

SEARCH FOR UNITY IN PHYSICS: CHALLENGES, SOLUTIONS AND PROSPECTS

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Introduction

The current systems of education and science together with mass media make people think that physics is a hard science and physical theories represent the objective reality. We lightly take this on trust. Meanwhile, this is all wrong.

A well-known theoretical physicist Richard Feynman described the progress and fundamentals of the current physical science in his book *The Feynman Lectures on Physics*: “Up to this point, we have only described how the Earth is turning around the Sun having told nothing about the impelling mechanism. Newton did not speculate about that, *it was enough for him just to discover a fact without boring with the actual mechanism of the case*. However, none has discovered any mechanism ever since. All physical laws are abstract in this respect... The law of energy conservation, ... and the great laws of mechanics are *quantitative mathematical regularities*, and there are no data on their inherent mechanisms... We keep this way because discoveries still happen here” [1]. According to Feynman, this is true even for the most fundamental physical notions: “It is important to understand that *today’s physics does not know what the energy is*. We do not believe that energy is transferred in a form of small pills. Nothing of the sort! We have only formulas to calculate certain numerical quantities”... “Each new step in the study of the Nature is only a further approximation to the truth or to what we believe to be the truth... Any studies give rise to even more questions about the studied object or, at the best case, show that previous formula have to be corrected” [1].

Perversely looking over critical contradictions, “sweeping difficulties under the rug” (R. Feynman) and once again “explaining a secret with a puzzle” (M.Vitty), scientists, for several decades already, have been discussing the progress made by modern theoretical physics in the formulation of general physical laws. Meanwhile, very few uninitiated understand that an actual knowledge of the objective laws of the Nature’s development is not the case in hand. For theoretical physicists, “atom is just a framework for the classification of experimental facts” [2]. And an “...‘electron’ is a set of physical values introduced to establish a system of principles that will make it possible for us to infer pointer readings of a physical device [2]”. Such approaches do not change in the modern physics: in quantum chromodynamics, a transfer from bipolar to tripolar charges is made on account of three ‘colors’, and ‘aromas’, ‘hedgehogs’ and ‘strings’ etc. appear [3].

How did we happen to get in a situation when inconsistent laws reflecting nothing are still ruling in science?

Which principles will make it possible to approach understanding, and which ways lead to the understanding of the general laws of Nature?

Let us try to get to the bottom of such issues.

1. Analysis of the development of ideas about the nature of matter

Physics, a successor of natural philosophy, continues a search for unity: both the unity of its fundamental theories and the unity of its relations to other natural sciences.

Such historical search occurs through a tough competition of alternative concepts, theories and approaches to solution finding processes. A conceptual shift usually results in a consolidation of the victorious theory for a certain period of time (round) until another theory gets a win. These rounds are represented in the periodization of science history. Such periodization shall be updated accounting for the recent winner period; therefore, development of science looks like a continuous onward progress and yet another victory over a crisis.

Here is an example of current periodization of science:

1) pre-classical period (early antiquity, search for the absolute truth, observation and thinking, and analogue method);

2) classical (16th through 17th century, introduction of experiment design and determinist approach, increase in the importance of science);

3) non-classical (end of the 19th century, development of powerful scientific theories, e.g., relativity theory, search for relative truth, realization that determinist approach is not always applicable and an observer influences the quest of an experiment);

4) post-neoclassical (end of the 20th century, synergetics emerges, the objective field of cognition expands and the science extends beyond its framework into other spheres, and the objectives and goals of science are looked for) [4].

The subjective nature of science periodization is its main feature manifested through the criteria of periods under comparison above all. On closer view, it resembles a comparison of a snake with an urchin, i.e., a comparison of different things divorced from each other. Thus, while periods (rounds) alternate, the problems stand over, and a crisis of science deepens instead of being resolved, and such situation slows down the development of science.

Let us consider the challenges and achievements of physics in each phase of the aforementioned periodization of its development.

1) Pre-classical period – continual concept by Aristotle (384 – 322 BC) – philosophically speculative period (up to the 16th century).

A picture of the universe from the whole down to space objects and planets was created on the basis of deductive (from the general to the special) logical speculations. The pattern was generalized down to the terrestrial level following the principle of ‘terrestrial is similar to celestial’ without detail elaboration.

According to Aristotle, the general mechanism of Nature’s development, the first principles and the ultimate conditions of all existence are as follows:

- Matter without form is a ‘non-existence’ – ‘potential being’ (the elements *out of which* an object is created) – a moving continuous medium (ether), a flow. It has rate of flux (quantity of matter flowing in a certain space per unit time). However, it has no form (a confined volume differing with its properties from the environment).

- A material form, apart from a volume having distinguished properties, has also a new property – a movement relative to the environment, or a driving force. A form and its movement highlight an individual substance – ‘actual being’ (the expression of *what* it is) - a moving volume having its individual energy showed up from a flow.

- There is always a cause or an active essence resulting in the birth of a new form.

- A set of one-type moving forms filling the space may constitute a new (more rough) level of amorphous material medium. Arising of a cause (‘essence’) may result in the creation of a new individual form and so forth endlessly.

The conceptual and philosophical notion of ‘cause’ (driving force of forms development) on each level was not concretized theoretically. Aristotle considered the God to be the first of all causes.

According the continuum concept, continuous motion accompanying generation of forms, self-organizing and development is an inherent feature of the matter. Such motion is the result of the internal driving force – “inherent material force” [5].

Dynamic generation of forms out of the elements of fluid (ether) of the continuous medium is the universal forming mechanism at all levels of subtlety of the matter.

The fundamentals are summarized in Table 1.

The ‘professional’ features of the approaches and problems solved in this phase are similar to the problems solved by an ‘architect’, doer or creator.

Unsolved and controversial points of the concept are as follows:

The nature of the driving force of matter and formation forces has not been explained. In that phase, the scientists confined themselves to problem statement and formulation of basic principles, according to which the nature of forces lies in the interrelation of the environmental medium and a material structure developed out of such medium (“antiperistasis”) in the processes of streamlining and circulation (vortex formation) of the medium around bodies (material structures).

The forces of interaction of material bodies were not elucidated in detail for different levels of brute matter.

Dogmatism and detachment reigned over the processes of solution and generalization of applied problems under the conditions of extensive accumulation of experimental facts.

2) *Classical or – more simply – practice phase (classical mechanics, 17th - 20th century).*

That period was the phase of extension and accumulation of knowledge about natural phenomena and human practice and experience on the planetary (terrestrial) level. Studies on the level of applied forces (interaction forces), chasing for facts and a trial of mathematical generalization of obtained results were characteristic of that phase.

In a course of solution of practical, worldly everyday life problems, the laws of the structure of the Universe paled into insignificance. Matter was considered a part or a flake of the solid Earth. In that phase, scientists turned to investigation of the behavior of shatters, or solid particles with a further generalization from a ‘particular to general’.

Atomistic ideas about the structure of matter formed the basis for such investigation.

Since the nature of the driving force of matter and the forming forces were left undiscovered, the scientists quit coming down to brass nails and excluded the “causes” from consideration proceeding to a reduced (gross) practical insight into the features of matter.

Plenty of empirical data on the movement of bodies and various natural phenomena were obtained to be used in the development of applied technical knowledge. The major emphasis was made on a reveal of new regularities of interaction between different bodies and its mathematical description.

The fundamentals are summarized in Table 1.

The ‘professional’ features of the problems solved in this phase are similar to the problems solved by an ‘archeologist’ working with the chips of destructed dead bodies and searching for interrelations.

Unsolved and controversial points of the concept are as follows:

The driving force of matter was substituted with an idea of constancy of the kinetic moment of a body under vacuum (void) conditions or in case of a lack of a drag force.

Fluid mechanics turned out to be an instrument of mathematical analysis of experimental data having lost its predictability as a physical theory. An illusion about the viscosity as the sole cause of vortex formation existed in mechanics.

That phase in the development of science was aptly characterized by D. Birkhoff who ironically divided the specialists in fluid mechanics into experimenters who observe something that cannot be described and theorists who describe something that cannot be observed.

A transit from one level to another usually implies a qualitative change in the structure-forming relations. Particles are interconnected with different types of interaction. Such an approach excludes the common mechanism of matter formation on different levels.

An extensive use of quickly developing technical methods and instruments on the basis of the newly discovered natural forces and phenomena encouraged researchers. The scientists turned to a belief that a man might be the cause of various supernatural phenomena and destruction processes. A man self-confidently abandoned the idea of being under the authority of God and felt himself the emperor of nature. Such self-confidence together with a lack of knowledge about the actual inherent forces and natural laws played a low-down trick: natural resources exhausted and ecological status and climate of the Earth worsened. That was a pre-critical phase.

Basically, an analysis of that period makes it possible to conclude that existence in the Earth is impossible on the basis of destruction by using applied forces only. Prompt mastering of the inherent material forces is required for the purposes of smooth coexistence with Nature.

3) *Non-classical – observation and mathematical phase (20th century and the beginning of 21st century); the phase of mathematicians engaged in physics – a period of a still deeper crisis in science.*

Theory was considered a designer of formulas describing observations of matter destruction; the processes of creation and wholeness of nature were completely ignored, and attention was abnormally drawn to destruction and destructed objects (‘necromania’).

The methods, objectives, goals and results achieved in that phase fitted mostly the profession of a ‘coroner’ (anatomical pathologist).

Unsolved and controversial points of the concept were ‘swept under the rug’ with the introduction of a new model of ‘enigma’ inducing a crisis in science.

The fundamentals are summarized in Table 1.

4) Post- non-classical – natural and creative phase (19th century – beginning of 21st century): a phase of recovery.

In that phase, development of Nature together with its driving forces were the main objects of investigation; researchers returned to continuum ideas about the nature of the driving force of matter, they copied Nature and applied inherent forces of material structures in engineering. That phase of development of science was represented by J. Kelly (1827-1898), N. Tesla (1856-1943), V. Shaugberger (1885-1958), A.Ya. Milovich (1874-1958) and R. Fuller (1895-1983) etc.

Great while, the classical mechanics of fluid and continuous media studied the interaction between a moving fluid and an obstacle, streamlining and the nature of forces and vortex structures arising in such processes on the basis of the theory of impact momentum action. Newton, Euler and other scientists faced substantial difficulties: their theoretical models did not agree with experimental results. Those theoretical problems were ‘swept away’ out of sight, and since the beginning of 20th century, scientists started to rely strictly on empirical relations obtained on the basis of experimental data having attributed all interaction forces and energy of the formed vortex structures to the viscous drag forces of a medium [6].

Russian scientist, Professor A.Ya. Milovich (1874-1958) [7] has developed a theory of interaction between bodies and fluid, according to which:

- the main cause of vortex structures formation is the obstruction of a flux, and not the viscosity;
- a vortex structure has a dipolar shape;
- a vortex structure of a dipole has a limited volume; it has also complementary energy and moves relative to the medium (generated such vortex structure) with a certain velocity;
- pressure gradient arising during vortex flowing of a medium around a body forms the basis for a driving force;
- a vortex structure having complementary energy is always formed during dynamic rotation of a fluid (also on bending) with the conservation of the energy of the main stream. The process of formation of a dynamic vortex structure having complementary energy in a medium is inoperative [8].

The works by Milovich have complemented the continuum ideas of Aristotle about the nature and properties of matter with a new profound theoretical and applied meaning. They have made it possible to trace informatively the common mechanism of formation from galactic (Fig. 1, 2 and 3) and planetary (Fig.4) structures down to mechanic (Fig. 5) and electromagnetic (Fig. 6) structures.

“... moving along a curved channel, a stream as a whole moves progressively and has no torque relative to the axis of curving.

Thus, all its internal deformations mean that the mass of a fluid is displaced through a curved channel without acquiring a torque” [9].

I.e., a *stream* deals with passing along a curving *by itself* without an involvement of “applied forces”. Energy for such process is generated by a stream itself via generation of additional circulating flows for the purposes of curving the main stream on a bending. In such case, the ‘*inherent strength*’ or *energy of matter downstream the bending increases by the value of the total kinetic energy of circulation*. The rate of such circulation defines the increase in kinetic moment or inertia mass of the fluid.

“The inherent strength of matter is its immanent ability to maintain its energy constant.

Axial circulation is a mechanism that makes it possible to maintain the energy of matter constant in case of deformation, or constraint reaction to a change in the external conditions of a medium.

There is not only the law of conservation of energy or matter in Nature that we have already revealed, but also a mechanism that makes it possible to implement this law [10].

Austrian researcher Viktor Shaugberger had no such academic knowledge as professor A.Ya. Milovich, however his inquiring mind could not pass by the manifestations of complementary energy in natural processes in the curves of river streams. Viktor Shaugberger was thinking about ways of practical application of such energy. Back in the 1930-ties, he developed first power installations for autonomous heating and electric energy supply of his house by using the complementary energy of vortex structures. V. Shaugberger is an originator of biotechnology, a new trend in engineering that employs natural mechanisms and phenomena for the purposes of displacement of bodies in power engineering or ecological purification of fluid, and etc. [10].

The problems solved in this phase of devotion to and emulation of Nature (biophilia) have no ‘professional’ analogue, however, they may be considered relevant to the calling of a natural philosopher.

The fundamentals are summarized in Table 1.

Unsolved problems:

As Professor Milovich wrote, “In order to complete consideration of basic principles of a new theory of fluid medium resistance, we have to make such principles definitely free of the influence of viscosity and show that they are true for an *ideal fluid* too. This is all the more necessary because a boundary vortex band theory is still accepted...

If we assume that a viscosity factor of a fluid in the boundary layer equals to zero, there will be no effect of the boundary layer. Vortices will not arise on the surface of a streamlined body according to such theory. Streamlining will turn potential, and no interaction force will appear between a body and a fluid. An ideal fluid has no viscosity; however, the particles of such fluid still have mass and inertia. *Kinetic moment of such fluid will be a certain force* that is not a function of viscosity, and such force will not disappear at viscosity equal to zero as it has been shown by Newton; therefore, on streamlining of bodies with an ideal fluid, there will certainly be an interaction force between them, i.e. a generation and development of vortices” [11].

Ideas of a laminar flow of fluid and explanation of pressure loss only with viscosity and friction prevailed in hydraulics and *made invalid and unaccounted*, hence *impossible to use a half of the actual kinetic energy of transverse circulation of a fluid in a course of its vortex movement impeding the development of technologies that exploit the energy of dynamic structures.*

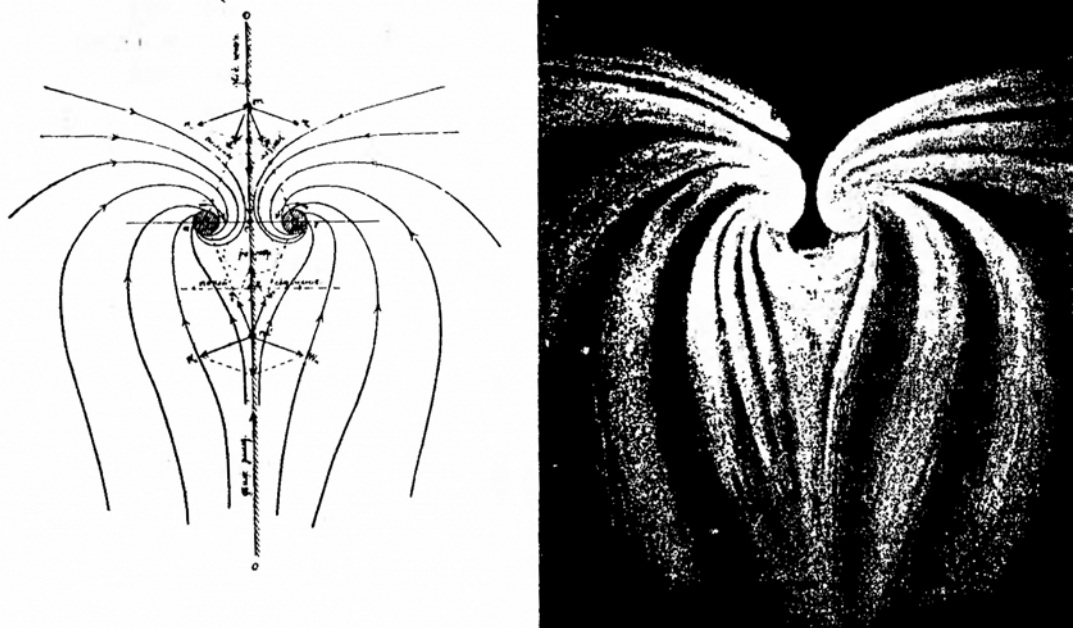


Figure 1

- pattern of motions of fluid from two vortex sources having opposite signs (left);
- core part of Orion Nebula – “Snapdragon” (right) [12].

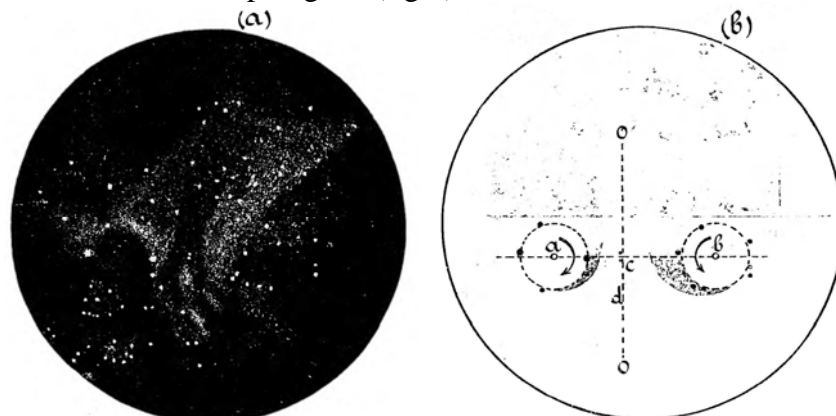


Figure 2

- a) Omega Nebula in John Sobieski constellation;
- b) A reduced scheme of the nebula [12]

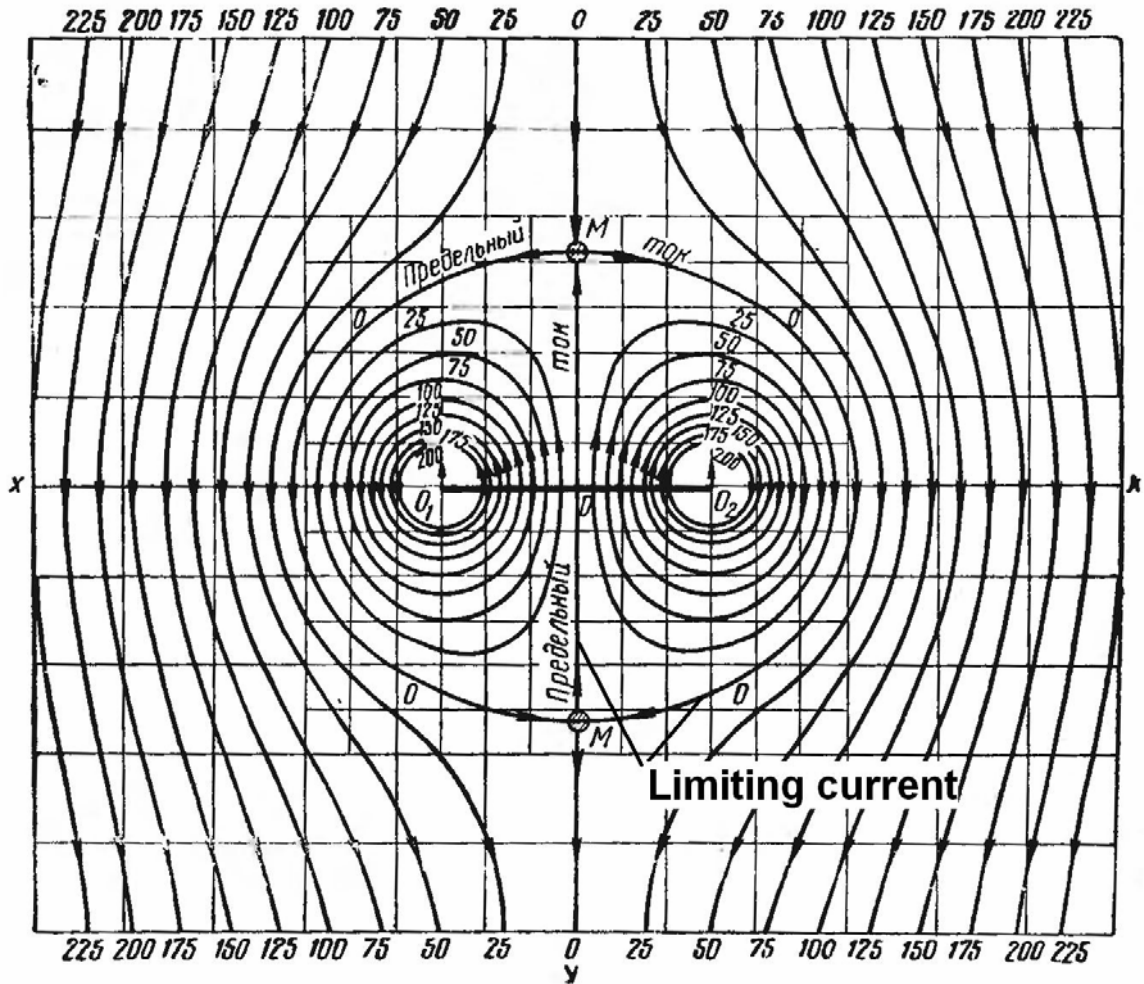


Fig 3. A scheme of a dipole. 'Vortex atmosphere' is a volume confined with the closed surface of a limiting current [11]

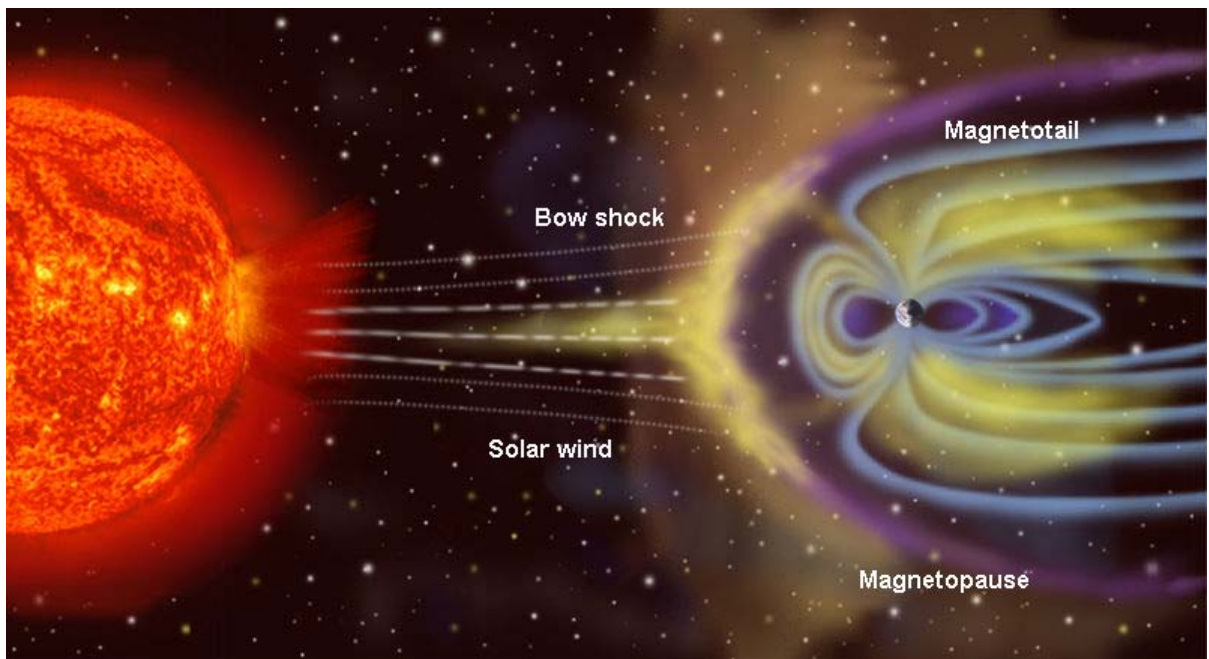


Fig. 4 Scheme of the structure of the magnetosphere of the Earth [13]

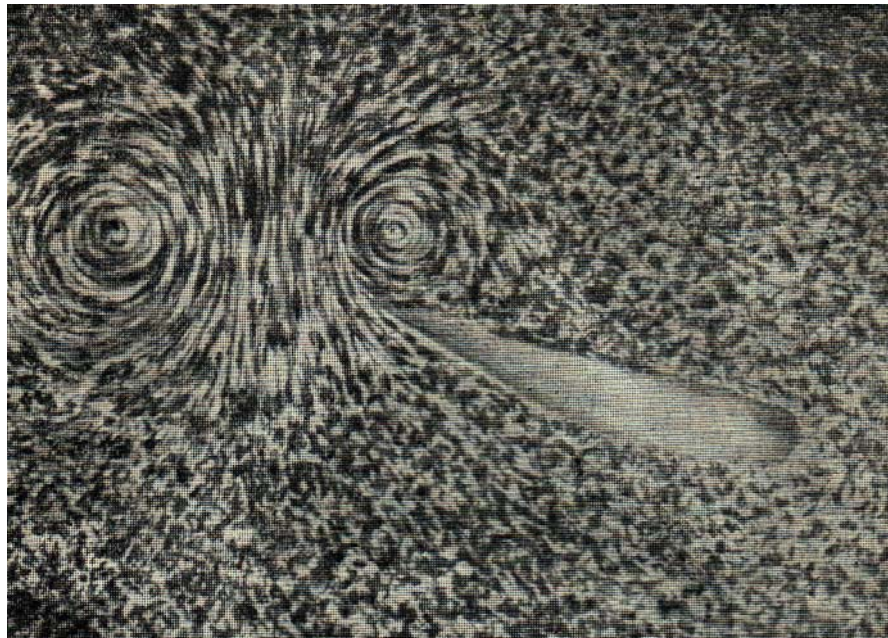


Fig. 5. Vortex structure formed by a paddle [11]

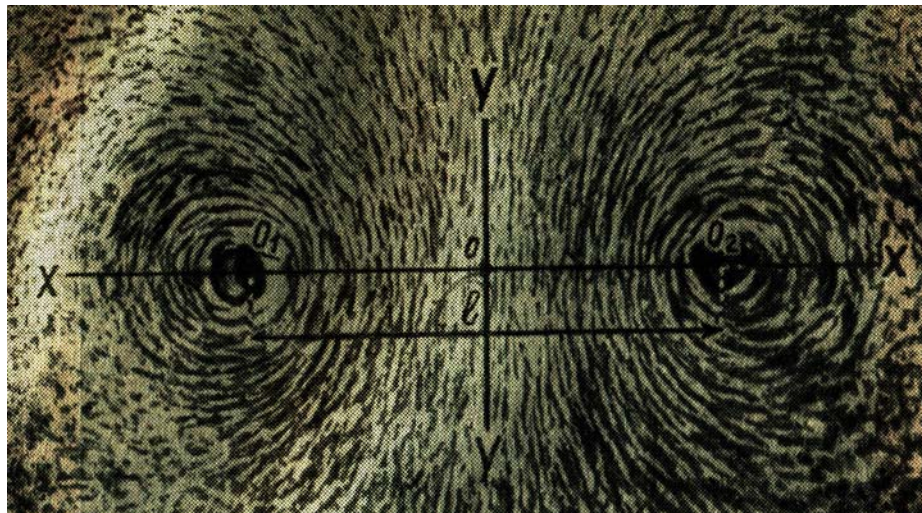


Fig. 6. Force lines of magnetic field of current of two conductors with opposite currents [11]

Table 1

| Phase | Background and fundamentals |
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| 1. Pre-classical period– continual concept | <p>The universe and each particle of its matter are formed from ether (quintessence). Ether is a subtle weightless matter, and a fluid is a continuous medium, the particles of which are permanently moving. There is an unlimited set of the levels of ether’s ‘subtlety’ differing with the size and velocity of the particles comprising them.</p> <p>Originally, matter has no structure; structure appears in the phase of integration with form, which is an organizing essence.</p> <p>Ether fills the space continuously without any void because any movement of particles induces a substitution of a particle removed from its place with another (adjacent) particle, which forms a system of relations between material objects and processes.</p> <p><i>Antiperistasis</i> is a sort of circulation of interconnected displacements of objects, during which bodies a kind of replace each other getting into the freed places. A possibility of such motion is demonstrated by the example of human breathing: “<i>Since there is no void, in which anything moving could get while breathing moves particles outward, it is obvious that breathing is not coming out</i>”</p> |

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| | <p><i>into void, but rather pushes the adjacent matter out of the way, while such matter, in turn, pushes its neighboring, and thus everything is carried in a vortex-like manner to the same place of origin of breathing, it enters such place, fills it and again follows breathing. This process is akin a rotating wheel since there is void nowhere” [14].</i></p> <p>All matter is permanently moving inducing the formation of great many of vortices having various properties. All physical objects are nothing else than a result of vortex movement in incondensable and non-expandable (liquid) ether (Descartes). Examples of vortex structures are shown in Figures 1, 2, 4, 5 and 6.</p> <p>Brute matter forming the Earth (planets) and other terrestrial bodies consists of four main elements having different properties in accordance with different physical states (solid, liquid, gaseous and fire). The density of such elements is higher than the density of surrounding ether forming them.</p> <p>A force acts between bodies of the same type to group them together.</p> <p>Objects and matter may move with a constant velocity only under the effect of a constant force and energy accompanying such movement. Movement is the cause of an interaction of a moving object with a medium, through which such object is moving.</p> <p>A force applied to a body will make such body moving only if such force exceeds certain minimum value.</p> <p>Velocity of the body’s movement is inversely proportional to the density of the medium: movement is faster in a rarer medium [15].</p> <p>Aristotle explained compression and expansion of bodies postulating that the same quantities of matter may have different volumes.</p> <p>Movement or development is the general law, a form of matter’s existence. Matter develops (and continues) in all parts, i.e., develops as a whole because of its interconnections. Things and phenomena should be studied accounting for their interrelationships.</p> <p>Natural laws have the same meaning under any conditions of their observation. In case of simultaneous movements, time is measured in the same way irrespective of the velocities of such movements, including zero velocity of one of the bodies.</p> <p>Reality is objective. Theories shall describe the objective reality. Knowledge is achieved through relative truths. Relative truths make it possible to formulate an absolute truth. Main objectives include a revelation of the source of matter’s movement and explanation of all phenomena studied by different sciences on the basis of matter <i>per se</i> and the inherent properties of matter [2].</p> <p>There are no separated, ‘free’ or ‘guideless’ particles. Even when particles are located at substantial distances from each other, they still belong to the medium they originate from, and which is permanently moving in a chaotic and ‘turbulent’ manner [15].</p> |
| <p>2. Classical phase; atomistic concept</p> | <p>The universe consists of vacuum (void space) and endless number of unchangeable, indivisible and impermeable tiniest particles called atoms. Atoms are qualitatively uniform and unchangeable particles differing with their shape and size and permanently and chaotically moving.</p> <p>Binding of atoms with each other results in the formation of everything existing in the world (Democritus et al.).</p> <p>“There can be no movement without void” – this assumption was the main argument explaining movement.</p> <p>Occurrence of void gaps explained the phenomena of rarefying and condensation or compression and expansion of bodies etc., as well as propagation of different (heat, light or magnetic etc.) irradiation.</p> <p>Meanwhile, accumulation of great quantities of void was considered impossible. It was confirmed with a demonstration of a vessel with a very narrow neck: if such vessel was put upside down, water would not pour out of it. Such</p> |

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| | <p>fact was explained with that “nature hates void”.</p> <p>The “fear of void” force is limited and is neither more nor less than the value of air pressure (Galileo) [14].</p> <p>A body experiencing no effect of outer forces will continue straight line motion with a constant velocity.</p> <p>A motion uniformly accelerates under the effect of constant force.</p> <p>A body will be put in motion under the effect of any – even infinitesimal – force.</p> <p>All bodies fall down with the same velocity irrespective of their weight.</p> <p>Actual obtaining of vacuum was used as an argument against the followers of the continuum concept [16].</p> |
| <p>3. Non-classical; the phase of mathematicians engaged in physics</p> | <p>All notions and regularities are relative. There is no objective basis of theories. Theories are just symbols or marks for practice: relative means subjective or conventional. “Atom is just a framework for a classification of experimental facts” (Jordan). “Electron is a set of physical values introduced by scientists in order to establish a system of principles that will make it possible to derive readings of physical devices logically” (F. Frank). In the 20th century, the development of objective theories lagged behind the quick growth of the number of empirical discoveries in physics to promote such a reduced approach to solution of arising problems. The so-called ‘observability’ (everything else being derived from the same) comes to the fore rather than the features of the micro-world resulting in the inapplicability of the methods of classical physics in the study of such features. “Today, atom is just a system of formulas, and nuclear physics is a good framework for formulas” [16]. This is a concept of microphenomena’s objectivity negation. Development of matter involves only quantitative growth or only increase or decrease, while any emergence of qualitatively new forms of matter and its movement is excluded. When scientists approach to such uniform and simple elements of matter which movement laws may be analyzed mathematically, mathematicians just obliterate matter in favor of equations, and so mind dictates laws to nature. E.g. the concept of the “heat death of the universe” makes it possible to suggest an objective existence of a ‘cadaver’ of the Universe died of heat death, i.e., an occurrence of matter that has lost its attribute - ability to transform [2].</p> <p>All visible matter of the Universe – both on the Earth and in space – consists of fundamental particles of three different types: electrons and two types of quarks.</p> <p>Usual matter is formed from electrons and quarks grouped in objects having neutral color and electric charge. Color strength is neutralized (as described below more in detail) when particles are combined into triplets. (This also explains the term “color” adopted from optics: white color is formed through mixing of three basic colors). Thus, quarks, for which the color strength is dominant, form triplets.</p> <p>Stable protons and neutrons attracted by each other by residual color interaction forces form the neutral color nucleus of an atom. Meanwhile, nuclei carry positive electric charges and tend to form electrically neutral atoms by attracting negatively charged electrons rotating around nuclei like planets rotate around the Sun.</p> <p>There are several hundred of natural varieties of atoms (including isotopes) differing with the number of protons and neutrons in their nuclei, hence, with the number of electrons on the orbits. Hydrogen atom is the simplest one: it consists of the nucleus containing one proton, and one electron rotating around the nucleus. All ‘visible’ matter in nature consists of atoms and partially ‘disassembled’ atoms called ions. Ions are charged particles formed as a result of loss or acquisition of one or more electrons by atoms. A matter, in which a certain proportion of electrons are free (ions), is called plasma. Stars glowing because of thermonuclear reactions occurring inside them consist mostly of</p> |

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| | <p>plasma, and since stars are the most common form of matter in the Universe, one may say that the whole Universe consists predominantly of plasma. More precisely, stars consist predominantly of completely ionized hydrogen (gas), i.e. a mixture of free protons and neutrons. Therefore, almost all the visible Universe consists of a mixture of free protons and neutrons.</p> <p>Apart from visible matter, the Universe comprises also invisible matter. There are also particles carrying forces. Besides, there are antiparticles and excited states of certain particles. This results in an excessive abundance of ‘elementary’ particles. Such abundance may help to identify the true nature of elementary particles and forces acting between them. According to the recent theories, particles may be considered extended geometrical objects – ‘strings’ – in a ten-dimensional space.</p> <p>Invisible universe includes ‘dark matter’ and black holes, and, e.g., cold planets that may turn visible if illuminated. There is also truly invisible matter threading all of us and the whole Universe every moment. It is a quickly moving gas containing one particle type – electronic neutrino.</p> <p>The physics of elementary particles has not been elaborated in full yet. It is still unclear whether the available data are sufficient to understand the nature of particles and forces and the true nature and dimensionality of space and time. There is no answer yet. Maybe there will be only few fundamental ideas, including gauge principle, high-dimension spaces, collapse and expansion, and geometry above all [3].</p> <p>The general theory of relativity treats gravitation as a result of curving of space and time in the vicinity of massive bodies.</p> |
| <p>4. Postclassical, naturally creative phase</p> | <p>Drag force is generated as a result of inertia of fluid particles coming across an obstacle. Vortices are formed when longitudinally moving particles have to transform their inertial translational movement into rotational movement upon coming across an obstacle. As a result, a side surface of any streamlined body is covered with vortices irrespective of the viscosity of the liquid medium.</p> <p>The direction of vortices rotation depends on the direction of liquid flow movement streamlining a body. Therefore, vortices on different sides of a streamlined body rotate in opposite directions. A portion of the surface of a body facing the incident flow bounces such flow as if fluid is thrown out of the points of such surface. Meanwhile, fluid tends to leave the other part of the surface of a streamlined body that, moving by inertia, draws such fluid in. A body sort of excites a system of currents connecting the throwing-out and drawing-in points on its surface, thus forming a dipole (Fig. 3).</p> <p>Such currents are channels (tubes), along which fluid flows in the direction opposite to the direction of the incident flow under the effect of pressure difference on the ends of such channels. Force acting on a fluid flowing in a tube equals to the kinetic moment of fluid coming through such tube. Professor Milovich called such tube ‘a tube of force’ since it is an estimate of the unit force of interaction between a body and an incident flow of fluid.</p> <p><i>A flow of fluid as a whole moves only progressively along a curved channel.</i></p> <p>All initial kinetic energy of the longitudinal movement of a flow is transformed into potential energy of flow pressure on the external wall of a bend. <i>A zone of increased pressure is formed at the external wall.</i></p> <p>Overrunning, <i>because of momentum</i>, the external wall of a channel bend, a flow of fluid recesses out of the <i>internal wall</i> to form there a <i>zone of reduced pressure</i>.</p> <p>Such phenomena generate a <i>difference of pressure at the external and internal walls</i> of each axial section of a curved channel. Such <i>pressure difference induces a new additional motion inside a flow in a form of a loop circulation of fluid in axial sections</i> of the channel.</p> <p>Since in a bend, a flow acquires, apart from its longitudinal motion in a</p> |

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| <p>channel, <i>new motion of circulation in axial planes having kinetic energy equal to the kinetic energy of the initial motion, total kinetic energy of particles of the fluid in a flow curvature is equal to double kinetic energy of the straight line movement of such a flow.</i></p> |
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Processes accompanied with axial circulation are inoperative, i.e. they produce no work and consume no energy of the main stream. Axial circulation of a fluid is a result of its internal deformations induced by external deformations. Circulation energy arising in such case is a result of the inertia of fluid mass and additional constraining force [10].

In order to analyze the general state of science, let us classify its periods (phases) by 'professional' criteria. Each phase is governed by the principles and rules meeting the following professional criteria:

- "Architect" – philosophical and speculative period;
- "Archeologist" – reduced practice period;
- "Anatomical pathologist" – observation mathematical period;
- "Naturalist" – naturally creative period.

Such periodization supports the statement of the antique science that science repeats itself in a cyclic manner and development of science necessarily causes a crisis. "Naturalist" period adumbrates the end of applied forces priority and return to the beginning of the cycle of continuum concept aimed at its further development on the basis of elaborated mechanism of inherent driving force of matter and gained experience of science development in all previous phases.

A technique of "sweeping difficulties under the rug" used by present-day scientists prolongs the crisis instead of helping to solve the problems. The same effect has Newton's statement "I do not hypothesize" used by present-day scientists, which was made upon a failure to solve the problems of continuum concept after repeated attempts. Impact theory of streamlining developed by Newton exactly twofold deviated from experimental results and has never been solved by him [11].

The critical situation was also emphasized by R. Boyle: "Everything that we cannot explain without continuum ideas, we cannot also reasonably explain using such ideas" [14].

General estimation of classical science development from the point of view of natural science could be made on the basis of the comment by V. Shauberger to the case of an apple falling down on Newton: "Newton had better to understand how that apple had ascended there".

It should be also noted that in each phase, either 'archeologist' or 'anatomical pathologist' considered their methods solely fruitful, rooting out creative elements, devotion and emulation to Nature.

The aforementioned could not but influence the approaches to the development of engineering and processes. Natural driving forces are not in use today. 'Archeologist'- and 'Anatomical pathologist'-type scientists could devise nothing but destruction or arrest of the natural movement processes (streams of rivers or wind flow etc.) or employment of movement on ignition or destruction (explosion) of matter for the purposes of energy recovery [10].

2. Ways of problem solving and prospects

A prompt acknowledgement of Nature's self-organization natural mechanisms occurrence on all levels of matter on the basis of inherent forces of material structures is the main objective of the present-day science. It should be realized that the features of dynamic structures of matter and the processes of its formation from the environment [5] lay the basis for such self-organization.

A study and generalization of the mechanisms of dynamic shaping from the level of space and electromagnetic structures and objects to process solutions is required together with rejection of energy- and fuel-consuming processes and development and implementation of machinery and processes (including toroid [17, 18]) based on the mechanisms of nature's self-organization [8, 10].

The understanding of the inherent forces of material dynamic structures is promising for the development of general physical ideas in cosmology, field structure of matter, cohesive forces and energy of matter, etc.

Professor M.Ya. Milovich wrote: "There is no doubt that the further development of this theory will change the current understanding of phenomena occurring in a liquid (or air) medium, in which

solid bodies – aircrafts and vessels etc. – are moving, which cannot but result in the progress in the relevant fields of engineering that, in turn, will give a stimulus to the further development of the theory of hydromechanics” [11].

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