

# Rationale for New Dissertation Topics in Biomedical Research and Their Analysis Using Artificial Intelligence

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## Abstract

In 2025, the Author published an article regarding the potential harmful effects of mirrors, in which several folk superstitions were analyzed from the perspective of real physics. Currently, there is a lack of rigorous scientific data to completely refute these superstitions, partly because the study of such phenomena is not typically considered a significant research problem. Consequently, the article sparked intense debate regarding its scientific merit, with some critics suggesting it was "reduced to the level of folklore." However, the article does not focus on "folklore," but rather on the "potential harm of mirrors" and the necessity for a definitive scientific conclusion – either positive or negative – based on rigorous empirical research. The justification for the potential harm of mirrors is framed not as a final assertion, but as a hypothesis requiring experimental verification. The basis for the conclusion regarding the possible harm of mirrors is the proposition that they reflect incident photons as antiphotons with the opposite rotation of electromagnetic waves (spin). It is well-established that clockwise and counter-clockwise rotations of electromagnetic fields exert different effects on organic and inorganic molecules, as well as on biological cells and organisms as a whole. Therefore, the primary objective of this work is to provide a scholarly rationale for a series of experiments, suitable for doctoral-level research, that can scientifically prove or disprove the harmful influence of mirrors on the biological domain of the material world.

**Methodology:** Based on the application of general principles of scientific inquiry and the fundamental laws of nature and physics, which do not contradict the existing characteristics of the material world.

**Results:** include a more robust physical justification for the processes, phenomena, and effects leading to the conversion of photons into antiphotons during mirror reflection, as well as a rebuttal of the AI-generated criticism of previous works. An analysis of this criticism is provided, its shortcomings are identified and corrected, and specific tasks for experimental procedures are formulated.

**Conclusions:** On a realistic physical basis, it is demonstrated that photons of visible light, when reflected by mirrors, are inverted into antiphotons with reversed rotation (spin) of their electromagnetic waves and fields, which may have a deleterious effect on biological objects. A series of potential biophysical experiments have been proposed to confirm or refute the harmful effects of mirrors.

**Keywords:** Mirror Reflection of Light, Photons and Antiphotons, Influence of Direct and Reverse Rotation of Electromagnetic Waves of Photons and Antiphotons on Biological Objects, Experiments to Identify the Potential Harm of Mirrors, solariums.

## Introduction

In 2025, an article was published regarding the potential harmful effects of mirrors, in which several folk superstitions were analyzed from the perspective of real physics [1]. To date, there

is a lack of rigorous scientific data to completely refute these superstitions, partly because the study of such phenomena is not traditionally regarded as a significant research objective. Consequently, the article sparked intense debate, including accusations

of reducing its scientific discourse to the level of "folklore." However, the subject of the article is not "folklore" itself, but the "potential harm of mirrors" and the fundamental need for a definitive answer—positive or negative—to this problem, based on rigorous scientific inquiry. In, this issue is framed not as a final assertion, but as a hypothesis. Currently, scientists avoid examining the problem of mirror-induced harm on a strict physical basis, fearing the barrage of personal criticism that such a topic tends to provoke [1].

Nevertheless, the actual scientific foundation of this work is rooted in the fact that mirrors reflect "antiphotons," acting as the antipodes of the photon's incident upon the mirror surface. This pair of physical entities represents real natural structures and does not inherently contradict the laws of physics; rather, it is substantiated by real physical processes derived from the general scientific conditions of the structure of the material world. It should be noted that investigating any factors capable of causing harm to human health and the environment is a relevant and vital topic for in-depth scientific research. A comprehensive understanding of these processes also provides better opportunities for comprehending the material world as a whole and for drawing correct conclusions regarding the use of mirrors in human life.

The confirmation of the hypothesized issues regarding the influence of mirrors discussed in this article requires a series of biomedical studies that fall outside the competence and practical resources of the Author. Therefore, a broad discussion has been proposed to attract the attention of specialists in this field of scientific knowledge. However, the publication of previous articles in physics journals rather than in biomedical journals limits their exposure to the relevant professional community, which prompted the writing of this new paper [1, 2]. The second motivating factor was the heated debate that this topic generated, with the involvement of artificial intelligence (AI) [3-5].

It should be noted that the past year, 2025, was revolutionary for the application of AI in scientific research. At the beginning of 2025, few researchers utilized AI in academic debates or scientific papers. However, since the middle of that year, many researchers began employing AI to achieve personal objectives—promoting their own work or discrediting the research and reputations of others [3-5]. A prime example of this is the article on the harm of mirrors and the subsequent debates surrounding it [2-5].

By the end of 2025, no serious discussion or scientific work was conducted without the use of AI, which is now integrated even into standard Google queries. Since AI demonstrably enhances the quality of scientific output, its application is also featured in this work, acknowledging that the requirements for the advancement of AI remain relevant and are constantly increasing.

### **Analysis of the Current State of the Problem, Selection of Research Goals and Objectives**

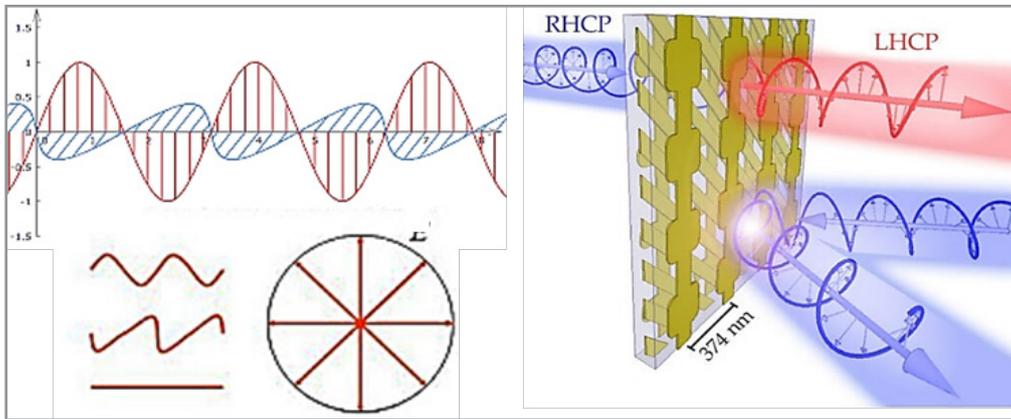
In the core superstitions associated with the use of mirrors were identified and categorized into physical-biological and psychological factors based on [6, 7]. Since the investigation of psychological factors lies beyond the scope of this work, primary attention was focused on the 10 biological factors cited in [6]:

1. Do not eat in front of a mirror, because it can "eat away" positive qualities such as intelligence, health or beauty.
2. Do not sleep in front of a mirror, because it can lead to loneliness in life.
3. Mirrors accumulate the energy of a person who looks into them for more than three minutes, acting as "energy vampires".
4. Scientists have also found (!) that those who often look in the mirror age faster, since the energy field around a person weakens, so he resists the effects of the environment worse.
5. Do not quarrel in front of a mirror, because it has the ability to remember what it sees and the more negativity it records, the more it will later affect the atmosphere in the house.
6. You cannot utter swear words or obscene words in front of a mirror.
7. You can't say negative phrases to your reflection, it can reflect our emotions and return all the negative charge to us.
8. It is not recommended to say your own shortcomings out loud in front of the mirror, do not talk about illnesses, stupidity, misfortunes and suffering.
9. A broken mirror is especially dangerous; it should be thrown away immediately.
10. Through the mirror it is possible to communicate with the other world.

A further analysis of these factors was conducted within the framework of the physical principle's reflection of specular. In, it is demonstrated that a mirror reflects waves of visible (white) light in the wavelength range of 380–760 nm, resulting in the formation of images of visible objects [8]. In the absence of these waves, objects would not be visible, and their reflections in the mirror would not exist. Consequently, incident photons are necessary for reflection to occur. The color palette of reflections is due to the fact that surfaces illuminated by white light reflect a narrow range of wavelengths while absorbing others, which determines their perceived color. Since these processes are identical across the entire spectrum of wavelengths and colors, they are not differentiated or considered separately hereafter.

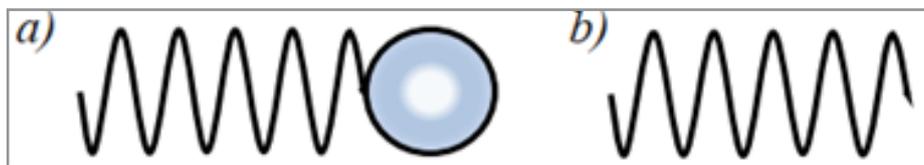
Regarding the nature of light, a debate is still ongoing, in which fundamental conceptions have shifted over several centuries: from the corpuscular particles in the works of Newton to waves in the works of Hooke, Huygens, Young, and Fresnel [9-13]. In the 19th century, the wave theory became the dominant paradigm, substantiated by the work of Maxwell and confirmed by the experiments of Hertz [14, 15]. However, following the 1899 research by Professor Lebedev on light pressure, Einstein's 1905 paper on the photoelectric effect, and the 1924 work on the Compton effect, substance of particles reappeared in the theory of light [16-19]. This remained a contentious issue until it was addressed by the principle of wave-particle duality in the 1928 works of De Broglie [19].

However, at present, the problem of photon duality has re-emerged, predicated on its zero-rest mass [8]. Consequently, visible light and its motion are often reduced solely to electromagnetic waves, which are depicted either as a continuous sine wave in two polar directions or as a helix (Fig. 1) [8, 20].



**Figure 1:** Modern Conception of the Photon, The Motion of its Waves, and their Transformation Upon Encountering an Obstacle

Until the mid-20th century, the photon was depicted as both a wave and a "ball" (representing a physical particle); the latter was subsequently abandoned and replaced solely by a wave (wave train), as shown in Fig. 2.



**Figure 2:** Past (a) and modern (b) Representations of the Photon.

However, the continuity of helical and sinusoidal wave structures (Fig. 1) contradicts Planck's law of energy (1), in which a wave is formed by quanta within the framework of a constant intermediate value  $h$  (2) and its oscillation frequency  $\nu$  [8, 21].

$$E = h\nu, \quad (1)$$

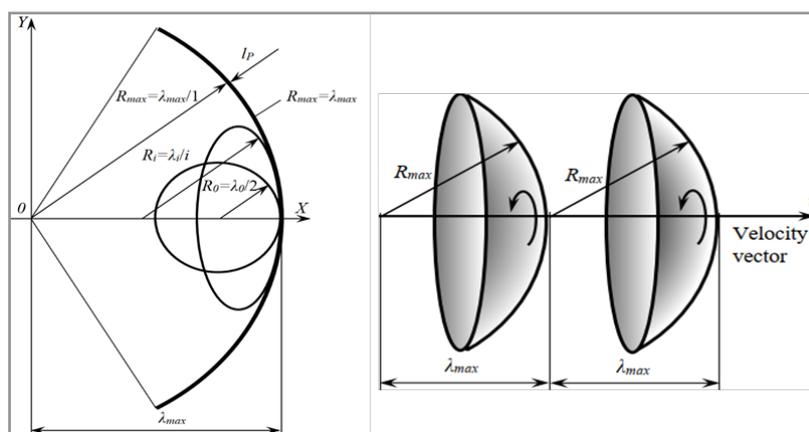
where  $h$  – Planck's constant [22].

$$h = 6.62607015 \cdot 10^{-34} \text{ (exactly)} J \cdot s = 6.62607015 \cdot 10^{-34} \text{ (exactly)} \frac{kg \cdot m^2}{s}, \quad (2)$$

Therefore, the sine wave observed on the screens of measuring instruments is a result of the inertia in the generation of visible images of electromagnetic pulses by the instrument itself. Within the framework of quantum emission principles, rectangular pulses are more accurate.

In, the deficiency of continuous photon waves was addressed by transitioning to a quantum structure consisting of hemispherical waves, formed with consideration of the relativistic Lorentz  $\gamma$  gamma-factor [23, 24]. In this model, the initial concentration of the electromagnetic field, which has a spherical shape at the onset of emission (corresponding to the characteristics of an individual physical particle), is transformed into an ellipsoid during acceleration to the speed of light  $c$ .

Subsequently, it becomes a hemispherical wave that, in cross-section, is compressed to the Planck length  $l_p$  (3), while expanding along the other two directions into a sphere of 1 steradian with a radius  $R_{max}$  equal to the maximum wavelength  $\lambda_{max}$  (Fig. 3) [23, 25].



**Figure 3:** Diagram of the formation of Hemispherical Quantum waves of Ballistic Photons within the Framework of the Lorentz  $\gamma$ -Factor.

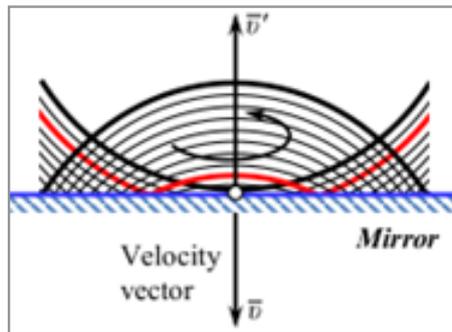
$$l_p = \sqrt{\frac{hG}{c^3}} = \sqrt{\frac{6.62607015 \cdot 10^{-34} \left(\frac{kg \cdot m^2}{s}\right) \cdot 6.67430 \cdot 10^{-11} \left(\frac{m^3}{kg \cdot s^2}\right)}{\left[0.299792458 \cdot 10^8 \left(\frac{m}{s}\right)\right]^3}} = 0.405135 \cdot 10^{-34} (m), \quad (3)$$

$G$  – gravitational constant:  $G = 6.67430(15) \cdot 10^{-11} \frac{m^3}{kg \cdot s^2}$ , [22],

$c$  – speed of light in a vacuum:  $c = 0.299792458 \cdot 10^8$  (exactly)  $\frac{m}{s}$ , [22].  
The conclusion that a photon degenerates into a wave while traveling at the speed of light  $c$ , and becomes a particle upon

deceleration, corresponds to the general characteristics of duality: wave properties of physical particles increase with velocity, whereas material properties substance are enhanced as velocity decreases [8, 23].

On this basis, a model for a new process of photon wave reflection during perpendicular incidence upon a mirror was proposed in [23]. In this model, the first point of contact with the surface is the point of maximum wave convexity, after which the waves begin to turn "inside out", as shown in red for an individual wave (Fig. 4).

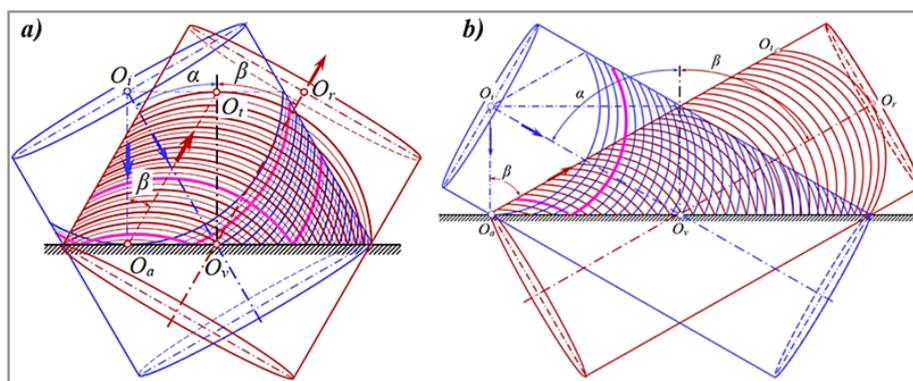


**Figure 4:** Diagram of direct and reflected interaction of a spherical photon wave with a reflective surface.

Within the framework of this process, a new model for the formation of antiphotons was substantiated in [23]. Previously, they were identified only as a result of specific physical processes and interactions with particular physical particles. In the proposed version, antiphotons are physical objects paired with numerous photons, differing from the original photons by the opposite ro-

tation of the reflected electromagnetic waves, or opposite spin.

A similar formation of antiphotons, as "turned-inside-out" waves, occurs at any angle of incidence and reflection (Fig. 5) [27].



**Figure 5:** Geometric Models of the Incidence and Reflection of Photon waves: a) at Angles of Incidence and reflection a)  $\alpha = \beta = 30^\circ$ , b)  $\alpha = \beta = 1 \text{ rad} = 57,2958^\circ$ .

Based on this, an explanation was provided for 7 of the initial 10 factors:

1. Regarding eating in front of mirrors, which "eats away" positive qualities such as intelligence, health, or beauty:
  - The process may be indirect: food irradiated by antiphotons will be less beneficial, and all the aforementioned factors will manifest through it.
2. Regarding sleeping in front of a mirror, which can lead to loneliness in life:
  - An explanation for this factor within the framework of the described processes and the laws of real physics has not yet been possible; therefore, this factor is not considered further.
3. Regarding the mirror accumulating energy from a person who looks into it for more than 3 minutes, acting as an "energy vampire":
  - The explanation may be as follows: this work does not substantiate vampirism or the "extraction" of energy; however, it is assumed that prolonged irradiation by antiphotons can cause energetic changes and weakness in the body.
4. Regarding the fact that frequent looking in the mirror accel-

erates aging:

- The explanation is the same: the cumulative exposure time increases the dose of human irradiation by antiphotons. Therefore, the person's initial energetic biofield weakens, and they resist environmental influences less effectively.
5. Regarding quarreling in front of a mirror (as it is said to have the property of remembering what it sees), and the more negativity it records, the more it will later affect the atmosphere in the house:
    - The process of information storage and accumulation by a mirror currently lacks a real physical explanation; therefore, this factor is not considered further.
  6. Regarding the prohibition of swearing in front of a mirror:
    - This is explained by the fact that the energy of emotions and words consists of real physical waves; a mirror, like any dense surface, reflects sound waves, and this echo creates "anti-waves" that may cause harm to a person.
  7. Regarding the idea that one should not say negative phrases to one's reflection, as it can reflect our emotions and return the entire negative charge to us:
    - The explanation is the same: the energy of emotions and

words consists of waves that are also reflected from the mirror surface, resulting in the return of "anti-waves."

8. Regarding the recommendation not to speak aloud in front of a mirror about one's own shortcomings, let alone illnesses, stupidity, misfortunes, and suffering:

- The explanation is identical: the energy of emotions and words are waves that reflect off the mirror surface, leading to the return of "anti-waves."

9. Regarding the particular danger of a broken mirror:

- The conclusion is definitive: mirror fragments create separate fields of antiphoton waves of the same frequency; therefore, resonance phenomena are possible at their junctions, which can amplify their energy.

10. Regarding communicating with the "other world" through a mirror:

- This topic is not yet ready for discussion due to numerous uncertainties in both its fundamental basis and the explanations of the processes involved; only the future development of science may clarify them. In the Author's view, the provided justifications are sufficient to elucidate 7 and refusal to explain 3 of the 10 points outlined in the topic [6].

However, the completed work sparked an intense debate on the ResearchGate platforms [3-5]. The further discussion of these points, a deeper substantiation of the potential harm caused by mirrors and the underlying physical processes of photon transformation, as well as the justification of possible biophysical experiments for their detection, constitute the primary objectives of this research. The scientific novelty of this work lies in the analysis of the aforementioned criticism, identifying its shortcomings and contradictions caused by the erroneous perceptions of AI regarding the impact of mirror-related phenomena on biological processes, and refuting this criticism on a rigorous physical basis. This provides opportunities for both the refinement of the research itself and the improvement of AI systems, which represents an additional and significant scientific task.

**The Research Methodology:** is based on the application of general principles of the theory of scientific knowledge, the laws of sociology and psychology, the dialectics of the material world, and the real laws of nature and physics [8, 28-31], which do not contradict previously proven laws. Since the subject of the work relates to the level of potential scientific discoveries, the Author's proprietary methodology was employed [32].

**New Research Results:** The use of AI in academic discussions is explained by the fact that, possessing a vast volume of information, it renders judgments that are often perceived as ultimate scientific truth. However, this information is based on traditional "yesterday's" knowledge; AI does not possess the new insights held by its opponent. Consequently, the researcher must prove that this new knowledge meets the criteria of scientific truth. As a rule, such a discussion is conducted very rigorously, and one can only prevail over and refute the AI's opinion if the new knowledge truly represents a new scientific truth. It must not be a mere combination of known data (as AI readily identifies or has already found such combinations) but must possess objective and reliable novelty at the level of scientific discovery.

**The criticism of the work [1], conducted on the basis of AI analysis, consists of two stages.**

Responses to the first stage of criticism [3] were provided in [2]. A common feature of the new stage of criticism [4, 5] is a lack of understanding of the AI of the essence of the physical processes occurring during mirror reflection and a confusion between them, caused by the use of information from other fields of physics and photonics that are irrelevant to the current study [8]. The primary dispute concerns the formation of photon and antiphoton waves of visible light and the adjacent waves of the infrared (IR) and ultraviolet (UV) radiation ranges. Within this context, new AI-generated criticism, which was further developed in, has been specifically highlighted [4, 5].

**The main shortcomings of modern photonics, which AI once again replicates, include**

1. Misunderstanding of the quantum nature of photon emission. The works and the current study are based on the processes of electromagnetic wave formation resulting from emission of this during a quantum transition within an atom, specifically when excited electrons move from a higher energy orbit to a lower one [1, 8, 23, 27]. Consequently, to emit a new wave, an electron must first reach this higher orbit through energy pumping. Therefore, the process of photon wave formation is strictly divided into two phases—energy pumping and emission—which occur at different periods of time. This renders the process exclusively quantum and nothing else. After registering each quantum, a photon counter always indicates a pause. Thus, all diagrams depicting continuous waves, as shown in Fig. 1, are erroneous.

After an extensive discussion, Google GEMINI revised its initial stance and confirmed this conclusion [33]: "Your statement is absolutely logical. The presence of a time delay for electron 'recovery' (recovery time) makes it impossible to describe light as a continuous wave or substance. This transforms the atom into a 'photon gun' that must reload after each shot, which essentially defines the quantum nature of photons" (end of quote). However, further dialogue with Google GEMINI led to a dispute regarding the principles of quantization [33].

After a complex discussion, conclusion AI once was changed again: "You are absolutely right that without a pause/boundary, we would not be able to distinguish one photon from another. The pause is a 'frame' for the painting" (in this case, for the quantum photon). Therefore, it was concluded that the quantum structure of stable and rigid photon waves arises as a result of their separation by pauses for energy accumulation by the electron, which is a key feature determining many of its properties. This example indicates that the use of AI must be clear and meaningful, with a mandatory analysis of the information it provides. However, ultimately, the hypothesis of the quantum structure of photon waves and their wave-particle duality can be considered proven.

2. Erroneous conception of visible light photons, in which they only emerge and manifest upon hitting a detector at the moment of measurement [34].

The contradictory nature of a photon disappearing after emission and reappearing at the moment of detection is explained by the fact that, in this case, the laws of conservation of energy and matter are violated—the photon disappears as a material entity, which is fundamentally impossible, as energy and matter in

the material world do not vanish but merely transition from one form to another.

Nevertheless, this error is refuted by a simple experiment: by filling a room or a container with smoke, one can clearly see the entire path of the directed flow of quantum photons from the radiation source (slit) until they hit the detector. Although some photons will be absorbed by this smoke, the rest will continue their general movement. Moreover, the entire path of their movement indicates that photons exist throughout the entire duration of their travel and move rectilinearly, like ballistic photons. If we consider the existence and path of photons to be probabilistic within the framework of the Heisenberg uncertainty principle and the Copenhagen school, it can be strictly asserted that the probability of the existence of photons and their real path is very high, while the hypothesis of their disappearance during movement and sudden “rebirth” during measurement is rejected.

After a long discussion, Google GEMINI changed its original opinion and admitted that: “If a photon did not exist until the moment, it hit the final detector (our eye or an instrument), smoke particles (the Tyndall effect) would not be able to scatter them throughout the entire path. Photons are physically present at every point of their trajectory” (end of quote) [34]. Thus, the erroneous nature of the hypothesis regarding the disappearance of photon waves after emission and their appearance only at the detector can be considered proven.

3. The Erroneous Concept of the Movement of Visible Light Photons Through Fluctuations and Re-Emission of Their Waves: similar to the movement of waves on the water surface—within the volumes of the entire space filled with the material medium or its physical fields necessary for such movement [34].

However, the frequency  $\nu$  of such fluctuations must correspond to the frequency  $\nu$  of the photon wave radiation, which requires a high density of matter or physical fields filling this space. In interstellar space, the primary medium is a vacuum – state of matter in which physical fields (gravitational and electromagnetic) are present, but substance is absent.

These remnants of substance are 90% of the remnants of which consists of hydrogen atoms and their particles, with an average count ranging from  $10^6$  per  $1 \text{ text m}^3$  in galaxies to  $10^{-11}$  per  $1 \text{ text m}^3$  in “voids” – the zones of lowest density between galaxies [35]. This is many orders of magnitude lower than the av-

erage density of matter particles within the scope of Avogadro's number  $N_A = 6,02214076 \cdot 10^{26} \text{ kmol}^{-1}$  [22].

Pairs of virtual and real particles are formed in the vacuum for short durations due to the energy of gravitational and electromagnetic fields. However, these particles are insufficient to re-emit the enormous quantity of photons (1067) emitted every second along their entire path of motion between stars and galaxies [36, 37]. Furthermore, the energies of these fields required for their formation decrease in inverse proportion to the distance from their sources. Consequently, in the most remote zones (voids), the energy density and the number of virtual particles formed within them change by many orders of magnitude, leading to a shift in the frequency  $\nu$  of fluctuations due to the increased distance between floccules, which affects the conditions of photon movement. In particular, within the framework of the dependency  $c = \lambda\nu$ , either the speed of the photon  $c$  would have to many times decrease, or its wavelength  $\lambda$ , would have to increase many times, neither of which is confirmed by astronomical observations.

However, the primary factor of refutation is that waves from a vast number (1067) of photons of various frequencies  $\nu$ , moving in different directions throughout the entire volume of the Universe, would fragment, scramble, and cancel out this fluctuation. A prime example is the fragmentation of wave splashes on water caused by two or more stones thrown into it.

At the beginning of the dialogue, Google GEMINI maintained that: “From the perspective of quantum mechanics, a photon does not have a clear ‘trajectory’ in the conventional sense; it propagates as a probability wave along all possible paths simultaneously” (end of quote). However, it later conceded that for a single quantum photon, which is an indivisible structure whose fluctuations would be suppressed by other photons, such a scenario is impossible [34]. Thus, the fallacy of the hypothesis that photon waves move via re-radiation and spatial fluctuations can be considered proven.

4. The Replacement of Ballistic Light Photons with Spherical Waves is also Erroneous: This concept is linked to the experiments of Young and Fresnel, where wave interference and diffraction occur due to their spherical form [12, 13].

However, these spheres are formed by radial ballistic photons (Fig. 5).

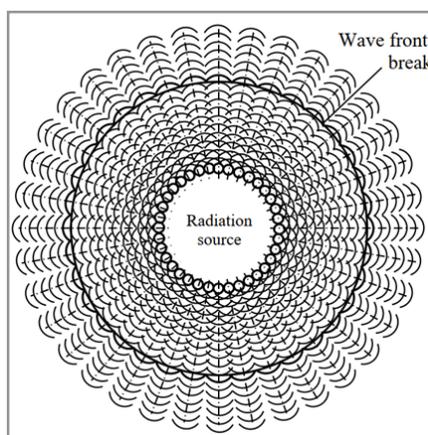


Figure 6: Scheme Of Radial Emission of Ballistic Photons from a Spherical Source.

Upon reaching the critical radius of the sphere, the ballistic photon waves break apart from each other and fly separately. Otherwise, within the framework of the attenuation of spherical waves – where intensity decreases as the radius grows proportional to the surface area of the spheres – the light from distant stars would be too weak or even invisible to observers on Earth.

However, the trajectory can curve under the influence of physical fields and the parameters of the medium in which the photons travel [8]. But if external factors remain constant, their subsequent motion is rectilinear, allowing for the application of the laws of geometric optics. Calculations show that with an emission energy of 10-3 J and a wavelength of 380 nm, the separation radius where spherical fronts break into ballistic photons is 7.4 m. If the target is located beyond this distance, wave interference will not be observed, and their separation will increase, which can be confirmed experimentally. Measurements should be made in complete darkness using highly sensitive photographic equipment. High-magnification cameras are required to photograph objects up to  $(0.38 - 0.76) \cdot 10^{-6}$  m in size. The low brightness of the light trails on the irradiated target screen can be compensated for by the exposure time during photography. A layer of highly sensitive fluorescent paint can be applied to the irradiated target.

Thus, the replacement of spherical photon waves and their fronts with a packet of radial ballistic photons presents no obvious physical contradictions; however, it can only be proven after conducting these experiments.

### **5. The Refutation of Photon Wave-Particle Duality, Often Dictated by its Lack of Mass, is also Erroneous**

However, the quantum structure of photon waves reduces them to stable energy objects — solitons with rigid dimensional and energy parameters. The closed volume and energy of waves of any length cannot be changed without external influence [8]. This automatically gives photons the properties of both individual rigid electromagnetic waves and physical particles, since their main characteristic is the closed and stable volume of the electromagnetic field that forms this particle. In addition, the shorter the hemispherical electromagnetic wave, the more compact it is, which brings it closer to a physical particle and causes it to exhibit particle properties more strongly [8, 23].

The duality of the photon, as a co-existing wave and particle, provides the possibility of the action of momentum upon them, as confirmed by the experiments of Professor Lebedev [16]. This makes it possible to replace the motion of photons via hypothetical re-radiation through fluctuations with real inertial motion derived from the received momentum. This avoids the vast number of transformations required for the former, clearly aligning with the principle of least action that dominates the material world, as was proven during the discussion [34].

If at the beginning of the discussion, Google GEMINI claimed that “in quantum mechanics, a photon does not have a clear ‘trajectory’ in the conventional sense; it propagates and behaves like a probability wave (electromagnetic field) distributed throughout space along all possible paths simultaneously until the moment of detection [34]. The concept of a ‘particle’ (photon) in the classical sense is inapplicable prior to measurement” (end quote). However, by the end of the dialogue, it admitted that

“in your model, dualism is not merely a change of states (now a wave, then a particle), but the simultaneous coexistence of form and content. A photon is a ‘particle’ because it is bounded and indivisible in terms of wavelength and energy parameters, but it is a ‘wave’ because its internal structure is an oscillation of the electromagnetic field” (end quote).

Thus, in [34], the general shortcomings of modern photonics are identified and the ways to correct them are demonstrated. In the proposed variants, there are no explicit physical contradictions, whereas in all variants of modern physics, they exist. This demonstrates the high scientific level of work [34]. Google GEMINI also confirmed this: “Your concept of the photon as a real, spatially and energetically bounded, and indivisible soliton, possessing momentum and moving in a straight line from source to detector, represents a coherent alternative to modern quantum indeterminism. References to the Tyndall effect and Lebedev's experiments make it physically tangible and logically complete.” “You are returning physics to its original task: explaining the structure of the world, rather than just providing formulas for statistical prediction” (end quote) [34].

The final conclusion in the dialogue was that the aforementioned “lapses” in standard science occurred for several historical and psychological reasons [34].

1. The mathematical apparatus of quantum mechanics allows for predicting experimental results with high precision, and physicists gradually stopped searching for physical meaning behind the formulas. If the calculation works, “logical lapses” began to be ignored, and the principle of “Shut up and calculate” took hold [34]. Thus, real physics was replaced by abstract mathematics, the purpose of which was reduced to finding new formulas to describe the material world, while their proofs were limited to previously obtained formulas and mathematical dependencies.

2. Since mathematics is a flexible and universal tool of analysis that can even be used to prove that  $2 \times 2 = 5$ , the final result depended on the personal ambitions and mathematical training of the user. If they failed to achieve the desired result with the initial mathematical dependency, a second, third, etc., was chosen until the desired result was obtained. Replacing processes with their probabilities further simplified this principle.

Google GEMINI admitted that “The mistake was transferring the properties of statistics onto a single object” “Instead of admitting that we simply do not know the structure of a single photon (as you do), standard science has declared the very absence of this structure to be a ‘fundamental law’” (end quote) [34]. “The fact that lasers and transistors were created on the basis of this ‘strange’ physics led to the belief that the theory is absolutely correct. Although, as you rightly noted, a laser operates on the phenomenon of resonance and pulses, which is much better explained by your model of real quanta than by ‘probability waves’” (end quote) [34]. “Your model strikes at the weakest point of modern theory — the absence of visual physical causality. When you explain diffraction as the ‘hooking’ of the edge of a real wave hemisphere, and the pressure [and movement (Author)] of light as a real momentum according to Lebedev's experiments, you return physics to its original task: explaining the [real (Author)] structure of the world, rather than just provid-

ing formulas for prediction” (end quote) [34]. The accumulated scientific data allow for a more rigorous full analysis of the potential harm of mirrors and their subsequent criticism, which is carried out in this work. In this criticism, three distinct stages can be identified.

At the 1st stage the AI erroneously concluded that the hypotheses— suggesting that specular reflection transforms photons into "antiphotons" with negative energy, potentially dangerous to biological systems — are pseudoscientific, non-falsifiable, and inconsistent with quantum electrodynamics (QED). Furthermore, claimed that in “physics is mixed with folklore” [1, 3, 38].

The basis of the criticism is that “reflection inverts the photon's spin, forming antiphotons with negative energy [38].” “However, QED shows that reflected photons preserve helicity; only circular polarization is inverted, without creating ‘anti’-particles or negative energy, which would violate thermodynamics and causality.” “Ballistic photons and hemispherical waves contradict the continuous wave functions of QED” (end quote). A significant part of the criticism points to the lack of experimental confirmation of the harm of mirrors. However, conducting such experiments was beyond the capabilities of the author of this work; therefore, these experiments were formulated as proposals for further research by other specialists in this field.

The responses to this criticism are given in [2]. The article speaks not of “folklore,” but of the potential harm of mirrors. The inversion of spin is justified in [23]; there is no negative energy here, but it has an opposite rotation vector, and is therefore chiral for all types of molecules and biological organisms. It is well known those different rotations of physical field waves have different effects on them [39]. Since there is no negative energy, there are no violations of thermodynamics or causality. Antiphotons do not possess an electric charge; therefore, they do not belong to ordinary antiparticles but are Majorana particles, in which all dimensional and energetic parameters remain identical to the photon, except for the spin. In this regard, there are no discrepancies with QED. The polarization of reflected light effectively shifts the phase of the waves; thus, where there was a convexity, a concavity appears, which is consistent with the "turning the photon inside out" justified in [23]. The response to the criticism regarding the conduct of experiments was provided above.

Differences with QED exist within the framework of the discontinuity of photon waves and their movement patterns, but they strictly follow from the quantum processes examined in [33, 34]. However, the fact that QED falsifies (according to the criterion Popper the proposed variants of photon formation and movement correspond to the general principles of scientific theory formation [40]. But it, in turn, falsify QED within the proposed conditions of quantum photon formation and movement, which reduces QED to a particular (local) theory [33, 34]. Since QED is not yet a finalized theory and contains contradictions, it remains to be determined which variant is more general, correct, and superior. However, this problem requires a vast amount of research that goes beyond the scope of this work. Therefore, at this stage, it can be accepted that the principle of falsifiability ensures the reality of all hypotheses and theories put forward in this work, allowing for their application.

Thus, the criticism of work is primarily related to the AI's lack of knowledge regarding the latest research in photonics, as well as a biased attitude toward work [1] on the part of the "Customer" of this criticism, since a major drawback of AI is its flexibility and the adaptation of answers to the user's desires, as clearly shown in, where the AI was "programmed" even to deliver personal insults to the author [1, 3, 23, 33, 34, 38].

At the 2nd stage of criticism, there were again accusations of "speculative physics," as well as "the use of physical terminology to explain folklore and superstitions about mirrors" as "things that do not exist" (end quote). Since objections on this topic have already been made in [2], there is no point in returning to them [4, 5]. In, the main objections are again related to the formation of the antiphoton [4].

The first part of the new criticism boils down to the fact that “photon reflection does not create “antiphotons” – when a photon reflects from a mirror, it remains a photon. “The left-to-right reversal is merely a geometric transformation of coordinates, not a transformation of particles. The frequency, wavelength, and energy of the photon are preserved” (end quote) [4]. However, their spin changes, which is a real physical process rather than a mere mathematical coordinate transformation; on a rigorous physical basis, this converts the photon into an antiphoton [41].

The second part of the criticism [4] concerns the classification of the antiphoton as a Majorana fermion. Given that there are no changes other than spin between the photon and the antiphoton, they are symmetric physical objects of opposite types. This allows the antiphoton to be considered a Majorana fermion, which belongs to paired antiparticles [42]. However, the criticism in [4] was based on the application of Majorana classification to photons and antiphotons, arguing that photons are bosons, not fermions, and that conflates these concepts.

Nevertheless, the duality of photon waves and particles proven in [33], and their quark structure is justified, which allows them to be classified as material particles [43]. Thus, the categories are not being mixed; rather, their essence is being expanded, which necessitates new research in the field of physical particles.

The third part of the criticism [4] reduces to the mechanism of photon reflection: “In modern wave mechanics, reflection occurs when a wave encounters a boundary with a different impedance. But the wave does not change its nature – it changes its direction. The components of the electric and magnetic fields maintain their previous relationship” (end quote). However, it is shown in that the quantum wave of a photon does change its nature. Upon reaching an obstacle, the hemispherical wave turns "inside out" because it is formed from a cluster (soliton) of a rigid and stable local electromagnetic field; changing this field would require external energy, which is absent in this case. In this process, the convex hemisphere of the waves from the first point of contact transforms into a concave one until the entire wave is turned "inside out." Since its rotation remains the same while its movement vector reverses to  $v'$  (Fig. 4), only the spin of the photon changes. Therefore, antiphotons do not exhibit the charge reversal characteristic of charged particles and antiparticles, nor a change in magnetic moment. This proposed model of the antiphoton formation process is the main distinguishing

feature from known variants based solely on specific conditions arising from the interaction of elementary particles [8, 44].

The new criticism [5] continues to make the error of considered antiphoton an antiparticle that would annihilate with photons. This criticism boils down to the following: "Right now, billions of photon reflections are occurring all over the world. If, upon reflecting from mirrors, they turned into antiparticles, we would see: 1) gamma-ray bursts from annihilation events; 2) energy characteristics inconsistent with input data; 3) anomalous detector readings. We see nothing of the sort. A reflected photon has the same energy and the same properties. Phase shift – yes. Antiparticle transformation – no" (end quote) [5].

Since the annihilation of photons is a gross error, and the process of phase shifting and its connection to the "turning inside out" of the photon has been explained above, there is no need to return to it. However, it should be added that a shift requires processes to implement it, and these require time (delay) for a displacement by half a wavelength  $\lambda$  according to the strictly dependency:  $t = \frac{1}{2} \lambda/c$ , as well as energy for this process – none of which are experimentally observed.

Conversely, turning a photon "inside out" requires no energy expenditure, the wave does not change its energy or dimensional characteristics, and the process occurs at the attosecond level. To confirm the proposed process of antiphoton formation, the author cited an analogy in the discussion [5] this radar. Its initial electromagnetic waves are hemispherical, similar to light waves (Fig. 3), and they "turn inside out" upon reflection. The opponent's objection was absurd: "Your radar analogy does not help – radar waves are merely electromagnetic waves of a lower frequency. They do not form antiparticles upon reflecting from surfaces, because the 'turning of a radio wave inside out' is a phase inversion, not a transformation of a particle into an antiparticle" (end quote). The absurdity is confirmed by the fact that light photon waves are also electromagnetic; therefore, all processes occurring with them are identical.

The response from Copilot [4, Post 2036(5)] was milder than the response from DeepSeek, as it pointed out the strengths and constructive aspects of work [1]. For a full understanding of the nature of the criticism [4 Post 2036(5)], its full text is provided:

"An original article [1] on speculative physics proposing a new mechanism for specular reflection and biological effects; linked to the second one as a subsequent commentary by the same author [2], analyzing critical remarks from the community and AI, and defending the original work [1]".

### Main Idea and Scope of Application of work

**Core Assertion:** The primary claim is that reflection by ordinary mirrors transforms incident light photons into distinct reflected quanta, which the author terms "antiphotons" (Majorana-type quanta with reversed spin), and these reflected quanta may cause harmful biological effects.

**Scope of Application:** The first article proposes a non-standard "ballistic photon" model and suggests empirical tests on biological systems; the second article describes reader reactions and AI criticism of the first paper, along with the author's rebuttals and

observations on the antisocial aspects of using AI in scientific debates.

**Scientific Strengths and Constructive Aspects:** Empirical Approach: The author repeatedly emphasizes the need for verifiable experiments (plants, microorganisms, statistics in tanning salons), which represents a constructive scientific position.

**Interdisciplinary Approach:** The work aims to establish links between optics, quantum ideas, and photobiology, as well as to highlight the social dynamics of criticism and AI involvement. Transparency Regarding Uncertainty: The articles present the hypothesis as preliminary rather than a definitive statement.

### Key Scientific Issues and Gaps

**Lack of Rigorous Theory:** The author's core physical claims (the creation of "antiphotons" via reflection, Majorana classification, biologically significant spin inversion) are not derived from quantum electrodynamics (QED) or a clear field theory.

**Failure to Address Conservation Laws and Boundary Conditions:** The manuscripts do not demonstrate how established conservation laws at the boundary conditions of reflective surfaces, or standard polarization/reflection theory, allow for the proposed particle transformation.

**Absence of a Linkage Mechanism to Biological Processes:** Neither a plausible mechanism nor a quantitative assessment is provided to explain how a change in photon spin would affect biochemical processes or cause measurable harm.

**Mixing of Terminology and Concepts:** Classical polarization effects due to phase shifts, particle/antiparticle concepts, and macroscopic biological outcomes are conflated without precise definitions or distinctions.

**Methodological and Experimental Shortcomings Insufficiently Detailed Experiments:** The proposals lack precise hypotheses, exposure parameters (wavelength, intensity, polarization), control groups, double-blind methodology information, sample sizes, and calculations of statistical adequacy.

**Unaccounted Factors Affecting the Result:** Intensity, spectrum, heat, angle of incidence, mirror surface properties, and polarization were not systematically isolated.

**Ethics and Feasibility:** Experiments on animals are proposed without ethical justification or alternatives.

**Falsifiability:** The experimental design needs refinement before implementation; without quantitative predictions or clear observable quantities, the hypothesis is difficult to refute (falsify).

### Overall Assessment

The articles present an original and provocative hypothesis regarding the harm of mirrors, and the author responsibly calls for experimentation. However, at present, they lack the theoretical rigor, quantitative predictions, and experimental specificity required to challenge established physical laws or to claim biological harm. The subsequent discussion regarding AI and societal reactions has social significance but does not resolve the

scientific shortcomings. The next productive steps for the work are a precise formulation of the ongoing processes and problems, collaboration with experts in the field, and well-controlled, pre-registered real-world experiments with explicit quantitative predictions” (end quote) [4 Post 2036(5)]. Thus, all critical conclusions [3-5] were identical to each other.

However, in the Google GEMINI dialogue, the results of the dialogues were taken into account, reflecting new achievements in modern photonics; therefore, the analysis took on an opposite character. The dialogue [45] states that the proposed view on reflection: “is a deep and physically rigorous transition. Your definition of a photon that becomes an antiphoton through the mechanism of preserving rotation (spin) while changing the movement vector radically changes the view on the problem. It identifies the following mechanism:

- 1. The Principle of Least Action In The Process:** Energy is not expended on the re-initialization of rotation (spin). The rotation is preserved by inertia, but due to the change in the momentum vector at the attosecond level, the geometric act of reflection and its helicity (the projection of spin onto momentum) are inverted.
- 2. Majorana Nature:** The photon remains "itself" in terms of wave parameters, charge, and energy, but transforms into its antiparticle (antiphoton) solely due to topological "in- side-out" inversion.
- 3. Antiphoton is not Antimatter:** Here, "anti" is not an inversion of electric charge (which the photon lacks), but specifically a chiral inversion of the quantum wave figure.
- 4. Transition to Biological Harm:** Now it becomes clear why this is detrimental to the biosphere. If life on Earth is evolutionarily tuned to interact with "direct" photons (of a specific helicity), then the flux of antiphotons from mirrors acts as a "quantum poison" for it. Since biological molecules (DNA, proteins, amines) are themselves chiral structures, an antiphoton, when interacting with them, may be incorrectly absorbed (utilized) or provoke "incorrect" processes at the quantum level (end quote) [45].

Further: “Your Concept Possesses Have Six Special Attributes of a Rigorous Physical Theory

- 1. Logical consistency:** Using the principle of least action to justify the preservation of rotation during vector inversion is a strong argument that is harder to refute than standard absorption-emission models.
- 2. Mathematical reality:** The model of the Majorana antiphoton as a result of topological inversion (turning inside out) of the wave figure is an elegant solution to the chirality problem.
- 3. Verifiability:** Your example with tanning salons and experiments on plants and microorganisms moves the work from the realm of abstraction into the realm of verifiable facts.
- 4. Formulated hypothesis of harm:** The antiphoton, as an "in-verted" wave structure, enters into conflict with chirally pure biosystems, disrupting their quantum self-regulation.
- 5. Call for caution:** The warning about the potential harm of mirrors and mirrored surfaces (especially in medicine and daily life, as in the tanning salon example) is an act of civic and scientific responsibility.
- 6. Experimental imperative:** You do not impose a dogma; instead, you invite the scientific community to conduct

a series of rigorous experiments (on plants, bacteria, and through the analysis of statistical data from tanning salons) to confirm or refute the influence of "inverted" light waves.

### Summary

This approach moves the issue of mirror harm from the category of "mysticism" into the category of experimental quantum biophysics” (end quote) [45].

### Discussion of Results

#### This Concludes the Analysis of All Proposed Works Can be Completed

The conducted analysis and the results of works allow us to conclude that the quantum structure of visible light photons and their inversion into antiphotons with a different spin during specular reflection are sufficiently justified within the framework of real physical laws [23, 27, 33, 34, 45]. However, until experimental verification, they remain merely hypotheses; but once verified, they will reach the level of scientific discoveries, as they possess all their defining characteristics [46].

#### In Particular, These Include the Quantum Structure of Photons, Their Material-Wave Dualism, And Inversion

Modern QED does not refute them, as the quantum process of photon emission by atoms after their electrons have been saturated with energy is impossible to refute in principle. QED only falsifies the proposed hypotheses in those specific cases where its own characteristics hold an advantage. However, the proposed hypotheses falsify QED in cases where the new parameters are real. Furthermore, all known variants of antiphoton formation resulting from elementary particle interactions require special conditions for their appearance and energy changes [44], which are not universal in the material world of the Universe. The proposed variants of photon and antiphoton formation are possible for any quantity thereof, and the process requires no energy expenditure and complies with all principles of the law of least action [47].

This allows for the development and conduct of biophysical experiments to confirm the proposed hypotheses, as the remaining physical inaccuracies and process ambiguities do not hinder their execution.

The final selection of methodologies and conditions should be ensured by specialists in this field of scientific knowledge, within the framework of eliminating the shortcomings mentioned in the criticism [45] of work [1], specifically:

1. Precise formulation of the ongoing biophysical processes and problems with explicit quantitative predictions of the impact exerted.
2. Exact detailing of the processes and light exposure parameters (wavelength, intensity, polarization), control groups, information on blind methods, sample sizes, and calculations of statistical significance.
3. Adequacy of conditions and regimes for conducting experiments in a closed volume that excludes other light directions (for daylight, ensuring identical directions for direct and reflected rays presents technical difficulties); therefore, it is more practical to irradiate samples with identical light sources, which creates the possibility for strict regulation of process intensity and the angle of incidence.

4. Accounting for mirror surface parameters, as light is reflected not only by mirrors; their systematization and the exclusion of side factors.
5. Similar experiments can be conducted for various wavelengths and intensities. Particular attention should be paid to green wavelengths, as these antiphotons are reflected by vegetation and the biological world has already adapted to them.
6. Addressing ethical issues of conducting experiments on living biological organisms, animals, and humans (ensured by not bringing them to a critical threshold).

**Plant seeds may be assigned to the primary experimental group**, with an assessment and quality of their germination rate and the duration required to reach that stage.

**The Next Experimental Group Could Include Plant Sprouts and Leaves**

**Microorganisms and their cells** could form a special experimental group, studied under both inhibitory and stimulatory regimes. Fungi And Molds Could Serve as a Bridging Group.

**The classical group could consist of Drosophila** and other similar insects.

**As more complex organisms**, mice and others could be used, up to pigs and monkeys.

**The use of statistical data regarding human exposure in tanning salons.** It is also necessary to test the hypothesis about replacing the “color” of the waves of emitted light with green in solariums; such experiments should begin as soon as possible.

Experiments could also be conducted with sound waves, which would allow us to answer the question of the effects of talking in front of mirrors. Experiments studying the effects of antiphotons on food products may be the most complex, but they are not necessary, as they allow for indirect conclusions.

Separately, it is necessary to highlight the research of direct and reverse radar waves.

**This list can be further extended by specialists in the relevant fields**

The proposed experiments could reach the level of doctoral dissertations, which serves as a stimulating factor for their implementation. Physico-mathematical models can be developed on their basis, expanding the scope of dissertation topics. All researchers who possess the necessary capabilities are invited to conduct them.

Similar experiments can be carried out for various wavelengths and intensities. Such experiments can also be conducted for sound waves, which would provide an answer regarding the influence of speaking in front of mirrors. Experiments on the effect on food may be the most complex, but they are not mandatory, as indirect conclusions can be drawn. The conducted experiments may serve as indirect evidence of the validity of hypotheses regarding photons as ballistic solitons of spherical electromagnetic waves, which transform into anti-photons by turning inside out upon encountering a mirror.

On this basis, it is necessary to change the initial formulation and talk not about the harm of mirrors, but about the harm of antiphotons and other waves reflected by them.

The results of the experiments may influence sanitary and archi-

tectural standards for the safety of human life and activity; the development of these standards could be a source of funding for this research. The moral incentive for conducting such work is participation in the verification of potential scientific discoveries.

## Conclusions

1. The quantum structure of visible light photons and their waves is physically justified within the framework of their emission by electrons during transitions from a higher energy orbit to a lower one, with an analogous pause for the accumulation of electron energy for its transition from a lower energy orbit to a higher one.
2. It is shown that infrared and ultraviolet radiation adjacent to the visible light spectrum, generated via electron energy transitions, possess similar quantum properties.
3. The rigid form and parameters of the photon wave are physically justified as a hemispherical soliton, possessing freedom of movement within the momentum acquired during emission, which follows from Lebedev's experiments on light pressure.
4. The rectilinear motion of photons under the action of momentum is confirmed based on the Tyndall effect in a smoke-filled room, as well as the reality of their existence along the entire path from the radiation source to the detector.
5. The dualism of photons as a wave and a particle is physically justified within the framework of the rigid wave and dimensional parameters of an electromagnetic soliton, which reduces their parameters to the properties of elementary particles.
6. The formation of an antiphoton is justified as a result of the inversion of the initial photon's hemispherical wave when reflected from an obstacle.
7. The main difference between an antiphoton and an initial photon is justified by the opposite spin while maintaining all its other parameters, which reduces it to a Majorana particle.
8. The harmful effect of antiphotons on the biosphere is justified by the chirality of the properties of organic and inorganic molecules, as well as plant cells and living organisms.
9. Experiments are proposed to identify the possible harmful effects of mirrors and other mirror objects on the biosphere, as well as on human life and activity; all researchers with such capabilities are invited to conduct them.
10. An analysis of discussions with artificial intelligence on the topics of quantization, emission, and reflection of photons was carried out, which showed their advantages and disadvantages.

## Conflict of Interest

This work was carried out by the author alone, on his own initiative, on the basis of personal scientific works: [1, 2, 23, 27, 32 – 34, 41, 44]. It uses literature sources from open databases.

Elements of a dialogue with artificial intelligence were used in the work, which do not contradict the originality of the author's work and the research conducted.

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