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Article

Hypothesis about Natural and Artificial Creation of Globular Rays

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Simple Summary: The central idea of this article is to present - with evidence based on observations and computer simulations - a hypothesis that can solve the long-standing question of how ball lightning, also known as globe lightning, electric sphere, among other names, arises. Different ideas that may be of great utility for understanding this phenomenon and the possibility of replicating it will be added to the article.

Abstract: The central of this article is to present a hypothesis that can solve the long-standing question of how ball lightning arises.

Keywords: Ball lightning; rays; electricity; energy

Introduction

Electricity is a highly debated topic around the world and has been for centuries. Humans, through various methods such as religion, have tried to provide answers. The Greeks believed in a god, Zeus (Ζεύς), whose story related to lightning goes as follows: after Zeus freed Cronos' brothers, he released the Hecatoncheires and the Cyclopes[2] from their dungeon in Tartarus and killed their guardian, Campe. As a show of gratitude, the Cyclopes[1] gave him the thunderbolt, lightning, or flash of lightning, which had been previously hidden by Gea. In Norse mythology, the son of Odin and Frigg, Thor, was the god of thunder and lightning and the champion of the human race of Midgard, which he defended from all the evils that populated the Nine Realms. As evidenced, humans have always sought answers. When they began to seek them through the scientific realm, they realized how little they knew. Nowadays, there are many institutions that focus on the study of electricity in a scientific manner, such as the Tesla Foundation. It is an institution dedicated to the study, research, and dissemination of electricity, inspired by the genius Nikola Tesla. This foundation has made significant advances in the field of electrical energy, standing out for its contributions to wireless energy transmission technology and the development of renewable energy systems. Among the achievements of the Tesla Foundation is the creation of innovative devices for efficient and sustainable energy transmission, as well as the organization of conferences and events to promote awareness of responsible electricity use. Furthermore, the foundation has collaborated with universities and research centers on projects related to electricity and energy, fostering scientific collaboration and knowledge exchange in this field. Many things that we consider correct or incorrect today may no longer be so in the future. Therefore, the dissemination of various "discoveries" is always necessary for the acceptance or rejection of our reality. Criteria of the ball lightning. (Copied information) Ball lightning, also known as globe lightning, fireball, globe lightning, spherical lightning, or luminous sphere, refers to an unexplained and potentially dangerous atmospheric electrical phenomenon. The term refers to reports of luminous spherical objects ranging in size from a pea to several meters in diameter. Although it is generally associated with thunderstorms, the phenomenon lasts considerably longer than the fraction of a second of a lightning bolt. Two nineteenth-century reports say that the sphere eventually explodes, leaving a smell of sulfur. The actual existence of ball lightning phenomena is proven, but they appear in a variety of records throughout the centuries. Until the 1960s, most scientists were skeptical of reports of ball lightning,

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despite sightings worldwide. Laboratory experiments can produce effects that visually resemble reports of ball lightning, but how they relate to the natural phenomenon remains unclear. Scientists have proposed many hypotheses about ball lightning over the centuries. Scientific data on natural ball lightning remains scarce due to its infrequency and unpredictability. The presumption of its existence depends on reported public sightings, which have produced somewhat inconsistent findings. Due to inconsistencies and a lack of reliable data, the true nature of ball lightning remains unknown.

Analysis of the Phenomenon

For a long time, the phenomenon was considered a myth. Although the exact nature of it is still subject to speculation, it is accepted that it is not an invention or purely psychological phenomenon. More than 3000 eyewitness reports have been obtained, and it has been photographed several times. There is still no widely accepted explanation. Some difficult-to-explain characteristics are the longevity of its existence and the almost neutral floating in the air. It is possible that the energy powering the glow is generated by a slowly released chemical combination. Many attempts have been made to create ball lightning in laboratories, and some have resulted in superficially similar phenomena, but there is no convincing evidence that the natural phenomenon has been reproduced. A popular hypothesis posits that ball lightning is highly ionized plasma contained by self-generated magnetic fields. After detailed examination, this hypothesis does not seem to be sustainable. If the gas is reasonably ionized, and if it is also close to thermodynamic equilibrium, then it must be very hot. As its pressure must be in equilibrium with the surrounding air, it should be much lighter than air and thus rise rapidly. A magnetic field can help solve the problem of the cohesion of the plasma globe, but it would make it even lighter. Additionally, hot plasma, even combined with a magnetic field, would not survive the time that ball lightning lasts, due to recombination and thermal conduction. However, there may be special forms of plasma for which the above arguments do not fully apply. In particular, plasma may be composed of positive and negative ions, rather than positive ions and electrons. In that case, recombination can be quite slow, even at room temperature. One of these theories involves positively charged hydrogen and a mixture of negatively charged nitrites and nitrates. It has also been proposed, through the analysis of the luminous spectrum, that these ball lightnings would be produced from materials evaporated at high temperatures when a lightning bolt reaches the ground, with the light emitted by the ball lightning corresponding to the spectrum of the ground material. The model of a ball lightning based on nonlinear oscillations with spherical symmetry of charged particles in the plasma was developed. These oscillations were described using both classical and quantum approaches. It was found that the most intense plasma oscillations occur in the central regions of a ball lightning. It is suggested that bound states of charged particles, oscillating radially, with spins oriented in opposite directions - the analogue of Cooper pairs - may appear within a ball lightning. This phenomenon, in turn, can produce a superconducting phase in ball lightning. The idea of superconductivity in ball lightning was previously considered. The possibility of the existence of a ball lightning with a composite core was also discussed in this model.

References of Sightings by Individuals

On October 21, 1638, in Widecombe-in-the-Moor (a village in Devon, at the southwest end of England) the “Great Thunderstorm” occurred. It was the first documented case of a ball lightning. Russian explorer Vladimir Arséniev witnessed a similar phenomenon in Siberia in 1908, in his work “In the Mountains of the Sijoté-Alín.” There, he describes weather conditions of “total calm”: “It was a luminous ball the size of two fists and of a matte white color. It moved slowly through the air, adapting to the topography of the place. It descended where there were depressions and rose where the ground rose and where the bushes were taller. At the same time, it avoided contact with branches and grass and diligently navigated through branches, stems, and buds. When the ball reached the point where I was, no more than ten steps away from me, I could examine it closely. Its outer layer opened twice and I could see that inside there was a bright blue-white light. The leaves, grass, and branches near which the ball passed were dimly lit with its matte light and it appeared as if they were

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in motion. A small tail of fire hung behind the swift ball, as thin as a thread, releasing small sparks from time to time. I understood that I was facing a spherical lightning, with clear skies and total calm. Each of the plants must have carried the same electric charge as the ball. For this reason, there was never any contact between them." At different times, aviators from around the world reported sightings, especially during World War II. Due to the lack of knowledge about the phenomenon during that period, the pilots called them foo fighters. In the city of Rosario (Argentina) on February 25, 2012, a series of ball lightnings appeared in the courtyards of residential homes in the Alberdi neighborhood, north of the city. A witness experienced the explosion of one of them while in the kitchen of his home, resulting in his mother falling to the ground and several complaints to local newspapers from neighbors.

Own Observations

Given the limited knowledge about this phenomenon, it is said to be a kind of sphere, charged with electricity, which is highly dangerous. They originate when lightning strikes during stormy weather, remaining an enigma for the scientific community and society in general. The problem to address is how this phenomenon arises. To answer this, we must first gather known data for a better perspective.

1- It is a sphere, charged with electricity.

2- It can last a "long" period of milliseconds to around 9 or 10 seconds (depending on its energy).

3- This phenomenon can last for a certain time without interaction with the "bridge" of proton-electron that creates and maintains a lightning, until the air's insulating "power" breaks the tension. These are not many data, but by observing the behavior of an "ordinary" lightning, conclusions can be drawn. -Electric storm lightning, which are the lightning bolts that possess an interactive proton-electron "bridge," have a limited time, similar to ball lightning, but without the proton-electron interaction, they cannot be sustained. Therefore, if the "bridge" is "cut," the lightning disappears.

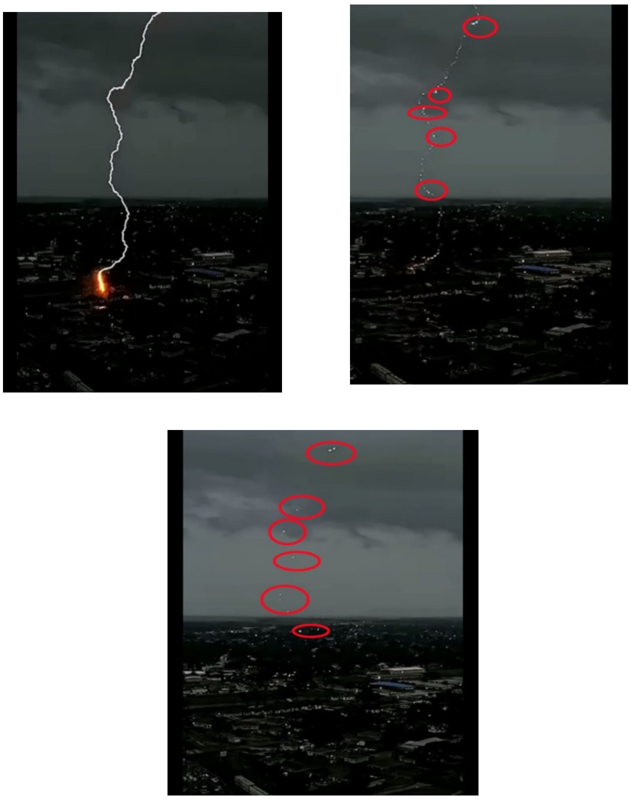

Figure 1. 2 y 3: The different irregularities in the beam are appreciated.

Specific response: The air in the atmosphere itself acts as an insulator for these charges [proton(+) and electron(-)], either in the clouds or between the clouds and the ground. However, when the

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opposite charges accumulate in the clouds enough, this insulating capacity of the air breaks, leading to an electrical discharge we know as lightning. In light of the above, there is an interesting fact about the behavior of lightning in the environment. When observed with the naked eye, it does not stand out much, making it necessary to observe it with a video camera. With this, it can be seen that at the moment the lightning is disappearing, there are some points (areas) of it that continue to glow moments after it has completely vanished.

The behavior of plasma is quite complex, but (guided by basic concepts of plasma physics), could we argue that containing greater luminosity in those areas compared to other points of the same lightning could be the result of an irregularity in the distribution of energy of the lightning due to the lightning; as higher luminosity (in this specific aspect, without considering the effects generated by light itself) would imply a larger size and temperature; since, in the case of plasma, if the electrons in this type of gas were to become even more excited, their temperature, size, and luminosity would increase considerably, and that would be what we would be seeing in lightning, an irregularity in the distribution of energy from the lightning itself? Could it be something else? Is it possible that two charges could collide by "luck," or rather, two branches of lightning could collide and create these characteristic points in the lightning as shown in black in Figure 4?

Figure 4. The different irregularities for later explanation are shown in red, and in black, a possible collision of ¨branches¨ or connections of the same beam is depicted, forming an increase in energy at the point of impact, causing the temperature, luminosity, and size of the same area to increase.

Well, to answer all these questions, we must conduct a more in-depth analysis. In order to better understand it, let's perform an experiment that, although it may not seem related, can help us better understand this phenomenon.

NOTE: The following thought experiment, like the ones that will follow, will be a very precise way to understand this phenomenon as well as my hypothesis. These "experiments" are not intended to verify this phenomenon; they are merely a closely related explanation of this phenomenon, but they are not part of its verification. They are simply a method to be used for better understanding. Let's imagine two containers (A) and (B), with container (A) containing water. Inside container (B), there are irregularities that represent the "zigzag" behavior in this mental experiment.

Have to pour the water from container (A) into container (B), but not from a corner, but in a particular way. Let's imagine that container (A) is a glass with straight edges, not like the usual circular glasses. But we pour the water from the longest side, so that when it falls, it does so as if it were a "waterfall". Similarly, we pour the water differently, not from one side, but from the center of container (B). What will happen when the water is falling through the center of container (B)? Well, what will happen is that, as the liquid is falling, with these "lines" interfering with its path, sometimes the water will end up in the concentrated areas of the lines, preventing most of the water from reaching the bottom. The relationship between this thought experiment and the explanation of "irregularities" in lightning is that, in this case, the water would represent the distribution of electric charges, produced by the transition of the air from dielectric to conductor. Container (B) is the lightning itself, and the lines inside it are the spaces where there is a certain type of irregularity. And finally, the "water" concentrated in the lateral points due to the irregularities is the difference in

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electrical energy that exists in lightning, causing some parts of the lightning to have more energy than others (it should also be clarified that these irregularities may be due in part to an accumulation of charges by the lightning in its different zones). All of this is very speculative and unlikely, and one could argue that the relationship made between the proposed thought experiment and the behavior of ball lightning is nonexistent and absurd. However, as I mentioned earlier, this would be a way to "summarize" some of my ideas and explain them as best as possible for a better understanding. That being said, let's go to the true explanations. As previously stated, this "irregularity" of electrical energy in lightning, and the points (zones) that are more resistant are the ones that "shine" the most (meaning that in the areas of lightning where a significant luminosity can be observed in comparison to the rest of the lightning, it is possible that the electrons are more excited than in other areas, which could cause the temperature, size, and of course energy in that specific point to have higher values compared to other areas of the same lightning, and therefore, when the interactive bridge of the lightning disappears, these points may resist a little longer compared to other zones due to the "elevated" factors mentioned earlier). The greater energy accumulated (with air resistance as a constant insulator) the longer that system's energy will last in the environment. However, at some point, that energy accumulated in that specific zone will dissipate due to the action of the air as an insulator.

One question that may arise from this is:

1- What if it's a matter of perspective?

Light can be concentrated at a point and that illuminated point may shine brighter if more and more light is focused on it. Well, it is possible to observe an "increase" in luminosity at a given point if it is "focused" on (for example), several flashlights at the same time, but there are many other photos and videos that show this unequal distribution of energy. Just as light interacts, this is further proof, explained as follows: a cold gas is composed of molecules, which in turn are formed by atoms; if the gas is heated, for example by light interaction (or the process mentioned in previous texts), the molecules will move faster and collide with each other more forcefully until they break apart, leaving dispersed atoms. These atoms and their electrons can, in this process, transform some of their energy into photons, which is why a hot gas glows. Therefore, if the temperature continues to increase, the atoms begin to agitate their electrons, forming a gas composed of free electrons (which emit photons) and ions (atoms with fewer electrons than protons), so where there is greater luminosity, there is higher temperature, and where there is higher temperature, there will be energy dependence; an irregularity of energy in the plasma due to ionization of the gas is possible, as its free electrons constantly deflect the paths of photons, gaining luminosity; it is the reason why we can see the plasma and its points of irregularity but not the air, which is a non-ionized gas (at least at room temperature). A doubt in this may arise, which is that the collision between two discharges occurs regularly, and not always are "electric balls" or rather, increases in factors in the ionized gas observed, such as temperature, energy (electrical to be precise), and size, as a result of electron excitation. Here, it is important to note that normally in an "artificial recreation" between two electric discharges "colliding", this effect is not observed for two reasons: it is very weak, and it is very small. Therefore, in lightning, this phenomenon is observed due to its high amount of energy. How could this increase in energy be produced? We could refer to the action of coincidences. Conceptual clarification: When an electric discharge occurs (an ordinary lightning bolt), the electrical energy is not evenly distributed in each zone of it, as some points of the bolt are more highlighted than others. Why is this? Response: For a particle interaction, a force is needed, an attracting force. The electric interaction force between two bodies with their respective charges, the distance between them, and the proportionality constant. This law (Coulomb's Law) tells us: "The greater the force, the greater the electric interaction (between two particles), and the greater the electric interaction, the greater the energy would be produced and needed." Let's consider the data. This law states that in a charge interaction, opposites attract and likes repel. Just as a strong interaction requires a force, for force it requires energy, which the lightning possesses adequately. For a better understanding, it is suggested to consider each of the above arguments as influencing factors in this interaction.

Factors

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- Force (F) [electric attraction]
- [?]

There is a property that acts as a double-edged sword for electrical interactions in the environment (mainly lightning discharges), and it is the ability of air to act as an insulator and at the same time as a conductor. Knowing that “Lightning has 2 polarities, positive and negative, which are distributed throughout all areas of it.” So, wouldn’t it be possible for particle interactions to occur within and/or connected to the lightning bolt? Having two poles, there is a possibility that an electrical interaction may “arise” But how?

Well, to get to the point, we have to start from another fundamental law of physics, “The Law of conservation of energy,” which tells us in simplified terms that energy is neither created nor destroyed, only transformed or transmitted, meaning that to increase energy in a specific point, zone, or system even momentarily, energy is crucial, as it is essential for its “energy endurance.” If we apply the aforementioned in the context being discussed, it tells us: “For an electrical interaction to occur, a force is needed, which in turn requires energy, which will be responsible for ‘creating’ that proportional and momentary increase in energy (electric) of the system. Factors: • F (electric attraction) • En (necessary energy) “Since there is a particle interaction (in this case of different poles), with a certain (F) and (En), an increase in the energy of an interactive point in a specific zone and at a specific moment can occur due to the interaction of opposite poles in the lightning bolt.” In fact, there is an electrical phenomenon that occurs in our homes with electrical outlets: short circuits. These occur when the ends or the metal parts of two cables of different polarity are connected, resulting in a momentary increase in energy in the contact area. The same situation applies. Two opposite charges (different poles), manifesting an electrical interaction (proton-electron), which requires necessary energy (provided by the power generator; in lightning, it is the same distribution of charges and the interactive bridge), that is transmitted by an electricity conductor (in lightning, the air). An increase in energy (electric) occurs in a specific area, which is momentary but powerful. Not to mention that ions in gases (ionized) move at high speeds. Therefore, we would be talking about a rare coincidence in the distribution of force and energy in the particular “collision” of particles for the “creation” of these specific irregularity zones in the energy distribution in and by the lightning bolt.

Data

Air:

- Eectrical insulator (At room temperature)
- Electrical conductor (When a very intense electric field is generated, the molecules surrounding the interactive bridge ionize, and at that point, the air loses its insulating capability and becomes an electrical conductor, but not indefinitely, since when the interactive bridge is “broken”, it regains its property as an electrical insulator).

It should be clarified that the aforementioned is not the explanation for ball lightning, (which could be better defined in Figure 5) but rather how points of greater irregularity could arise in the same lightning in order to recreate this energy distribution and possibly a ball lightning through artificial actions, that is, trying to recreate it. To do this, we need to locate these points of greater irregularity in the lightning and invent a device capable of significantly increasing the energy of the same point of irregularity at the exact moment of disappearance of the same ordinary lightning.

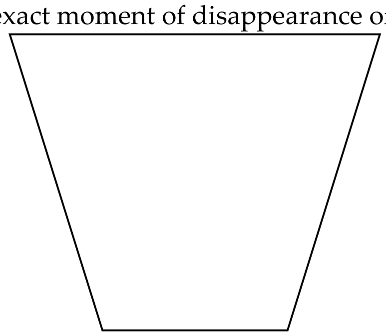

Figure 5. Conteiner (A).

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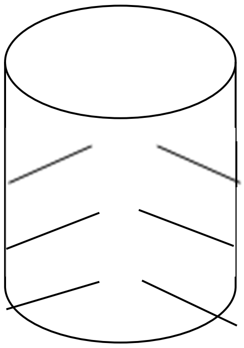

Figure 6. Contenier (B).

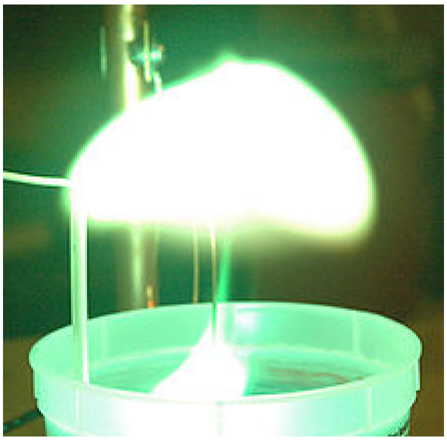

Figure 7. A small but not simple experiment is shown of what, from our perspective is a globular lightning, but in plasma physics it would not be so.

It is unlikely that such an experiment will occur, mainly due to the cost-benefit relationship or simply because it is represented as illogical. However, with the aim of exploring all possibilities, the following is expressed: To "create" a contained ball lightning, it is necessary, as mentioned, to have a device capable of controlling these points of higher energy. Why? How can it be done? In response to the first question, thanks to cameras that allow us to see them (in this case, lightning) in slow motion, it is observed that these points of irregularity fade very quickly as the lightning disappears and therefore, its energy supply decreases. But in many instances, in the second, third... n (produced discharges), they remain in the environment, for a short time but they do remain. This gives rise to thought. At the moment when one believes that there will be no more discharges, another one appears (an example), which carries more energy along the entire path of the lightning, and consequently, those "tiny" zones of higher energy (in comparison) receive the respective energy distribution. It is as if those zones that are apart from each other are connected by the following discharges. When they connect, they are no longer scattered in the air and remain very still. This could tell us that at that moment, in that energy increase, those places behave as if they were a kind of ball lightning, but it is concentrated, depending on the supplied energy. It will not be floating in the air, nor will it dissipate, but all of this will be possible if a constant and high supply of energy is maintained towards it. The second question is somewhat introduced in the first. The way to "trap" these irregularities and contain them between a discharge. It would be possible to achieve this with a device that either predicts where this energy increase will occur and concentrates it in that place, or artificially creates that energy increase in the lightning by supplying energy to a specific area of it. The "extraction" of that zone that the lightning itself had created is not very feasible, as it would require very concentrated reasoning in the search for these "points." The second option is not as far-fetched as one might think. It only requires a lightning strike, either naturally or artificially, and that energy be supplied to any point of it. If the second approach is chosen, like in the first, a device capable of constantly supplying energy in the lightning to increase the energy in that specific zone

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will be necessary. So that when the lightning disappears, that zone of higher energy concentration remains. However, it must be clarified that these discharges seen in photos have shown an increase in energy at a specific point through a direct collision (mostly), making it even more difficult to replicate. The procedure to be attempted is simpler than creating a machine of this type and achieving it in reality, but still, this will be the concept. Bringing the above to a more quantitative reasoning, it is emphasized that this situation is purely hypothetical. In relation to the above, an explanation of the interaction of the device used to increase the energy of that point and maintain it is presented, explaining the interaction between the two.

Data: In the following arguments, in representation of the previously mentioned procedure, (A) = point of higher energy in the lightning, (B) = energy used by the artifact.

The total energy of an electrical system can be calculated using the following equation:

$$E = 1/2 * C * V^2$$

Where E is the total energy, C is the capacity of the system, and V is the electrical potential.

Let's suppose we have two electrical discharges, (A) and (B), interacting with each other. If (A) has lower energy and electrical potential than B, we can say that:

$$EA < EB \quad VA < VB$$

During the interaction, part of the energy from (B) will be transferred to (A).

Let x be the amount of energy transferred from (B) to (A).

After the interaction, the energies will balance out and we will have:

$$EA + x = EB – x$$

We can solve for x from this equation:

$$2x = EB - EA \quad x = (EB - EA) / 2$$

Of course, the energy supplied from (B) by (A) will be less than what (B) has, but not necessarily greater than the energy that (A) already had. Now, let's consider the size of the impact point. If the discharges are considered as point charges, the distance between them can influence the size of the impact point. When the discharges collide, electrostatic interaction can cause a dispersion in the transferred energy, which can result in an increase in the size of the impact point. As for movement, this can be influenced by:

1. The force exerted between the charges. This force can be calculated using Coulomb's Law.
2. Force that accelerates the electrons.

$$1 = F = k * (q1 * q2) / r^2$$

If the charges are of opposite magnitude and sign, the force will be attractive and contribute to the movement of the discharges.

$$2 = F = qU/d$$

The electrons gain kinetic energy due to the work done on them by the electric field. Lastly, in terms of temperature, the energy transferred during the interaction can be converted into thermal energy due to the resistance of the medium in which the discharges are located. This thermal energy can increase the temperature of the impact point. In summary, using relevant physical equations, we can understand how the interaction between two electrical discharges with different energy and electrical potential can result in an increase in energy, size, movement, and temperature at the impact point, without interaction with other objects. [This also influences the moment of interaction of the discharge with the "waste" of higher energy concentration: increasing the energy, and with it increasing its size, brightness, and temperature (of the waste)].

Through different sightings of lightning and some physical concepts, the behavior of lightning can be further explained. For example, my opinion is that: "Lightning arises through a difference in charges of different signs, which are found in the clouds and on the ground. Lightning can occur with a ground-cloud interaction, cloud-cloud, or within the clouds themselves. When lightning appears, it is a wide range of connections through plasma with different discharges. These discharges at the moment the lightning is about to 'disappear' are the first affected areas." Lightning is nothing more than the union of plasmas side by side, as plasma is an excellent conductor of electricity, electrical discharges pass through each one. The concept of what lightning is can be applied by us to artificially

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create one, let me explain: It was said that lightning is composed of two parts that interact with each other. If one disappears, the other does too, meaning they are intrinsically related. By using the same concept, we can create our own lightning. Experiment: Let's place a one meter wide by ten meters long metal tube on a surface that prevents it from moving. Every one meter inside the tube, small holes about 0.50m wide will be made, reaching a total of 10. Tubes that fit perfectly will be inserted into these holes, sealing them afterward so that nothing enters or escapes. These tubes will be connected to individual containers containing ionized gas. A small hole will be made at one end of the main tube. This hole will serve to insert, through any available device useful in this case, to produce an electrical discharge. After everything is inserted, proceed to release the ionized gas, which will pass through the tubes until it reaches the main tube. At that moment, not a second more or less, the discharge occurs. That ionized gas (which has just entered and after it enters, the conduits were closed to prevent it from affecting the supplying chamber) serves as a current conductor, and as it is a current conductor, when the discharge occurs, the energy of this (depending on the quantity) will be delivered to the first 'bulge' of ionized gas from the first slit. Then this to the second, then this to the third, then this to the fourth, and so on until reaching the tenth, and since the last one has no successor, the distributed energy will be manipulated to maintain. If desired and there is sufficient energy, it can be increased, making the discharge stronger. Of course, two options (efficiency) are presented here: if the path of the ionized gas is very long, a lot of energy or different discharges will be needed, and if its path is short, then little will be needed.

Just as it happens in lightning, ionized gas transports energy to its successor, creating a chain that can take any form, from a star to a circle, depending on the placement of the ionized gas supply and the power and energy of the device producing the electrical discharge. Or you can also use two electrical discharges, preferably one with less energy than the other. They would be placed at the two ends of the main tube, and the process would be repeated. This time, the point of contact would be the collision point between the discharges. The one with higher energy and the device with greater power will transmit part of its energy to the one with less energy until both are balanced. The exact effect of lightning may not be achieved, but it will be similar. The tube can be made as large as desired, but it must be remembered that if the distance is increased, the supplied energy must also be increased, as well as the size of the holes where the gas enters and the quantity of the gas itself. It is observed that before the discharge occurs at one end of the lightning, there was no 'bridge' connecting the different places where the plasma accumulated, achieving energy transmission throughout the lightning. This leads me to think about the application of this for feedback, let me explain: The fundamental things for feedback are (in this case) a substance that can serve as a base and, in artificial cases, an instrument, in natural cases, an external agent such as the transmission of the substance and what conducts it (which contribute to this feedback). My hypothesis - now talking about the natural creation of ball lightning - starting from the above, is that in the center of ball lightning there may be a nucleus charged with electricity. This nucleus is compressed and, being charged with electricity, it will transmit that electricity to all parts of the ball lightning from the inside out. This energy is transmitted from the nucleus to the exterior. Ball lightning itself becomes small gas points interconnected by the action of electricity distributed by the nucleus, transmitting energy from one to another. Since the nucleus is plasma and the first 'bulge' to transmit, many others will be directly connected to it and establish a connection, transmitting electricity, and the cycle repeats until the energy is exhausted. Cycle The energy of the bulges located in the nucleus is transmitted through them to the others around them, reaching the outer limit and then through plasma bulges located throughout it. This transmitted energy, in this case, from the exterior to the interior, to the nucleus, establishing an energy-energy connection from the exterior to the interior until it dissipates in many ways, such as by size, speed, environment, temperature, among others. How would it be possible to compress the plasma? When an electric field appears due to the interaction of areas with energy irregularities, also influenced by the rising air currents, the plasma can be compressed.

Theoretical Simulation

Let's say that, at the moment the lightning appears, these zones in which a lot of energy is accumulated due to the concentrated amount of particles emerge. These zones, along with the air, create an electric field. This field helps when the plasma, which influences the inside of the ball lightning, is "compressed". When the plasma is compressed, it increases in temperature, density, and consequently in energy. By increasing in energy, it can withstand more time in the environment. Any ionized gas particle that is nearby (within its range) will be attracted towards the compressed and energy-filled gas. When the lightning disappears, a part of it will be startled, a bright ball, which has a compressed core due to the action of the electric field, filled with energy that is transmitted in all directions, gradually losing energy from the core. The "life" of the ball lightning decreases until it also disappears. This raises a question: if only at the moment when the electric field is applied to compress the gas, it will be compressed, and when the field is released, it will release that pressure and no longer be compressed, then how can that unstable, compressed core be maintained and "ready" to transmit that energy? Well, this can be explained by the action of electricity on the plasma. It has been observed that the plasma remains "still" during this interaction. This is because electricity circulates through it, transmitting it to the next bump and so on until the end of each ionized gas bump. So, when we talk about how ball lightning or globular lightning is created, we are talking about specific points of the lightning strike where additional electrical energy is "given" higher than other places, allowing these points to stay in the air longer than others. Therefore, to create a zone that can withstand the air's insulating force for longer, a high concentration of electrical energy is required, powerful enough to "withstand" the insulating force of the air (for an extra period). These "unformed globular lightning strikes" are small balls, each charged with a specific electrical energy, allowing them to exist longer than their "peers" against the air's insulating force. If these resistant zones need a specific amount of electrical energy to be created, then for the "creation" of a ball lightning with a specific energy, size, and width as seen in videos and photos, the lightning strike must distribute an electrical energy such that when it disappears, it can "withstand" the insulating force of the air (for a specific period). This all depends on the distribution of energy(e) throughout the lightning. The insulating force of the air has a "breaking" limit, which means that when a certain level is reached, this force "breaks," but because "nothing is eternal," over time, that energy cannot be maintained and yields to this force. This all depends on the distribution of electrons to a specific place. The natural occurrence of ball lightning is a bit confusing, but as mentioned, it is a matter of phases.

Why?

Well. Previously, the existence of phases in the creation of ball lightning was discussed. These phases are short, somewhat rapid, and very unique, but in theory, they should occur.

The phases (grouping the aforementioned and public knowledge) are:

1: Upward currents create an accumulation of electric charges.

2: This excess of electrons seeks balance, generating electrical discharges, which produce the lightning, in them, the ''plasma balls."

3: These (the balls) create an electric field interacting with air currents.

4: This field intervenes in increasing the density of the plasma, reducing its size (compressed).

5: This compressed plasma interacts with other plasma "bulges" around it.

6: It attracts positive and negative charges from different "bulges."

7: A "large" mass of plasma is created with a very dense and energy-filled core.

8: This core provides energy to all parts of the same plasma bulge.

9: This energy will be distributed less and less, due to its expenditure.

10: Finally, it can explode or simply dissipate.

Proposed Experiment 2

With the interest of verifying the aforementioned, the conduct of an experiment is proposed, following the principles of formation and maintenance of a ball lightning.

Experimental Design:

1. Set up a vacuum chamber that simulates the atmospheric conditions in which ball lightning forms, with the presence of ionized gas and a controlled electric field.

2. Place an electrically charged nucleus in the center of the vacuum chamber, simulating a possible compressed nucleus in ball lightning.

3. Generate an electric field that compresses the plasma around the nucleus of the phenomenon.

4. Observe the transmission of energy through interconnected points of the plasma, considering the hypothesis of a cycle of energy transmission exterior-interior. Variables to measure:

1. Observe the stability of the electrically charged nucleus and the duration of the phenomenon in the presence of the electric field.

2. Record the transmission of energy through interconnected gas points in the plasma and analyze how energy is maintained within the ball lightning.

Expected Results

1. If the experiment were to replicate the formation and maintenance of ball lightning, with the transmission of energy from a nucleus compressed by plasma compression, the hypothesis could be considered plausible in theoretical terms.
2. The observation of a cycle of energy transmission exterior-interior and the stability of the nucleus during the interaction could support this hypothesis.

Given the above, we can make the following reasoning: Ball lightning (natural) appears due to different coincidences in the distribution of energy within lightning strikes. When these irregularities occur, fields (with their specific power) compress the areas with a higher accumulation of ionized gas, with this compression increasing over time. The compression of the ionized gas by the powerful electric fields characteristic of lightning strikes creates a dense nucleus of ionized gas. This nucleus has high values in temperature, size, a high speed of its electrons, and therefore, a high concentration of energy. When this dense nucleus of ionized gas forms, different agglomerations or areas of irregularities nearby, and with the absence of the electric field due to the “disappearance” of the lightning strike, complement each other outside the nucleus. The dispersed ionized gas is not absorbed by the nucleus but could create an attraction to the same bulges or dispersed ionized gases, ultimately creating a ball of ionized gas with its specific nucleus and what would be considered the outer part, the ionized gas that is attracted by the electric attraction produced by the dense ionized gas nucleus, thus causing a feedback of the ionized gas in the nucleus with the ionized gas that would act in this case as the outer part of it. The nucleus transmits the energy to the exterior where the “trapped” ionized gas is, and this maintains that energy until it is depleted for different reasons, such as the low amount of stored energy, the existence of a “time limit,” the action of the air as an insulator, the influence of artificial devices, among others.

Conclusion

It is worth mentioning that the objective of this “research” is to try to find the correct definition of ball lightning, proposing different ideas that led to the formation of a hypothesis (highly debatable). In essence, this article has no other objective than the search for true knowledge, even if most of what is presented here is incorrect, the intention is to continue investigating more deeply.

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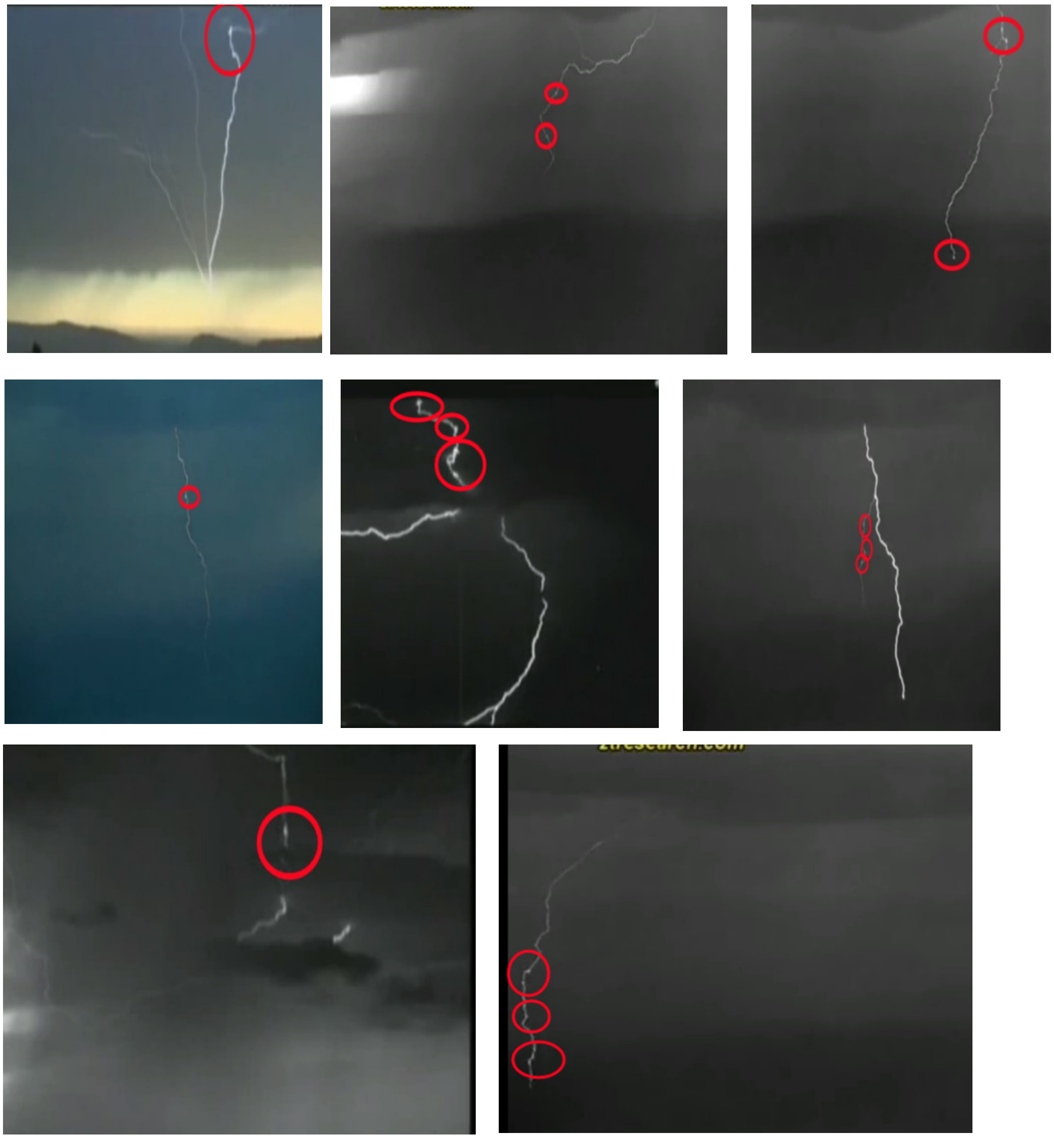
ANNEX



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