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HISTORY OF SCIENCE AND METHODOLOGY: THE SIGNIFICANCE OF ARISTOTLE'S TREATISES

Abstract: The study is devoted to highlighting the legacy of Aristotle from the point of view of its modern interpretation. Also, this work has a didactic character, since the structure of the proposed educational material corresponds to the main milestones of the life and work of an outstanding thinker of antiquity. The article emphasises the importance of studying Aristotle's biological knowledge in modern sciences, in particular in interdisciplinary studies, teaching methods, in the methodology of sciences, etc. The authors recommend scientists who work in the field of natural sciences, as well as teach these sciences to students in educational institutions, to take into account the principles of Aristotle's scientific picture of the world, since Aristotle was the first in the history of science to present a scheme of scientific research methods and provide a complete classification of animals. He also proposed a hierarchy of levels of life, created a scheme of causality in biology, initiated the doctrine of distribution and the principle of analogy, laid the foundations of embryology, enriched the categorical apparatus of science (whole and its part, species and genus, functions, form and matter, movement, primary cause, entelechy, substance, soul, etc.), which are still used in various fields of scientific knowledge.

Keywords: history of science, methodology of science, scientific picture of the world, research methodology, biological treatises, natural knowledge, aristotelism, biological knowledge, biophilosophy

Introduction

The history of the ancient world demonstrates the origins of all types of the world-view systems. In particular, in Ancient Greece many theories arose, they dominated in the world scientific ideas over many following centuries and affected different scientific schools and tendencies of the present.

The history of the origin and development of the theoretical foundations of natural sciences shows that the Greek natural philosophy gave rise to thoughts significant for the following generations and influenced the system of views on the origin of living things, evolution of the organic world, formation and development of organisms.

The ancient Greeks in their attempt to cover the entire Universe with the only outlook, naturally, could not avoid the problem of the origin of life and such a universal phenomenon of Nature as the origin and individual development of an organism.

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At that time biology being at the initial stages of its development and having no theoretical foundations, was a part of philosophy. Therefore, philosophers tried to describe the origin of living things (Anaximander, Anaximenes, and Anaxagoras) and the evolution of the organic world (Empedocles).

However, the first great work on zoology was written by the ancient Greek philosopher Aristotle, who was deeply interested in the world of nature overall and the life of animals in particular. He established foundations of theoretical biology.

In view of the above, the study is devoted to highlighting the significance of Aristotle's biological legacy and specifying its modern interpretation concerning:

- 1) The origins of biological and bio-philosophical knowledge,
- 2) Basic milestones of aristotelism of the past decades,
- 3) The factors of the formation of Aristotle's biological worldview,
- 4) The significance of Aristotle's main biological treatises.

The paper proves that it is necessary for modern scientists engaged in nature research to take into consideration the principles of the biological picture of the world established by Aristotle. It stresses "the viability" and value of Aristotle's biological knowledge for modern science (biology, bio-philosophy and medicine in particular). The study pays attention to the main biological treatises of Aristotle - "History of animals", "On the parts of animals" and "Progression of animals", reflecting the ideas about the ancient biological picture of the world.

In addition, the goal of our research is to improve the teaching methodology of individual humanities and natural sciences, which are tangential to Aristotle's work, as we outline which topics and in what form can be presented to pupils or students. This is about the formation of Aristotle's personality as the first scientist, about the structure of his scientific and philosophical knowledge and the system of teaching this knowledge in Lyceum.

Methodology

Research questions

- Where does biophilosophical knowledge and aristotelism come from?
- How was Aristotle's biological outlook formed?
- What is the significance of Aristotle's biological treatises?
- Why should Aristotle's biological legacy be studied now?

Methods used in the study

Given the specificity of our research, we used mainly theoretical research methods.

The hypothetical-deductive method made it possible to put forward hypotheses about the formation of Aristotle's worldview and the reasons for his interest in biological knowledge. The application of the logical-historical method made it possible to reproduce the course of the historical process of the emergence of biophilosophical knowledge.

We also used such general logical methods as analysis, synthesis, and generalisation. In general, this helped to consider the individual features of aristotelism and to generalise the modern content of Aristotle's biological treatises.

Results, analysis, and data interpretation

Aristotelism in the light of time

The history of the development of science shows that explorers of living things appealed to Aristotle's philosophical and biological legacy regularly and quite actively over millennia: they translated his treatises, commented on them, analysed and criticised them. Namely, George H. Lewes published the book about "errors" in Aristotle's biological treatises in London in 1864 [1]. In the history of medicine of the 19th century researchers often referred to Aristotle's biological treatises, describing the natural achievements of representatives of the Peripatetic school and pointing out "false" facts in their works [2].

Since the second half of the 19th century zoologists admired Aristotle's biology, they went on exploring it and highlighted the advantages of his biological knowledge. For instance, the German zoologist and paleontologist Henric Bronn in his work "General Zoology" (in Germ. "Allgemeine Zoologie") made the first attempt to represent the animal world in all its diversity, including the extinct species, on the basis of Aristotle's biological studies [3]. In his turn, the German philosopher Jurgen Meyer using numerous mentions and comparisons, scattered in Aristotle's text "History of animals", improved and reconstructed the taxonomy of animals in 1955, presenting it so well that this taxonomy is used by scientists at present [4].

The French naturalist and zoologist Georges Cuvier, the German physiologist, anatomist, ichthyologist and herpetologist Johannes Peter Muller, the Swiss biologist and geologist Louis Agassiz and many other famous researchers appealed to Aristotle's biological masterpieces.

Charles Darwin highly appreciated Aristotle's biological knowledge. In particular, he quoted an extract from Aristotle's "Physics II 8" in his work "The origin of species", where he wrote about the possibility of the process of selection by a random combination of parts of the body [5]. The evolutionist wrote: "Linnaeus and Cuvier have been my two gods, though in very different ways, but they were mere school-boys to old Aristotle" [5].

The Scottish mathematician Darcy Thompson translated the treatise "History of animals", identified the animals described in it and systematised Aristotle's anatomic descriptions in 1910 [6].

In the 20th century scientists also often appealed to Aristotle's biological texts, however, they criticised him for some faults (in the light of the present time). For instance, from the point of view of modern science, in the treatise "On the parts of animals", there are many vague statements: "the purpose of breath consists in cooling internal warmth developed in the heart", "women are warmer than men", "the right side is more noble (*edler*) and better than the left one, that the top is more noble and better than the bottom, the front part is more noble and better than the back", "the back of the head does not contain brain", "veins start from the head" etc.

However, in spite of "ancientness", Aristotle's studies contain much valuable information for modern scientists, and the philosopher himself is still unknown to contemporaries, though zoologists consider him "Father of biology" [7].

Aristotle's works invoke interest in a wide range of scientists all over the world even nowadays. The philosopher Alasdair MacIntyre is thought to be the most famous modern follower of Aristotle, he considers aristotelism as new "revolutionary Aristotelianism" and highlights that it is "the best theory ... both in political and social senses, ever outlined" [8].

The philosopher-objectivist Fred Miller [9] is also referred to contemporary followers of Aristotle, maintaining Aristotle's political naturalism, and the philosopher-ethicist Rosalind Hursthouse from New Zealand [10].

Such philosophers as the Australian David Malet Armstrong, the British metaphysician Steven Mumford, the Australian philosopher-mathematician James Franklin (philosophy of mathematics) and many others defend Aristotle's realism concerning universalia in metaphysics [11].

The director of the Centre for Contemporary Aristotelian Studies in Ethics and Politics (CASEP) Kelvin Knight states that Aristotle is the most influential philosopher of practice, therefore he gives a theoretical argument about the reformation of aristotelism and an ethical argument for social changes [12].

On the whole aristotelism is quite a widespread philosophical orientation in the world, it is proved by contemporary international conferences, symposia, and congresses devoted to the philosophical legacy of Aristotle - "the greatest intelligence of ancient times". For instance, the Interdisciplinary Centre for Aristotle studies was an initiator of declaring 2016 as the Aristotle year by UNESCO. In that year the world community venerated the renowned philosopher of ancient times - in May the World Congress "Aristotle is 2400" was held in the Aristotle University in Thessaloniki (the city where the thinker was born), and in June - the World Philosophical Congress "Aristotle's Philosophy" took place in the University of Athens supported by the International Federation of Philosophical Societies (FISP), known as an organiser of the world philosophical congresses.

Statement: Aristotle Stagirite

Aristotle (384-322 B.C.) - was an extraordinary erudite, recognised as the most universal "intelligence of ancientness". First of all as a philosopher and author of an original philosophical system he made a great contribution to the development of logic, ethics, psychology, history, political science, nature science and theology. (His logic and ethics are still academic subjects).

Aristotle's legacy (corpus) numbers about 30 works (treatises) about Nature (natural phenomena, natural environment, nature of plants, animals and humans), among which are the following: "Physics", "Generation and corruption", "On the heavens" (the authorship is doubtful), "On length and shortness of life", "On youth, old age, life and death", "On respiration" (the authorship is doubtful), "The history of animals", "On the parts of animals", "Movement of animals", "On the generation of animals", "On plants" (the authorship is doubtful, the work has been lost) etc. [11, 13].

In particular, Aristotle's works on nature science has been recognised as very important (not less than the philosophical ones!), and his biological treatises (four long and eleven small ones) of a later period of his creation, including "History of animals", "On the parts of animals" and "On the generation of animals" have been considered the best ones of his scientific works, major masterpieces of Aristotle's biology.

There is some information about Aristotle's achievements in biology: on the basis of numerous observations, Aristotle divided animals into two groups, approximately corresponding to the groups of vertebrates and invertebrates, established foundations of descriptive and comparative anatomy, described 454 species of animals. Examining embryonic development of chicken, Aristotle watched gradual formation of the parts of their organism. He offered ideas about unity in nature and about gradation of organisms, i.e. about the existence of gradual transition from non-living things to plants and to animals

from them in nature. Aristotle's works had a huge impact on further development of biology and medicine.

Formation of the worldview

Aristotle was born in a Greek colony Stagira, on the coast of the Aegean Sea, not far from Mount Afton. His father Nikomakhos came from the family of doctors where the art of medicine was passed from one generation to the next. Evidently, it was he as a hereditary doctor and physician in ordinary of the Macedonian Emperor Aminta III, who became the first mentor of Aristotle, who learnt from him about many things, using that knowledge in his chapters which are close to medicine. Probably, it determined the philosopher's further destiny.

Being a 15-year-old boy Aristotle lost his parents, and he was cared for by his father's relative Proxen, who actively supported the boy's eagerness for knowledge, he bought books for him, and Aristotle maintained love towards them throughout his life, even many years later Plato named his home "the house of a reader". (Aristotle had good impressions about him, and when Proxen died, he adopted his son Nikanor and joined him in marriage with his daughter Pifiada).

Aristotle's worldview was mainly developed in Plato's school, well-known in the cultural Hellenic world, where he started his study at the age of 17 years (376 B. C.), he studied during 20 years till Plato's death being one of his closest pupils. Certainly, this education gave much to Aristotle, since the renowned people of that time from all the parts of Greece gathered in the Academy, in particular, mathematicians and astronomers (these sciences deserved Plato's special attention, therefore they were the subject of research, different sciences of that time were taught to young men and they were also involved into research work - it can be said that it was a kind of first scientific research institute).

Later (335 B. C.) Aristotle started his own peripatetic school - the Lyceum, its special feature was an attempt to solve the problems of the ideas of Plato and his pupils merely in a naturalistic way - there the philosopher gave systematic courses of lectures, each of them covered the whole empirical and available material at that time and was a complete scientific unit. (The Lyceum can be considered a prototype of a university, playing an important educational and scientific role).

The young Aristotle was also greatly influenced by the Macedonian imperial court where he spent his early childhood and got acquainted to the Emperor Philip II, the father of the great commander Alexander III of Macedon that played its role in his being appointed Alexander's tutor [14].

Aristotle's worldview, his philosophical ideas and thoughts about happiness (eudaimonia), requiring such external conditions as noble descent, luckiness (fortune), wealth, prestige, beauty, friends etc., become more clear.

It was considerable financial legacy, inherited from his father that allowed Aristotle both avoiding poverty and buying expensive books. In addition to money Aristotle inherited his father's works thoroughly describing his observations of living and non-living things. Therefore before Aristotle started his education in general sciences, he studied plants and animals, trying to generalise Nikomakhos' experience, that later developed into individuals works on organic nature, on animals in particular.

Certainly, all Aristotle's works comprise a system of the scientific and philosophical picture of the world of that time and they are divided into thematic cycles - special lectures, prepared and given by him and his followers in the Lyceum:

Cycle one. Logic and rhetoric:

“Categories”, “On interpretation”, “The prior analytics” (study on syllogisms), “Posterior analytics” (study on evidences), “Topics” (dialectics), “On sophistical refutations”, “Rhetoric”.

Cycle two. Study on nature:

Inorganic nature: “Physics” (general study on natural origins and movement), “On the heavens”, “On the generation and corruption” (on elements), “Meteorology”.

Organic nature: “The history of animals”, “On the parts of animals”, “On the generation of animals”, “On the soul”, “Parva naturalia” (seven small works on physiological issues - “On sense perception”, “On remembering and recollecting”, “On dreams”, “On prevision through dreams”, “On length and shortness of life”, “On youth, old age, life and death” and “On respiration”).

Cycle three. Humanitarian and social sciences:

“Ethics”, “Politics and economics”, “Poetics”.

Cycle four. The first philosophy:

“Metaphysics” - the study on sources and causes of existence, on living things, basic features of existence (ontology), the study on extra-natural things - Plato’s ideas, Aristotle’s prime mover (theology) [14].

As we can see Aristotle’s lectures on organic nature took appropriate place in the system of his education, and his works were among the scientific knowledge of the Ancient world establishing foundations for further development of biology and medicine, and at present - of bio-philosophy as well.

However, we should pay attention to Aristotle’s famous biological treatises - “The history of animals”, “On the parts of animals” and “On the generation of animals” giving ideas about the biological picture of the world of the ancient times.

1. The treatise **“The history of animals”** is recognised as the most unique work of Aristotle. It is his longest text giving ideas about the breadth of theoretical and practical biological views of the philosopher and his natural philosopher. This treatise gives an idea about the biological picture of the world of the ancient time (when there was neither the term “biology”, nor the science/subject close to biology), introduces to Aristotle’s biological conception containing the elements of theoretical biology and it was an important step towards multi-dimensional, biological to some degree, and not only logical interpretation of the categories of a species and a genus. In the Middle Ages and in the Renaissance and during the 17th-18th centuries it was a basic source of information about the world of animals, its taxonomy and ecology [15].

2. The treatise **“On the parts of animals”** begins with the text seemingly not concerning the topic mentioned in the title, it does not contain information about the parts of animals, and it is an introduction to the philosopher’s all biological works by its methodological character. Because of this there was a hypothesis that this text should have opened the treatise “The history of animals”, and it did not become a part of the book “On the parts of animals” because of misunderstanding (Tice-Francius’ hypothesis, the beginning of the 20th century) [16].

Thinking of the parts of animals Aristotle did a huge volume of work - he described over 500 species of animals: he distinguished animals with no legs (snakes), bipeds (birds) and four-legged animals, animals laying eggs and the ones giving birth to the young, horned and hornless animals, polydactyl and ungulate animals (one-toed and even-toed animals), hairy and feathery animals.

3. The treatise **“On the generation of animals”** is recognised as the most outstanding work in the area of natural sciences. This work starts the discussion lasting many centuries between preformation pangenesis and epigenesis (of Aristotle), causing the emergence of embryology as a science. It contains Aristotle's ideas about recapitulation at an embryonic stage of organisms, becoming later a considerable achievement in theoretical embryology (in the 19th century) - the theory of recapitulation and determination of the biogenetic law. This work presents a study on self-generation rather strongly. It also gives ideas about the sex and sexual reproduction in plants. Thus Aristotle established principles of scientific comparative embryology on a physiological basis [17, 18].

In addition, it is necessary to pose the following questions: why should all these works be studied nowadays? What do they provide for the understanding of generation and development of biological science and bio-philosophy? What do they give to us? What does the significance of Aristotle's biological treatises consist in for the contemporaries?

The significance of Aristotle's biological treatises

Aristotle's main biological treatises “History of animals”, “On the parts of animals” and “On the generation of animals” give ideas about the biological picture of the world of the ancient times and they were not only valuable for that time, but they also provoke interest in contemporary biologists, philosophers and scientists engaged in nature research.

Primarily, Aristotle was the first systematiser of animals. According to Jürgen Meyer, the philosopher systematised about 510 species of animals on the whole [4].

Secondly, Aristotle's biological works present a scheme of methodology of scientific research, in particular, the treatise “On the parts of animals” (Book one) contains a general methodological introduction as a detailed dialectical analysis of the preconditions concerning the science about animals. A scientist's work, in Aristotle's opinion, must include the following main stages: a report on the history of the issue under study with analysis and criticism of the opinions of previous researchers; clear statement of the problem to be investigated; presentation of one's own solving of the problem - a hypothesis; substantiation of this solution by means of logical arguments and empirical data. It is necessary to highlight that this Aristotle's scheme of scientific research is applied nowadays (and not only in biology!).

Thirdly, here (in these biological treatises) Aristotle outlines a hierarchy of the levels of living things: he gives “stages of creatures” - from substance as a possibility to generation of single forms of life and further: inorganic formations (an inorganic world), a world of plants and living things, a world of different species of animals - humans.

Fourthly, the philosopher develops many doctrines famous in a wide range of researchers and significant for science in these very works.

For instance, he creates a scheme of causality in biology - *a doctrine about causes* (it is given in “Physics”). He presents four levels of causes: 1) “what” generates something, material or “matter”; 2) “form”, “kind”, or essence of a subject; 3) “where changes start”, or motive cause, and 4) “for what” something occurs, a goal or a purpose; in other words causes: material (*causa materialis*), formal (*causa formalis*), efficient (generating) (*causa*

efficientes) and final (causa finalis). In examining natural things, especially animals, the three latter types of causes are united into one, for instance, the form or essence of the animal "human" is both a motive cause (humans generate humans) and a final cause, the realisation of which results in natural ending. (In his biological works Aristotle often dwells on the cause "for what", meaning all the three latter causes, therefore his views acquire certain theological features, but this theology is immanent and comes to determining a function value of each part).

Here the philosopher also introduces *a doctrine about distribution* (dichotomous - non-dichotomous) of animals. He maintains that it is impossible to distribute animals in a dichotomous way by the feature of lacking something, and that the same creature could be fallen within different features and different forms (it is necessary to divide by the same feature). In addition, Aristotle offers principles of a taxonomic distribution of animals: the features of distribution should be contrary to each other, animals should be distributed into genera by many different features - the distribution based on one feature is impossible.

Here the philosopher substantiates *a doctrine about analogy*, or the principle of analogy. Aristotle introduces this principle to compare the morphology of animals being distant from each other. It is a study on parts of animals totally heterogeneous by form, but corresponding to each other; in the proportions of an organism as a whole they are equal. For instance, according to Aristotle, hair, feather, scuta of reptiles and scales of fish are analogous; animals with blood have blood, animals without blood have its analog; analogs as rows of parallel lines run through the entire animal world and provide solid methodological background of comparative examination of animals.

Aristotle's contribution to *foundations of embryology* is also essential. Among the famous theories and ideas developed by the philosopher there are the following: the theory of epigenesis (development), preformism (preexistence of the features of an organism in embryo), ideas about recapitulation of organisms in embryo, a main idea of the biogenetic law, the study on self-generation, the doctrine about fertilisation, about sex in plants and many others. For instance, Aristotle's ideas about recapitulation in embryo of an organism and main ideas of the biogenetic law became important achievements of theoretical embryology of the 19th century.

If we analyse even wrong (from a modern scientist's point of view) statements of the treatises, we can say that they present perfect conclusions from that practical material which was available to him, and this, certainly, cannot underestimate Aristotle's achievements as a creator of scientific zoology.

Moreover, in his biological treatises Aristotle showed his knowledge of a number of philosophical categories (the whole and the part, species and genus, functions, matter and form, movement, primary cause, entelechy, substance, soul etc.), applied in different areas of scientific knowledge nowadays.

It is necessary to add that Aristotle's understanding of the world, and his natural philosophy, is dynamic by its character. The main principles of Aristotle's natural philosophy are the following: anybody, both natural and artificial, consists of matter (ὕλη) and its source, forming the matter - the form (μορφή, εἶδος), and in this aspect it is the whole (το σύνολον). (Aristotle was chary of explanations therefore a modern reader may misunderstand the sense implied in the form: for instance, the philosopher identified the form and the figure or appearance (in Greek σχῆμα - scheme), as an example, the statue occurs in the texts).

The form of animals and their parts is related not only to organisation of appropriate matter, being their part, but also to life. Life is known as motion since all its manifestations, including senses, related to motion in a broad sense, in other words, to changes. Nature is defined by Aristotle as "the beginning of motion and changes". It also concerns the soul discussed by him in his other works.

Discussion

It should be emphasised once again that in recent years there has been a revival of interest in Aristotle's biology, and researchers are discussing the significance of his works from new angles and in the light of modern scientific understanding.

Thus, researchers from the University of Oxford collected articles about Aristotle from around the world and created a collection of Aristotelian studies. There are ethics and politics, logic and language, psychology and theology, biological research. The authors of this book interpret Aristotle's works from the point of view of a modern reader (Shields, 2012) *The Oxford Handbook of Aristotle*. More recent studies that can also lead us to debates about Aristotle's legacy are the works of Edith Hall, Richard Kraut, Ursula Coope, Charles H. Lohr, Jorge Torres, Christopher F. Sharpley and Clemens Koehn [19-25]. In particular, Sharpley and Kahn's research paper contains 38 peer-reviewed articles on various topics from Aristotle's biological works that have been published over the past 50 years [25].

Jorge Torres offers an interesting study of Aristotle's biology: here the author demonstrates the "natural phylia" that exists in animals and draws attention to similar biological mechanisms in humans [24].

The above shows that the creative heritage of Aristotle must be studied and researched, as well as taught in educational institutions.

Conclusion

As we can see, biological knowledge originates from ancient Greek philosophy. Ancient philosophers were very interested in sciences about living things, and the problem of exploring living things for them was quite thoroughly presented: both as theoretical philosophy, the doctrine about logical forms and methods of cognition, and a relatively independent area of nature research.

Aristotle states: "... The study on Nature will be cognition of everything: since the same science deals with investigating intelligence and thoughts, if only they relate to each other, and the same theoretical examination concerns everything, possibly related, evoking at least senses and things experienced" [16].

Aristotle's biological treatises show the evolution of his views in fundamental methodological issues of causality and randomness, the role of experience and observation in opinion etc. From the point of view of the editors of the series "Classics of biology and medicine", the treatises "most vividly reflect his deviation from Plato's idealism and the tendency to materialism" [15].

The fragments written by Aristotle and his followers appeared to be capable of integrating intellectual culture of that time and were probably a part of a grandiose project - to cover the animal world in a single scheme: firstly - at a descriptive level ("History of animals"), then - at a casual level "On the parts of animals" and "On the generation of

animals”). It is necessary to state: this project was realised, arising as first masterpieces of philosophical and biological thought.

Aristotle established an original philosophical system, which lives through time - aristotelism. Aristotelism is a philosophical doctrine from within: it avoids extreme solutions and is inclined to recognise that part of truth, concealed in each of them [26]. It is the doctrine of Aristotle’s followers, and the history of interpretation of his philosophy on the whole, its propagation, dissemination and, certainly, the impact of his works on other philosophical systems, functioning at present.

Aristotelism today deserves the attention of researchers and teachers of philosophy, as it is not only a philosophical trend, but also a specific system of thinking based on the principles and teachings of Aristotle. “When we appeal to Aristotle we are always aware that there is a certain connection between those ancient times, between Aristotle and the present time, philosophy and other intellectual discourses have many years of tradition. And the entire tradition, or the fundamental tradition of the European philosophical thought, certainly, was greatly influenced by those ideas expressed by Aristotle ... it was such a figure, such a person, who was able to integrate intellectual culture of that time” [27].

It is necessary to underline that it was Aristotle who established foundations of a biological picture of the world - he assisted in developing many biological sciences: anatomic - and physiological knowledge (distribution of an organism into tissues and organs), embryology and ontogenesis, ethology and ecology.

Moreover, his figure occupies an honorable place in the history of science, which is especially relevant, since today there is a growing interest in “scientific communication in general, as well as a growing need for its correct understanding” [28].

In addition, the history of philosophy shows us how Aristotle’s biological worldview was formed, why Aristotle was the greatest mind of the ancient world, and where biological knowledge originates. And it is important for modern teachers to demonstrate this to their students - that is, to educate their students on the example of Aristotle. It is teachers who “can promote or inhibit the development of scientific literacy” [29].

As we can see, modern science is much differentiated, and new interdisciplinary studies of knowledge, which represents a holistic unity of philosophy and biology, philosophy of life, axiology and methodology of science, are gaining great popularity.

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