of relativity time is incorporated into space, time is a coordinate of space; time is spatial and does not flow, particularly in the individual elements According to quantum mechanics time is correlated with energy, is spatial and the so-called quantum entanglement takes place. These phenomena prevent any system from evolution, understood in the Darwinian sense, because the laws of quantum mechanics and Einstein's theory of relativity are universal for all the systems in the Universe, including all biological systems. It does not mean that in the light of quantum and relativistic physics evolution of systems is impossible. It means that evolution of any systems (biological and non-biological) is in completely different way and is common for all objects in the Universe (including all living systems).

2. Darwin's theory of evolution as a gradual process

In the evolution model, the entire living "universe" is considered as having evolved by natural processes and random selection into its present state of high organization and complexity. In this model the

Universe began in a state of pure randomness. Gradually, it has — through the "survival of the fittest" — become more ordered and complex. In 1859 Charles Darwin published his book entitled *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* [Darwin 1859]. The publication of Darwin''s book *On The Origin of Species* in 1859 changed biology for good. Natural selection can ultimately lead to the formation of new species. Sometimes many species evolve from a single ancestral species. Evolution is understood as a process in which species respond to environmental conditions by changing gradually over time. Evolution has led to the diversification of all living organisms from a common ancestors, which are described by Charles Darwin as "endless forms most beautiful and most wonderful" [Darwin 1859]. According to Darwin's theory of evolution, complex creatures evolve from more simplistic ancestors naturally over time. 'Darwin's Theory of Evolution is a slow gradual process. Darwin wrote, "…Natural selection acts only by taking advantage of slight successive variations; she can never take a great and sudden leap, but must advance by short and sure, though slow steps." Darwin conceded that "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down." Such a complex organ would be known as an "irreducibly complex system". **According to Darwin himself, the existence of these irreducible, complex systems is a devastating blow to the theory of evolution!**

The summarize Darwin's Theory of Evolution:
1. Variation: There is Variation in Every Population.
2. Competition: Organisms Compete for limited resources.
3. Offspring: Organisms produce more Offspring than can survive.
4. Genetics: Organisms pass Genetic traits on to their offspring.
5. Natural Selection: Those organisms with the Most Beneficial Traits are more likely to Survive and Reproduce.

3. Quantum Mechanics and the theory of relativity and world vision

In order to understand the problem of biological evolution as seen by modern physics I would like to give a brief outline of the main

principles of 20th quantum mechanics and the theory of relativity and its influence on the world vision.

The discovery (at the end of the 19th century) that the speed of light is the absolute value not depending on any reference system, which has a constant speed of 300 thousand km/s and is the highest speed possible in nature has revealed that the classical laws of mechanics of the 17th century can only be applied to a limited range of speeds. This discovery was the basis for the Einstein's theory of relativity. At the beginning of the 20th century the theory of elementary particles emerged on the basis of quantum mechanics. As follows from 20th century physics, atoms are not the smallest and indivisible components of matter; they are built of quarks (whose existence has been experimentally confirmed) and the quarks are probably built of strings (which have not been experimentally confirmed yet). The existence of discrete components known as quasi-particles has been proved, without which the interactions in nature would be impossible. Contemporary atomism is the theory of elementary particles assumed to be the smallest and indivisible elements of matter; however, it is substantially different from the atomism of the 17th, 18th and 19th centuries. Quantum mechanics has proved that the smallest particles never occur by themselves as independent entities but always in interactions with other particles or components of the field. It has been also proved that a vacuum is not empty. These facts are vital for the vision of the world developed in the 20th century; there are no fully isolated and independent objects.

The Cartesian and Newtonian mechanicism, atomism and reductionism [Descartes 1644; Newton 1686] seem to have failed to describe the present day vision of the world. In the light of the above two great theories of a new ontology of a continuous and indivisible process appeared.

Quantum mechanics and the theory of relativity provide for a completely different approach to the vision of time: time is a coordinate of space so the image of the movement is frozen. Dynamics converts into geometry. The arrow of time can exist only in the systems composed of a huge number of particles, e.g. in biological systems. These systems are characterized by a statistical quantity, i.e. entropy, whose value increases or decreases with time.

4. Should the evolution of the system be described in terms of determinism or indeterminism?

Can the world vision presented by quantum mechanics and Einstein's theory of relativity be described in terms of determinism? What about the implications of quantum mechanics and the theory of relativity?

On the one hand we have the reversible and deterministic evolution described by the Schrodinger equation and on the other hand — the indeterminisitic and irreversible reduction of the wave function to only one value measured. In quantum mechanics the so-called neutrophic probability is defined.

According to the theory of relativity, events are predictable but irreversible; evolution of the system is deterministic and irreversible. However, the relativistic equations of Einstein describe the deterministic and reversible evolution of a system.

A common feature of quantum mechanics and the relativistic theory is the irreversibility of events. The indeterministic events of quantum measurements coexist with the deterministic events of the relativity theory. In conclusion, the world described by quantum mechanics and the theory of relativity is not strictly deterministic and combines the determinism of the theory of relativity and indeterminism of the quantum theory.

What are the consequences? The indeterministic reduction of the wave function leads to the appearance of an unpredictable state determining the whole system. When this state disappears the whole system disappears, in line with the assumptions of the quantum mechanic and theory of relativity. The processes taking place in the system are irreversible and have the arrow of time.

What about the Darwin theory of evolution? This theory assumes the indeteministic and irreversible character of evolution. According to the Darwin theory of evolution the evolution process is irreversible in this sense that if even the external circumstances were suitable the evolution had never returned to the identical form from the past. As a typical example from the Darwin theory is evolution of tortoises [Darwin 1839]. In the present form the tortoises are not identical from the tortoises from the past: from the mesozoic and kenozoic eras. The varieties of tortoises form by sorting already-existing gene by natural selection are shown [Cosner 2009].

According to the quantum mechanics the unpredictable state determines the whole system, not only its part. Darwin theory of evolution is in opposition with this statement. Darwin theory is also in opposition with the determinism arise from the theory of relativity.

5. How about the biological evolution of the system?

From the point of view of the world vision presented by quantum mechanics and the theory of relativity, reductionism is impossible and there are no fully isolated and independent objects. All elements make up one entity. This assumption implies that individual elements of the system cannot evolve separately. According to the theory of relativity, time and space are strictly interrelated, so time is not independent of space and its flow cannot be considered for isolated elements of the system.

Another problem is quantum entanglement. Quantum entanglement occurs when electrons, molecules even as large as photons, etc., originally interact physically and then become separated in such a way that each resulting member of a pair carries the same quantum mechanical description (state). The entanglement of a general initial state vector would not change. In the absence of interaction subsystems A and B would evolve independently of each other. Entanglement between the quantum system and its environment causes decoherence, which is in contradiction to the coherent gradual changes in the evolution process proposed by Darwin. According to Żurek [Żurek 2009] decoherence turns fragility of quantum states — the author writes in his progress article. Biological systems, composed from many quantum states of molecules, are not fragile The fragility of states makes quantum systems very difficult to isolate [Joos 2003], [Żurek 2003]. The biological system is composed of multiple particles; one of the particles cannot be fully described without also considering the other(s), even if the particles are separated by some distance.

In the light of quantum mechanic all the systems in the Universe, including living ones can be described by a Schrodinger wave function. Theoretical physicians and cosmologists S. Hawking and J. Hartle are the fathers of a new discipline called the quantum cosmology, which applies quantum theory to the large structures. They claim that there is a Universe wave function [Hartle and Hawking 1983]. According to the authors the quantum state of a spatially closed Universe can be

described by a specific wave function. The wave functions can be associated with large objects, like biological species. In the light of quantum mechanic everything in the Universe has the wave function: the elementary particles and the large objects, including the biological and non-biological ones. The people also has the wave function. An American physicist Aman Ahuja states [Ahuja 2001]:

> ...all matter possess wave-like properties, so do humans, and cats, and whatever you please.

The elementary particles possess wave-functions and make up all other matter in the Universe, including the biological systems. The wave function refers to a system as a whole (not its parts). Postulate V of quantum mechanic states that the time-dependant Schrödinger equation [Schrödinger 1926] describes the evolution of a system's wave function through time. The time-independent Schrödinger equation describes the stationary state by the time independent wave function [Schrödinger 1926]. We know that the evolution of any system (including a biological) is a strictly time process. The time-dependent Schrödinger equation, gives a description of a system evolving with time. The time evolution of the state of a quantum system (as a whole) is described by the time-dependent Schrödinger equation (time-dependent wave function) then. When the system has enough energy goes to a stationary state described by the time-independent wave function. The time-independent Schrödinger equation is the equation describing stationary states of a given system. From the quantum mechanic we know that the wave function is linear and cannot change in a given stationary state. For this reason the system (biological or non-biological) in a given stationary state described by the time-independent linear wave function cannot change. Under the specific circumstances (e.g gravitation force and other factors) the state of system (as a whole) may change. Under special circumstances the wave function of a given system could become a time-dependent. The existing state may disappear and another may emerge. It is connected with the indeterministic change the wave function in the whole system. This specific situation may lead to change of the state of system — this is, its evolution. In other words, in the light of quantum mechanic the evolution of a system means an indeterministic alteration of its

stationary state described by a new wave function, which refers to a system as a whole, not its parts. I think, that this potentially explains evolution process as an indeterministic change of a whole state of system described by its wave function. The evolution process is performed by disappearance of one stationary state and emergence another. Fig. 3 schematically illustrate haw the process of evolution might look according to the quantum wave function described above. It is not easy to change the whole wave function defining the stationary state in the large systems, in particularly including the biological species. This fact refers both for biological and not biological systems, as well as to the whole Universe. Properties of the wave function of the quantum theory presented above are in accordance with theory of relativity where time is not flowing in isolated parts of the system. This seems to be in contradiction to the theory of evolution, which assumes gradual changes in individual elements of the system that can lead to the transformation of one species into another. In the light of quantum mechanic the individual elements in a given system not possess the individual wave function. I think that this implication explains why one species cannot evolve into another one, by the gradually changes e.g. a fish cannot gradually evolve into an amphibian and an amphibian cannot gradually evolve into a mammal. For example, according to the theory of evolution the scales of reptiles have transformed into the wings of birds and the gills of fish have transformed into the lungs of higher order animals. These transformations have not been supported by experimental evidence, and have been recently questioned. Quantum entanglement, linear wave function described the state of system as a whole, not its elements and the theory of relativity (time does not flow in the individual elements of a system) seem to explain that fact.

Biological systems are made up of molecules and atoms subjected to quantum and relativistic laws that determine the evolution of systems of all types of species, including the Universe and biological organisms. Consequently, quantum mechanics and the theory of relativity are not compatible with the evolution process of separate elements of the system.

An alternative to the Darwin's theory is that of Cuvier [Cuvier 1812] — the theory of catastrophes to which the concept presented by quantum mechanics and Einstein's theory of relativity seems closer. The theory of catastrophes assumes that new species appear in the

process of catastrophes taking place every one million years. It has been established on the basis of the analyses of fossil remains that certain species went extinct every 62-63 million years [Rohde and Muller 2005]. Entire species became extinct and other ones appeared. This process is consistent with the assumptions of modern physics; the non-relativistic being can be attributed only to the process as a whole.

6. Other theories of biological and chemical sciences about the evolution of the biological system

Let's consider also some main theories from biological and chemical sciences which seem to be particularly close to modern physics assumptions.

A trend called Aristotelism treats a living entity as a complex whole whose living structure is a structure-forming dynamic.

In light of the tremendous advances in molecular biology, biochemistry and genetics over the past fifty years Darwin's Theory of Evolution is a theory in crisis. Molecular and cell biologists claim that there are in fact tens of thousands of irreducibly complex systems on the cellular level. An irreducibly complex system is one that is composed of multiple parts, all of which are necessary for the system to function. If even one part is missing, the entire system will fail to function. Every individual part is integral [Behe 1996]. Thus, such a system could not have evolved slowly, piece by piece.

The existence of the so called irreducible complex molecular machines cannot be explained by gradual, 'evolutionary' evolvement of the components of these machines, as these systems can only perform if all the components are present. Therefore, a gradual "evolution" is not possible. 'The bacterial flagellum uses a paddling mechanism, and it must meet the same requirements as other such swimming systems. And it is necessarily comprised of at least three parts — a paddle, a rotor, and a motor — it is irreducibly complex. Gradual evolution of the flagellum faces mammoth hurdles" [Behe 1996]. Michael Behe (1996) claims instances of "irreducible complexity" in biology, which adds up to little more than an old-fashioned incredulity about achieving complex interdependent structures incrementally.

Bridgham et al. [Bridgham 2006] study a system that looks irreducibly complex: a hormone-receptor pair. The results indicate that tight interactions can evolve by molecular exploitation — into a new

functional complex. In the end of article the authors conclude: "The puzzle that complex systems pose for Darwinian evolution depends on the premise that each part has no function — and therefore cannot be selected for — until the entire system is present. This puzzle might indeed cause Darwin_s theory to break down if the functions of the parts must remain static for all time".

According to Meyer-Abich [Meyer-Abich 1963] the connections between the elements of individual levels are complementary in character, not additive.

Inyushin's view is considered as being holistic and antireductionistic [Inyushin et al. 1992]. According to Inyushin a biological field appears as a very important element of living organisms. However, this field cannot be understood as a simple sum of physical fields.

Lenski et al [Lenski 2003] have performed experiments with digital organisms — computer programs that self replicate, mutate and compete. Theirs simulations indicate that "no particular intermediate stage was essential for evolving complex functions." It is in opposition to the Darwin theory which assumes intermediate stages in the evolution process.

The contemporary theory of chaos assumes that the instability of a nonlinear system far from equilibrium can lead to the appearance of qualitatively new forms of matter. According to this theory only a system as a whole can changes, not its components. According to one definition, "Chaos theory is the qualitative study of unstable aperiodic behavior in deterministic nonlinear dynamical systems." [Kellert 1993]. Systems are understood as a whole. Systems may display both chaotic and non-chaotic behavior depending on the control parameters used. As an classical example is the logistic equation, first devised in 1845 by Verhulst [Verhulst 1845]. Modern science has reached the conclusion that the complex building blocks of the simplest living cell — proteins, DNA and molecular machines — do not allow for a random assembly even over long periods of time. Deterministic and indeterministic laws of modern physics rule here.

7. A comparison between Newton's classical physics, quantum physics, Einstein's theory of relativity and Darwin's theory of evolution

The vision of biological evolution represented by quantum mechanics and the theory of relativity differs from Newton's classical mechanic visions and Darwin's theory of evolution. A comparison between them is given in the table 1. The two figures presented show the differences between classical physics (Fig. 1) and 20th c. quantum mechanics and the theory of relativity (Fig.2).

According to classical physics and Newton's mechanics (Fig. 1) time flows independently of space and matter, and evolution as a gradual process is possible. In classical physics the dynamical evolution of a closed system is determined by its real Hamilton time function. Evolution appears as a function of time. Evolution of a biological and other system is an essential feature of reality. It is in accordance with Darwin's theory of evolution.

In quantum mechanics the dynamical evolution of a closed q-system is determined by its hermitian Hamilton matrix $\hat{H}$. The evolution is not a temporal event but rather a spatial process. In the theory of relativity we define a space-time or world as a four-dimensional product of space and time. A point in the space-time is called an event, and a curve a world line. Any history (e.g. evolution of species) of a point particle is represented by such a world line. In the light of quantum mechanics and the theory of relativity time is incorporated into space, time is correlated with energy, time is spatial and time does not flow for isolated elements of system what is determined by the time-independent wave function. For this reason evolution cannot be considered as a function of time. Quantum entanglement in biological systems and in many-body systems takes place. For this reason the evolution of separate elements and whole biological systems is not possible in the Darvinian sense. (Fig.2). It is in contradiction to Darwin's theory of evolution.

8. Discussion: Darwinism and modern physics — is it possible?

In the past the Darwin theory of biological evolution was the most priority and the most important theory for me and I believed it is absolutely true. I simply ignored some disagreements with this theory I noticed. When I started to work in physics I gradually noticed that more

and more facts seem to be in contradiction to Darwin's theory of evolution. I began ask myself: how can we explain gradual evolution and natural selection proposed by Darwin by actual physical laws? Is there a connection between Darwin's mechanisms of evolution and laws of quantum mechanic and theory of relativity? I gradually realized that Darwin's theory of biological evolution is not connected with laws of quantum physics and theory of relativity laws and with classical thermodynamic physical laws. Darwin theory does not explain the whole Universe evolution. Gravitation, relativity, entanglement, deterministic and in-deterministic laws of quantum mechanic and deterministic rules of the theory of relativity, non-separation of basic elements are not compatible with gradually evolution of separate elements in Darwin theory of evolution. The laws of quantum mechanics and Einstein's theory of relativity are universal for all the systems in the Universe, including all biological systems. In his book, Darwin never mentioned the origin of life. I think this is a great problem.

I would like to cite philosophers of science, physicists, and other persons about Darwinian theory of evolution and some aspects of modern physics.

Massimo Pigliucci [Pigliucci 2006] in his book entitled *Sense of Evolution: Toward a Coherent Picture of Evolutionary* consider the Thomas Kuhn concept of philosophy of science. He writes that according to Thomas Kuhn in *The Structure of Scientific Revolutions* (1962), 'paradigm shifts' are replacements of the core theories scientists use to describe the world: they are 'fundamental changes in perspective'. The classic examples of paradigm shifts tend to come from astronomy and physics. They include the replacement of Ptolemaic astronomy by the Copernican system, or the transition from Newtonian mechanics to Einstein's relativity. The situation is similar for the Newtonian vs Einsteinian view of space-time: a rigid unchanging medium in the Newtonian case, a pliable fabric in the Einsteinian. 'Paradigm shift' proposed by philosopher of science Thomas Kuhn is apply also for Darwin theory of evolution vs. modern physics

Massimo Pigliucci [Pigliucci 2006] asks whether evolutionary biology has ever shifted paradigms. He writes: "But the theory of evolution currently accepted by scientists is no more straightforwardly 'Darwinian' than modern physics is 'Newtonian' — and indeed the

entire field of evolutionary biology is still undergoing a revision and expansion of its views on the history and connectedness of life. (…) In fact, evolutionary biology's only major shift of perspectives took place right at the beginning, at the hand of Charles Darwin himself."

Let's consider now Wojciech Żurek's Progress article (on page 181). [Żurek 2009] *How Darwinian is quantum Darwinism*? — the author asks in the end of the article. This is a 'quantum Darwinism', which leads, posits Żurek, to the meaningful emergence of the classical from the quantum. According to author quantum Darwinism describes the proliferation, in the environment, of multiple records of selected states of a quantum system. He tries to explain how the quantum fragility of a state of a single quantum system can lead to the classical robustness of states in their correlated multitude. But this is very difficult question.

Seth Lloyd in Commentary [Lloyd 2009, 164] considers how "quantum mechanics has a profound effect on the naturally selected world." It is, of course, impossible to discuss. He writes: "The laws of physics as we know them may themselves have been the outcome of a process of natural selection." However, the Darwin theory of natural selection do not connected with physical laws and seems be in contradiction with these laws.

Erwin Schrödinger a famous physicist in his book entitled *What is life*? [Schrödinger 1944] states in the chapter VI:

> ...living matter, while not eluding the "laws of physics" as established up to date, is likely to involve "other laws of physics" hitherto unknown, which however, once they have been revealed, will form just as integral a part of science as the former.

The father of quantum mechanic Heisenberg said [Heisenberg 1959]:

> ...the world thus appears as a complicated tissue of events in which connections of different kind alternate or overlap or combine and thereby determine the texture of whole.

Under Darwin's concept, variation is completely random, whereas selection introduces order and creates complexity. This statement is in opposition to the quantum mechanics and theory of

relativity concept whereas the selection of any state of particle does not create any order and complexity in the system. Quantum mechanics is notorious for its pervasive dynamic randomness. Randomness also makes physical systems haphazardly explore their possible states, leading to irreversibility. And now, it makes no sense to speak of predetermined order. According to Chatin [Chaitin 1987] random data is pattern less so no cause behind it can be inferred. Hawking [Hawking and Penrose 1996] claims that a black hole is as much a source of true randomness as the Big Bang. But randomness does not follow order and complexity in systems.

According to Badii and Politi [Badii and Politi 1997] studying complexity requires more than traditional physics. What exact history is realized in a universe does, of course, depend on microscopic details. They claim that complexity is valid under a wide range of dynamical laws and initial conditions: concepts like irreversibility, self-organization, and Darwinian variation-and-selection are not very sensitive to the underlying microscopic physics.

There are also some opinions about Darwin's theory of evolution and laws of modern physics taken from the internet pages:

Philippe Arquie says: "Darwinism isn't a theory of the entire universe; it is only a theory explaining how the present species evolved from common ancestors in the past. No one expects the theory of gravitation to show how life evolved in the same way that Darwinism doesn't explain why physics works."

"Drae" from Michigan says: "Evolution doesn't even try to answer where life came from or where physics came from."

Matthew Seppanen says: "Only the first claim (that "Darwinism" doesn't explain how life began) can even remotely be associated with evolution. The rest of the claims are just ridiculous; anyone who has taken even high school science courses can tell the difference between biology and physics."

Mike Rosulek brings attention to the suppression of dissent from Newton's dogmatic theory of gravity. He says: "After all, Newtonism, as a theory that explains the attraction between masses, is incredibly brilliant. But as a theory that explains everything in terms of forces, it doesn't explain the diversity of life. It doesn't explain where thermodynamics comes from, where the laws of physics come from, or where matter came from. And adding to the list of flaws, don't forget

that neither Newtonism nor Darwinism satisfactorily explain the popularity of Paris Hilton (a truly eternal mystery)."(...)"It is true that evolution does not explain thermodynamics. But his "criticism" of evolution in this interview does nothing more than expose his own scientific illiteracy. It is a non sequitur to criticize a theory for its inability to explain things outside its scope, because no scientific theory explains everything. Surely any scientific alternative to evolution would also fail to explain the laws of physics, by the simple fact of being a theory about biology, not physics."

"Physicalist" in Boston says: "Of course Darwin has nothing to say about how gravity works; that was Newton! Darwin offered a biological theory of evolution; it explains how, given a population of simple living things that population could develop into extremely diverse populations of more complicated living things. It doesn't pretend to say anything about gravity, thermodynamics, chemistry, or astronomy. "

Kevin Miklasz says: "There are two points to Ben's claim, first that scientists do not know how gravity/life originates, and second that scientists claim that "Darwinian means" must be responsible. Neither point is true. The origin and nature of gravity is explained in the Big Bang theory and other theories in physics. These explanations for the origin of gravity have no relation to evolutionary theory. The same goes for the origin of life. There are several theories of the origin of life, including the iron-sulfur world and the RNA world hypotheses. These hypotheses have little conceptual similarity to current evolutionary theory or "Darwinism."

Prof. Michael Denton (an Australian biochemist) in his book *Evolution: A Theory in Crisis* [Denton 1985], examined the theory in the light of different branches of science, and concluded that the theory of natural selection is very far from providing an explanation for life on earth.

Maynard Smith and Szathmáry [Smith 1995] in the book entitled *The Major Transitions in Evolution* draw request that Darwian theory has been in any crises. They distinguished this phenomenon from statistical minor transitions of species/populations, by describing it as the initial step of a series of major physical transitions of interacting (sub)systems into interacting systems.

Szathmary and Smith (1995) in the abstract of review article states: "there is no theoretical reason to expect evolutionary lineages to increase in complexity with time, and no empirical evidence that they so do."

Lita Cosner and Jonathan Sarfati in the article about evolution of Darwin's tortoises comment [Cosner, 2009]: "This is definitely *natural selection* in action, but **not** evolution."

Darwin's theory of evolution, in contrast with contemporary physics and chemistry, attempts to explain events and processes. Laws and experiments carried out especially in the modern physics are inappropriate techniques for the explication of such events and processes. This is a great problem. In Darwin evolutionary biology, theories are largely based on concepts such as competition, selection, succession, dominance, etc. These biological concepts, and the theories based on them, cannot be reduced to the laws and theories of the physical sciences. In the physical sciences, as a rule, theories are based on laws; for example, the laws of motion led to the theory of gravitation. Apart from that Darwinism refutes typology. In science from the time of the Pythagoreans and Plato, the general concept of diversity of the world emphasized its invariance and stability. In the philosophy, this viewpoint is called typology, or essentialism. Typological thinking is unable to accommodate variation. The physical laws that govern the atoms in all biological cells are invariable.

9. Conclusions

In light of 20th century quantum mechanics and Einstein's theory of relativity the evolution of the separate elements of any system is not possible. It seems to be in contradiction to Darwin's theory of evolution, which assumes gradual changes in individual elements.

According to many scientists and philosophers of science the Darwin theory does not explain the whole Universe evolution as well as does not explain the origin of life. There are not any connections between gravitation, relativity, entanglement, deterministic and in-deterministic laws of quantum mechanic and deterministic rules of the theory of relativity, non-separation of basic elements as well as the classical thermodynamic laws in the Darwin theory.

In the light of quantum mechanic the individual elements in a given system (including the biological species) not possess the

individual wave function and cannot gradually evolve. According to the theory of relativity, time can not flow for isolated elements of the system.

Darwin theory of evolution focused on explanation of events and processes refutes typology and based on concepts not laws, which are not established by of standards of scientific reasoning.

Basing on the above statements we can conclude: the quantum mechanics and Einstein's theory of relativity indicate that Darwin's theory of evolution is in crisis.

	NEWTON'S CLASSICAL MECHANICS	**QUANTUM MECHANICS**	**EINSTEIN'S THEORY OF RELATIVITY**	**DARWIN'S THEORY OF EVOLUTION**
Attitude to evolution	Evolution of any systems is an essential feature of reality	Evolution of separate elements cannot take place, everything is given for ever	Evolution of separate elements cannot take place, everything is given for ever	Biological evolution is an essential feature of reality
Character of the evolution of systems	There is only one reversible and deterministic process of evolution	Two processes of evolution: continuous, reversible and deterministic described by Schrodinger's equation and discontinuous, indeterministic reduction of the wave function to one result of measurement	Deterministic and irreversible evolution	Indeteministic and irreversible character of evolution
Applicability of reductionism	Can be applied, a system can be decomposed into smaller elements	Cannot be applied; photons and other massless particles cannot be decomposed. Quarks cannot exist independently. Can be applied; electrons and other particles having mass can be reduced to quarks and	Cannot be applied; time cannot be separated from space and gravity, gravity cannot be separated from matter	Can be applied - gradual evolution of separated elements

		quarks can be reduced to strings		
Applicability of the atomistic theory	Fully applicable; fundamental elements of matter are fully independent	Not applicable; fundamental elements of matter are interrelated	Not applicable; fundamental elements of matter are interrelated	Fully applicable; fundamental elements of matter are fully independent.
Relations between time, space, matter and gravity	All these quantities are independent and absolute	For massless particles time does not exist, they are absolute spatial electromagnetic waves. For particles having mass time, space, matter and gravity are quantised — relative and interrelated	All these quantities are relative; time and space are joined into spacetime. Gravity is related to spacetime. Gravity is strictly related to matter generating gravitation field. Spacetime, gravity and matter and interrelated	No information

Table 1.

Figures captions

Fig. 1. A model of evolution represented by classical physics and Newton's mechanics. Evolution appears as a function of time.

Fig. 2. A model of evolution represented by quantum mechanics and the theory of relativity. Evolution appears not as a temporal event but as a spatial process. The evolution of species is represented by the separate world lines.

Fig. 3. A universal scheme of evolution represented by a quantum mechanic and theory of relativity refers to all both biological and non-biological systems.

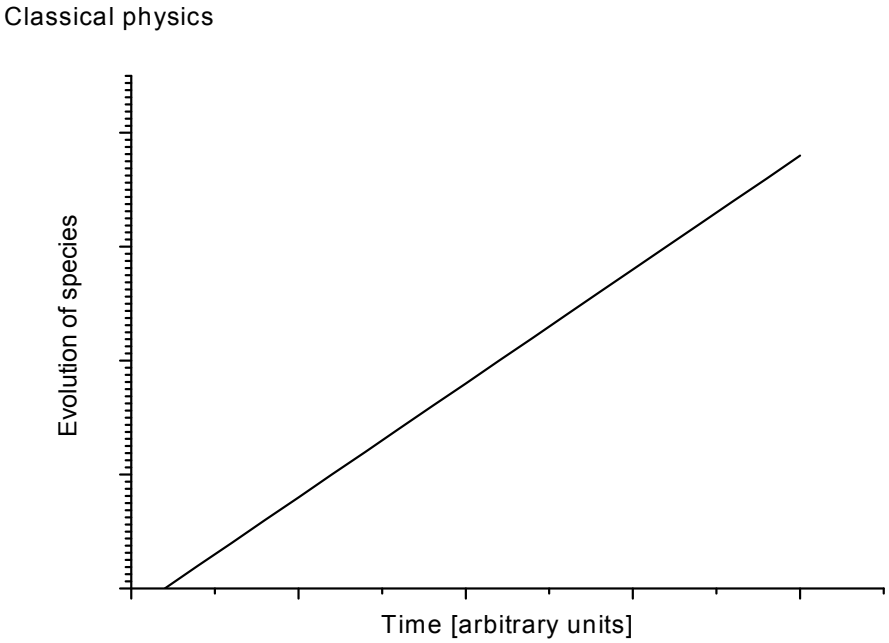
Classical physics
Evolution of species
Time [arbitrary units]

Fig. 1.

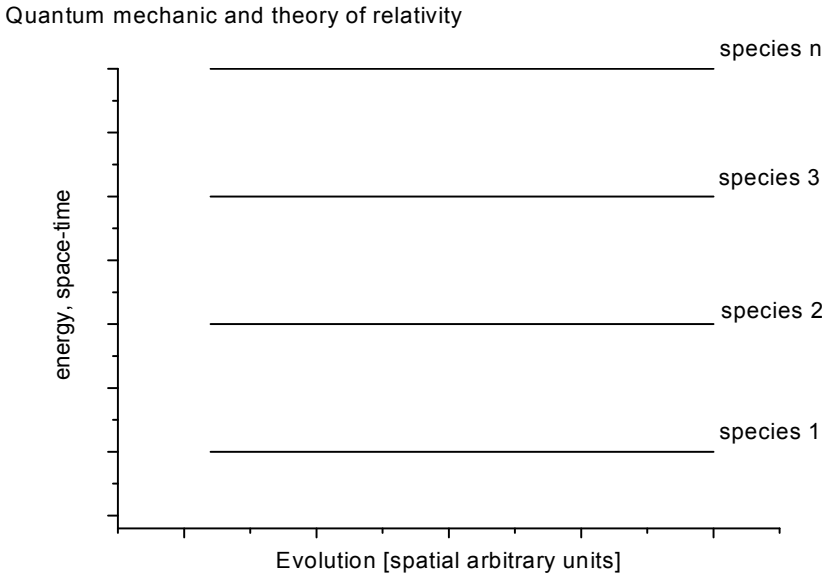
Quantum mechanic and theory of relativity
species n
species 3
species 2
species 1
energy, space-time
Evolution [spatial arbitrary units]

Fig. 2.

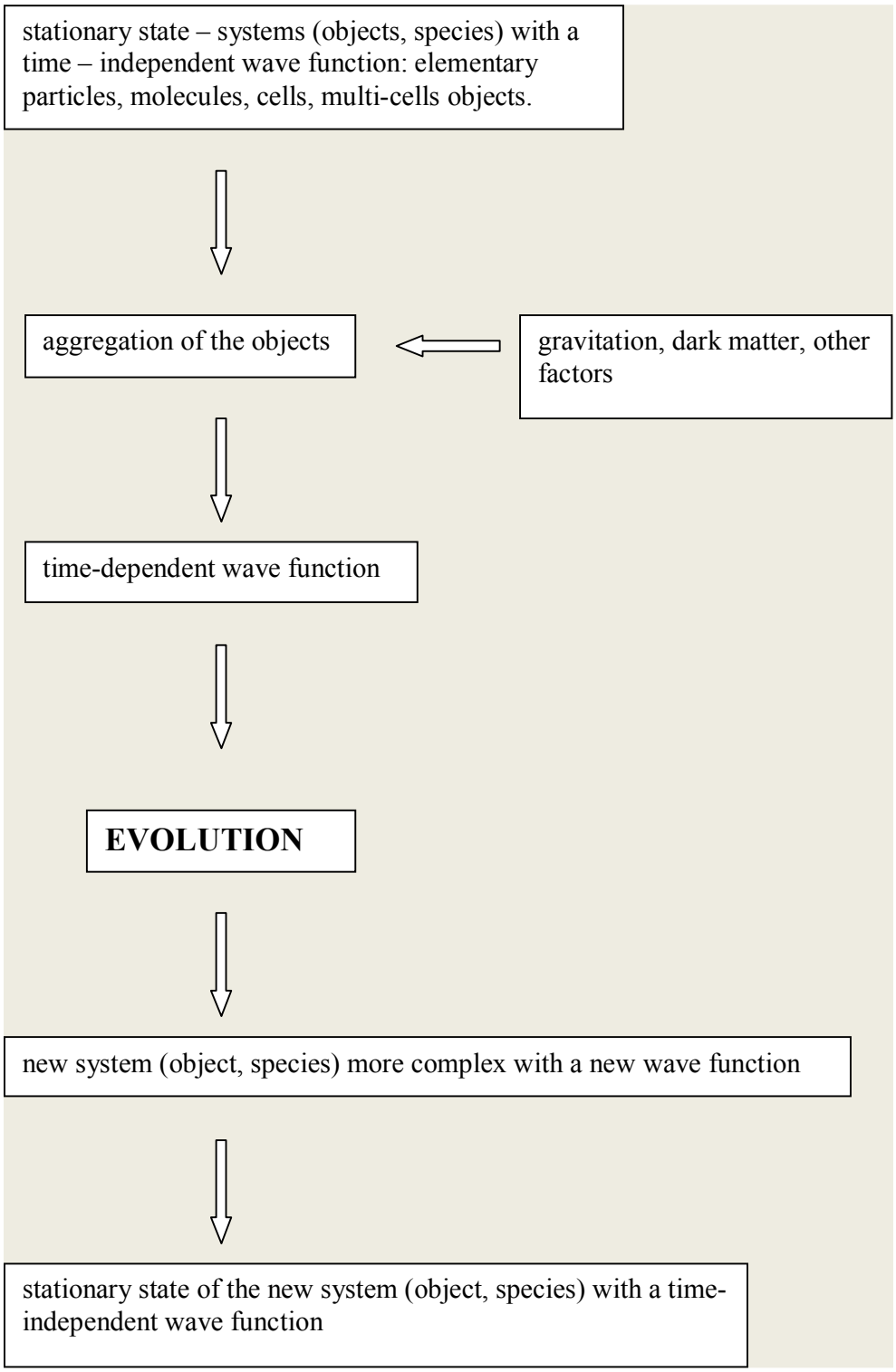
stationary state – systems (objects, species) with a time – independent wave function: elementary particles, molecules, cells, multi-cells objects.
aggregation of the objects
gravitation, dark matter, other factors
time-dependent wave function
EVOLUTION
new system (object, species) more complex with a new wave function
stationary state of the new system (object, species) with a time-independent wave function

Fig. 3.

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ABSTRACT

DARWIN'S THEORY OF BIOLOGICAL EVOLUTION SEEN FROM THE POINT OF VIEW OF MODERN PHYSICS

This paper aims to show the influence of 20th century quantum mechanics and the theory of relativity on the philosophical problems of Darwin's theory of biological evolution. Evolution as a non-relativistic being can be attributed only to the process as a whole. Quantum mechanics and the theory of relativity are not compatible with the evolution process of separate elements of the system. It seems to be in contradiction to Darwin's theory of evolution as a slow and gradual process of separate elements in the biological system. According to many scientists and philosophers of science the Darwin's theory does not explain the whole Universe evolution as well as does not explain the origin of life. Explanation of events and processes, reliance on concepts not laws, refutation of typology by Darwin theory of evolution are not established by standards of scientific reasoning. Many scientific facts from modern physics indicate that Darwin's theory of evolution is in crisis.