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THE SIGNIFICANCE OF THE ACHIEVEMENTS OF LIGHT PHYSICS FOR ART AND CULTURE

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Abstract

A philosophical analysis of the humanitarian and natural science approaches to the artistic problems of light and color is presented. The humanitarian approach of Isaev A. A., is an understanding of the problems of light and color from the spiritual and spiritual positions (from the standpoint of creating meanings and values). Whereas Brill T., in his book “Light: Impact on Works of Art”, considers the same problems from materialistic, natural-scientific positions (from the point of view of the safety and durability of the meanings and values embedded in works of art). The connection between philosophy and other sciences is shown, in which philosophy is a kind of basic science. There is an integration of philosophy not only with related social and human sciences, but also with some branches of natural science, such as light physics, photochemistry, physiology, etc. Natural sciences, such as the physics of light and color, optics, photochemistry, along with philosophy and the humanities, also brought tangible results in the field of the artistic problems of light and color, which have both universal and personal significance. The significance of scientific discoveries in the field of the artistic problems of light and color is expressed in the shift of achievements from the field of basic research to the field of applied research, with the aim of changing the objects of the surrounding reality. Thus, the problems of value, social, moral and cultural orientation are also captured.

Keywords: Color, light, physics of light, significance, art, culture.

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1. Introduction

As far back as the 17th century, Isaac Newton, as a result of a series of experiments on the study of sunlight and the causes of flowers, laid the foundation for modern scientific ideas about color and light. Having broken the light ray through the prism, he revealed to mankind a great secret, thereby creating the foundation for the further development of not only purely philosophical, natural and humanitarian, but also interdisciplinary, integrated sciences.

There are different points of view on the role and importance of natural science achievements for art and culture, which can be conditionally reduced to two diametrically opposite poles: idealistic and materialistic.

As a source for scientific discussion, I take (with the permission of the author) the work of my teacher, philosopher and artist Isaev (2006) "The phenomenon of color in the context of human being: the experience of philosophical analysis". In this work, Alexander Arkadyevich analyzes color in various planes, defines the "ontological status of the color phenomenon" using existential slices, or "ontological dimensions of being". Defining the "ontological status of the color phenomenon" with the help of existential slices, A. Isaev says that the ontological basis (necessary condition) of the color phenomenon is light. In general, it is necessary to agree with this idea, because the fact that light is a necessary condition for the existence and manifestation of color is a fact that is undeniable today, argumentumnimiumprobans. Light is that ontological link in the chains "light-color-art", or "light-color-life", thanks to which we are able to perceive the world in color, perceive the details of life in color, that is, to perceive the world in its entirety.

In the writings of such authors as: Newton (1954), Goethe (1957), Wilson (1972), Serov (2001), P. Florensky (1994), Johnston-Feller (2001), Thomson (1971) and many others – the artistic problems of light and color are considered in one context or another.

2. Problem Statement

«Plato is my friend, but the truth is dearer»

Aristotle

The problem of interpreting the role and significance of the achievements of natural science in the field of the art of color and light for art and culture remains relevant today, because in the works of many modern thinkers alternative and original, but at the same time purely subjective, in my opinion, interpretations of this issue.

So, Isaev (2006) in his work "The Phenomenon of Color in the Context of Human Being: The Experience of Philosophical Analysis", gives its own alternative point of view. In the section devoted to the natural science theory of cognition of the color phenomenon, the author writes:

> *In this scheme there is no place for the value-semantic strata of a person's existence, the spiritual and spiritual phenomena of his being [...] whether a person likes any color, what he thinks about him, what he evokes associations in him, what sense and meaning the artist uses with the help of*

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> *the color gamut, neither physiology, nor even physical optics is of interest, however, like the natural science psychology of color perception*. (Isaev, 2006, p. 22)

The author's alternative views show the following statement: "In its worldview potential, it is purely anti-humanistic, demonstrating the limitations of the natural science approach to man and nature" (Isaev, 2006, p. 28).

However, at present, in addition to physiologists, the perception of color is studied by psychologists, ethnographers, and sociologists (Medova, 2018). Take, for example, the same psychology of color perception. Branches such as technical semiotics and the social psychology of color perception appear in the general structure of the above science. The latter studies the socio-cultural and emotional features, the history of the sociocultural perception of color (the language of colors), the interaction of linguistics with the cultural characteristics of color perception.

In fact, Isaev Alexander Arkadevich managed in a general, holistic study, devoted to the analysis of the "color phenomenon in the context of human being", to separate one concept (natural science) from the other two (philosophical and humanitarian) by unjustifiably removing the first humanistic potential, endowing them with the latter .

It is enough to recall such a famous stylistic trend in the art of neo-impressionism at the end of the nineteenth century as "pointillism" (or "divisionism"), a powerful impetus for the origin and development of which, in fact, served as their modern scientific discoveries.

3. Research Questions

In order to understand the above problem, you need to look at the artistic problems of light and color from the standpoint of light physics. And carefully analyzing the facts, "substantiate the humanistic foundations" of natural science achievements in the field of light and color.

In this section, it is necessary to talk about color, referring to its "parent" – the light. For talking about color, as objective as possible, is impossible without resorting to light. And vice versa, speaking of light, one way or another you will have to remember the color. Light is directly related to the manifestation of color, appearance and change not only of the objects of the surrounding reality, but with the help of the same processes affects the entire artistic process in the broadest sense of the word. And, therefore, the results of it are objects of art and culture, with their "universal and individual values." The American scientist Thomas Brill in his book "Light: Impact on Works of Art" writes:

> *Light plays an important role in the development of many concepts of cosmology, physics and philosophy. Its properties have a decisive regulatory effect on life. A physicist, philosopher, artist, historian, museum worker, chemist, engineer intuitively or consciously, albeit in different ways, recognize the fundamental importance of light. It represents, at least, a common platform on which their interests clash.* (Brill, 1983, p. 18)

The book of Brill (1983) contains a great humanistic potential, as a recipient who has carefully studied it, for example, an artist or restorer, has at his disposal knowledge that will help protect his work

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from troubles and give people the joy of communicating with works of art. In a good way, a true humanist artist, who worries about the safety of his works, and, therefore, cares about conveying the meanings and values embodied in his work, in an undistorted, full-fledged form, should be grateful for such results of scientific achievements.

At this point, one can draw a preliminary conclusion about the groundlessness of the statements that the results of natural science discoveries in the field of light and color "have no special significance in artistic and aesthetic activity" (Isaev, 2016, p. 96).

Quite the contrary: "art and its dialectical nature are characterized by the integration of philosophy, science and humanities, the achievements and influences of which are woven into its structure in one or another proportional ratio, forming a self-organizing, multimodal system" (Demenev, 2018, p. 97).

But back to the problem of light and color. Brill (1983) himself at the very beginning of his work, wondering about the need to determine what light is, answers it not so much as a scientist, but philosophically: "this is impossible, since the concept of" light "is more fundamental among the terms used to describe it" (p. 24).

The modern theory of light, based on the integration of the electromagnetic theory of light by Maxwell (1865) and the concepts of photons and relativity of Einstein (1916, 1920), has already been widely described (Lehmkuhl, 2014). Therefore, it makes no sense to cover it in this work, among other things, my goal is not this. Briefly, we can only say that most of the energy range of electromagnetic radiation has important applications in physics, chemistry and biology. However, "with regard to works of art and materials of historical interest, medium energies (infrared, visible and ultraviolet) are of the greatest importance due to the fact that during the demonstration they are usually exposed to these types of measurements" (Brill, 1983, p. 28).

Even though ultraviolet and infrared rays are invisible to the human eye, they are nevertheless "seen" by works of art. Therefore, my further task is to show the dialectics of such a vision, that is, to reveal the interaction of the average energies of electromagnetic radiation with art materials and a work of art in general. For example, it is known that ultraviolet radiation "causes photochemical reactions and bond breaks in many organic compounds" (Brill, 1983, p. 33), That is, causes aging and destruction of polymers (in particular, the disappearance of color), has a negative effect on works of art. However, these same photochemical reactions also have a positive effect: for example, by exposing the just-written study to daylight, they accelerate the drying of the latter. In addition, ultraviolet radiation also benefits the curator or employee of the museum: it can be used to prove corrections.

The visible radiation that the human eye responds to is a tiny fraction of the electromagnetic radiation range. How the spectrum of visible radiation arises was first shown by Newton (1954) in his work "Optics" and Goethe (1957) in the work "Theory of Flowers". I will not dwell on the visible radiation and its role and significance for the existence of a work of art. You can only specify information about the phenomenon of dispersion, which is divided into normal and abnormal. The first is observed in a colorless transparent medium, which is possible only under experimental conditions, and therefore is not directly related to artistic and aesthetic activity, while the second is anomalous, observed in a colored environment, that is, in nature – it directly affects one or another the result of the artist's work in the open air.

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An example of another dialectical interaction of light and works of art is the presence of infrared rays in medium energies: “Infrared radiation causes thermal effects that can mechanically or chemically change materials [...] Yellowing of natural varnish films can be a direct result of exposure to infrared radiation” (Brill , 1983, p. 47).

But this radiation, in addition to the negative impact, thanks to the development of science and technology, is already of great benefit to mankind, for example, as an important research method in the museum infrared photography.

All these examples (far from the last ones) allow us to consider the significance of scientific achievements for art from a purely physical, material side, allowing you to store artistic values. In addition, there are several modern visual arts that, thanks to optics, physics of light, are directly involved in the creation of value artworks.

4. Purpose of the Study

The problem outlined above determined the goal of this work: by comparing and analyzing two diametrically opposite approaches in understanding the artistic problems of light and color, to show not only the artistic and practical, but also the social, cultural and value significance of the achievements of light physics.

Scientific discoveries, including the achievements of physics in the field of the artistic problems of light and color, as the subject of this study, must be considered in the aggregate of all factors: subjective and objective, empirical and theoretical, from the standpoint of natural science and humanities, from the position of a holistic general philosophical approach.

5. Research Methods

The work uses such general scientific methods as analysis, synthesis, comparison, historical and logical methods. Also, understanding the significance of the achievements of light physics in art and in the service of humanity is impossible outside the dialectical principles of universal interaction (or universal connection), universal variability, the contradictory nature of being, as well as the dialectical laws of the transition from quantitative to qualitative, unity and struggle of opposites, and negation of negation. Isaev (2016) himself writes on the twelfth page of his other work:

> *Human existence is unique. This uniqueness lies in the fact that the functioning of the flesh is closely connected with the activity of the brain and nervous system, and through them with the human psyche and consciousness. Thanks to the unity of flesh and spirit, a person acts as a “thinking and feeling” being, capable of actively influencing the world around him and himself, providing a being of creation and a being of self-creation.* (p. 10)

In his reflections on the unity of spirit and flesh, the author talks about the dialectic of our being, about the functioning of dialectical laws and principles.

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6. Findings

All the above facts directly testify to the importance of scientific discoveries, including the achievements of the physics of light, which they have for culture and art.

The knowledge associated with sensory (visual) perception, which is supplied by such sciences as optics, physics of light and color, is important for art and culture. A true humanist artist, worried about the safety of his works, and, therefore, taking care of the transfer of the meanings and values embodied in his work, in an undistorted, full-fledged form, should be grateful to such results of natural science.

A pessimistic, at first glance, scientific result is a kind of warning for both the individual artist and the whole society. This is the information that helps to store artistic values. Scientific discoveries, including the achievements of physics in the field of the art of color and light, have shown people the path to the longest possible existence of works of art.

Talking about color and light within the framework of any one science today is not possible, since this discourse is shifted to an interdisciplinary plane related to the meanings and values of human activity and existence.

7. Conclusion

The humanitarian approach of Isaev A., is an understanding of the artistic problems of light and color from the spiritual and spiritual positions – from the point of view of creating meanings and values. Whereas Brill T., considers the same problem from a materialistic, natural science perspective – from the point of view of the preservation and durability of the meanings and values embedded in works of art.

Natural sciences, along with philosophical and humanities, also brought tangible results in the field of the study of color and light, which have both universal and personal significance. This significance can be expressed by the following questions: What gives light and color to a person culturally? How does it affect people's lives at the level of art and culture?

The significance of scientific discoveries in the field of light and color physics is expressed, therefore, in the shift of achievements from the field of basic research to the field of applied research, with the aim of changing the objects of the surrounding reality, their maximum adaptation for aesthetic needs of man. Thus, the problems of value, social, moral and cultural orientation are also captured.

The presence of those material objects and knowledge that is supplied by natural science and applied science (the use of x-rays in the study of works of art, the chemistry of paints and varnishes, instrumentation, lighting in museums and theaters, etc.) also allows you to pave the way from the material sphere to the spiritual sphere. In other words, in the context of this study, it is unauthorized to separate the ideal, spiritual and spiritual being of a person from his material, physical being.

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