

Using three light-related conclusions to explain 76 light-related physical phenomena and experimental results at the same time

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[Abstract]: Through my long-term research on dozens of physical phenomena and experimental results related to light, I have summed up three related conclusions, which respectively explain the nature of light, the law of interaction between light and medium, the nature of light speed and the main factors that determine light speed. At the same time, it also shows that many physical phenomena and experimental results related to light can be explained only by using the most basic Coulomb law and Biot-Savart law in electromagnetism. This paper uses these three conclusions to explain the following 76 common physical phenomena and experimental results related to light at the same time, and has achieved unexpected success. Please correct your mistakes if you are interested. At the same time, I hope to collect more questions related to light through this paper to further test the applicability, reliability and correctness of these three conclusions. If these three conclusions can explain more physical phenomena and experimental results related to light without exception, it can be proved that the closer these three conclusions are to objective reality, the closer they are to truth. These three conclusions will be more accurate, objective and true in understanding and summarizing the nature of light, the law of interaction between light and medium, the nature of light speed and the main factors that determine light speed.

First, three conclusions related to light

1. Conclusion 1: light is only one of the forms of Coulomb force and magnetic force interaction between charge and charge, and it is not an objective entity (electromagnetic wave or photon) which can exist independently from light source / charge. Light can cause the charged body to change its speed and / or direction of motion.

There are three main bases for this conclusion:

first, according to the definition of field, it can be asserted that there should be no electric field and magnetic field in the space where there is no electric charge. That is, there can be no interaction between Coulomb force and magnetic force between electric charge and uncharged body or true space. Therefore, it is impossible to have electromagnetic waves formed by mutual excitation of changing electric field and magnetic field. For details, see my "the discrepancy between the hypothesis and the reality implied in the definition of field is the main cause of many theoretical errors in modern physics." (<https://www.toutiao.com/article/7114946582335783464/>);

Second, there is direct evidence that there is no light in the vacuum or that the light in the vacuum is invisible: the dark night sky without the moon and the starry sky seen by the astronauts illuminated by the sun is the most powerful direct evidence;

third, human beings have never seen the light itself, nor have it been photographed with equipment. Otherwise, it would be impossible for the wave-particle struggle of light for hundreds of years to be able to deal with the mud with the nondescript wave-particle duality. For details, see my "Human beings have never seen the light itself, but only the luminous body that is glowing." (<https://www.toutiao.com/article/7132767526286590494/>) ;

2. Conclusion 2: the law of interaction between light and medium is that the incident light makes the atoms in the medium become electric dipoles whose electric dipole moment varies with the frequency, amplitude, polarization direction and phase of the incident light and

produces corresponding secondary light. the so-called reflection, scattering, refraction, transmission, diffraction, interference, diffraction and conversion are only part of the secondary light with different directions of action. In this process, the incident light will be gradually offset by the secondary light and disappear.

There are four main bases for this conclusion:

first, the medium is generally composed of atoms, and the electricity of the nucleus in the atom is exactly opposite to that of the electrons outside the nucleus. Under the action of the thermal motion of the atom or the external electric field (Coulomb force), magnetic field (magnetic force), light (time-varying Coulomb force and magnetic force), the electrons in the atom will move out of sync with the nucleus or even reverse the motion state. As a result, the atom polarizes into an electric dipole whose electric dipole moment varies with the frequency, phase, polarization direction and amplitude of the incident light, and produces the secondary electric field and magnetic field of the corresponding electric dipole (in fact, it produces Coulomb force and magnetic force interaction with other charged bodies).

Second, the half-wave loss of reflected light, the Faraday magneto-optic effect of polarized refracted light and the four laws of the intensity variation of single-slit experimental diffracted light all prove that reflected, transmitted and diffracted light are not part of the incident light changed by the medium. but the secondary light reproduced by the medium. For details, see my "complete chain of evidence to prove that the law of interaction between light and medium is that incident light makes the medium become a secondary light source."

(<https://www.toutiao.com/article/7134195997403529767/>) ;

Third, the speed of light in a uniform medium (relative to the speed of the medium itself) has nothing to do with the speed of incident light, while the speed of light transmitted in vacuum is related to the motion state of the medium that produces transmitted light. For details, see my "evidence effectiveness Analysis of several Experimental results related to the Speed of Light and discussion on the correct method of measuring the Speed of Light"

(<https://www.toutiao.com/article/7136941687456219682/>) ;

Fourth, the reflectivity/absorptivity and transmittance of the medium are directly related to the properties of the medium surface, the molecular structure of the medium and the spatial distribution of atoms, but have little to do with the elements that make up the medium. For example, the absorption rate of graphene changes by several times due to the change of surface properties, and the great difference in optical properties between graphite and diamond is the most powerful direct evidence.

3. Conclusion 3: the essence of the speed of light is the interaction speed of Coulomb force and magnetic force between charges, and there are three main factors that determine the speed of light: first, the speed of light produced by the static light source in vacuum; second, the speed of light produced by the light source; third, the number of times of light regeneration per unit length N.

That is to say, even in vacuum, the speed of light is only constant relative to the light source that produces it (actually, the coulomb force and magnetic force interaction speed between two static charges is constant), while the observer moving relative to the light source will measure different speeds of light (the coulomb force and magnetic force interaction speed between relatively moving charges is not constant) and follow the principle of velocity vector superposition.

There are four main bases for this conclusion:

First, the relevant evidence indicated in the above conclusion 1;

Second, the relevant evidence indicated in the above conclusion 2;

Thirdly, the trajectory of different charged particles in the cloud chamber;

Fourth, the atoms in the medium consume half a cycle of time in each process of regenerating light (the Coulomb force and magnetic force generated from the incident light cause the electrons to move in the opposite direction with the nucleus and reach the maximum displacement (the amplitude of the regenerated light also reaches the maximum). It takes half a period of time, this is the so-called mechanism of half-wave loss of reflected light). Therefore, the speed of light in the medium has a negative correlation with the density of the medium and the main frequency of incident light: the greater the density, the more times of light regeneration per unit length, the more time will be consumed, the smaller the speed of light or the higher the frequency, the more times of light regeneration per unit length, the more time will be consumed, and the lower the speed of light will be. This is also the root cause of the dispersion of the light inside the medium. For details, see my "Analysis and Research on the Nature of Light, the Law of interaction between Light and medium and the main factors that determine the Speed of Light"

(<https://www.toutiao.com/article/7127560940249301512/>) 。

Second, the mechanism interpretation of 76 common physical phenomena related to light and experimental results

1、 Half-wave loss of reflected light

It can be well explained by "conclusion 2": it can be well explained that when the incident light irradiates on the surface of the medium, the electrons in the atoms on the surface of the medium will be changed and the atoms will become electric dipoles and produce secondary electric dipole fields. However, the phase difference between the secondary electric dipole field and the incident field is exactly half a period. The reason is that it takes half a period of the main frequency of the incident light to accelerate the electron from the external electric field to the maximum. For details, see my "the mechanism of half-wave loss of reflected light and its physical significance".

(<https://www.toutiao.com/article/6943141929446048260/>) 。

2、 Faraday magneto-optical effect of polarized light

It can be well explained by "conclusion 2": The refracted light is re-generated by the atoms in the medium. in the process of producing secondary light, the electrons and nuclei in the atoms will be changed by the external magnetic field, resulting in a change in the direction of polarization of the secondary light. The greater the intensity of the external magnetic field, the greater the amount of electrons and nuclei changing the direction of motion. At the same time, the longer the length of the medium, the more the regenerative times of refracted light, and the greater the cumulative number of changes in the direction of motion of electrons and nuclei. This is why the change of the polarization direction of polarized light is proportional to the intensity of the external magnetic field and the length of the medium. For detailed demonstration and analysis, please refer to my "detailed explanation of the mechanism of Faraday magneto-optical effect and its physical significance". (<https://www.toutiao.com/article/6909459286905209348/>) 。

3、 The single slit experimental results of ultra-black materials show that there is no diffracted light phenomenon.

It can be well explained by "conclusion 2": Because the diffracted light is the secondary light generated by the edge of a single slit, when the edge of the single slit is covered with ultra-black material, of course, secondary light cannot be produced, and there will be no diffracted light. For detailed demonstration and analysis, please refer to my "Analysis of the Action Mechanism and physical significance of Ultra-Black Materials in single slit diffraction experiments"

(<https://www.toutiao.com/article/6825505871347319299/>) 。

4、 Huygens-Fresnel principle

It can be well explained by "conclusion 2": Because only when the medium exists can it become a sub-light source under the action of incident light. In a vacuum, light does not produce secondary light. For detailed demonstration and analysis, please refer to my "right and wrong of Huygens-Fresnel principle". (<https://www.toutiao.com/article/6816241572179345927/>) 。

5、 Why are there rich and colorful colors of red, leaf, green, fruit and yellow in the world?

It can be well explained by "conclusion 2": Because the atoms in the matter composed of different elements and groups of elements are subjected to different Coulomb forces and magnetic forces of neighboring atoms and molecules, the dipole moments of electric dipoles produced by incident light are naturally different, and the law of change with time is also different. Therefore, the main frequency of the vector superposition of secondary light produced by electric dipoles in different spatial positions will be different. The color of the surface of an object is determined by the so-called dominant frequency of reflected light. As a result, the reflected light produced by plants with different atomic and molecular structures and leaves and flowers of different plants appears in a variety of colors.

6、 Why does a quantum computer have to be near absolute zero to work?

It can be well explained by "conclusion 1" and "conclusion 2": Because it can be used to calculate atoms in different states of motion, not photons. Only when the thermal motion of the atom is eliminated as much as possible can it be manipulated by human beings. If you really manipulate photons directly, there is no need to lower the temperature of the computer at all. It is reasonable to increase the temperature in order to increase the speed of calculation.

7、 Michelson-Morey experiment

It can be well explained by "conclusion 2" and "conclusion 3": Because in the course of the experiment, on the one hand, the two light paths are in the atmosphere, on the other hand, they are reflected once by the mirror and semi-lens, and refracted and transmitted once by the semi-lens. Therefore, the light in the experimental process is the secondary light produced by the atmosphere, mirror and semi-lens, and its velocity is only constant relative to the atmosphere, mirror and semi-lens, that is, the speed is constant relative to the experimental device. Naturally, the interference fringes will not change because the experimental device is rotated 90 degrees. For details, see my "the true physical meaning of the Michelson-Morey experimental results". (<https://www.toutiao.com/article/6782450889085944324/>) 。

8、 Compton effect

It can be well explained by "conclusion 1" and "conclusion 2": Because all scattered and transmitted X-rays are secondary X-rays produced by atoms in the irradiated light metal, of course, the frequency change is caused by the change of the motion state of electrons and nuclei in atoms, which leads to a similar redshift of secondary X-rays: the frequency of secondary light produced by electrons and nuclei far away from motion decreases. Of course, the different velocities of electrons and nuclei moving in different directions will lead to different frequencies of secondary X-rays in different scattering directions. For more information, see "how to correctly interpret the Series of physical experiment results-- Compton effect and photons"

(<https://www.toutiao.com/article/6780619197463396868/>) 。

9、 Photoelectric effect

It can be well explained by "conclusion 1" and "conclusion 2": Because the electrons in the atoms in the metal will change their motion state after the light irradiates on the metal surface, when the frequency and phase of the Coulomb force and magnetic force exerted by the incident light on the electrons are appropriate, some electrons will be synchronously accelerated and reach the escape velocity to become photoelectrons, that is, the photoelectric effect. This can also explain

why light with too high frequency can not produce photoelectric effect. This problem cannot be explained by photons with kinetic energy and momentum proportional to frequency. For details, see my "Analysis of the essential factors of photoelectric effect"

(<https://www.toutiao.com/article/6782450034978849287/>) 。

10、 Blackbody radiation

It can be well explained by "conclusion 2" : Because in the process of molecular thermal motion, the motion and displacement of nuclei and electrons are not synchronous, which forms a similar electric dipole of time-varying electric dipole moment which is consistent with the frequency of thermal motion and produces corresponding electric and magnetic fields (electromagnetic radiation). Although the thermal motion direction, stroke and frequency of different molecules in the body are different, the relationship between the number of molecules with the same frequency and frequency follows the normal distribution, and the electric field and magnetic field produced follow the principle of vector superposition. This leads to the phenomenon that the relationship between blackbody radiation intensity and frequency is also similar to the continuous frequency spectrum of normal distribution. For details, see my "how to correctly interpret the fourth series of physical experimental results-the experimental results of blackbody radiation intensity". (<https://www.toutiao.com/article/6733856367733375499/>) 。

11、 There is no charm star phenomenon in double star system

It can be well explained by "conclusion 3" : Because there is a medium in the interstellar space, the starlight observed by the earth is the secondary light produced by the interstellar medium, and its transmission speed is determined by the nature and motion state of the medium. For the same binary system, the medium distribution between the stars and the earth is the same, so the observed starlight time sequence is the same as that of the double stars, and it is impossible to have the so-called charm star phenomenon.

12、 The Hubble constant is proportional to the frequency

It can be well explained by "conclusion 2" : Because any frequency of light produced by earthlings observing celestial bodies is secondary light produced by interstellar media, including the earth's atmosphere. Under the condition of the same distance, the higher the frequency is, the more times the secondary light is regenerated, the more the frequency will decrease, and the greater the redshift will be. This causes the measured Hubble constant to be proportional to the frequency. For details, see my "essential factor analysis of different Hubble constants measured by different methods" (<https://www.toutiao.com/article/6837046414741078535/>) 。

13、 The redshift of celestial bodies is proportional to the distance between celestial bodies and the earth

It can be well explained by "conclusion 2" : Because of the existence of the interstellar medium, the starlight observed by the earth is the secondary light produced by the interstellar medium, and in the process of producing the secondary light, the frequency of each regenerated secondary light and the frequency of incident light will be slightly reduced. This determines that the frequency of starlight will increase with the increase of the number of regeneration, that is, with the increase of distance. This leads to the phenomenon that the redshift of celestial bodies is proportional to the distance between celestial bodies and the earth. For details, see my "Real reason Analysis and Verification method that the Red shift of Celestial bodies is proportional to distance" (<https://www.toutiao.com/article/6782452364352684555/>) 。

14、 Electronic double-slit interference phenomenon

It can be well explained by "conclusion 1" and "conclusion 2" : Because there is temperature electromagnetic radiation generated by the edge of the double slit between the double slit plates, when the electron passes through the double slit, the velocity of the electron will be changed by

the electric field, and the magnetic field will change the direction of motion. Due to the periodic variation of the electromagnetic radiation between the slits, it will lead to different changes in the velocity and direction of the electrons passing through the gap at different times, and the position in which they fall on the screen will be different. When the number of electrons through the slit reaches a certain extent, it will naturally appear that the position of the peaks and troughs of electromagnetic radiation between the slits on the screen is relatively stable and the number is more than that in other places, forming a distribution phenomenon similar to interference fringes. For details, see my "Real physical meaning of the Experimental results of Electronic double-slit interference" (<https://www.toutiao.com/article/6782795041745142275/>) 。

15、 Double-slit interference phenomenon of light

It can be well explained by "conclusion 2": Because except for the two main lobes, the light in other places is the secondary light produced by the edges of the four parallel slits of the double slit, which accord with the condition of coherent light source, so the secondary light produced will appear interference phenomenon. When the double-slit edge is covered with ultra-black material, the double-slit interference phenomenon will disappear as in the single-slit diffraction experiment of ultra-black material. For details, see my "derivation of formulas for calculating diffraction and interference light intensity using single-slit diffraction and double-slit interference light sources with slit edges" (<https://www.toutiao.com/article/7133947727863464486/>) 。

16、 Dark matter and dark energy problems

It can be well explained by "conclusion 2" and "conclusion3": Because on the one hand, the receding velocity of celestial bodies calculated by Hubble's law is inaccurate or even completely wrong, the part in which the redshift of celestial bodies is proportional to the distance is not the Doppler effect produced by the retrogression of celestial bodies, but the result of the action of interstellar medium. Therefore, the theory of cosmic expansion or big bang is not in line with the objective reality, and there is no need for the so-called dark energy to support the expansion of the universe. On the other hand, it is wrong to replace the total mass of galaxies with visible mass. Large amounts of cryogenic matter within and between galaxies do not produce visible light. The so-called cosmic background radiation is produced by ultra-cryogenic matter with an average temperature of only about 2.7K and is also invisible. As a result, there is a great difference between the total mass and the visible mass of galaxies, and the calculated gravity of galaxies is naturally much smaller than the actual value. In other words: the so-called dark matter is just non-luminous, normal ordinary cryogenic matter. It is not that it does not participate in the electromagnetic interaction, but does not participate in the electromagnetic interaction in the frequency band of visible light. For details, see my "how to correctly interpret the Series of physical experiment results-- the past Life and present Life of Dark matter"

(<https://www.toutiao.com/article/6747861961620324872/>) 。

17、 Atomic linear spectral phenomenon

It can be well explained by "conclusion 1" and "conclusion 2": Because the atomic spectrum is that after all electrons outside the nucleus are instantly driven out of the bondage of the nucleus under the action of an extra strong electric field, the nucleus still maintains its original complex and similar compound circular motion around the center of mass of the atom and the sub-center of mass composed of electrons and the nucleus, and the electromagnetic radiation it produces is a linear spectrum composed of various single frequencies. However, the movement path of electrons out of the nuclear bondage should be linear or arc-like movement, which will only produce a continuous frequency spectrum similar to pulse. For details, please refer to my book "How to Correctly Interpret the Results of Physical Experiments Series 6-Linear Spectral Lines".

(<https://www.toutiao.com/article/6734583863332307469/>) 。

18、Cosmic microwave background radiation

It can be well explained by "conclusion 2" : Because there is a large amount of low-temperature matter between the stars, there is low-temperature matter close to minus 240 degrees at the edge of the solar system, and the temperature of the matter between galaxies must be much lower than that at the edge of the solar system. The average temperature of these substances should be about 2.7K corresponding to the so-called cosmic background radiation. Therefore, the cosmic background radiation should be electromagnetic radiation produced by low-temperature matter between galaxies. If the universe really has a background and produces so-called background radiation, the phenomenon of uniform radiation intensity in all directions should not be observed on the earth, and it should be anisotropic. Because the earth cannot be located right at the center of the Big Bang and equidistant from all directions of the edge of the universe. For details, see "how to correctly interpret the ninth series of physical experimental results-- cosmic microwave background radiation"

(<https://www.toutiao.com/article/6742381411119923719/>) 。

19、The nature of temperature, heat and energy

It can be well explained by "conclusion 1" and "conclusion 2": The essence of temperature is the sign of the peak frequency or main frequency of molecular thermal motion, which can be derived directly from Planck's blackbody radiation formula; heat is a measure of the change of the average kinetic energy of molecular thermal motion; energy is one of the expressions of the motion characteristics and spatial properties of matter with mass, and there is no pure, independent energy. For details, see my "the nature of temperature and heat and their application in the process of material phase transformation". (<https://www.toutiao.com/article/6632920708190044685/>) and "on the essence and significance of Energy"

(<https://www.toutiao.com/article/6641441931131879949/>) 。

20、Aberration constant

It can be well explained by "conclusion 2" and "conclusion 3": Because no matter whether the celestial body is located at the zenith position or in other directions, the starlight observed on the earth's surface is secondary light generated by the atmosphere, and its speed is only constant relative to the atmosphere. Therefore, when the celestial body is located at the zenith position, the speed of starlight transmitted to the ground observation station through the atmosphere is the speed of light in the atmosphere perpendicular to the ground, and its values are of course equal. The ratio between it and the revolution speed of the earth naturally becomes constant. The light vertical to the ground observed by the observer in the solar reference system has a certain inclination angle, and its apparent velocity is the result of vector superposition of the speed of light in the atmosphere and the revolution speed of the earth. For details, please refer to my "New Explanation of the Causes and Physical Meaning of Optical Aberration and Its Verification Method".

(<https://www.toutiao.com/article/6698509387041866253/>) 。

21、Fizeau flowing water experiment results

It can be well explained by "conclusion 2" and "conclusion 3": Because the speed of light in the water is only constant relative to the water itself, the speed of the current is superimposed when the speed of light in the flowing water is observed. For details, see my "Reliability Analysis and Verification Scheme of Optical Velocity Formula in Fizeau Motion medium"

(<https://www.toutiao.com/article/6935786632075330080/>) 。

22、The sudden change of the speed of light at the interface of the medium, especially when entering the optical sparse medium from the optically dense medium, the speed of light will jump

It can be well explained by "conclusion 2" and "conclusion 3": Because the speed of light in

different media is only determined by the properties and motion state of the medium, the speed of light on both sides of the junction of different media will be different, and of course there will be a sudden change or even a jump at the interface.

23、 The phenomenon that the velocity of light in a uniform medium is constant relative to the velocity of the medium itself

It can be well explained by "conclusion 2" and "conclusion 3": Because the medium is uniform, the number of atoms per unit length is basically the same, the number of times of regenerated light is the same, the time required and the transfer time between atoms are the same, the speed of light is naturally the same or constant.

24、 Rotating transparent crystal will change the basic property of light-- the phenomenon of frequency reduction

It can be well explained by "conclusion 2" and "conclusion 3": Because the light passing through the transparent crystal is the secondary light produced by the crystal, due to the rotational motion of the atoms in the medium in the process of producing secondary light, for the transmitted light, it is equivalent to the receding apparent speed of the light source. the frequency of the secondary light will naturally be lower or redshift than that without rotation.。

25、 The phenomenon that the temperature of ultra-black material is almost the same as that of transparent material under the same condition

It can be well explained by "conclusion 1" and "conclusion 2": Because no matter what kind of medium meets light, it will become a secondary light source, but the ultra-black material hardly produces reflection and scattered light in visible light band, or the scattered light will cancel each other out and disappear; The secondary refracted light generated by the transparent material will be emitted from the other side of the medium and become transmitted light. However, the temperature change of different materials under the same intensity of light is mainly related to the change of the main frequency of molecular thermal motion, and the temperature change of materials with different colors under light will not be greatly different due to different colors. This also proves from one side that light itself has no energy, and dark materials can not absorb more energy.

26、 Cherenkov radiation phenomenon

It can be well explained by "conclusion 1" and "conclusion 2": Because high-speed charged particles will polarize atoms in the medium as light sources, resulting in electric and magnetic fields. This phenomenon also proves that the medium glows because the electric dipole electric field and magnetic field can be produced after the atom is polarized. Although the speed of charged particles is faster than the speed of light in the medium, they still can not produce light (only the electric and magnetic fields of pulsed continuous frequency are very weak, and the intensity of the visible band is so weak that it can not be observed). For details, see "the main frequency range of Cherenkov radiation and its physical significance" (<https://www.toutiao.com/article/6890152330432348683/>) .

27、 The absorbance of graphene is generally 20.3%. However, if a certain texture is produced on the surface through a special process, it will become a super light-absorbing material, and its light absorption rate can reach more than 90%

It can be well explained by "conclusion 1" and "conclusion 2": Because the surface properties are different, the superposition results of secondary reflected light are naturally different. Special texture can make the reflected light of certain frequencies cancel each other out and disappear, not that the light is absorbed by the material.

28、 During a solar eclipse, the starlight near the sun will deflect

It can be well explained by "conclusion 2" and "conclusion 3": Because there is a certain density of gaseous substances around the sun, which are evenly layered and similar to the earth's

atmosphere, it is in line with the conditions for the formation of redirected refracted light and forms a mirage-like light deflection phenomenon on the earth.

29、Albus' paradox: if the universe is full of stars, no matter which direction we look, why is the night sky not as visible as the sun?

It can be well explained by "conclusion 1" and "conclusion 2": Because on the one hand, the intensity of starlight attenuates with the square of distance, on the other hand, starlight follows the principle of vector superposition, under the condition of multiple light sources, its intensity does not increase in direct proportion to the number of light sources, and sometimes counteracts each other or is partially offset.

30、Laser cooling

It can be well explained by "conclusion 1" and "conclusion 2": Because the electric field and magnetic field with appropriate frequency and phase can reduce the frequency of thermal motion of molecules and atoms, thus achieving the purpose of lowering their temperature. This also proves from one side that the light itself has no energy, but only the electromagnetic force, which can change the state of motion of the charged body. Otherwise, the atoms and molecules irradiated by laser should gain energy and accelerate their motion.

31、When the angle between the polarization direction of the polarized light and the polarization axis of the polarizer is 45 degrees, the probability of transmitting light is 50%

It can be well explained by "conclusion 2": The transmitted light passing through the polarizer is actually the secondary light generated by the polarizer. The polarizer has the ability to produce directional polarized light because its molecules and atoms are regularly arranged. The freedom of movement of molecules and atoms in this arrangement is not three-dimensional, but nearly one-dimensional linear motion. When the incident light is irradiated, the secondary transmitted light produced by it is the directional polarized light produced by the molecules and atoms arranged in the polarizer. However, when 45-degree polarized light irradiates the polarizer, when the natural vibration directions of atoms and molecules are different, the ability to respond to polarized incident light will be different, and there will be a phenomenon that the probability of directionally arranged atoms and molecules being polarized into secondary light sources is only 50%! This has nothing to do with quantum, superposition state and entangled state!

32、Quasars have multiple linear clusters of emission lines and absorption lines with different redshifts. For example, the emission line redshift of quasar PHL 957 is 2.69, and the absorption line redshift has five groups: 2.67、2.55、2.54、2.31、2.23

It can be well explained by "conclusion 2": The light of quasars observed by earthlings is secondary refraction produced by interstellar media. When the refracted light produced by quasars encounters an uneven medium on its way to the earth, the medium becomes a secondary light source and reproduces secondary light, in which the refracted light is re-emitted and regenerated many times. its frequency gradually decreases and forms several groups of emission and absorption lines with different redshifts. This phenomenon directly proves: first, the starlight observed on the earth is not primary light, but secondary refracted light; second, it proves that the frequency of starlight is decreasing on the way to the earth, not because of the redshift caused by the retrogression of the earth.

33、How the fiber optic gyroscope works: "when the beam travels in a circular channel, if the annular channel itself has a rotational speed, then it takes more time for the light to travel in the direction of rotation than it takes to travel in the opposite direction." what is the root cause?

It can be well explained by "conclusion 2" and "conclusion 3": Because the refracted light inside the optical fiber is the secondary light generated by the optical fiber, its speed is only constant relative to the speed of the optical fiber. The light moving along the rotation direction of

the fiber ring takes more paths than the light moving in the opposite direction, but the speed inside the fiber is the same, so the former needs more time than the latter, and the length of time is proportional to the rotation speed of the fiber. For details, see my "Sagnak effect Mechanism Analysis and its physical significance" (<https://www.toutiao.com/article/6942053496661230084/>) 。

34、Thin Film interference and Rainbow phenomenon

It can be well explained by "conclusion 2": When sunlight hits the film and clouds made of small water droplets suspended in the air, the film and small water droplets become secondary light sources. The secondary light produced by atoms, molecules and molecular groups (referred to as "polarized bodies" for short) in different parts of the human eye will follow the principle of vector superposition and form a superposition. When these secondary lights meet the interference conditions, they will form a similar interference phenomenon and the light of some frequencies will be strengthened, while the light of other frequencies will be suppressed, thus forming a colorful light band, which is the so-called thin film interference or rainbow phenomenon. This phenomenon cannot be explained by particles, and it cannot be said that different photons will strengthen or cancel each other out. It is also difficult to explain that light is an electromagnetic wave, because neither electrons nor nuclei can reflect electric or magnetic fields. It is most reasonable to use thin film and small water droplets as secondary light sources and produce secondary light. For details, see my "how to correctly interpret the 11th Series of physical experiment results-- the interference between Rainbow and thin Film" (<https://www.toutiao.com/article/6760133691021722115/>) 。

35、Mechanism of crystal optical rotation phenomenon

It can be well explained by "conclusion 2": We know that many crystals have birefringence. This is actually the ability of the crystal to produce two kinds of secondary light. It should be that the particularity of the structure and arrangement of atoms and molecules in the crystal leads to two groups of electric dipoles with different polarization directions under the action of external electric field and magnetic field, and the polarization direction and phase of the secondary light produced by them are also different. Therefore, the transmitted light from the crystal is formed by the superposition of these two kinds of secondary light. When the polarization direction of the two kinds of secondary light changes regularly with time, the polarization direction of the transmitted light formed by the superposition will rotate regularly. This is the internal reason why crystals have different optical rotation phenomena.

36、Why is it that the color temperature above 5300k is cool, while that below 3300K is warm?

It can be well explained by using "conclusion 1" and the existence of natural vibration frequency of atoms and molecules ("natural frequency" for short): When the intensity of light is not strong enough to accelerate the electrons in the atom to escape velocity in half a period and ionize the atom, the electromagnetic field generated by the light in the space of the atom will change the movement trend of the electron and the nucleus in the opposite direction. However, atoms and molecules have different natural frequencies according to their structure. Generally, the larger the molecular weight is, the lower the natural frequency is. Only when the electric field generated by light is close to the natural frequency of the molecule will it be easier to change the thermal motion frequency of the molecule and to change the temperature of the object. The so-called cold and warm colors are divided by the ability of human skin to change temperature when exposed to light. Because the human body contains a large number of water molecules, the natural frequency of water molecules is relatively low, which is close to the frequency of light in the infrared band. All the light that is close to this natural frequency is the real warm color light, and the other light is the non-warm color light. When the frequency is very different, it is the cool color light. This is obviously contrary to the photon theory that the higher the frequency, the stronger the

energy!

37、 Why do microwave ovens heat food faster by using lower frequency microwaves instead of higher frequency light?

It can be well explained by using "conclusion 1" and the existence of natural frequencies of atoms and molecules: Same as the 36th question above. Only light or electromagnetic fields close to the natural frequency of water molecules can better change the thermal motion frequency and temperature of water molecules.

38、 Why is the temperature in space between the sun and the earth cooler?

It can be well explained by using the "conclusion one" and the nature of temperature: The essence of temperature is the sign of the frequency corresponding to the maximum value in the distribution curve of the number of molecules of the same frequency (referred to as "peak frequency") in the thermal motion of matter molecules, but not the sign of the average kinetic energy of molecular thermal motion. In other words, the temperature of an object moving at a uniform speed in a straight line will not increase with the increase of speed and temperature. In a truly ideal state, the temperature of a particle moving at a uniform speed in a straight line is absolute zero, because the frequency of its thermal motion is 0. Therefore, although the surface temperature of the sun is about 6000 degrees, the surface temperature of the earth is generally between -60 and 60 degrees. The temperature in space between the sun and the earth is generally below -100 degrees. This obviously violates the law of temperature gradient change. The root cause is that all kinds of substances in space are difficult to collide with each other because of their low density and large molecular spacing, so that the thermal motion frequency is very low, and the particles carried by the solar wind move nearly in a straight line. Therefore, the corresponding temperature is of course very low.

39、 Why do macromolecular substances generally have lower ignition points?

It can be well explained by using "conclusion 1" and the existence of inherent natural frequencies of atoms and molecules: The higher the molecular weight is, the lower the natural frequency is, and the lower the frequency or temperature of molecular thermal motion corresponding to resonance is. When the external electromagnetic field reaches the natural frequency, it will cause the molecule to resonate and disintegrate. At the same time, the molecule will react with oxygen to generate heat and burn.

40、 Why can a convex lens ignite combustible materials after focusing light?

It can be well explained by "conclusion 2": We know that a convex lens can concentrate light because it can make the secondary transmitted light produced by parallel incident plane light uniformly change the transmission direction and focus on a point. The phase of the light at this point is basically the same, which accords with the superposition enhancement condition and increases the amplitude or intensity of the light. When the intensity of light is strong enough to make the thermal motion frequency of the molecule in the fuel reach the natural frequency, the molecule of the fuel will disintegrate and have an exothermic chemical reaction with oxygen and burn.

41、 Why is the length of rod antenna mostly $1/2 \sim 1/4$ of the wavelength of receiving frequency?

It can be well explained by "conclusion 1" and "conclusion 2": Because the phase of the electromagnetic signal in different parts of the antenna is different at the same time, the motion state of the electrons in the atom will be different. Only the more electrons in the same direction, the stronger the electrical signal will be received. Only when the electrons within half the wavelength of the received signal in the rod antenna move in the same direction, the signal will be enhanced by superposing in the same direction. When the rod antenna is more than half the

wavelength, the direction of electron motion in different parts of the antenna will be different, which not only can not superimpose and enhance the signal, but may cancel each other out. This is also completely different from receiving particles.

42、 Mechanism of Inverse Compton Effect

It can be well explained by "conclusion 1" and "conclusion 2": Because, like the Compton effect, the X-rays scattered by the light metal are the secondary X-rays produced by the light metal, mainly under the action of the incident X-ray, the electrons and nuclei in the atoms in the light metal will move in completely opposite directions (the two charges are opposite, the movement trend is opposite under the same external electric field and magnetic field), which causes the atom to polarize into an electric dipole and produce secondary X-rays. However, the frequency of secondary X-rays produced by atoms in different motion states (mainly electrons) will change slightly due to the Doppler effect: the frequency of secondary X-rays produced by atoms moving towards the observer will be higher than that of incident X-rays (that is, blue shift). This is the mechanism of the so-called inverse Compton effect.

43、 The mechanism of Suniyev-Zeldovich effect

It can be well explained by "conclusion 1" and "conclusion 2": Because the high-energy electrons produced by celestial bodies such as galaxy clusters interact with the low-temperature matter that produces the so-called cosmic background radiation, the low-temperature matter will interact with the Cherenkov radiation phenomenon, which makes the low-temperature matter produce electromagnetic radiation with high peak frequency. when people inversely calculate the temperature of the observed object according to the frequency corresponding to the peak electromagnetic radiation intensity, the temperature of this part of matter will rise relatively. It is not the so-called cosmic background radiation photons that are energized by high-energy electrons.

44、 The Mechanism of Casimir Effect

It can be well explained by "conclusion 1" and "conclusion 2": Because atoms close to each other can form molecules, and molecules close to each other can form molecular clusters and tangible substances, the reason is that when atoms and molecules are close to each other, they will form synchronous thermal motion and produce the same electromagnetic radiation, which will make atoms and molecules form a mutual attraction. This force is the mutual absorption force in the so-called Casimir effect. See my "The Mechanism of Casimir Effect and Its Verification Method" for details. (<https://www.toutiao.com/article/6936481287813267971/>) 。

Methods to verify this force:After the so-called Casimir effect is formed between two parallel ultra-thin metal plates, one plate is heated and the other is cooled, so that when the temperatures of the two plates are different, the Casimir effect will disappear. This is because when the thermal movements of atoms and molecules on the surfaces of the two plates are not synchronized, the electromagnetic radiation generated will not form mutual absorption.

45、 The Mechanism of Stern-Gerlach Experiment

It can be well explained by "conclusion 1" and "conclusion 2": Because silver atoms are not really electrically neutral particles, but electric dipoles that produce temperature-type electromagnetic radiation and are reacted by electric and magnetic fields in their space. In the process of high-speed movement of external electrons around the nucleus, a single silver atom is an electric dipole with time-varying electric dipole moment. It is just that when many silver atoms form a solid silver metal block, because of the randomness of the thermal motion between the silver atoms, the superposition result of the electromagnetic radiation produced by the silver atoms tends to be zero when the time is greater than that of the electrons around the nucleus for more than one cycle. thus, on the whole, the silver is electrically neutral. Thus it can be seen that when a single silver atom passes through a non-uniform magnetic field, the silver atom will be changed by

the magnetic field. It is only the randomness of the direction of the electric dipole moment when it enters the magnetic field, so that different silver atoms are changed in the direction of motion. But on the whole, it can only be deflected in two directions, which causes the silver molecules to split into two channels. For details, see my "Mechanism Analysis and Test method of Stern-Grah Experimental results" (<https://www.toutiao.com/article/6940263884867551758/>) 。

Verification method: If this experiment is carried out with real neutral particle neutrons, there will be no splitting phenomenon.

46、 The Mechanism of Sagnac Effect

It can be well explained by "conclusion 2" and "conclusion 3" : Because the light in the single-mode optical fiber ring is the secondary light generated by the ring, the speed is constant only relative to the ring itself. That is, the light through the rotating optical fiber ring is actually the secondary light produced by the ring itself, and its velocity is only constant relative to the ring itself, which leads to different distances or optical paths between the direction of motion of the cis-ring and the direction of the reverse ring, and forms an optical path difference proportional to the speed of the ring. This effect proves that the speed of light produced by a moving light source is different. For details, see my "Sagnac effect Mechanism Analysis and its physical significance" (<https://www.toutiao.com/article/6942053496661230084/>) 。

47、 Why is the penetration depth of electromagnetic waves inversely proportional to the frequency in the skin effect, while visible light cannot penetrate deeper into the metal like higher-frequency X-rays and gamma rays?

It can be well explained by "conclusion 1" and "conclusion 2" : Because there are two main factors that determine the penetration depth of incident light into the metal: first, the incident light polarizes the atoms in the metal into the electric dipole electric dipole moment, the larger the electric dipole moment, the smaller the penetration depth; second, the number of sub-light sources produced by incident light and secondary light polarization per unit length, the more the number, the smaller the penetration depth.

The incident light polarizes the metal surface and shallow atoms into electric dipoles and produces secondary light with the same frequency but opposite phase as the incident light. The intensity is proportional to the displacement of the electrons in the atom in one cycle of the incident light. At the same time, the number of sub-light sources polarized into secondary light sources by incident light and secondary light per unit length is proportional to the frequency of incident light. Therefore, if the secondary light is to completely offset the incident light, it must have a certain intensity and a certain number of cancellation times. When the incident light frequency is low, although the intensity of the secondary light source is large, the number of sub-light sources per unit length is small, and when the number of offsets is small, the atoms with larger depth are needed to participate, that is, the penetration depth is large; while when the incident light frequency is high, although the intensity of a single sub-light source is small, there are a large number of sub-light sources per unit length, so the penetration depth will be reduced. When the frequency of the incident light is high to a certain extent, the intensity of the sub-light source will be very small, and the incident light will decay slowly with the depth. Therefore, more sub-light sources will be needed to gradually counteract the incident light. This is why X-rays and gamma rays can penetrate into the metal plate, while visible light at lower frequencies cannot. For details, see "on the Mechanism of skin effect and its physical significance" (<https://www.toutiao.com/article/6857884161680605703/>) 。

48、 Error Analysis in Wheeler's Delay (Thought) Experiment

Using "conclusion 1" and "conclusion 2", we can know its mistakes: Because the reflected and transmitted light of the half lens is the secondary light generated by it, it is impossible to have

the possibility that a single photon is reflected or transmitted by the half lens. At the same time, the light reflected by other mirrors is also the secondary light generated by the mirrors, not the so-called photons reflected by the mirrors. Therefore, in the whole process of self-incident light irradiating the semi-lens, causing it to generate secondary reflected or transmitted light and irradiating it to different mirrors along two optical paths, and making the secondary light generated by the mirrors reach the same spatial position and overlap, it is not the incident light reflected/transmitted from the semi-lens that reaches the overlap point, but the regenerated light of the mirror and the semi-lens reaches the overlap point. When the half lens and the reflector are fixed, the optical path difference and phase difference of the two paths of light reaching the superposition point are fixed and will not be changed by putting or not putting the half lens at this intersection point. Only when a half lens is placed can the superposition result be observed by human eyes or equipment. The motion direction and state of the secondary light in the two optical paths will not be changed by putting or not putting a half lens at the intersection. For details, please refer to my Detailed Analysis of Wrong Conclusions in Delayed (Thought) Experiments. (<https://www.toutiao.com/article/6631030822436602371/>) 。

49、 The mechanism and physical significance of the phenomenon that the speed of light is inversely proportional to the frequency in the medium

It can be well explained by "conclusion 1" and "conclusion 2": Because the refracted light in the medium is the secondary light produced by the atoms, molecules and molecular groups in the incident light polarized medium. When we call the atoms, molecules and molecular groups polarized simultaneously by incident light (or secondary refractive light produced by adjacent polarizing elements) as polarizing elements, the size of polarizing elements should be proportional to the wavelength of incident light, or the number of polarizing elements per unit length is inversely proportional to the wavelength of incident light. As a result, it is determined that the time consumed in the process of regenerating light per unit length is inversely proportional to the wavelength. That is, the shorter the wavelength of the incident light, the more the number of polarization elements per unit length, the more time it takes in the regeneration process, and the smaller the speed of refraction light. Therefore, the reason for the negative correlation between the speed of light and frequency in the medium is that the shorter the wavelength, the more times of regeneration per unit length, the more time it takes to regenerate, and the lower the speed of refracted light. This phenomenon is completely contrary to the law that light should have for photons with kinetic energy and momentum proportional to its frequency, that is, the greater the kinetic energy and momentum, the smaller the kinetic energy and momentum (lower velocity) of photons entering the medium. this is a property that particles should not have. This proves on the other hand that light is not a photon with kinetic energy and momentum.

50、 Why is it that the speed of light in vacuum obtained from a large number of experiments on the speed of light measured at present is all constant?

It can be well explained by "conclusion 2" and "conclusion 3": Because in all the current methods of measuring the speed of light, the actual measured object light is the secondary light produced by optical devices such as mirrors, semi-lenses and lenses in the measuring device, and it is not possible to have incident light with different speeds. That is to say, in all experiments, the actual measured object light is the light produced by the static light source / secondary light source of the relative measuring device, and its relative speed of the measuring device is of course constant, and the measuring result is naturally a constant constant.

If you want to measure the true speed of light produced by real and different moving light sources, it is obviously impossible to use indirect measurement methods such as interferometer method and cavity method, and it is only possible to use baseline method. At the same time, if you

want to measure the speed of light produced by a moving light source, you have to use the baseline method to measure the speed of light produced by a light source moving in a vacuum. This is obviously extremely difficult on the surface of the earth. Only when two geosynchronous satellites looking at each other are used to measure the speed of light produced by celestial bodies such as the sun, is it possible to get the true speed of light produced by moving light sources.

51、 The generation mechanism of polarized light

It can be well explained by "conclusion 1" and "conclusion 2": Because light, especially visible light, is the electric field and magnetic field produced by atoms and molecules that become electric dipoles with time-varying electric dipole moment under the action of their own or external forces. When the direction of the time-varying electric dipole moment of the electric dipole is fixed, the direction of the electric field and magnetic field in the specific space position is also fixed. In other words, polarized light is an electric field and magnetic field generated by a time-varying electric dipole with a relatively fixed vibration direction and a fixed intensity direction formed by oriented atoms and molecules. This is why polarizers can generate and detect polarized light.

52、 The reason why the speed of light is only more than ten meters in the condensed state of "Bose-Einstein"

It can be well explained by "conclusion 2" and "conclusion 3" : Because the so-called "Bose-Einstein" condensed matter refers to a state in which matter has almost no thermal motion when it is close to absolute zero: there is almost no relative motion between atoms and molecules, within a certain range of scales. these atoms and molecules are like one atom and molecule. These phenomena are only due to the inevitable phenomenon when the thermal motion of the molecule is close to stopping. When external light shines on such a substance, the electrons and nuclei in the atom still move in the opposite direction, resulting in the phenomenon that the atom is polarized. The refracted light inside the condensed matter is still the secondary light produced by the matter. Just because in this state, the incident light can polarize more atoms at the same time than in the non-condensed state, the incident light will soon be offset by secondary light. At the same time, the intensity of secondary light that can continue to polarize neighboring atoms is also very weak, resulting in the refraction of light inside the matter attenuating faster than that in the non-condensed state. In this case, the measured speed of refracted light inside the condensed matter should be the unreal speed of light, but it is likely to be the pseudo speed or group speed of light caused by environmental interference.

53、 The Mechanism of Cotton-Mutton Effect

Cotton-Multon effect is also called magnetic birefringence effect. When light propagates in a transparent medium, if an external magnetic field is added perpendicular to the propagation direction of light, the medium shows the properties of a uniaxial crystal, the optical axis is along the direction of the magnetic field, and the difference of the principal refractive index is proportional to the square of the magnetic induction intensity. This effect is also called magneto-induced birefringence effect, which is similar to Faraday magneto-optic effect, except that the direction of external magnetic field is not parallel to the transmission direction of refracted light, but perpendicular to the transmission direction of refracted light.

It can be well explained by "conclusion 2": Because the refracted light inside the medium is the secondary light produced by the incident light polarized by the atoms in the medium. When there is an external magnetic field, the external magnetic field will increase the acceleration of the electron and nucleus in the polarized atom perpendicular to the direction of the magnetic field and change the direction of the dipole moment of the polarized atom. Therefore, the secondary light and incident light produced by it will have the change of polarization direction and transmission direction. When the motion direction of the electrons and nuclei in the polarized atoms is

consistent with the direction of the external magnetic field, it will not be affected by the external magnetic field, and the polarization direction and transmission direction of the secondary light will remain unchanged. This leads to two kinds of secondary light with different polarization directions in the medium. So that the transparent medium has the property of birefringence. For details, see my "Analysis of the Mechanism of Cotton-Multon effect and its physical significance" (<https://www.toutiao.com/article/7031705671452148262/>) 。

54、 Mechanism of Zeeman effect

Zeeman effect refers to the phenomenon that the luminescence lines of atoms split and polarize in the external magnetic field. That is, the external magnetic field will cause the atom to produce more polarized light with characteristic spectral lines of different frequencies.

It can be well explained by "conclusion 2" : Because under the action of the external magnetic field, the orbit of the electron moving around the nucleus tends to move around the nucleus perpendicular to the direction of the external magnetic field, that is, the orbit plane of the electron tends to be consistent. as a result, the vibration direction of the light or secondary light will be similar and polarization will occur. On the other hand, the direction in which the electrons move around the nucleus and in the plane perpendicular to the external magnetic field may be clockwise or counterclockwise (there are some differences in the velocity of electrons in different directions). There are also some electrons moving around the nucleus in the original plane parallel to the direction of the external magnetic field. There will be some differences in the speed of motion around the nucleus, which will lead to some differences in the frequency of motion around the nucleus. As a result, the resulting characteristic lines will split: one characteristic line will be split into three. When there are a large number of electrons outside the nucleus, the electrons in different orbitals at different distances from the nucleus will be affected by the external magnetic field, which may lead to more splitting of the characteristic spectral lines. That is, the atom has only one spectral line, and there may be more than three spectral lines under the action of an external magnetic field. For details, see my "the mechanism of Zeeman effect and its physical significance" (<https://www.toutiao.com/article/7030957370633241102/>) 。

55、 Mechanism of magneto-optical Kerr effect

The phenomenon that linearly polarized light (consisting of left-handed circularly polarized light and right-handed circularly polarized light) is incident on magnetic materials and converted into elliptically polarized light is called magneto-optical Kerr effect.

It can be well explained by "conclusion 2" : Because the reflected light is essentially a part of the secondary light produced by the incident light polarized by the atoms on the reflection interface. When two kinds of light with vertical polarization direction irradiate on the reflection interface at the same time, the atom will be polarized in both directions due to the force in two vertical directions at the same time, resulting in secondary polarized light in both directions. Because of the magnetism of the medium, under the action of the magnetic field, the degree of polarization of the atom by the force in the two directions will be different: the polarization dipole moment in the direction of the parallel magnetic field and the vertical magnetic field will be different, and the secondary light intensity will be different naturally. As a result, the reflected light is elliptically polarized light formed by the superposition of two vertically secondary polarized light of different intensity. For details, see my "Mechanism Analysis of Magneto-Optical Kerr effect and its physical significance" (<https://www.toutiao.com/article/7032093068509659680/>) 。

56、 Working mechanism of optical tweezers

Optical tweezers are optical traps based on chip-based photon resonance capture technology, which can manipulate and capture nano-to micron particles. The laser gathers to form an optical trap, and the small object is bound to the optical trap by light pressure, and the light beam is

moved to make the small object move with the optical trap. this allows the displacement or operation of tiny objects (such as viruses, bacteria, organelles and cellular components in cells, etc.) under a microscope. [from Baidu encyclopedia]

It can be well explained by "conclusion 1" and "conclusion 2" : Because nano-to micron particles (referred to as particles) are non-electrically neutral, when changing the intensity and direction of the electric and magnetic fields in their environment, these particles will change their motion state and move position. It is not the so-called photons or light pressure that causes particles to move. When a single beam of light shines on the surface of the particle, the particle will be displaced by the combined force of Coulomb force and magnetic force exerted by light. At the same time, the charge on the particles will be redistributed with the Coulomb force and magnetic force of the external force. It is precisely because the charge is redistributed with the combined force of the Coulomb force and magnetic force produced by light that the direction of the resultant force exerted on the particles remains unchanged regardless of whether the direction of the resultant force of the external Coulomb force and the magnetic force changes. So as to promote the directional movement of the particles; when two symmetrical coherent beams are used to irradiate the particles, the magnitude and direction of the combined force of the Coulomb force and magnetic force formed by the vector superposition of the two beams do not change with time. Just like the interference image in the double-slit interference experiment is fixed. When the particles are located in the bright stripes, they will be moved toward the dark stripes by the resultant force until the resultant force is zero. When the phase (optical path) of a beam of light is adjusted, the vector superimposed electric field (Coulomb force) and magnetic field (magnetic force) formed at the particles will change, causing the charged particles to move towards the dark stripes again. Therefore, the working mechanism of optical tweezers is to change the size and direction of the electric field and magnetic field (that is, the combined force of Coulomb force and magnetic force) in the position of the particles, so as to promote the directional movement of charged particles. For details, please refer to my "New understanding of the working principle of Optical tweezers". (<https://www.toutiao.com/article/7122402150646514208/>) 。

57、 Working principle and physical significance of optical energy radiometer

When the light shines on the blade of the radiometer, the windmill in the radiometer rotates, and the rotation speed is proportional to the intensity of the irradiated light. However, when the interior of the radiometer is pumped into a vacuum, the windmill in the radiometer will not rotate under the light.

It can be well explained by "conclusion 1" and "conclusion 2" : Because the windmill blade in the radiometer is black on one side and white on the other. When the surfaces of different colors are irradiated by the same intensity of light, the speed of the increase of the thermal velocity of molecules on the surface is different. The black surface heats up faster, while the white surface heats up relatively slowly. This is because the Coulomb force and magnetic force produced by the irradiated light on the leaf surface make the electrons in the atoms on the surface move in the opposite direction with the nucleus and produce different secondary light intensity: the secondary light produced by the black leaf is stronger, indicating that the translational kinetic energy is higher and the temperature is higher. As a result, the gas molecules near the black blade surface will be heated more easily, and the stronger the reaction force to the blade surface. So that the windmill rotates from the black blade to the white leaf side. When there is a vacuum inside the radiometer, although the surface temperature of the black blade is higher than that of the white surface under the action of irradiated light, there is no gaseous substance that can be heated, so there is no reaction force produced by gas molecules. Naturally, the windmill can't spin.

When the interior of the radiometer is vacuum, the phenomenon that the windmill will not

rotate even when the light shines on the blade shows that the light itself has no kinetic energy and momentum and can not put pressure on the surface of the irradiated object. That is to say: light pressure does not exist. Nor does light have kinetic energy and momentum proportional to its frequency. For details, see my "A brief Analysis of the working principle and physical meaning of the Light Energy Radiometer" (<https://www.toutiao.com/article/7122742003586187791/>) 。

58、 Feasibility and mechanism analysis of solar sail

Some people imagine launching a sail made of special materials into space in order to make it move by using a solar drive. The experimental results based on the assumption that light has light pressure or that light is a photon with kinetic energy and momentum proportional to its frequency should not be successful. Unless the influence of the solar wind is not eliminated, the so-called solar sail is pushed by various particles carried by the solar wind.

It can be well explained by "conclusion 1" and "conclusion 2": Because under the same light beam, the electrons in the atoms on the surface of the solar sail are equal to the combined forces of Coulomb force and magnetic force on the nucleus, but in the opposite direction. Therefore, the resultant force produced by the sunlight on each atom is equal to zero. Just like when the interior of a light radiometer is in a vacuum, the strong light does not make the windmill inside it rotate.

59、 Mechanism Analysis of Brewster's Law

Brewster's law refers to the condition that the reflected light is linearly polarized light after the natural light is reflected by the dielectric interface. This law was developed by the British physicist D. Brewster was discovered in 1815 and is suitable for physical optics and geometrical optics. When light is incident at Brewster angle, the reflected light is perpendicular to the refracted light.

It can be well explained by "conclusion 2": Because the incident light is natural light, namely circularly polarized light. Therefore, when it irradiates an atom on the surface of the medium, the electrons and nuclei in the atom will reverse the state of motion and be polarized into an electric dipole perpendicular to the direction of the incident light (nonlinear in the direction of polarization). When the phase of the adjacent atoms polarized circularly polarized electric dipole changes regularly. The polarization direction of the secondary light (reflected and refracted light) after the vector superposition is different from that of the incident light, and there are some changes (some directions strengthen, others weaken, just like the phased array radar, the radar wave emitted by the unit transmitting unit is non-directional, while the radar wave emitted by the array is directional after vector superposition). When the phase difference of the circularly polarized electric dipole of the adjacent atoms meets certain conditions, the polarization direction of the reflected or refracted light obtained by the vector superposition will be linearly polarized. This is the inherent mechanism of Brewster's law.

60、 Working principle and physical significance of phased Array Radar

Phased array radar, also known as phase array radar, is a kind of radar that changes the direction of the beam by changing the phase of the radar wave. it is also called electronic scanning radar because it controls the beam electronically rather than the traditional mechanical rotating antenna surface. Phased array radar has a quite dense antenna array. Thousands of phased array antennas are installed on the area of the traditional radar antenna surface. Any one antenna can send and receive radar waves, while several adjacent antennas have the function of a radar.

It can be well explained by "conclusion 1": Because each transmitting unit in phased array radar is a unit generator with the same charge change, the charge generated by it can independently interact with other charged particles to form Coulomb force and magnetic force interaction. When the transmitting units of a row or an array change their charge simultaneously or asynchronously, the array will form a vector superposition of Coulomb force and magnetic force at different distances in all directions. Due to the different phase differences of the adjacent

transmitting units in different directions, the superimposed results show directionality: in some directions, the Coulomb force and magnetic force are strengthened, while in some directions, they cancel each other out and disappear. This is the so-called mechanism of changing the beam direction, and it is also the working principle of phased array radar. For details, see "illustrating the inherent law of the combination of charge motion states and light transfer phenomena in a light source" (<https://www.toutiao.com/article/7130614560494895629/>) 。

The physical meaning of the working principle of phased array radar: it well interprets the internal reasons why electromagnetic waves (in fact, there is no electromagnetic wave excited by changing electric field and magnetic field, only the changing Coulomb force and magnetic force caused by the change of the position or quantity of electric charge) and the transmission of light are directional. It is also the inherent mechanism that the point source is spherical radiation, the synchrotron source is cylindrical radiation, and the synchrotron plane source is directional radiation. It is also the reason why the so-called electromagnetic waves and light travel in a straight line.

61、 Why is the sky dark blue?

It can be well explained by "conclusion 2": Because any color seen by the human eye is a group of charged particles in a light source or secondary light source (medium) that is vibrating at the frequency of some frequency bands in the visible light band. In fact, it is the Coulomb force and magnetic force interaction between these groups of charged particles and the corresponding charged particles in the human retina, which makes the charged particles on the retina change the state of motion and send corresponding information to the brain. resulting in a visual effect. While some gaseous substances in the sky (such as atoms and molecules in the ozone layer) under the combined action of sunlight and reflected light on the earth's surface, the frequency band of the secondary light produced by it happens to be the dark blue band, so that the sky that people see is dark blue. In short, the blue sky that people see is not the light itself, but some groups of matter that are glowing. When the vibrational frequency (dominant frequency) of the charged particles in the luminous body is different, the color of seeing them is naturally different. For details, see my "Blue Sky and Blue Earth Natural phenomena are the touchstones to distinguish the true and false laws of the interaction between light and medium." (<https://www.toutiao.com/article/7195923614791860768/>)

62、 Mechanism analysis of Tyndall effect

It can be well explained by "conclusion 2": Because what human eyes or camera equipment see and record is not the light itself, but the charged particle group whose surface is vibrating at the frequency of visible light band, and at any specific moment, the strongest luminous substance (the one with the largest coulomb force and magnetic force applied to the retina of human eyes or the photoreceptor of camera equipment) in a specific direction and at different distances can be seen and recorded. Therefore, when the sunlight or flashlight is strong, you can see the secondary light generated by small particles such as dust, water droplets and ice crystals in the atmosphere. This kind of secondary light can be seen in all directions. Therefore, secondary light cannot be simply considered as reflected light, refracted light or scattered light. This proves once again from one side that light itself cannot be seen directly, even if there is light in a vacuum without medium, but only the group effect of charged particles that are shining: the comprehensive effect of coulomb force and magnetic force exerted by charged particle groups on the surface of the seen object on the retina of human eyes or the photosensitive materials in the camera equipment.

63、 What is the reason why it gets dark faster after sunset at high altitudes than at low altitudes?

Problem: on the plateau thousands of meters above sea level, the sky gets dark within ten minutes or so after the sun sets, while it usually takes more than half an hour on the low-altitude plain to get dark slowly.

It can be well explained by "conclusion 2": Because there are generally few impurities in the atmosphere at high elevations, when the sky is clear and cloudless, because there is no substance in the air that can produce scattered light (in fact, scattered light is part of the secondary light produced by the medium), it is impossible to scatter light from the part of the atmosphere that is still illuminated by sunlight to places where there is no direct sunlight to illuminate the ground. On the other hand, the content of impurities in the air in the plain area at low altitude is relatively high, and there are often clouds with different densities. Because of the Tyndall effect (actually the secondary scattered light produced by the inhomogeneous medium), the sunlight will be scattered to the area where there is no direct sunlight. On the other hand, because the total thickness of the atmosphere at high altitudes is thinner than that at lower altitudes, the duration of exposure to sunlight in the atmosphere is shorter after the sun goes down. The time it takes to generate secondary light to illuminate the ground will naturally be shorter. These two factors are the main reasons why the plateau darkens faster than the plain after sunset.

64、 What is the reason for the darkness everywhere in space?

It can be well explained by "conclusion 1" and "conclusion 2": Because what human beings can see is not the light itself, but the luminous bodies of charged particles that are vibrating at the frequency of visible light. There is almost no medium in space, so there is no secondary light source or luminous body. Therefore, sunlight can not illuminate space, but can only make charged particles vibrate at certain frequencies. When there are no charged particles, there will naturally be no visible object, and space will naturally be dark.

65、 Why does the light dim when you wear sunglasses?

It can be well explained by "conclusion 1" and "conclusion 2": Because the scene seen after wearing sunglasses is the interaction between the secondary light (Coulomb force and magnetic force) formed by the interaction between the charged particle population on the scene surface vibrating at visible light frequency and the charged particle population on the sunglasses and the Coulomb force and magnetic force interaction between the charged particle population on the human retina and the interaction before wearing sunglasses, this interaction must be different. On the one hand, the intensity (amplitude) of the interaction force is different, so the brightness decreases, that is, it darkens. At the same time, the size and visual distance of the scene will also change slightly, especially when the focal length of the sunglasses is limited (the focal length is not infinite). This is why the glasses have flat light, myopia and presbyopic glasses.

66、 What is the reason why the sea is blue and the lake is green?

It can be well explained by "conclusion 1" and "conclusion 2": Because whether it is the blue of the sea, the green of the lake, or even the dark blue of the sky, it is seen by the human eye that the charged particles in the luminous body are vibrating at a certain frequency of visible light. Because any color seen by the human eye is a group of charged particles in a light source or secondary light source (medium) that is vibrating at the frequency of some frequency bands in the visible light band. In fact, it is the Coulomb force and magnetic force interaction between these groups of charged particles and the corresponding charged particles in the human retina, which makes the charged particles on the retina change the state of motion and send corresponding information to the brain. resulting in a visual effect. Under the combined action of sunlight, reflected light from the earth's surface or sky, the secondary light produced by water molecules of some depths in sea water and lake water happens to be blue and green bands. As a result, the sea water that people see is dark blue, and the lake water is emerald green. In short, the blue sea water and green lake water that people see are not the light itself, but the groups of water molecules that are glowing. When the vibrational frequency (dominant frequency) of the charged particles in the luminous body is different, the color of the charged particles is naturally different when they are

seen.

67、 What is the other reason for the difference in optical properties between graphite and diamond, which are also composed of carbon atoms?

It can be well explained by "conclusion 1" and "conclusion 2" : Because the reflection, scattering, refraction and transmission of light produced by graphite or diamond are the result of the vector superposition of the secondary light produced by its atoms under the action of incident light. However, the arrangement and spatial position of carbon atoms in graphite and diamond are different, the phase of secondary light produced by each carbon atom must be different in different spatial positions, and the result of vector superposition is naturally different. Graphite has a layered structure, and the secondary light produced by different layers counteracts each other, resulting in weak reflection, scattering and refraction. The plum blossom-like structure of diamond is not the same. As a result, there is a great difference in the optical properties of the two.

68、 Usually, the refractive index of X-ray is slightly less than 1, and the difference between 1 and 1 varies from 10^{-3} to 10^{-6} with different wavelengths. That is, the speed of X-ray in the medium is slightly higher than the speed of light C, what is its mechanism and physical meaning??

It can be well explained by "conclusion 2" and "conclusion 3" : Because the frequency of X-ray is much higher than the frequency of electrons moving around the nucleus, which is about 2 to 5 orders of magnitude higher, the ability of X-ray to change the motion state of electrons and nuclei in one cycle is very weak. the electric dipole moment that causes the atom to become an electric dipole is also very small, and the intensity of the secondary X-ray is naturally very small, which leads to that the secondary X-ray can not cancel all the incident X-rays in a short distance. Therefore, X-rays can penetrate metals and other media over a long distance (thickness). In general, the transmission X-ray is dominated by incident X-ray and supplemented by secondary X-ray, which is the superposition product of the two. The part that exceeds the velocity of the incident X-ray is the secondary X-ray. Because the incident X-ray causes the atom to obtain an additional velocity in the same direction, the transmission speed of the secondary X-ray in the medium is slightly faster than that of the incident X-ray. This is why the velocity of X-rays in the medium is slightly faster than that of incident X-rays. Its physical meaning is that the speed of light / electromagnetic radiation generated by a moving light source / electromagnetic radiation source is only constant relative to the speed of the source that produces it, and the assumption that the speed of light is constant breaks itself.

69、 The essential factors of three primary colors: red, green and blue can be combined into seven colors: red, yellow (= red + green), green, cyan (= green + blue), blue, bright purple (= red + blue), white (red + green + blue)

It can be well explained by "conclusion 1" and "conclusion 2" : Because there are three kinds of photosensitive cells in the human retina, each cell has different response to different frequencies of light (changing Coulomb force and magnetic force). One has the best response to red light, one has the best response to green light, and one has the best response to blue light. At the same time, they also respond to light at other frequencies, but with different degrees of response. When the intensity of red, green and blue light is different, it can be combined into different color visual effects. On the other hand, if the charged particles in the luminous body vibrate at the frequency of non-trichromatic (red, green and blue) light, the three kinds of photosensitive cells in the retina will also have visual effects due to the Coulomb force and magnetic force produced by them. it's just that each cell has a different degree of response and combines into different color visual effects. In fact, there are far more than seven colors that can be combined. There should be countless colors. Because the frequency of visible light is continuous, there are infinitely many frequencies, so there

are infinitely many colors. Therefore, the human eye can not only see trichromatic light (groups of charged particles that are vibrating at trichromatic light frequency). As long as the luminous bodies in the frequency range of visible light can interact with three kinds of photosensitive cells in the human retina to produce corresponding visual effects by Coulomb force and magnetic force.

70、 Humans have never seen the light itself, but all they see are charged particle groups vibrating at the frequency of visible light → luminous bodies

It can be well explained by "conclusion 1" and "conclusion 2": Because the so-called light is only the coulomb force and magnetic interaction between charges, it is not an object that can exist independently from the light source/charge, or electromagnetic waves and photons, of course, it is even more impossible to have wave-particle duality. Therefore, what the human eye can see is only the charged particle group vibrating at the visible frequency → the luminous body: the charged particles in the luminous body and the charged particles on the retina of the human eye have coulomb force and magnetic interaction. It is this interaction that makes the visual cells on the retina generate corresponding electromagnetic signals and transmit them to the visual nerve of the brain before the visual effect is produced. Otherwise, if human beings can directly see or observe the light itself with instruments and equipment, they will know what light is, and there will be no wave-particle dispute of light for hundreds of years.

71、 Why is the sky seen by people on earth blue and the earth seen by astronauts blue?

According to the saying that the blue light of the sun reflected from the sky is reflected back to the ground by the atmosphere in the sky, astronauts should not see the blue earth, but should see the orange earth. Why on earth is that?

It can be well explained by "conclusion 1" and "conclusion 2": Because people on the ground and space people see the secondary light produced by the direct light from the sun and the sunlight reflected from the ground, which together cause the odor layer and the ionosphere in the atmosphere. Because the intensity of the secondary light in the blue band is higher than that in other bands, what people see is the light produced by the same light source / secondary light source, and its color is naturally the same. For details, see my "Blue Sky and Blue Earth Natural phenomena are the touchstones to distinguish the true and false laws of the interaction between light and medium." (<https://www.toutiao.com/article/7195923614791860768/>) 。

72、 What is the essential factor that the external magnetic field in Zeeman effect has similar functions to the four quantum numbers?

It can be well explained by "conclusion 1" and "conclusion 2": Because the so-called atomic linear spectrum is only the electromagnetic radiation produced by the nucleus or the ions composed of the residual electrons and the nucleus when all or individual electrons are suddenly lost in the complex composed of electrons (groups) moving around the nucleus at high speed (hereinafter referred to as "complex"). Because both the electrons and the nucleus in the complex move in a circle around the common center of mass at a certain frequency, when the electrons are out of the bondage of the nucleus (in a short period of time), the nucleus will continue to move in a circle around the center of mass with a fixed frequency in the original way and produce electromagnetic radiation with the same frequency, which is called atomic linear spectrum.

When a constant magnetic field is applied to the complex, because the external magnetic field will change the motion state of the moving charge, there are three possible changes in the motion frequency of the electron and the nucleus around the common center of mass in the complex:

of the applied magnetic field is greater than 0 and less than 180 degrees, its frequency will decrease (the applied magnetic field exerts resistance); Second, when the included angle is 0 or 180 degrees, its frequency remains unchanged (the external magnetic field does not exert force); Third, when the included angle is greater than 180 degrees and less than 360 degrees, its frequency

increases (the external magnetic field exerts power). Therefore, the original complex with the same frequency becomes three complexes with different frequencies, and their respective electromagnetic radiation frequencies will be different. This is the reason why one spectral line in the atomic linear spectrum can be split into three or more spectral lines under the action of an external constant magnetic field. At the same time, with the increase of the applied constant magnetic field intensity, the frequency difference between the two new linear spectral lines and the original spectral lines will also increase, which fully proves that the applied magnetic field splits the spectral lines by changing the movement frequency of electrons and nuclei around the common center of mass. At the same time, it shows that the four quantum numbers are only physical quantities describing the movement frequency of electrons and nuclei around the common center of mass in atoms.

Thus it can be seen that the essential factor that the external constant magnetic field in the Zeeman effect has a similar function to the four quantum numbers is to change the atomic linear spectral line by changing the frequency of the electrons and nuclei in the atomic complex moving around the common center of mass.

73、 The essential factors of determining dielectric constant and its physical significance

It can be well explained by "conclusion 1" and "conclusion 2": Because under the action of an external constant electric field, the electrons in the atoms in the medium and the nuclei become electric dipoles or the outermost electrons of the atoms become free electrons and gather on the surface of the medium under the action of an external constant electric field, and the ions that lose electrons will gather on the other side of the medium, thus forming a couple. Because the number / density of the charge accumulated on the surface of the medium is only related to the properties of the medium and the strength of the external constant electric field, it has nothing to do with the thickness of the medium. Therefore, the so-called dielectric constant is not a true constant, but a physical quantity independent of thickness. At the same time, when the external electric field is unsteady, its value will decrease rapidly with the frequency of the applied electric field. Therefore, calling it a constant does not accord with the objective facts. For details, see my "A brief Analysis of the essence and physical meaning of dielectric constant"

(<https://www.toutiao.com/article/7201512128183140920/>) 。

74、 Mechanism Analysis and physical significance of Raman scattering

It can be well explained by "conclusion 1" and "conclusion 2": Because the natural frequencies of atoms, molecules and molecular clusters in the medium are different, the ability of electrons and nuclei in atoms to respond to external changing electric and magnetic fields (incident light) is relatively stronger, while atoms, molecules and molecular clusters are not. Therefore, under the action of the same incident light, the frequency of secondary light generated by the asynchronous movement of electrons and nuclei in the same medium is basically the same as that of incident light, which is called Rayleigh scattering; However, the frequency of secondary light generated by the integral asynchronous motion of atoms, molecules and molecular groups is closer to its natural frequency, which is called Raman scattering, so the frequency of Raman scattering is different from that of incident light. At the same time, the intensity of Raman scattering is much less than that of Rayleigh scattering because the amplitude of state change of molecules and atoms under the action of external electric and magnetic fields is much smaller than that of electrons and nuclei in atoms. The physical meaning of Raman scattering is to prove that the interaction between light and the medium is that the incident light makes the medium become a secondary light source and produce the corresponding secondary light. For details, see my "A brief Analysis of the essence and physical meaning of Raman scattering" (<https://www.toutiao.com/article/7205132335967568384/>) 。

75、 What is the mechanism of night-luminescent pearl glowing?

It can be well explained by "conclusion 1" : Because both night-luminescent pearl and other matter are made up of molecules made up of different atoms, which are made up of electrons and nuclei. Electromagnetic radiation occurs when the nucleus and electrons move asynchronously or eccentrically around the center of mass, that is, light of different frequencies (visible and invisible). General substances also produce electromagnetic radiation at room temperature, but its main frequency is low, which is not in the range of visible light and is generally considered to be non-luminous. In fact, there is also a certain intensity of electromagnetic radiation in the visible band, but the human eye can not see it. On the other hand, some substances composed of some special atoms and molecules produce relatively strong electromagnetic radiation in the visible band, which can be seen by human eyes in a special environment (darker environment). There are also substances that contain small amounts of radioactive elements that produce visible light under the action of radioactive material. These are all the reasons why the so-called night-luminescent pearl glows.

76、 Why did the astronauts in the sun see that it was dark around them?

It can be well explained by "conclusion 1" and "conclusion 2" : Because only a group of charged particles vibrating at the frequency of visible light can interact with the charged particles in the human retina to produce Coulomb force and magnetic force and be seen. There are few charged particles in space, and although there is sunlight, there is no luminous body for human beings to see. So, it can only be pitch black.

Third, the total knot

Through the systematic analysis of dozens of light-related physical phenomena and experimental results, three conclusions are drawn, which are related to the nature of light, the law of interaction between light and medium, the nature of light speed and the main factors that determine the speed of light. Using these three conclusions to test and practice as many as 76 light-related physical phenomena and experimental results, it is found that all the results are self-consistent and there is no case. This result fully proves that the three conclusions related to light I have summarized are consistent with the objective facts. I hope that interested friends can further expand the scope of testing and practice and make it more credible and practical.

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Due to my lack of English ability, the Chinese to English translation was achieved through common software. Therefore, the English version is likely to have more inaccurate and not easily understood parts. In order to facilitate the review of the manuscript by experts, the original Chinese version is attached. Please accept my apologies for any inconvenience.

用三个与光有关的结论同时解释 76 个与光有关的物理现象与实验结果

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【文章摘要】：经过本人对数十个与光有关的物理现象与实验结果的长期研究，总结出了三个相关结论，它们分别诠释了光的本质、光与介质相互作用规律、光速的本质及决定光速的主因。同时，也表明：只需用电磁学中最基本的库仑定律和毕奥——沙伐尔定律，即可解释诸多与光有关的物理现象与实验结果。本文利用此三结论同时解释了以下 76 个与光有关的常见物理现象与实验结果，并得到了意想不到的成功。请有兴趣的朋友们斧正。同时，希望通过本文征集到更多与光有关的问题来进一步检验这三个结论的适用性、可靠性、正确性。如果这三个结论能对更多与光有关的物理现象与实验结果进行解释而无一例外时，就能证明这三个结论越接近客观实际，越接近真理。这三个结论对光的本质、光与介质相互作用规律、光速的本质及决定光速的主因的认识和总结也就越准确、越客观、越真实。

一、与光有关的三个结论

1、结论一：光只是电荷与电荷之间才存在的库仑力和磁力相互作用的表现形式之一，并非可脱离光源/电荷而独立存在的客观实体（电磁波或光子）。光可以使带电体改变运动速度或/和运动方向。

本结论的依据主要有三：**一是**按照场的定义，可以断言：没有电荷存在的空间位置上应该是不可能存在电场与磁场的。也就是电荷与不带电体或真空间是不可能存在库仑力和磁力相互作用的。因此，也就不可能存在由变化的电场与磁场相互激励而形成的电磁波。详见本人的《场的定义中隐含的假设与实际不符是近代物理学诸多理论错误的主因》（<https://www.toutiao.com/article/7114946582335783464/>）；**二是**有直接证据证明真空中不存在光或真空中的光是不可见的：没有月亮的夜空漆黑一片及太阳光照射下的太空人看到的星空也是漆黑一片的就是最有力的直接证据；**三是**人类从未见过光本身的样子，也未用设备拍摄到过光的样子。否则，也就不可能有数百年的光的波粒之争并不得以以不伦不类的波粒二相性来和稀泥了。详见本人的《人类从未看到过光本身，只看到过正在发光的发光体》（<https://www.toutiao.com/article/7132767526286590494/>）；

2、结论二：光与介质相互作用规律是：入射光使介质中的原子成为电偶极矩随入射光频率、振幅、偏振方向和相位等变化的电偶极子并产生相应的次生光，所谓的反射、散射、折射、透射、衍射、干涉、绕射和转换等光只是作用方向不同的次生光的一部分。而入射光会在此过程中被次生光所逐渐抵消而消失。

本结论的依据主要有四：**一是**介质一般都是由原子组成的，而原子中的原子核与核外电子的电性正好相反，在原子自身热运动或外加电场（库仑力）、磁场（磁力）、光（时变的

库仑力和磁力)等的作用下会使原子中的电子与原子核运动不同步甚至是反向改变运动状态,从而使原子极化为电偶极矩随入射光频率、相位、偏振方向和振幅等变化的电偶极子并产生相应的电偶极子的次生电场和磁场(实际上是与其他带电体产生库仑力和磁力相互作用)。

二是反射光存在的半波损失、偏振折射光存在的法拉第磁光效应、单缝实验衍射光强度变化的四大规律等均证明:反射、透射和衍射光不是被介质改变运动方向的入射光的一部分,而是由介质重新产生的次生光。详见本人的《完整证据链证明光与介质相互作用规律是入射光使介质成为次生光源》(<https://www.toutiao.com/article/7134195997403529767/>);三是均匀介质内部的光速(相对于介质本身的速度)与入射光速无关,而真空中的透射光的光速与产生透射光的介质的运动状态有关。详见本人的《几个与光速有关的实验结果证据效力分析及正确测量光速方法的探讨》(<https://www.toutiao.com/article/7136941687456219682/>);四是介质的反光率/吸光率和透光率与介质表面的性状、介质的分子结构和原子空间位置分布等直接相关,而与组成介质的元素关系不大。如:石墨烯因表面性质变化而出现数十倍的吸光率变化,石墨与金刚石的光学性质差异巨大等就是最有力的直接证据。

3、结论三:光速的本质是电荷之间才存在的库仑力和磁力相互作用速度;决定光速的主因有三:一是真空中静止光源产生的光之速度 C ;二是光源的运动速度 U ;三是单位长度内光的再生次数 N 。

也就是说:即使是在真空中,光速也仅相对于产生它的光源恒定(实际上是两个静止电荷间的库仑力和磁力相互作用速度恒定),而相对光源运动的观测者会测量到不同的光速(相对运动的电荷间的库仑力和磁力相互作用速度不恒定),并遵循速度矢量叠加原理。

本结论的依据主要有四:一是上述结论一所明示的相关证据;二是上述结论二所明示的相关证据;三是不同带电粒子在云室中的运动轨迹规律;四是介质中的原子在每次再生光的过程中会消耗半个周期的时间(从入射光产生的库仑力和磁力使电子与原子核反向运动并达到位移量最大值(再生光振幅也达到最大值)需要消耗半个周期的时间,这就是所谓的反射光存在的半波损失的机理),所以介质内部的光速与介质密度和入射光的主频成负相关关系:密度越大、单位长度内光的再生次数就会越多、消耗的时间也就会越多、光速自然会越小或频率越高、单位长度内光的再生次数就会越多、消耗的时间也就会越多、光速自然就越低。这也是介质内部的光会存在频散的根本原因。详见本人的《光的本质和光与介质相互作用规律及决定光速的主因分析与研究》(<https://www.toutiao.com/article/7127560940249301512/>)。

二、与光有关的常见物理现象与实验结果的机理解读

16、反射光存在的半波损失

利用“结论二”即可很好地解释：入射光照射到介质表面时，介质表面原子中的电子会被改变运动状态并使原子成为电偶极子并产生次生电偶极子场。而次生电偶极子场与入射场间的相位正好相差半个周期。原因是从外电场加速电子到电子位移量达到极大值需要入射光主频之半个周期的时间。详见本人的《反射光存在的半波损失现象的机理及其物理意义》(<https://www.toutiao.com/article/6943141929446048260/>)。

17、 偏振光的法拉第磁光效应

利用“结论二”即可很好地解释：折射光是由介质中的原子重新产生的，在产生次生光过程中，原子中的电子和原子核会被外加磁场改变运动方向，从而导致其产生的次生光偏振方向随之发生改变。外加磁场强度越大，电子和原子核改变运动方向的量就越大。同时，介质长度越长，折射光的再生次数也就越多，电子和原子核运动方向的改变量累计数就更大。这就是为什么偏振光的偏振方向改变量与外加磁场强度和介质长度成正比的原因所在。详细论证与分析请参见本人的《详解法拉第磁光效应的机理及其物理意义》(<https://www.toutiao.com/article/6909459286905209348/>)。

18、超黑材料单缝实验结果无衍射光现象

利用“结论二”即可很好地解释：因为衍射光是由单缝边缘产生的次生光，当单缝边缘用超黑材料覆盖时，当然就不能产生次生光了，衍射光也就不会有了。详细论证与分析请参见本人的《超黑材料在单缝衍射实验中的作用机理与重大物理意义剖析》(<https://www.toutiao.com/article/6825505871347319299/>)。

19、惠更斯—菲涅耳原理

利用“结论二”即可很好地解释：因为只有介质存在时才能在入射光的作用下成为子光源。在真空中时，光并不能产生次生光。详细论证与分析请参见本人的《惠更斯—菲涅耳原理的是与非》(<https://www.toutiao.com/article/6816241572179345927/>)。

20、为何世间有花红叶绿果黄的丰富多彩颜色

利用“结论二”即可很好地解释：因为不同元素及元素群组所组成的物质中的原子所受到邻近其他原子和分子的库仑力和磁力作用不同，其在入射光作用下产生的电偶极子之偶极矩自然也不同，随时间的变化规律也不尽相同。因此，不同空间位置上的电偶极子所产生的次生光的矢量叠加结果的主频也会不同。而物体表面的颜色是由所谓的反射光的主频决定的。因此，由不同原子和分子结构的植物及不同植物叶与花所产生的反射光就出现了丰富多彩的各种各样的颜色。

21、量子计算机为什么必须在绝对零度附近才能工作

利用“结论一”和“结论二”即可很好地解释：因为可以用来计算的是不同运动状态的

原子，而非光子。只有将原子的热运动尽量消除，才有可能被人类操控。如果真的是直接操控光子，就根本没有必要降低计算机的温度，按理应该提高温度才会提高计算速度才对。

22、迈克尔逊——莫雷实验

利用“结论二”和“结论三”即可很好地解释：因为实验过程中的两条光路一方面是在大气层内，另一方面均被反射镜和半透镜各反射一次，半透镜折射和透射各一次。因此，实验过程中的光都是大气层、反射镜和半透镜产生的次生光，其速度仅相对大气层、反射镜和半透镜速度恒定，也就是相对实验装置速度恒定。自然就不会因为实验装置旋转 90 度出现干涉条纹的变化了。详见本人的《迈克尔逊-莫雷实验结果的真实物理意义》(<https://www.toutiao.com/article/6782450889085944324/>)。

23、康普顿效应

利用“结论一”和“结论二”即可很好地解释：因为所有散射与透射 X 射线均是由被照射的轻金属中的原子产生的次生 X 射线，其频率变化当然由原子中的电子和原子核在入射 X 射线作用下改变运动状态而导致其产生的次生 X 射线出现类似红移的现象：远离运动的电子和原子核产生的次生光频率会降低。沿不同方向运动的电子和原子核的速度不同当然会导致不同散射方位上的次生 X 射线频率也有所不同。详见《如何正确解读物理实验结果系列之十二——康普顿效应与光子》(<https://www.toutiao.com/article/6780619197463396868/>)。

24、光电效应

利用“结论一”和“结论二”即可很好地解释：因为光照射到金属表面后，金属内原子中的电子会改变运动状态，当入射光对电子施加的库仑力和磁力的频率与相位合适时，部分电子就会被同步加速并达到逃逸速度而成为光电子，即出现光电效应。这也可以同时解释为什么频率过高的光也不能产生光电效应的问题。这个问题是用具有与频率成正比动能和动量的光子无法解释的。详见本人的《光电效应的本质因素分析》(<https://www.toutiao.com/article/6782450034978849287/>)。

25、黑体辐射

利用“结论二”即可很好地解释：因为分子热运动过程中，原子核与电子的运动和位移是不同步的，这就形成了类似的、与热运动频率一致的时变电偶极矩的电偶极子并产生相应的电场和磁场（电磁辐射）。虽然物体中的不同分子的热运动方向、行程和频率都是不同的，但其相同频率的分子数量与频率间的关系遵循正态分布，其产生的电场和磁场遵循矢量叠加原理。这就形成了黑体辐射强度与频率间的关系也呈现类似正态分布的连续频率谱的现象了。详见本人的《如何正确解读物理实验结果系列之四——黑体辐射强度实验结果》(<https://www.toutiao.com/article/6733856367733375499/>)。

26、双星系统无魅星现象

利用“结论三”即可很好地解释：因为星际空间存在介质，地球人观测到的星光是由星际介质产生的次生光，其传递速度由介质性质与运动状态决定。对于同一双星系统而言，星地间的介质分布是相同的，自然就会出现观测到的星光时序与双星产生时的时序相同，也就不可能出现所谓的魅星现象了。

27、哈勃常数与频率成正比现象

利用“结论二”即可很好地解释：因为地球人观测天体产生的任何频率的光都是由星际介质，包括地球大气层所产生的次生光。而在相同距离的条件下，频率越高的次生光的再生次数越多，频率的降低自然也会越多，红移量自然就会越大。这就导致所测量出来的哈勃常数与频率成正比了。详见本人的《不同方法测量得到的哈勃常数各异的本体因素分析》(<https://www.toutiao.com/article/6837046414741078535/>)。

28、天体红移量与天体到地球的距离成正比

利用“结论二”即可很好地解释：因为星际介质的存在，地球人观测到的星光都是星际介质产生的次生光，而介质在产生次生光过程中，每次再生的次生光的频率与入射光的频率都会稍微降低一些。由此决定了星光的频率会随再生次数的增加而增大，也就是随距离的增加而增加。这就导致了天体红移量与天体到地球的距离成正比的现象了。详见本人的《天体红移量与距离成正比的真实原因分析及验证方法》(<https://www.toutiao.com/article/6782452364352684555/>)。

29、电子双缝干涉现象

利用“结论一”和“结论二”即可很好地解释：因为双缝板间存在由双缝边缘产生的温度型电磁辐射，电子通过双缝时就会被其中的电场改变运动速度，磁场改变运动方向。由于缝间的电磁辐射存在周期性变化，这就会导致不同时刻通过缝隙的电子的运动速度和运动方向的改变量不同，其落到屏幕上的位置自然也就不同。当通过电子的数量达到一定程度后，自然就会出现缝间电磁辐射的波峰与波谷偏转的电子在屏幕上的位置相对稳定且数量比其它地方多而形成类似于干涉条纹似的分布现象了。详见本人的《电子双缝干涉实验结果的真实物理意义》(<https://www.toutiao.com/article/6782795041745142275/>)。

30、光的双缝干涉现象

利用“结论二”即可很好地解释：因为除两个主瓣外，其余地方的光均是双缝的四条相互平行的缝边缘产生的次生光，它们符合相干光源条件，所以其产生的次生光就会出现干涉现象。当用超黑材料覆盖双缝边缘后，双缝干涉现象也会像超黑材料单缝衍射实验时一样会消失的。详见本人的《用缝边缘为单缝衍射和双缝干涉光源推导衍射与干涉光强度计算公式》

(<https://www.toutiao.com/article/7133947727863464486/>)。

16、暗物质和暗能量问题

利用“结论二”和“结论三”即可很好地解释：因为一方面利用哈勃定律计算出来的天体退行速度是不准确甚至是完全错误的，天体红移量与距离成正比的部分并不是天体退行时产生的多普勒效应，而是星际介质作用的结果。因此宇宙膨胀或大爆炸理论是不符合客观实际的，也就根本不需要所谓的暗能量来支撑宇宙的膨胀说；另一方面，用可见质量代替星系总质量是错误的，星系内部及星系之间广大区域存在的大量低温物质均不产生可见光，所谓的宇宙背景辐射就是平均温度仅为 2.7K 左右的超低温物质产生的，也是不可见的。由此导致星系总质量与可见质量存在巨大差异，计算出来的星系引力自然比实际值小得多。也就是说：所谓的暗物质只是不发光的、正常的普通低温物质而已。它并不是不参与电磁相互作用，只是不怎么参加可见光频率段的电磁相互作用而已。详见本人的《如何正确解读物理实验结果系列之十一——暗物质的前世今生》(<https://www.toutiao.com/article/6747861961620324872/>)。

17、原子线性光谱现象

利用“结论一”和“结论二”即可很好地解释：因为原子光谱是在外加超强电场作用下使原子核外部的所有电子被瞬时驱赶脱离原子核的束缚后，原子核仍保持原来的、围绕原子质心和各电子与原子核构成的分质心作复杂的、类似复合圆周运动状态中，它产生的电磁辐射就是由各种单一频率构成的线性光谱。而电子脱离原子核束缚的运动路径应该是直线或弧线类运动，只会产生类似脉冲式的连续频率的光谱。详见本人的《如何正确解读物理实验结果系列之六——线性光谱线》(<https://www.toutiao.com/article/6734583863332307469/>)。

18、宇宙背景辐射

利用“结论二”即可很好地解释：因为星际间存在着大量低温物质，太阳系边缘就存在接近零下 240 度的低温物质，而星系间存在的物质温度肯定远低于太阳系边缘的温度。这些物质的平均温度应该就是所谓的宇宙背景辐射对应的 2.7K 左右。因此，宇宙背景辐射应该是星系间的低温物质产生的电磁辐射。如果宇宙真的存在背景且产生所谓的背景辐射，则地球上不应该观测到各个方向上的辐射强度一致的现象，应该会各向异性。因为地球不可能正好位于宇宙大爆炸中心位置上并离宇宙边缘各个方位上都是等距离的。详见《如何正确解读物理实验结果系列之九——宇宙微波背景辐射》(<https://www.toutiao.com/article/6742381411119923719/>)。

19、温度、热量与能量的本质问题

利用“结论一”和“结论二”即可很好地解释：温度的本质是分子热运动峰值频率或主频的标志，这是从普朗克黑体辐射公式可以直接推导出来的；热量是分子热运动平均动能的变化程度的量度；能量是带质量物质运动特性和所处空间性质的表达方式之一，并没有纯粹的、独立存在的能量。详见本人的《温度、热量的本质及在物质相变过程中的应用》

(<https://www.toutiao.com/article/6632920708190044685/>)。

20、光行差常数

利用“结论二”和“结论三”即可很好地解释：因为无论是天体位于天顶位置上还是其它方位上，在地球表面观测到的星光都是由大气层产生的次生光，其速度仅相对大气层速度恒定。因此，当天体位于天顶位置上时，其通过大气层传递到地面观测站的星光的速度都是垂直地面的大气层内的光速，其值当然相等。它与地球公转速度之比值自然也变为常数了。太阳参考系观测者观测到的垂直地面的光是有一定倾角的，其视速度为大气层内的光速与地球公转速度之矢量叠加结果。详见本人的《光行差成因和物理意义新解及其验证方法》(<https://www.toutiao.com/article/6698509387041866253/>)。

21、斐索流水实验结果

利用“结论二”和“结论三”即可很好地解释：因为水中的光速仅相对水本身速度恒定，当观测流动的水中的光速时就会叠加上水流的速度。详见本人的《斐索运动介质中光速公式的可靠性分析及验证方案初探》(<https://www.toutiao.com/article/6935786632075330080/>)。

22、介质界面处光速突变现象，特别是从光密介质进入光疏介质时，光速会跃升

利用“结论二”和“结论三”即可很好地解释：因为不同介质内部的光速仅由介质性质与运动状态决定，因此在不同介质交界处两侧的光速定会不同，界面处当然会发生突变甚至跃升。

23、均匀介质内部光速相对介质本身速度恒定现象

利用“结论二”和“结论三”即可很好地解释：因为介质均匀，单位长度内的原子数量基本相等，再生光的次数也就相等，需要消耗的时间及在原子间的传递时间均相同，其光速自然也就相同或恒定了。

24、旋转透明晶体会改变光的基本属性——频率降低现象

利用“结论二”和“结论三”即可很好地解释：因为通过透明晶体的光是晶体产生的次生光，介质内部的原子在产生次生光过程中由于存在旋转运动，对于透射光而言，相当于光源存在退行的视速度，其产生的次生光的频率自然会比不旋转时的频率会低或出现红移。

25、超黑材料与透明材料在同条件下温度相差无几现象

利用“结论一”和“结论二”即可很好地解释：因为无论哪种介质遇到光后均会使介质成为次生光源，只是超黑材料几乎不产生可见光波段的反射和散射光，或产生的散射光会相互抵销而消失；而透明材料产生的次生折射光会从介质的另一侧成射出而成为透射光。而不同材料在同样强度的光照射下的温度变化主要与分子热运动主频率的改变有关，不同颜色的材料在光照下的温度改变量并不会因颜色不同出现大的差异。这也从一个侧面证明光本身是不具有能量的，颜色深的材料也不是能吸收更多的能量。

26、契伦科夫辐射现象

利用“结论一”和“结论二”即可很好地解释：因为高速带电粒子会使介质中的原子极化为光源而产生电场和磁场。这一现象也证明介质发光是因为原子被极化后可以产生电偶极子电场和磁场。而带电粒子虽然速度大于介质中光速但依然不能产生光（仅产生强度很弱的脉冲式连续频率的电场和磁场，可见光波段的强度很弱以至于不能被观测到）。详见《契伦科夫辐射主频范围及其物理意义》（<https://www.toutiao.com/article/6890152330432348683/>）。

28、石墨烯的吸光率一般为 2~3%。但通过特殊工艺使其表面产生某种纹理就会成为超级吸光材料，其吸光率可达 90%以上

利用“结论一”和“结论二”即可很好地解释：因为表面性状不同，产生的次生反射光的叠加结果自然不同。特种纹理可以使某些频率的反射光相互抵消而消失，并非被材料吸收了。

28、日食期间，太阳附近的星光会发生偏转现象

利用“结论二”和“结论三”即可很好地解释：因为太阳外围存在一定密度的气态物质且分层均匀，与地球大气层类似的内密外稀，这就符合形成变向折射光的条件并形成类似地球上的海市蜃楼般的光线偏转现象。

29、奥尔伯斯的悖论：如果宇宙充满了星星，不管我们往哪个方向看，为什么夜空不像太阳那样清晰可见呢？

利用“结论一”和“结论二”即可很好地解释：因为一方面星光的强度随距离的平方衰减，另一方面星光遵循矢量叠加原理，在多光源的条件下，其强度并不会与光源数量成正比增大，有时候还会相互抵消或部分被抵消。

30、激光致冷

利用“结论一”和“结论二”即可很好地解释：因为合适频率与相位的电场和磁场可以使分子和原子热运动的频率降低，从而达到降低其温度的目的。这也从一个侧面证明光本身没有能量，只是电磁力，可以使带电体改变运动状态。否则，被激光照射的原子和分子应该获得能量而加速运动才对。

31、偏振光的偏振方向与偏振器的偏振轴方向夹角成 45 度时，产生透射光的概率为 50% 的现象

利用“结论二”即可很好地解释：通过偏振器的透射光实际上是偏振器产生的次生光。偏振器具有产生定向偏振光的能力是因为其分子和原子的定向有规律地排列，这种排列方式的分子和原子运动的自由度就是非三维的，而是接近一维的线性运动。当入射光照射时，其产生的次生透射光就是由偏振器中定向排列的分子和原子产生的定向偏振光了。但 45 度偏振光照射到偏振器时，当原子和分子的自有振动方向不同时，响应偏振入射光的能力就会不同，就会出现定向排列的原子和分子被极化为次生光源的概率只有 50% 的现象了！这与量子，叠加态和纠缠态根本无关！

32、类星体具有多组红移量不等的发射线和吸收线线性谱线簇的现象。如，类星体 PHL 957 的发射线红移为 2.69，吸收线红移有五组：2.67、2.55、2.54、2.31、2.23

利用 " 结论二 " 即可很好地解释：地球人观测到的类星体的光是由星际介质产生的次生折射光。当类星体产生的折射光在来地球的途中遇到不均匀的介质时就会使介质成为次生光源并重新产生次生光，其中的折射光通过很多次的重新发射与再生，其频率逐渐降低并形成多组不同红移量的发射谱线和吸收谱线簇。这一现象直接证明：一是地球上观测到的星光并不是原生光，而是次生折射光；二是证明星光在来地球的途中频率是在不断降低的，而并非是因为相对地球退行才产生的红移。

33、光纤陀螺仪的工作原理：“当光束在一个环形的通道中行进时，若环形通道本身具有一个转动速度，那么光线沿着通道转动方向行进所需要的时间要比沿着这个通道转动相反的方向行进所需要的时间要多”的根源是什么？

利用 " 结论二 " 和 " 结论三 " 即可很好地解释：因为光纤内部的折射光是由光纤产生的次生光，其速度仅相对光纤速度恒定。而沿光纤环旋转方向运动的光所走的路径要比反向运动的光走的路径更多，但在光纤内部的速度是相同的，因此，前者就需要比后者更多的时间且时间的长短与光纤的旋转速度成正比。详见本人的《萨格纳克效应机理分析及其物理意义》(<https://www.toutiao.com/article/6942053496661230084/>)。

34、薄膜干涉与彩虹现象

利用 " 结论二 " 即可很好地解释：当太阳光照射到薄膜和由悬浮于空中的小水珠构成的云朵时，薄膜和小水珠就成为了次生光源，不同部位的原子、分子和分子团（可简称为“极化体”）产生的次生光进入人的眼睛时就会遵循矢量叠加原理而形成叠加。当这些次生光满足干涉条件时，就会形成类似干涉现象而出来某些频率的光得到加强，另一些频率的光受到压制，从而形成七彩光带，也就是所谓的薄膜干涉或彩虹现象。这一现象用光是粒子是解释不了的，总不能说不同的光子会相互加强或相互抵消吧。用光是电磁波也不好解释，因为电子和原子核都不可能反射电场或磁场。只能用薄膜和小水珠为次生光源并产生次生光来解释最为合理。详见本人的《如何正确解读物理实验结果系列之十一——彩虹与薄膜干涉现象》(<https://www.toutiao.com/article/6760133691021722115/>)。

35、晶体旋光现象的机理

利用 " 结论二 " 即可很好地解释：我们知道，很多晶体具有双折射能力。这实际上就是晶体具有产生两种次生光的能力。它应该是晶体中的原子和分子结构与排列方式的特殊性导致在外电场和磁场作用下会产生两组极化方向有一定差异的电偶极矩之电偶极子，它们产生的次生光的偏振方向和相位也会存在差异。因此，从晶体射出的透射光是由这两种次生光叠加而成的。当两种次生光的偏振方向随时间有规律地变化时，其叠加后形成的透射光的偏振方向就会出现

有规律的旋转了。这就是晶体会不同旋光现象的内因。

36、为什么色温在 5300k 以上的是冷色光，而 3300K 以下的反而是暖色光？

利用 " 结论一 " 和原子及分子存在固有振动频率（简称“固有频率”）即可很好地解释：当光的强度不足以在半个周期内将原子中的电子加速到逃逸速度而电离原子时，则光在原子所处空间位置上产生的电磁场会使电子与原子核朝相反的方向改变运动趋势。但原子和分子根据其结构不同，自身的固有频率是不同的。一般分子量越大、固有频率越低。只有当光产生的电场与分子固有频率接近时才会更容易改变分子热运动频率并达到改变物体温度的目的。而所谓的冷、暖色是以人的皮肤受到光的照射时改变温度的能力来划分的。因人体含有大量的水分子，水分子的固有频率相对较低，正好与红外波段的光的频率相近。所有只有接近此固有频率的光才是真正的暖色光，其他的光就是非暖色光，频率相差悬殊时，就是冷色光了。这与光子说的频率越高能量越强是明显相左的！

37、为什么微波炉使用频率较低的微波加热食物的速度更快，而不用频率更高的光？

利用 " 结论一 " 和原子及分子存在固有频率即可很好地解释：与以上第 36 个问题相同。只有接近水分子固有频率的光或电磁场才能更好地改变水分子的热运动频率并以改变其温度。

38、为什么太阳到地球间的太空中的温度更低？

利用 " 结论一 " 和温度的本质即可很好地解释：温度的本质是物质分子热运动中，同频率的分子数量分布曲线图中最大值所对应的频率（简称“峰值频率”）的标志，并非分子热运动平均动能的标志。也就是说：匀速直线运动的物体的温度是不会因速度越大、温度越高的。真正理想状态下匀速直线运动的粒子的温度是绝对零度，因为其热运动的频率为 0。因此，虽然太阳表面温度达 6000 度左右，而地球表面温度一般在 -60~60 度之间。而太阳与地球间的太空中的温度一般在 -100 度以下。这明显违背温度梯度变化规律。其根源是：太空中的各类物质因密度极小、分子间距很大，导致其难以相互碰撞而致使热运动频率很低，太阳风所携带的粒子接近直线运动。因此，其对应的温度当然就特别低了。

39、为什么大分子物质一般燃点更低？

利用 " 结论一 " 和原子及分子存在固有自振频率即可很好地解释：分子量越大，固有频率越低，产生共振所对应的分子热运动频率或温度也就更低。当外加电磁场达到固有频率时就会使分子发生共振而解体，分子解体的同时就会与氧气发生化学反应而发热并燃烧。

40、为什么凸透镜聚光后可点燃可燃物？

利用 " 结论二 " 即可很好地解释：我们知道，凸透镜致所以能聚光是因为它可以使平行入射的平面光产生的次生透射光能均匀地改变传递方向并聚焦到一点上。在此点上的光的相位也基本相同，符合叠加加强条件而提高了光的振幅或强度。当光的强度足以使可燃物中的分子热运动频率达到固有频率时，可燃物的分子就会解体并与氧气发生放热化学反应而燃烧起来。

41、为什么棒状天线的长度多为接收频率波长的 $1/2 \sim 1/4$?

利用 " 结论一 " 和 " 结论二 " 即可很好地解释: 因为同时刻天线不同部位的电磁信号相位不同, 其使原子中的电子的运动状态就会不。只有方向相同的电子数量越多, 接收到的电信号才会越强。而只有在棒状天线中接收信号半个波长以内的电子之运动方向才会相同, 才会起到同向叠加而增强信号的作用。当棒状天线超过半个波长后, 天线内不同部位的电子运动方向会不同, 不但起不到叠加增强信号的作用, 反而可能会起到相互抵消作用。这也是与接收粒子类物质完全不同之处。

42、逆康普顿效应的机理

利用 " 结论一 " 和 " 结论二 " 即可很好地解释: 因为与康普顿效应一样, 由轻金属散射的 X 射线均是由轻金属产生的次生 X 射线, 主要是在入射 X 射线作用下, 轻金属中的原子中的电子和原子核会朝完全相反的方向运动 (两者电荷相反, 在同一外电场和磁场作用下的运动趋势相反) 而导致原子极化为电偶极子并产生次生 X 射线。但不同运动状态的原子 (主要是电子) 所产生的次生 X 射线的频率会因多普勒效应而稍微发生变化: 朝观测者运动的原子产生的次生 X 射线的频率会高于入射 X 射线 (即蓝移), 这就是所谓的逆康普顿效应的产生机理。

43、苏尼亚耶夫-泽尔多维奇效应的机理

利用 " 结论一 " 和 " 结论二 " 即可很好地解释: 因为星系团等天体产生的高能电子与产生所谓的宇宙背景辐射的低温物质相互作用时, 就会出现与契伦科夫辐射现象的相互作用, 使低温物质产生峰值频率很高的电磁辐射, 当人们以电磁辐射强度峰值所对应的频率反算出观测对象的温度时, 则此部分物质的温度就会相对上升。并非所谓的宇宙背景辐射光子被高能电子作用而提高了能量。

44、卡西米尔效应的机理

利用 " 结论一 " 和 " 结论二 " 即可很好地解释: 因为原子靠近可以组成分子, 分子靠近可以组成分子团并构成有形物质的原因在于: 当原子、分子相互靠近时, 它们之间就会形成同步热运动, 产生相同的电磁辐射, 这种辐射会使原子、分子间形成一种相互吸引力。这种力就是所谓的卡西米尔效应中的相互吸引力。详见本人的《卡西米尔效应的机理及其验证方法》 (<https://www.toutiao.com/article/6936481287813267971/>)。

验证此力的方法: 使两块平行的超薄金属板形成所谓的卡西米尔效应后, 分别给一块板加热, 另一块板制冷, 使两者的温度各异时, 卡西米尔效应就会随之消失。这是因为两块板表面中的原子和分子热的运动不同步时, 产生的电磁辐射就不会形成相互吸引力。

45、施特恩-格拉赫实验的机理

利用 " 结论一 " 和 " 结论二 " 即可很好地解释: 因为银原子并非真正的电中性粒子, 而是会产生温度型电磁辐射且会被其所在空间位置上的电场和磁场反作用的时变电偶极矩的电偶

极子。在外部电子围绕原子核高速运动过程中，单个银原子是具有时变电偶极矩的电偶极子。只是众多银原子组成实体银金属块时，由于银原子彼此间的热运动随机性，其产生的电磁辐射在时间大于电子绕原子核一个周期以上的时间段的叠加结果趋于 0，从而总体上看银块呈现出电中性。由此可见，当单个银原子通过非均匀磁场时，银原子会被磁场改变运动方法。只是其进入磁场时的电偶极矩方向的随机性，不同的银原子被改变运动方向也就具有了随机性。但总体上只能朝二个方向偏转，从而导致了银分子分裂成二道。详见本人的《施特恩-格拉赫实验结果的机理分析及检验方法》(<https://www.toutiao.com/article/6940263884867551758/>)。

验证方法：用真正的中性粒子中子进行本项实验的话，就不会出现分裂现象了。

46、萨格纳克效应的机理

利用 " 结论二 " 和 " 结论三 " 即可很好地解释：因为单模光导纤维环内的光是由环产生的次生光，仅相对环本身速度恒定。也就是通过旋转的光导纤维环的光实际上是环本身产生的次生光，其速度仅相对环本身速度恒定，从而导致顺环运动方向与逆环运动方向的光的运动距离不同或光程不同，并形成与环运动速度成正比的光程差。该效应证明运动光源产生的光的速度是不同的。详见本人的《萨格纳克效应机理分析及其物理意义》(<https://www.toutiao.com/article/6942053496661230084/>)。

47、为什么趋肤效应中电磁波透入深度与频率成反比，而可见光却不能像频率更高的 X 和 γ 射线那样透入金属更深处呢？

利用 " 结论一 " 和 " 结论二 " 即可很好地解释：因为决定入射光透入金属深度的主要因素有二：一是入射光使金属中的原子极化为电偶极子的电偶极矩大小，电偶极矩越大，透入深度越小；二是单位长度内由入射光和次生光极化产生的子光源数量，数量越多，透入深度越小。

入射光使金属表面及浅层原子极化成为电偶极子并产生与入射光频率相同但相位相反的次生光的强度与原子中的电子在入射光一个周期内能有多大的位移量成正比。同时，单位长度内被入射光和次生光极化为次生光源的子光源个数与入射光的频率成正比。因此，次生光要全部抵消入射光就得有一定的强度和一定的抵消次数。当入射光频率较低时，虽然次生光源的强度较大，但单位长度内的子光源数量少，当需要抵消的次数变化不大时，则需要深度较大的原子参与，也就是透入深度大；而当入射光频率较高时，虽然单个子光源的强度小，但单位长度内的子光源数量多，因此，透入深度就会反而减小。而当入射光频率高到一定程度后，子光源强度就会特别小，入射光随深度衰减就会较慢。因此，就会需要更多的子光源参与逐渐抵消入射光。这就是 X 和 γ 射线能够深入金属板内部，而频率较低的可见光反而不能的根源。详见《试论趋肤效应的机理及其物理意义》(<https://www.toutiao.com/article/6857884161680605703/>)。

48、惠勒延迟（思想）实验中的错误分析

利用 " 结论一 " 和 " 结论二 " 即可知道其错误之处：因为半透镜的反射和透射光均是由其

产生的次生光，不可能出现所谓的单个光子被半透镜反射或透射的可能性。同时，经过其他反射镜反射出来的光也是反射镜产生的次生光，并不是所谓的光子被反射镜反射出来了。因此，自入射光照射到半透镜并使其产生次生反射或透射光并沿两条光路分别照射到不同的反射镜，并使反射镜产生的次生光到达同一空间位置上而叠加的整个过程中，并不是入射光自半透镜经反射/透射到达叠加点，而是反射镜和半透镜的再生光到达叠加点。当半透镜和反射镜固定不动时，两路光到达叠加点的光程差和相位差是固定的，不会因为在此交汇点上放或不放半透镜而改变。只是只有放半透镜时，才能被人眼或设备观测到叠加结果而已。并不会因为在交汇点放或不放半透镜而改变两条光路上次生光的运动方向与状态。详见本人的《延迟（思想）实验错误结论的详细分析》（<https://www.toutiao.com/article/6631030822436602371/>）。

49、介质内部的光速与频率成反比现象的机理及物理意义

利用 " 结论二 " 和 " 结论三 " 即可很好地解释：因为介质内部的折射光是由入射光极化介质中的原子、分子和分子团而产生的次生光。当我们把入射光（或相邻极化元产生的次生折射光）同时极化的原子、分子和分子团称作极化元时，则极化元的大小应该与入射光的波长成正比，或单位长度内的极化元数量与入射光的波长成反比。由此决定了单位长度内再生光过程中需要消耗的时间与波长成反比。也就是：入射光的波长越短，单位长度内的极化元数量越多，再生过程所需消耗的时间也就越多，折射光的速度也就越小。因此，介质内部光速与频率负相关的原因是：波长越短、单位长度内的再生次数就越多、再生过程需消耗的时间就会越多、折射光速自然就会越低。这一现象与光为具有与其频率成正比动能和动量的光子所应具备的规律是完全相反的：即动能和动量越大的光子进入介质后的动能和动量（速度更低）反而越小，这是粒子不应该有的特性。这就从另一个侧面证明：光并不是具有动能与动量的光子。

50、为什么目前完成的大量实测光速实验所得到的真空中的光速都是恒定的常数？

利用 " 结论二 " 和 " 结论三 " 即可很好地解释：因为目前所有测量光速的方法中实际测量的对象光是由测量装置中的反射镜、半透镜和透镜等光学器件产生的次生光，并非可能存在速度不同的入射光。也就是所有实验中实际测量对象光是相对测量装置静止的光源/次生光源产生的光，其相对测量装置的速度当然是恒定的，测量结果自然是基本恒定不变的常数。

如果想要测量出真实的、不同运动状态光源产生的光的真实速度，使用干涉仪法和空腔法等间接测量方法显然是不可能的，必须使用基线法才有可能。同时，如果想测量运动光源产生的光的速度，就得用基线法测量在真空中运动的光源产生的光的速度。这在地球表面上显然难度极大。只有利用两颗互相通视的地球同步卫星在太空中去测量太阳等天体产生的光的速度才有可能得到真实的、运动光源产生的光的真实速度。

51、偏振光的产生机理

利用 " 结论一 " 和 " 结论二 " 即可很好地解释：因为光，特别是可见光都是由原子和分子

在自身或外部力的作用下成为时变电偶极矩的电偶极子所产生的电场和磁场。当电偶极子之时变电偶极矩的方向固定不变时，其产生的电场和磁场在特定空间位置上的方向也是固定不变的。也就是说：偏振光是由定向排列的原子和分子形成的振动方向相对固定的时变电偶极子产生的、强度变化方向固定不变的电场和磁场。这就是偏振器能产生并检测偏振光的原因所在。

52、“玻色-爱因斯坦”凝聚态下光速仅十几米的原因

利用“结论二”和“结论三”即可很好地解释：因为所谓“玻色-爱因斯坦”凝聚态是指物质在接近绝对零度时物质所处的一种几乎无热运动的状态：原子和分子间几乎不存在相对运动，在一定的尺度范围内，这些原子和分子就像一个原子和分子一样。这些现象只是因为分子热运动接近停止时所现出的必然现象。当外部光照射在这类物质上时，原子中的电子与原子核仍然会朝相反的方向运动而形成原子被极化的现象。所谓凝聚态物质内部的折射光依然是由物质产生的次生光。只是由于在此状态下，入射光可同时极化的原子数量比非凝聚态时更多，入射光很快就会被次生光所抵消。同时，能继续使邻近原子被极化的次生光强度也十分微弱，导致物质内部的折射光比非凝聚态时衰减得更快。在此种情况下实测到的凝聚态物质内部的折射光速度应该是不真实的光速，而很可能是测量环境干涉导致的伪光速或群光速。

53、科顿-穆顿效应的机理

科顿-穆顿效应又称磁双折射效应。光在透明介质中传播时，若在垂直于光的传播方向上加一外磁场，则介质表现出单轴晶体的性质，光轴沿磁场方向，主折射率之差正比于磁感应强度的平方。此效应也称磁致双折射本效应，其与法拉第磁光效应类似，只是外加磁场的方向不是平行于折射光的传递方向，而是垂直于折射光的传递方向。

利用“结论二”即可很好地解释：因为介质内部的折射光是由介质中原子被入射光极化后产生的次生光。当存在外加磁场时，则外加磁场会使极化原子中的电子与原子核增加一个垂直于磁场方向的加速度并改变被极化原子偶极矩的方向。因此，由其产生的次生光与入射光会存在偏振方向和传递方向的变化。而那些被极化的原子中的电子和原子核的运动方向与外加磁场方向一致时，就不会受到外加磁场的影响，其产生的次生光的偏振方向和传递方向会保持不变。这样就导致介质出现二种偏振方向不同的次生光了。从而使透明介质具有了双折射性质。详见本人的《科顿-穆顿效应机理分析及其物理意义简述》(<https://www.toutiao.com/article/7031705671452148262/>)。

54、塞曼效应的机理

塞曼效应是指原子在外磁场中发光谱线发生分裂且偏振的现象。也就是外加磁场会使原子产生更多不同频率的特征谱线的偏振光。

利用“结论二”即可很好地解释：因为原子在外加磁场的作用下，围绕原子核运动的电子的运动轨道就会发生垂直于外加磁场方向围绕原子核运动的倾向，即电子的运动轨道平面趋向

一致，从而导致其所产生的光或次生光的振动方向会相近而出现偏振现象了。而电子围绕原子核并在垂直于外磁场平面内运动的方向有可能顺时针，也可能逆时针方向（不同运动方向的电子之运动速度会存在些许差异），还有部分电子在原有的、平行于外磁场方向平面内围绕原子核运动。它们围绕原子核的运动速度会存在一定差异，也就导致围绕原子核的运动频率也出现些许差异。因此，其产生的特征谱线就会出现分裂：原来一条特征谱线就会分裂成三条了。当原子核外部的电子数量较多时，离原子核距离不同轨道上的电子受到外加磁场的影响就会存在差异，从而导致特征谱线可能出现更多的分裂现象。也就是原子只有一条谱线，在外加磁场的作用下可能出现三条以上的谱线的现象。详见本人的《塞曼效应的机理及其物理意义》（<https://www.toutiao.com/article/7030957370633241102/>）。

55、磁光克尔效应的机理

将线偏振光（由左旋圆偏振光和右旋圆偏振光所组成）入射于磁性材料反射后，转为椭圆偏振光的现象，称为磁光克尔效应。

利用 " 结论二 " 即可很好地解释：因为反射光实质上是由反射界面上原子被入射光极化后产生的次生光的一部分。当两种偏振方向垂直的光同时照射在反射界面上时，原子会同时受到两个垂直方向的力而呈现两个方向的同时极化而产生两个方向的次生偏振光。由于介质存在磁性，在磁场的作用下，原子被两个方向的力极化的程度就会存在差异：平行磁场与垂直磁场方向的极化偶极矩就会不同，其产生的次生光强度自然就会不同。从而导致反射光是由两个强度不同的垂直次生偏振光叠加而成的椭圆偏振光了。详见本人的《磁光克尔效应的机理分析及其物理意义》（<https://www.toutiao.com/article/7032093068509659680/>）。

56、光镊的工作机理

光镊是采用以芯片为基础的光子共振捕获技术的光阱，能对纳米至微米级的粒子进行操纵和捕获。由激光聚集形成光阱，微小物体受光压而被束缚在光阱处，移动光束使微小物体随光阱移动，借此可在显微镜下对微小物体（如病毒、细菌以及细胞内的细胞器及细胞组分等）进行的移位或手术操作。[摘自百度百科]

利用 " 结论一 " 即可很好地解释：因为纳米至微米级的粒子（简称微粒）是非电中性的，当改变其所处环境的电场和磁场的强度与方向时，这些微粒就会改变运动状态并移动位置。并非所谓的光子或光压使微粒移动。当单束光照射在微粒表面时，微粒会因带电而受到光施加的库仑力和磁力的合力作用而位移。同时，微粒上的电荷也会随着外力的库仑力和磁力而重新分布。正是由于电荷随光产生的库仑力和磁力的合力的作用而重新分布，导致微粒无论在外加库仑力和磁力的合力方向是否发生改变时，其给微粒施加的合力的方向是保持不变的。从而促使微粒定向移动；当采用二束对称的相干光束照射微粒时，则两束光在微粒位置上形成的矢量叠加后的库仑力和磁力的合力的大小与方向是不随时间变化。就如双缝干涉实验中的干涉图像是

固定不变的一样。当微粒位于亮条纹处时，就会受到合力的作用朝暗条纹方向移动，直到所受到的合力为 0 为止。当调节某一束光的相位（光程）时，在微粒处所形成的矢量叠加电场（库仑力）和磁场（磁力）就会发生变化，从而导致带电微粒再次向暗条纹方向移动。因此，光镊的工作机理是：改变微粒所在位置上的电场和磁场（即库仑力和磁力的合力）的大小与方向，从而促使带电的微粒定向移动。详见论述请参见本人的《光镊的工作原理新解》（<https://www.toutiao.com/article/7122402150646514208/>）。

57、光能辐射计的工作原理及物理意义

当光照射在光能辐射计叶片上时，辐射计内的风车就会旋转，且旋转速度与照射光的强度成正比。但当把光能辐射计内部抽成真空时，则辐射计内的风车在光照射下也是不会旋转的。

利用 " 结论一 " 和 " 结论二 " 即可很好地解释：因为辐射计内的风车叶片是一面黑色，一面白色的。不同颜色的表面受到同样强度的光照射时，其表面的分子热运动速度上升的快慢程度是不同的。黑色表面升温更快，白色表面升温相对较慢。这是因为照射光在叶片表面上产生的库仑力和磁力使表面上的原子中的电子与原子核反向运动并产生的次生光强度不同：黑色的叶片产生的次生光更强，表明其平动动能更大，温度更高。由此，黑色叶片表面附近的气体分子会更容易被加热，对叶片表面产生的反作用力就越强。从而使风车由黑色叶片面向白色叶片面方向旋转。当辐射计内部为真空时，虽然在照射光作用下，黑色叶片表面比白色表面温度更高，但没有可被加热的气态物质，也就没有气体分子产生的反作用力了。风车自然就不能旋转了。

当光能辐射计内部为真空时，即使是在光照射叶片的情况下，风车也不会旋转的现象表明：光本身是没有动能和动量的，不能对被照射物体表面施工压力。也就是说：光压是不存在的。光也没有与其频率成正比的动能与动量。详见本人的《光能辐射计的工作原理及其物理意义简析》（<https://www.toutiao.com/article/7122742003586187791/>）。

58、太阳帆的可行性及机理分析

有人设想向太空中发射由特殊材料制作的帆，以期利用太阳光驱使其运动。这种基于光存在光压或光为具有与其频率成正比动能和动量的光子假设为基础的实验结果应该是不会成功的。除非是因为没有剔除太阳风作用的影响情况下，因太阳风所携带的各类粒子导致所谓的太阳帆被推动。

利用 " 结论一 " 和 " 结论二 " 即可很好地解释：因为在同一光束照射下，太阳帆表面的原子中的电子与原子核所受到的库仑力和磁力的合力的大小是相等但方向是相反的。因此，每个原子所受到的太阳光照射所产生的合力是等于 0 的。就像光能辐射计内部处于真空状态时，强照射光也不能使其内部的风车旋转一样。

60、布儒斯特定律的机理分析

布儒斯特定律是指自然光经电介质界面反射后，反射光为线偏振光所应满足的条件。该定律由英国物理学家 D. 布儒斯特于 1815 年发现，适用于物理光学和几何光学领域。当光以布儒斯特角入射时，反射光与折射光互相垂直。

利用 " 结论二 " 即可很好地解释：因为入射光为自然光，即圆偏振光。因此，当其照射到介质表面上的原子时，就会使原子中的电子和原子核反向改变运动状态从而被极化为垂直于入射光方向的圆极化电偶极矩（极化方向非线性）的电偶极子，当相邻原子被极化的圆极化电偶极子的相位有规律地变化时，其矢量叠加后的次生光（反射和折射光）的偏振方向就会与入射光不同，存在某些变化（某些方向加强，另一些方向削弱，就像相控阵雷达一样，单位发射单元发射的雷达波是无方向性的，而阵列发射的雷达波经矢量叠加后就具有了方向性）。当相邻原子被极化的圆极化电偶极子的相位差符合一定条件时，就会使矢量叠加得到的反射或折射光的偏振方向为线偏振光了。这就是布儒斯特定律的内在机理。

60、相控阵雷达的工作原理及其物理意义

相控阵雷达又称作相位阵列雷达，是一种以改变雷达波相位来改变波束方向的雷达，因为是以电子方式控制波束而非传统的机械转动天线面方式，故又称电子扫描雷达。相控阵雷达有相当密集的天线阵列，在传统雷达天线面的面积上安装上千个相控阵天线，任何一个天线都可收发雷达波，而相邻的数个天线即具有一个雷达的功能。

利用 " 结论一 " 即可很好地解释：因为相控阵雷达中的每个发射单位就是一个具有相同电荷量变化单元发生器，其产生的电荷量可独立与其他带电粒子间形成库仑力和磁力相互作用。当一排或一个阵列的发射单位同时或异步改变其电荷量时，该阵列就会在各个方向不同距离上形成库仑力和磁力的矢量叠加。因不同方向上的相邻发射单元的相位差不同，其叠加后的结果就呈现出方向性：有的方向上库仑力和磁力得到加强，有的方向上则相互抵消而消失。这就是所谓的改变波束方向的机理，也是相控阵雷达的工作原理。详见《图解光源中电荷运动状态组合方式与光传递现象的内在规律》（<https://www.toutiao.com/article/7130614560494895629/>）。

相控阵雷达工作原理的物理意义：它很好地诠释了电磁波（实际上是不存在由变化的电场与磁场相互激励而形成的电磁波的，只有由电荷的位置或数量变化而导致的变化的库仑力和磁力）和光的传递具有方向性的内在原因。也是点源为球面辐射、同步线源是柱面辐射、同步平面源是定向辐射的内在机理。也是所谓的电磁波和光走直线的原因所在。

61、天空为什么是深蓝色的？

利用 " 结论二 " 即可很好地解释：因为人眼看到的任何颜色都是正在以可见光波段内的某些频率段的频率振动的光源或次生光源（介质）中的带电粒子群体。实际上是这些带电粒子群体与人眼视网膜上的相应带电粒子间产生的库仑力和磁力相互作用，使得视网膜上的带电粒子改变运动状态并给大脑发送相应的信息，从而产生了视觉效应的。而天空中的某些气态物质（如

臭氧层中的原子和分子)在太阳光和地球表面反射光的共同作用下,其产生的次生光的频率段正好为深蓝色波段,从而人们看到的天空就是深蓝色的了。总之,人们看到的蓝色天空并不是光本身,而是正在发光的某些物质群体。当发光体中的带电粒子的振动频率(主频)不同时,看到它们时的颜色自然就不同了。详见本人的《蓝天和蓝色地球自然现象是鉴别光与介质相互作用规律真伪的试金石》(<https://www.toutiao.com/article/7195923614791860768/>)。

62、丁达尔效应的机理分析

利用"结论二"即可很好地解释:因为人眼或摄像设备看到和记录到的并非光本身,而是物体表面正在以可见光波段的频率振动的带电粒子群体,且任意特定时刻时,特定方向不同距离上的众多发光物质中的最强发光体(对人眼视网膜或摄像设备感光体施加的库仑力和磁力最大者)才能被看到和记录到。因此,当太阳光或手电光较强时,就能看到大气层内的灰尘、水滴、冰晶等小颗粒产生的次生光了。这类次生光是在各个方位上都能被看到的。因此,不能简单地认为次生光只是反射光或折射光或散射光。这也再次从一个侧面证明:光本身并不能被直接看到,在没有介质的真空中即使是存在光也是不能被看到的,能看到的只是正在发光的带电粒子群体效应:被看到的物体表面带电粒子群体对人眼视网膜或摄像设备中的感光材料施加的库仑力和磁力的综合效应。

63、高海拔比低海拔地区日落后天黑的更快的原因是什么?

问题:在海拔数千米的高原上,太阳一下山后十来分钟内天就很快漆黑一片了,而在低海拔的平原上一般要半个小时以上天才会慢慢地黑下来。

利用"结论二"即可很好地解释:因为高海拔地区的大气层内的杂质一般含量很少,当晴空万里无云时,因空气中没有可产生散射光(实际上散射光是介质产生的次生光的一部分)的物质而不能将仍然被太阳光照射的大气层部分的光散射到已无直射阳光的地方而照亮地面。而低海拔的平原地区一般空气中的杂质含量相对较高,时常有密度不同的云层,会因丁达尔效应(实际上是不均匀介质产生的次生散射光)而使太阳光散射到已无太阳光直射的区域。另一方面,由于高海拔地区的大气层总厚度相对低海拔地区薄一些,在太阳下山后,大气层被太阳光照射的延续时间就会短一些。能产生次生光照亮地面的时间自然也会短一些。这两个因素是高原比平原日落后天黑得更快的主要原因。

64、太空中到处漆黑一片的原因是什么?

利用"结论二"即可很好地解释:因为人类能看到的并不是光本身,而是正在以可见光频率振动的带电粒子群体→发光体。太空中几乎没有介质,也就没有了次生光源或发光体。所以太阳光并不能把太空照亮,只能使带电粒子以某些频率振动,当没有带电粒子存在时,自然就没有可视的对象,太空也就自然只能是漆黑一片。

66、为什么一戴墨镜光线就暗了呢?

利用 " 结论二 " 即可很好地解释: 因为戴墨镜后所看到的景象是由景象表面正在以可见光频率振动的带电粒子群体与墨镜上的带电粒子群体相互作用后形成的次生光 (库仑力和磁力) 与人眼视网膜上的带电粒子群体间存在的库仑力与磁力相互作用, 这种相互作用与不戴墨镜前的相互作用肯定是不同的, 一方面相互作用力的强度 (振幅) 不同, 所以明暗度降低了, 即变暗了。同时, 景象的视象的大小和视距离也会发生些许变化, 特别是墨镜的焦距为有限 (焦距非无限的平光镜) 的情况下。这也是眼镜有平光、近视与老花镜的原因所在。

66、海水是蓝的, 湖水是绿的原因是什么?

利用 " 结论二 " 即可很好地解释: 因为无论是海水的蓝色、湖水的绿色, 甚至是天空的深蓝色都是人眼看到的发光体中的带电粒子在以某种可见光频率振动的景象。因为人眼看到的任何颜色都是正在以可见光波段内的某些频率段的频率振动的光源或次生光源 (介质) 中的带电粒子群体。实际上是这些带电粒子群体与人眼视网膜上的相应带电粒子间产生的库仑力和磁力相互作用, 使得视网膜上的带电粒子改变运动状态并给大脑发送相应的信息, 从而产生了视觉效应的。而海水和湖水中的某些深度的水分子在太阳光、地球表面或天空中的反射光的共同作用下, 其产生的次生光的频率段正好为蓝色和绿色波段, 从而人们看到的海水是深蓝色、湖水是翠绿色的。总之, 人们看到的蓝色的海水和绿色的湖水并不是光本身, 而是正在发光的水分子群体。当发光体中的带电粒子的振动频率 (主频) 不同时, 看到它们时的颜色自然就不同。

67、同为碳原子组成的石墨与金刚石的光学性能天差地别的原因是什么?

利用 " 结论二 " 即可很好地解释: 因为石墨或金刚石所产生的反射、散射、折射、透射等光都是由其原子在入射光作用下产生的次生光的矢量叠加结果。而石墨与金刚石内部的碳原子排列方式和空间位置不同, 各个碳原子所产生的次生光在不同空间位置上的相位肯定不同, 其矢量叠加结果自然不同。石墨为层状结构, 不同层产生的次生光相互抵消而导致反射、散射和折射光强度很弱。而金刚石的梅花状结构则不然。从而导致两者的光学性能存在巨大差异。

68、通常 X 射线的折射率略小于 1, 与 1 的差值随波长不同在 10^{-3} 到 10^{-6} 之间变化。即介质内部的 X 射线速度略大于光速 C, 其机理及物理意义是什么?

利用 " 结论二和三 " 即可很好地解释: 因为 X 射线频率远高于电子绕原子核运动频率, 约高 2^5 个数量级, 因此, X 射线一个周期内能改变电子和原子核运动状态的能力很弱, 其导致原子成为电偶极子的电偶极矩也很小, 所产生的次生 X 射线强度自然也很小, 这就导致次生 X 射线不能在短距离上将入射 X 射线全部抵消掉。所以, X 射线能穿透金属等介质较长的距离 (厚度)。通常情况下, 透射 X 射线中以入射 X 射线为主, 次生 X 射线为辅, 为两者的叠加产物。超过入射 X 射线速度的部分为次生 X 射线, 因入射 X 射线使原子获得了一个与其相同方向的附加运动速度, 其产生的次生 X 射线在介质内部的传递速度就会比入射 X 射线稍快一些。这就是介质内部的 X 射线速度稍大于入射 X 射线的原因所在。其物理意义就是: 运动光源/电磁辐射源

产生的光/电磁辐射的速度仅相对于产生它的源速度不变，光速不变假设不攻自破。

70、三原色光的本质因素：用红、绿和蓝三色光即可组合成七色光：红色、黄色（=红色+绿色）、绿色、青色（=绿色+蓝色）、蓝色、亮紫色（=红色+蓝色）、白色（红色+绿色+蓝色）

利用 " 结论二 " 即可很好地解释：因为人眼视网膜上有三种光敏细胞，每一种细胞对不同频率的光（变化的库仑力和磁力）的响应能力不同，一种对红光的响应最好、一种对绿光的响应最好、一种对蓝光的响应最好。同时它们对其它频率的光也会响应，只是响应程度不同而已。当红、绿和蓝光的强度不同时就可以组合成不同的颜色视觉效果。另一方面，如果发光体中的带电粒子以非三原色（红、绿和蓝）光的频率振动时，视网膜上的三种光敏细胞也会受到其产生的库仑力和磁力作用而发生视觉效应，只是每种细胞的响应程度不同而组合成不同的颜色视觉效果。实际上，可组合出来的颜色远不止七种，应该是无数多种。因为可见光的频率是连续的，有无穷多个频率，也就有无穷多种颜色。因此，人眼并非只能看到三原色光（正在以三原色光频率振动的带电粒子群体）。只要是可见光频率范围内的发光体都能与人眼视网膜上的三种感光细胞产生库仑力和磁力相互作用而产生相应的视觉效果。

70、人类从未见过光本身，见到的都是正在以可见光频率振动的带电粒子群体→发光体

利用 " 结论一 " 和 " 结论二 " 即可很好地解释：因为所谓的光只是电荷之间才存在的库仑力和磁力相互作用，并非可以脱离光源/电荷而独立存在的客体或电磁波和光子，当然更不可能具有波粒二相性了。因此，人眼能看到的只能是正在以可见光频率振动的带电粒子群体→发光体：发光体中的带电粒子与人眼视网膜上的带电粒子间产生库仑力和磁力相互作用。正是这种相互作用使视网膜上的视觉细胞产生相应的电磁信号传递到大脑视觉神经后才产生了视觉效果。否则，如果人类能直接看到或用仪器设备观测到光本身，也就知道光到底是什么了，也就不会有数百年的光的波粒之争了。

71、为什么地球上的人看到的天空是蓝色的、太空人看到的地球也是蓝色的？

按照天空颜色为地面反射的太阳蓝色光被天空中的大气层反射回地面的说法，太空人不应该看到蓝色地球，而应该看到橙色地球才对。这到底是为什么呢？

利用 " 结论一和结论二 " 即可很好地解释：因为地面和太空人看到的都是太阳直射光和地面反射的太阳光共同使大气层内的臭氧层和电离层等产生的次生光。因该次生光正好是蓝色波段的强度大于其他波段，所以人们看到的是同一光源/次生光源产生的光，其颜色自然相同。详见本人的《蓝天和蓝色地球自然现象是鉴别光与介质相互作用规律真伪的试金石》（<https://www.toutiao.com/article/7195923614791860768/>）。

72、塞曼效应中的外加磁场与四个量子数具有类似功能的本质因素是什么？

利用 " 结论一 " 即可很好地解释：因为所谓的原子线性光谱只是由绕原子核高速运动的电子（群）和原子核组成的复合体（以下简称为“复合体”）在突然失去全部或个别电子时，由

原子核或剩余电子与原子核组成的离子产生的电磁辐射。由于复合体中的电子和原子核都是以一定的频率绕共同质心作圆周运动的，当电子脱离原子核束缚期间（很短时间段内），原子核会仍然以原来的运动方式继续绕质心作固定频率的圆周运动并产生同频率的电磁辐射，即所谓的原子线性光谱。

当对复合体施加一个恒定磁场时，由于外加磁场会改变运动电荷的运动状态，从而会使复合体中的电子与原子核绕共同质心的运动频率出现如下三种可能变化：

一是电子与原子核的运动方向与外加磁场方向间的夹角为大于 0 并小于 180 度时，其频率会降低（外加磁场施加了阻力）；二是夹角为 0 或 180 度时，其频率不变（外加磁场不施加力）；三是夹角为大于 180 并小于 360 度时，其频率升高（外加磁场施加了动力）。因此，原来相同频率的复合体就变成了三种不同频率的复合体，它们各自产生的电磁辐射频率就会不同。这就是原子在外加恒定磁场作用下，原子线性光谱中的一条谱线可分裂成三条甚至更多条光谱线的原因所在。同时，随着外加恒定磁场强度的升高，新增的二条线性光谱线与原谱线的频率差异也会随之上升的现象也充分证明：外加磁场是通过改变原子中的电子与原子核绕共同质心运动频率来分裂谱线的。同时，说明四个量子数只是描述原子中的电子与原子核绕共同质心运动频率的物理量而已。

由此可见，塞曼效应中的外加恒定磁场与四个量子数具有相似功能的本质因素都是通过改变原子复合体中的电子与原子核绕共同质心运动频率来实现原子线性光谱线变化的。

73、决定介电常数的本质因素及其物理意义

利用 " 结论一 " 和 " 结论二 " 即可很好地解释：因为在外加恒定电场作用下，介质中的原子中的电子与原子核因所携带的电荷相左而成为电偶极子或原子最外层的电子在外加恒定电场的作用下成为自由电子并聚集在介质表面，而失去电子的离子会聚集在介质另一面，从而形成电偶。由于介质表面聚集的电荷的数量/密度仅与介质的性质和外加恒定电场的强度有关，与介质的厚度无关。因此所谓的介电常数并非真的常数，而是与厚度无关的物理量。同时，当外加电场为非恒定时，其值也会随外加电场的频率迅速降低。所以，称其为常数并不符合客观事实。详见本人的《介电常数的本质及其物理意义简析》（<https://www.toutiao.com/article/7201512128183140920/>）。

74、拉曼散射的机理分析及物理意义

利用 " 结论一 " 和 " 结论二 " 即可很好地解释：因为介质中的原子和分子及分子团的自振频率不同，而原子中的电子与原子核响应外加变化电场与磁场（入射光）的能力相对更强些，而原子、分子和分子团则不然。所以在同一入射光作用下，同一介质中的原子中的电子与原子核的异步运动所产生的次生光的频率与入射光基本相同，这就是所谓的瑞利散射；而由原子、分子和分子团整体性异步运动产生的次生光的频率更接近其自振频率，这就是所谓的拉曼散

射，所以拉曼散射的频率与入射光频率各异。同时因分子与原子在外加电场和磁场的作用下改变状态的幅度远小于原子中的电子与原子核，所以才有拉曼散射的强度远小于瑞利散射。

拉曼散射的物理意义主要是证明光与介质的相互作用是入射光使介质成为次生光源并产生相应的次生光。详见本人的《拉曼散射的本质及其物理意义简析》(<https://www.toutiao.com/article/7205132335967568384/>)。

75、夜明珠发光的机理是什么？

利用“结论一”即可很好地解释：因为无论是夜明珠还是其他物质都是由不同的原子组成的分子构成的，而原子是由电子与原子核构成的。当原子核与电子绕质心运动不同步或偏心时就会产生电磁辐射，即不同频率的光（可见和不可见光）。一般物质在常温下也产生电磁辐射，只是其主频较低，不在可见光范围内而通常认为其是不发光的。而实际上也存在一定强度的可见光波段的电磁辐射，只是人眼没办法看见而已。而有些由某些特殊的原子和分子构成的物质所产生的可见光波段的电磁辐射会相对较强，在特殊环境（较暗的环境）下人眼可以看见。还有些含有少量放射性元素的物质会在放射物质作用下产生可见光。这些都是所谓的夜明珠发光的原因。

76、位于阳光下的太空人为什么看到其周围是漆黑一团？

利用“结论一”和“结论二”即可很好地解释：因为只有正在以可见光频率振动的带电粒子群体才能与人眼视网膜中的带电粒子产生库仑力和磁力相互作用并被看见。而太空中几乎没有带电粒子，虽然有太阳光照射，但也没有可供人类看见的发光体。所以，只能是漆黑一团。

三、总结

通过对数十个与光有关的物理现象与实验结果的系统性分析得出的三个与光的本质、光与介质相互作用规律、光速的本质及决定光速的主因的结论，再用此三个结论对多达 76 个与光有关的物理现象与实验结果的检验与实践，发现其结果全部自洽，无一例。这一结果充分证明：本人总结的三个与光有关的结论是符合客观事实的。希望有兴趣的朋友们能进一步拓展检验与实践范围，使其更加可信和实用。

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