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God Particle H to Heaven Particle

Production and Decay of Higgs Boson

Highlights

Energy in Gravitational Fields

The Photon and the Principles of Matter

Discovering Thoughts, Inventing Future

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The Photon and the Principles of Matter

By Changming Wang

Abstract- Matter keeps its internal potential-energy (Ep) and sharing-energy (Es) as a (part of a) unity, until being forced out of the unity by external excess-energy (Ee >= Es) as a free particle. Matter shows its sharing-energy (Es) as gravity (F) or weight (W) or inertia-at-rest to its unity centre: Es = F = W. Unity force or inertia (Fu = Es + Ee) is matter's tendency to be unity, expressed as attracting while energy sharing in a unity (Ee = 0), as gravity or weight or inertia-at-rest to its unity centre; or repelling while excess-energy transferring out of the unity (Ee → 0), as inertia-in-motion or heat. That is, gravity is redefined as matter's attraction to its unity centre, caused by its sharing-energy. Inertia is redefined and generalised to matter's unity force, caused by its sharing-energy (as inertia-at-rest or gravity) and its excess-energy (as inertia-in-motion or heat). The Big Bang created four kinds of base particles: proton (p), electron (e), neutrino (ν), and photon (γ). The photon tends to be in an electron unity (eγ), oscillating around its electron (the unity centre), attracting while energy sharing. When getting external excess-energy (Ee >= Es), the photon oscillates out of the unity as a free photon (γ^+) with wave-particle duality, leaving the external energy at the speed of light, as a gamma ray, X-ray or light particle, repelling while excess-energy transferring.

Keywords: *photon, unity, unity force, nuclear fusion, beta decay, black hole, galaxy, electromagnetism.*

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The Photon and the Principles of Matter

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The Big Bang created four kinds of base particles: proton (p), electron (e), neutrino (ν), and photon (γ). The photon tends to be in an electron unity (eγ), oscillating around its electron (the unity centre), attracting while energy sharing. When getting external excess-energy (Ee >= Es), the photon oscillates out of the unity as a free photon (γ^+) with wave-particle duality, leaving the external energy at the speed of light, as a gamma ray, X-ray or light particle, repelling while excess-energy transferring. After transferring all its excess-energy, the photon shares energy with an electron that lost its photon previously, forming an electron unity (eγ) again. In a nuclear fusion centre, the base unities (pν and eγ) are so dense and hot that their sharing-energy is raised so high from their potential-energy (Ep → Es), they become energy sharing (nuclear fusing). Nuclear fusion is the unity force in action, creating nucleus unities so that every electron shares energy with two protons and one neutrino as n(^{2}pνe), where atomic number n >= 2. In a nucleus unity, neutrinos and electrons are energy-sharing agents, orbiting protons to share and distribute energy. Thus, unity force replaces strong force and quantum chromodynamics. The photon is not in an atomic nucleus, because in nuclear fusion, the photon oscillates away with excess-energy as the gamma ray (γ^+). Excess-energy transferring is an essential aspect of unity force, to maintain the newly produced unities, in nuclear fusion, beta decay, or any other reactions. In the universe, most nuclear fusion centres with excess-energy-transferring form stars and planets. The rest, extra-large fusion centres with inner cores unable to transfer out excess-energy as a repelling force, form black holes with much stronger attracting unity forces (gravities) of their respective galaxies. In a black hole, matter transfers its potential-energy completely into sharing-energy Ep → Es, so that Ep = 0, and sharing-energy becomes infinity: Es = Fu = F → ∞, making the black hole into a physical singularity. Every galaxy is a unity, the ultimate unity with its ultimate unity force, with at least one black hole as the unity centre. Unity force forms the hierarchical structure of each galaxy, making the black hole its unity centre. Under a galaxy, each star is the unity centre of the star system. Under a star system, each planet is the unity centre of its moons. Then, each atomic nucleus is the unity centre of the atom. Inside the nucleus, every proton is a unity centre. Outside the nucleus, each electron is the unity centre of the electron unity (eγ). Beta decay is also unity force in action: external energy breaks an unstable nucleus unity, leading to a more energy-sharing and hence more stable nucleus unity, while transferring out the excess-energy either as a neutrino and an electron (electron emission) or just as a neutrino (electron capture). Thus, unity force also replaces weak force. A "positron" is redefined as a high-energy electron. Matter's energy is scalar, not vector. Any "antimatter" is a misconception, including the concept of a "positively charged electron" and the idea of "annihilation". When a positron meets a normal electron unity (eγ), the excess-energy transfers from the positron to the bonded photon, producing a gamma ray or an X-ray, depending on the positron's excess-energy level. After transferring all its excess-energy, the positron becomes a normal electron. External electric forces can oscillate away the outermost electrons from the atom unities of a conductor, align and energise them as stronger electron waves with magnetic effects, and simultaneously cause them to flow along the potential difference as electric currents. Electricity is the synchronized repelling force of the electric currents, in which each electron transfers its excess-energy to an electrical device, or to its bonded photon causing light. Magnetic effects result from stronger electron waves aligning weaker electron waves. Electromagnetism is electron waves showing magnetic effects while transferring excess-energy as photon waves. So, electromagnetism is the unity force of free electrons and should be called electronism. Therefore, there are no such things as magnetism, magnetic fields, or magnetic waves. They are just electron fields with electron waves transferring excess-energy as photon waves.

Keywords: photon, unity, unity force, nuclear fusion, beta decay, black hole, galaxy, electromagnetism.

I. Introduction

In 1905, Albert Einstein first proposed that light, which had been considered electromagnetic waves, must also be particles. American chemist Gilbert Lewis later coined the term photon for the light particle. [1][2]

As one of the subatomic particles, having no electric charge and one unit of spin, photons are bosons that are carriers of electromagnetic energy. [1][2]

The energy of a photon depends on radiation frequency, from high-energy gamma-rays and X-rays, through visible light, to low-energy infrared and radio waves. All photons travel at the speed of light.[3]

But the photon has not been fully and correctly understood. For example:

1. Electromagnetism needs to be re-examined.
2. The idea of a positron annihilating an electron, producing gamma-rays, is disputable.

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3. The above statement that the energy of a photon depends on radiation frequency should be a reverse causation: the frequency of a photon depends on its energy.

More misconceptions (see later sections) have been prevalent since the photon's discovery. Therefore, the nature of the photon needs a more profound and distinct perspective, from the fundamental principles of matter and the origin of the photon, as follows.

II. The Principles of Matter – The Laws of Unity

Here are the Principles of Matter or the Laws of Unity, updated from my original version:[4][5][6][7]

1. *Matter* is any substance that has *mass* (m) and *energy*. Mass and energy are properties of matter, not physical entities. Matter's energy is scalar, not vector.
2. Matter shows its energy as *forces*. A *force* is a vector that transfers energy.
3. Matter keeps its internal *potential-energy* (Ep) and *sharing-energy* (Es) as a (part of a) *unity*, until being forced out of the unity by external *excess-energy* (Ee >= Es) as a *free particle* (see Figure 1: Matter).
   - 3.1. Matter shows its sharing-energy (Es) as *gravity* (F) or *weight* (W) or *inertia-at-rest* to its unity centre: Es = F = W.
   - 3.2. Matter does not show its potential-energy but transfers it between its sharing-energy and excess-energy (As shown in Figure 1: Matter). For example, when going up in an airplane, our weight is decreasing while our potential-energy is increasing (Es → Ep), while the plane's external excess-energy also increases our potential-energy (Ee → Ep). When going even higher in a spaceship, we become "weightless" (weighing less). When landing on the Moon or Earth, our potential-energy is decreasing while our weight is increasing (Ep → Es).

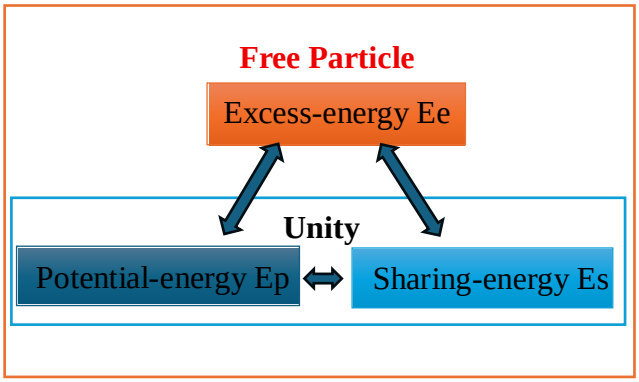

Figure 1: Matter

4. *Unity force* or *inertia* (Fu = Es + Ee) is matter's tendency to be unity, expressed as attracting while energy sharing in a unity (Ee = 0), as gravity or weight or *inertia-at-rest* to its unity centre; or repelling while excess-energy transferring out of the unity (Ee → 0), as *inertia-in-motion* or heat.
   - 4.1 A free particle oscillates away from the external excess-energy (Ee >= Es) as particle waves, transferring the excess-energy as heat or inertia-in-motion (Ee → 0) - such as light if the particle is almost massless (like a photon or a neutrino) or electron waves with magnetic effects if the particle is an electron - until returning or joining to a unity (Ee = 0).
   - 4.2 In the unity (Ee = 0), matter orbits or gravitates to its unity centre, attracting while energy sharing, like an electron orbiting an atomic nucleus or a planet orbiting a star. The orbit is the path where Ee = 0, leaving Es as the gravity (F) or weight (W) or inertia-at-rest to its unity centre: Fu = Es = F = W.
   - 4.3 Breaking a unity (or inertia-at-rest) requires strong enough external excess-energy (Ee >= Es), leading to inertia-in-motion and a new unity in the new situation (Ee → Ep or Ee → 0). The more energy is shared (Ep → Es, such as in a nuclear fusion), the tighter the formed unity (such as the produced nucleus unity), the more external excess-energy is required to break the unity, and vice versa (such as in beta decay).

In his first law of motion, Isaac Newton described inertia as the natural tendency of objects in motion to stay in motion and objects at rest to stay at rest, unless a force causes the velocity to change.[8]

As proposed above:

1. Gravity is redefined as matter's attraction to its unity centre, caused by its sharing-energy.
2. Inertia is redefined and generalised to matter's unity force, caused by its sharing-energy (as inertia-at-rest or gravity) and its excess-energy (as inertia-in-motion or heat).

So, the Principles of Matter or the Laws of Unity can be described by the unity force or inertia:

Fu = Es + Ee, where,

Es = F = W = mg, where m is the mass, g is the acceleration by gravity [8],
Ee = ma, where m is the mass, a is an acceleration by external force.

Therefore,

Fu = mg + ma = m(g + a), cycling through the following states:
a = 0 (in unity),
a >= g (out of unity),
a → 0 (return or join to unity).

III. The Origin of the Photon

According to the Big Bang model, the universe began 13.8 billion years ago by expanding from a single point of infinite density and heat, known as the singularity.[9]

As the universe expanded and cooled, matter formed, as four kinds of base particles: proton, electron, neutrino, and photon, in descending order of mass.[4][5][6][7]

Then, each free proton (p) shares energy with a free neutrino (ν) as a proton unity (pν) because their mass fit each other to be a unity:

$$p + \nu \rightarrow p\nu$$

Each free electron (e) shares energy with a free photon (γ) as an electron unity (eγ), also because their mass fit each other to be a unity:

$$e + \gamma \rightarrow e\gamma$$

Proton unities (pν) and electron unities (eγ) are called base unities.

The light could not propagate because each photon bonded with an electron as a unity. The base unities also made the universe opaque (Cosmic Dark Age).

So, I propose and summarise:

1. The Big Bang created the photon as one of the four base particles.
2. A photon tends to be in an electron unity (eγ), circling the electron as the unity centre.

IV. The Photon in Nuclear Fusion

In a nuclear fusion centre, the base unities have been so dense and hot that they have become more energy sharing (Ep → Es) and have begun nuclear fusion. That is, nuclear fusion is unity force in action, mainly through the proton-proton chain reaction[10], in the following simplified steps, updated from my original version:[4][5][6][7]

1. Two proton unities and two electron unities share energy to form a hydrogen-2 nucleus called deuterium, transferring out a high-energy neutrino (ν^+), a high-energy electron (e^+ or positron) and a high-energy photon (γ^+ or gamma ray) as excess-energy:

$$2\ p\nu + 2\ e\gamma \rightarrow {}^2p\nu e\gamma + \nu^+ + e^+ + \gamma^+$$

2. The deuterium ${}^2p\nu e\gamma$ shares energy with another proton unity to form a helium-3 nucleus, transferring another high-energy photon (γ^+ or gamma ray) as excess-energy:

$${}^2p\nu e\gamma + p\nu \rightarrow {}^3p^2\nu e + \gamma^+$$

3. Two helium-3 nuclei share energy to form one helium-4 nucleus and transfer two proton unities to continue the process:

$${}^3p^2\nu e + {}^3p^2\nu e \rightarrow {}^4p^2\nu^2 e + 2\ (p\nu)^+$$

4. The helium-4 nucleus, ${}^4p^2\nu^2 e = 2({}^2p\nu e)$, becomes repelling while transferring the excess-energy mentioned above and moves out of the fusion centre to the outer core as the nucleus unity, and the product of the fusion.
5. Or the helium-4 nucleus $2({}^2p\nu e)$ shares more energy with other nuclei or proton unities to form a heavier nucleus unity: $n({}^2p\nu e)$, where atomic number $n > 2$, if the situation permits.
6. Therefore, in a newly formed nucleus unity from nuclear fusion, every electron shares energy with two protons and one neutrino as $n({}^2p\nu e)$, where the atomic number $n >= 2$. Although isotopes happen, this is the main composition.
7. Most fusion centres transfer out their excess-energy as high-energy neutrinos, photons, and electrons:
   - 7.1. The high-energy neutrinos and photons (ν^+ and γ^+) carry their excess-energy away directly as light (invisible in the beginning due to high energy).
   - 7.2. The high-energy electrons (e^+) bump into outside normal electron unities (eγ), transferring the excess-energy to their bonded photons (no "annihilation"), producing gamma rays (γ^+) as light:

$$e^+ + e\gamma \rightarrow 2\ e + \gamma^+$$

8. The rest, extra-large fusion centres could not transfer out their excess-energy in the inner core but use it instead for energy sharing of tighter unities. Without repelling by excess-energy transferring, these extra-large fusion centres become black holes with much stronger attracting unity forces (gravities) of their respective galaxies.

So, I propose and summarise:

1. Nuclear fusion is the unity force in action, creating nucleus unities so that every electron shares energy with two protons and one neutrino as $n({}^2p\nu e)$, where atomic number $n >= 2$. In a nucleus unity, neutrinos and electrons are energy-sharing agents, orbiting protons to share and distribute energy. Thus, unity force replaces strong force[11] and quantum chromodynamics.[5][6][7]
2. In a nucleus, every pair of (pe) shows as a neutron.
3. A "positron" is redefined as a high-energy electron. Matter's energy is scalar, not vector. Any "antimatter" is a misconception, including the

concept of a "positively charged electron" and the idea of "annihilation".

4. Excess-energy transferring is an essential aspect of unity force, to maintain the newly produced unities. As an excess-energy-transferring agent (γ^+) in nuclear fusion, the photon is not in a nucleus.
5. In the universe, most nuclear fusion centres with excess-energy-transferring form stars and planets. The rest, extra-large fusion centres with inner cores unable to transfer out excess-energy as a repelling force, form black holes with much stronger attracting unity forces (gravities) of their respective galaxies.[6][7]
6. In a black hole, matter transfers its potential-energy completely into sharing-energy Ep → Es, so that Ep = 0, and sharing-energy becomes infinity: Es = Fu = F → ∞, making the black hole into a physical singularity.
7. Mass and energy are properties of matter, not physical entities, and not exchangeable, not even in nuclear fusion. The concept of mass-energy equivalence ($E = mc^2$)[12] is deemed a mis-conception.
8. Every galaxy is a unity, the ultimate unity with its ultimate unity force, with at least one black hole as the unity centre. If two or more black holes exist in one galaxy, they are close enough to attract each other and will eventually merge into one.[6][7]
9. Unity force or inertia (its sharing-energy Es showing as gravity) forms the hierarchical structure of each galaxy, making the black hole its unity centre. Under a galaxy, each star is the unity centre of the star system. Under a star system, each planet is the unity centre of its moons. Then, each atomic nucleus is the unity centre of the atom. Inside the nucleus, every proton is a unity centre. Outside the nucleus, each electron is the unity centre of the electron unity (eγ).[6][7]

V. The Photon in Atom Formation

Around 380,000 years after the Big Bang, out of the fusion centres in the disks of the star systems, the temperatures were eventually cool enough for the nuclei to capture electron unities (eγ), forming the first atoms and making the cosmos transparent:[5][6][7]

1. Absent from nuclear fusion, each free proton unity attracts and shares energy with an electron unity in its orbit, forming a hydrogen atom: (pν) + (eγ), producing most of the light elements in the universe.
2. Created in the fusion centres and moved out, each helium-4 nucleus shares energy with two electron unities in its orbit, forming a helium atom: $2(^2p\nu e) + 2(e\gamma)$, producing the rest of the light elements in the universe.
3. The heavier nuclei form atom unities the same way, with exact numbers of protons and electrons in an atom: $n(^2p\nu e) + n(e\gamma)$, where atomic number $n > 2$.

When getting excess-energy from the environment, like nearby fusion centres, the outermost electron unity (eγ) of an atom oscillates out of the atom, becoming a free electron unity again, and in turn transfers the excess-energy to its bonded photon, producing light:

$$(e\gamma)^+ \rightarrow e + \gamma^+$$

together with the light produced from nuclear fusion, bringing the dawn of the universe.[5][6][7]

So, I propose and summarise:

1. In atom formation, absent from nuclear fusion, each free proton unity (pν) shares energy with an electron unity (eγ) in its orbit, forming a hydrogen atom: (pν) + (eγ).
2. Created in fusion centres and moved out, those nuclei share energy with electron unities in their orbits, forming atom unities: $n(^2p\nu e) + n(e\gamma)$, with the same number of protons and electrons, but only half the number of photons and neutrinos. The other half of photons and neutrinos are transferred out as excess-energy in nuclear fusion, as free photons and neutrinos (visible and invisible light) in the universe.

VI. The Photon in Beta Decay

As stated in the section of Nuclear Fusion, the nuclei of helium and heavier atoms are created in nuclear fusion centres by every electron sharing energy with two protons and one neutrino as $n(^2p\nu e)$, where atomic number $n >= 2$.

In a nucleus, every (pe) shows as a neutron. In the following beta decay processes, electron emission breaks a neutron (pe) into p + e; while electron capture is a reversal: p + e → pe.

According to the Laws of Unity, breaking a unity requires strong enough external excess-energy (Ee >= Es), although some very unstable unities (with more potential-energy but less sharing-energy) can break easily, almost spontaneously.

In the case of beta decay, the external excess-energy mostly comes from random environmental sources (besides manually induced in nuclear fission), including cosmic rays, high-energy photons (gamma rays, X-rays), neutrinos or electrons. Most of the sources are nearly untraceable.

Beta decays happen in two types:

1. *Electron emission*[13]. The external excess-energy breaks free an electron and a neutrino shared with a proton, causing one less neutron and one more proton:

$$pe\nu \rightarrow p + e^{+} + \nu^{+}$$

The broken-free neutrino (ν^{+}) carries the excess-energy away as invisible light. The broken-free electron (e^{+} or positron) transfers the excess-energy to a normal electron unity ($e\gamma$), producing a gamma ray or X-ray (γ^{+}) depending on the energy level.

2. *Electron capture*[14]. The external excess-energy can also energise an electron in the orbit of an unstable nucleus. The energised orbiting electron can break the unity of its nucleus, forming a new unity with a proton, causing one less proton and one more neutron:

$$e^{+} + p\nu \rightarrow pe + \nu^{+}$$

transferring out a high-energy neutrino ν^{+} as excess-energy and invisible light.

So, I propose and summarise:

1. Beta decay is also unity force in action: external energy breaks an unstable nucleus unity, leading to a more energy-sharing and hence more stable nucleus unity, while transferring out the excess-energy either as a neutrino and an electron (electron emission) or just as a neutrino (electron capture). Thus, unity force also replaces weak force.[5][7][15]
2. In beta decays, as agents for excess-energy transfer (γ^{+} gamma ray or X-ray), photons maintain the newly produced unities.
3. In beta decays, electron emission breaks a neutron (pe) into p + e; while electron capture is a reversal: p + e → pe.
4. As stated before, the concept of a "positively charged electron" is a misconception. Beta decays should be categorised into electron emission and electron capture, instead of "negative or minus" and "positive or plus".
5. In beta decays (including nuclear fissions), the transferred energy comes from the potential-energy of the source nuclei, not from their mass. The excessive potential-energy stored in the source nuclei from nuclear fusion makes them unstable.

VII. The Photon as Gamma Ray and X-Ray

As stated in the above sections:

1. A gamma ray is a very-high-energy photon (γ^{+3}, +3 is used in this section to indicate higher energy than +2) transferred out from nuclear fusion:
   - Either directly as the photon (γ^{+3}),
   - or as a very-high-energy electron (e^{+3} or positron) that transfers its energy to a normal electron unity ($e\gamma$), also producing a very-high-energy photon (γ^{+3}):

$$e^{+3} + e\gamma \rightarrow 2\,e + \gamma^{+3}$$

2. An X-ray is a high-energy photon (γ^{+2}) produced from a high-energy electron (e^{+2} or positron) transferred out from beta decay and met a normal electron unity ($e\gamma$):

$$e^{+2} + e\gamma \rightarrow 2\,e + \gamma^{+2}$$

So, I propose and summarise:

1. When a positron meets a normal electron unity ($e\gamma$), the excess-energy transfers from the positron to the bonded photon, producing a gamma ray (γ^{+3}) or an X-ray (γ^{+2}), depending on the positron's excess-energy level. "Annihilation" is a misconception.
2. After transferring all its excess-energy, the positron becomes a normal electron (e).

VIII. The Photon in Electromagnetism

According to current knowledge, electromagnetism or electromagnetic radiation[16] is the flow of energy at the speed of light through space or a material medium in the electric and magnetic fields that make up electromagnetic waves such as radio waves, visible light, and gamma rays. In such a wave, electric and magnetic fields are mutually linked with each other at right angles and perpendicular to the direction of motion. An electromagnetic wave is characterised by its intensity and the frequency of the electric and magnetic fields. In quantum theory, electromagnetic radiation is the flow of photons through space.

According to the Principles of Matter, electromagnetic radiation is just electron waves transferring excess-energy as photon waves.[4][5]

In an electric field or a conductor, when electron unities ($e\gamma$) get excess-energy from an electric source that has a potential difference (voltage) for direction of motion, the energised electron unities $(e\gamma)^{+}$ oscillate away from the electric source as electron waves (the wave-particle duality) with magnetic effects (the wave property), perpendicular to the simultaneously caused electric current (the particle property), and in turn oscillating away their bonded photons as light (γ^{+}), at right angles to the electrons:

1. The electron unities $(e\gamma)^{+}$ oscillate away from their external energy (the electric source) as far away as possible, which is perpendicular to the direction of the simultaneous electric current.
2. The photons γ^{+} also oscillate away from their external energy (the electrons) as far away as possible, which is at right angles to the electrons. That is why the magnetic waves (photon waves actually) are at right angles to the electron waves.

So, I propose and summarise:

1. Without external forces:
   1.1. In most materials, most electrons are in atom unities; the rest, occasional free electrons,

make random waves that cancel each other out without magnetic effects.

1.2. In the rest materials, like iron, more free electrons can be aligned, showing some magnetic effects. A magnet has many more free electrons that are already aligned when created.

2. External electric forces can oscillate away those outermost electrons from the atom unities of a conductor, align and energise them as stronger electron waves with magnetic effects, and simultaneously cause them to flow along the potential difference as electric currents. Electricity is the synchronized repelling force of the electric currents, in which each electron transfers its excess-energy to an electrical device, or to its bonded photon causing light.[5]
3. Magnetic effects result from stronger electron waves aligning weaker electron waves. The aligned electron waves synchronise attractions and repulsions: while aligning is energy sharing, the aligned electrons all repel in the same direction, forming an electric current or potential difference. For example, a magnet or an electric source with stronger electron waves align and then attract small iron pieces with weaker electron waves.[5]
4. Electromagnetism is electron waves showing magnetic effects while transferring excess-energy as photon waves. So, electromagnetism is the unity force of free electrons and should be called electronism.[5]
5. Therefore, there are no such things as magnetism, magnetic fields, or magnetic waves. They are just electron fields with electron waves transferring excess-energy as photon waves.[5]

IX. The Photon as the Agent for Excess-Energy Transfer

When not bonded in an electron unity (eγ), as agents for excess-energy transfer, free photons (γ^+) are vitally important to the universe (as shown above), as well as to human beings.

We have used free photons (γ^+) as waves and particles in countless applications. One small example is the photovoltaic (PV) cells, also known as solar cells[17]. They are electronic devices that absorb and convert excess-energy from high-energy free photons (γ^+), producing electrical currents. These cells are the foundation of solar panels to generate electricity from sunlight.

1. *Light absorption:* The PV cells comprise materials that can absorb high-energy photons (γ^+) efficiently from the sun.
2. *High-energy electron generation:* The absorbed high-energy photons (γ^+) excite electron unities (eγ) within the material, oscillating them free as high-energy electron unities $(e\gamma)^+$:

$$\gamma^+ + e\gamma \rightarrow (e\gamma)^+ + \gamma$$

3. *Current flow:* These high-energy electron unities $(e\gamma)^+$ oscillate away to electrical contacts of the device, and flow through an external circuit, producing an electrical current.

This process of converting light into electricity is called the photovoltaic effect.[17]

X. Conclusion

1. Matter keeps its internal *potential-energy* (Ep) and *sharing-energy* (Es) as a (part of a) *unity*, until being forced out of the unity by external *excess-energy* (Ee >= Es) as a *free particle*.
2. Matter shows its sharing-energy (Es) as *gravity* (F) or *weight* (W) or *inertia-at-rest* to its unity centre:

$$Es = F = W.$$

3. *Unity force* or *inertia* (Fu = Es + Ee) is matter's tendency to be unity, expressed as attracting while energy sharing in a unity (Ee = 0), as gravity or weight or inertia-at-rest to its unity centre; or repelling while excess-energy transferring out of the unity (Ee → 0), as *inertia-in-motion* or heat.
4. That is, gravity is redefined as matter's attraction to its unity centre, caused by its sharing-energy.
5. Inertia is redefined and generalised to matter's unity force, caused by its sharing-energy (as inertia-at-rest or gravity) and its excess-energy (as inertia-in-motion or heat).
6. The Big Bang created four kinds of base particles: proton (p), electron (e), neutrino (ν), and photon (γ), in descending order of mass.
7. The photon tends to be in an electron unity (eγ), oscillating around its electron (the unity centre), attracting while energy sharing, as gravity (F) or weight (W) or inertia-at-rest. Its orbit is the equilibrium of its unity force Fu = Es = F = W.
8. When getting external excess-energy (Ee >= Es), the photon oscillates out of the unity as a free photon (γ^+) with wave-particle duality, leaving the external energy at the speed of light, as a gamma ray, X-ray or light particle, repelling while excess-energy transferring. After transferring all its excess-energy, the photon shares energy with an electron that lost its photon previously, forming an electron unity (eγ) again.
9. In a nuclear fusion centre, the base unities (pν and eγ) are so dense and hot that their sharing-energy is raised so high from their potential-energy (Ep → Es), they become energy sharing (nuclear fusing).
10. Nuclear fusion is the unity force in action, creating nucleus unities so that every electron shares energy with two protons and one neutrino as $n(^2p\nu e)$, where

atomic number n >= 2. In a nucleus unity, neutrinos and electrons are energy-sharing agents, orbiting protons to share and distribute energy. Thus, unity force replaces strong force and quantum chromodynamics.

11. The photon is not in an atomic nucleus, because in nuclear fusion, the photon is transferred out as excess-energy - the gamma ray (γ^+).
12. Excess-energy transferring is an essential aspect of unity force, to maintain the newly produced unities, in nuclear fusion, beta decay, or any other reactions.
13. In the universe, most nuclear fusion centres with excess-energy-transferring form stars and planets. The rest, extra-large fusion centres with inner cores unable to transfer out excess-energy as a repelling force, form black holes with much stronger attracting unity forces (gravities) of their respective galaxies.
14. In a black hole, matter transfers its potential-energy completely into sharing-energy Ep → Es, so that Ep = 0, and sharing-energy becomes infinity: Es = Fu = F → ∞, making the black hole into a physical singularity.
15. Mass and energy are properties of matter, not physical entities, and not exchangeable, not even in nuclear fusion or beta decay. The concept of mass-energy equivalence ($E = mc^2$) is deemed a misconception.
16. Every galaxy is a unity, the ultimate unity with its ultimate unity force, with at least one black hole as the unity centre. If two or more black holes exist in one galaxy, they are close enough to attract each other and will eventually merge into one.
17. Unity force (its sharing-energy Es showing as gravity) forms the hierarchical structure of each galaxy, making the black hole its unity centre. Under a galaxy, each star is the unity centre of the star system. Under a star system, each planet is the unity centre of its moons. Then, each atomic nucleus is the unity centre of the atom. Inside the nucleus, every proton is a unity centre. Outside the nucleus, each electron is the unity centre of the electron unity (eγ).
18. In atom formation, absent from nuclear fusion, each free proton unity (pν) shares energy with an electron unity (eγ) in its orbit, forming a hydrogen atom:

$$(p\nu) + (e\gamma).$$

19. Created in fusion centres and moved out, those nuclei share energy with electron unities in their orbits, forming atom unities: $n(^2p\nu e) + n(e\gamma)$, with the same number of protons and electrons, but only half the number of photons and neutrinos. The other half of photons and neutrinos are transferred out as excess-energy in nuclear fusion, as free photons and neutrinos (visible and invisible light) in the universe.
20. Beta decay is also unity force in action: external energy breaks an unstable nucleus unity, leading to a more energy-sharing and hence more stable nucleus unity, while transferring out the excess-energy either as a neutrino and an electron (electron emission) or just as a neutrino (electron capture). Thus, unity force also replaces weak force.
21. In a nucleus, every (pe) shows as a neutron. In beta decays, electron emission breaks a neutron (pe) into p + e; while electron capture is a reversal:

$$p + e \rightarrow pe.$$

22. A "positron" is redefined as a high-energy electron. Matter's energy is scalar, not vector. Any "antimatter" is a misconception, including the concept of a "positively charged electron" and the idea of "annihilation". Therefore, beta decays should be categorised into electron emission and electron capture, instead of "negative or minus" and "positive or plus".
23. When a positron meets a normal electron unity (eγ), the excess-energy transfers from the positron to the bonded photon, producing a gamma ray or an X-ray, depending on the positron's excess-energy level. After transferring all its excess-energy, the positron becomes a normal electron.
24. External electric forces can oscillate away the outermost electrons from the atom unities of a conductor, align and energise them as stronger electron waves with magnetic effects, and simultaneously cause them to flow along the potential difference as electric currents. Electricity is the synchronized repelling force of the electric currents, in which each electron transfers its excess-energy to an electrical device, or to its bonded photon causing light.
25. Magnetic effects result from stronger electron waves aligning weaker electron waves. The aligned electron waves synchronise attractions and repulsions: while aligning is energy sharing, the aligned electrons all repel in the same direction, forming an electric current or potential difference.
26. Electromagnetism is electron waves showing magnetic effects while transferring excess-energy as photon waves. So, electromagnetism is the unity force of free electrons and should be called electronism.
27. Therefore, there are no such things as magnetism, magnetic fields, or magnetic waves. They are just electron fields with electron waves transferring excess-energy as photon waves.

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Vysikaylo's Laser for de Broglie Waves of Electrons to Protect the Earth from Asteroids. Interdisciplinary Research of Incongruent Electric Field Shock Waves

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Abstract- We have proposed a mechanism that explains all phenomena observed in nature during lightning propagation and all phenomena during the fall of the Chelyabinsk meteorite in the Russian Federation. These positively charged cumulative-dissipative plasma systems (+CDS), as we have established, are surrounded by incongruent shock waves of the Vysikaylo electric field (VSW). We demonstrate that de Broglie waves of free electrons arising in the plasma tail behind the meteoroid behave similarly to electromagnetic waves in a laser. There, a cumulative jet of high-energy electrons (CJ) is formed, which breaks into the meteoroid, causing it to collapse according to the Coulomb mechanism. The formation of VSW in the atmosphere is due to the peculiarities of the chemical kinetics of negative ions at the boundary of the plasma tail. *The time of Vysikaylo-Poisson's structural turbulence, providing the formation of CJ in the plasma tail, was ≈ 1.5 s.*

Keywords: *cumulative-dissipative systems, entering and runaway electrons, coulomb explosion, asteroid fragmentation according to vysikaylo.*

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Abstract- We have proposed a mechanism that explains all phenomena observed in nature during lightning propagation and all phenomena during the fall of the Chelyabinsk meteorite in the Russian Federation. These positively charged cumulative-dissipative plasma systems (+CDS), as we have established, are surrounded by incongruent shock waves of the Vysikaylo electric field (VSW). We demonstrate that de Broglie waves of free electrons arising in the plasma tail behind the meteoroid behave similarly to electromagnetic waves in a laser. There, a cumulative jet of high-energy electrons (CJ) is formed, which breaks into the meteoroid, causing it to collapse according to the Coulomb mechanism. The formation of VSW in the atmosphere is due to the peculiarities of the chemical kinetics of negative ions at the boundary of the plasma tail. *The time of Vysikaylo-Poisson's structural turbulence, providing the formation of CJ in the plasma tail, was ≈ 1.5 s*We prove that de Broglie electron wave lasers with a cavity length of 30 km and a diameter of 18 m are realized in nature and can be described. This gives us grounds to use this mechanism to explain the joint organization of counter-flowing jets of protons from black holes and electrons directed into black holes. These laser-like jets have already been observed in Hubble-type telescopes and have a length of up to 1.5 kpc. Thus, our cumulative-dissipative mechanism can explain the increase in the velocities of active neutron stars. We proposed and investigated a new 4D inertial-polarization-quantum cumulative-dissipative Vysikaylo mechanism for fragmentation of meteoroids and asteroids (self-defense of the Earth from meteoroids) into simple ions and electrons. *We proposed a mechanism for an external combustion engine with an efficiency of 50% and described in detail the Le Chatelier-Brown principle.* In this paper, we present a new interdisciplinary approach that combines plasma physics, quantum theory, and atmospheric observations.

Keywords: cumulative-dissipative systems, entering and runaway electrons, coulomb explosion, asteroid fragmentation according to vysikaylo.

I. Introduction

Louis de Broglie suggested: "Particles can behave like waves". The author claims that the movement of free electrons in the plasma trail of the asteroid is similar to the movement of electromagnetic waves in a laser. As a result, a CJ occurs, which catches up with and explodes the asteroid. *The time of Vysikaylo-Poisson's turbulent relaxation, which ensures the formation of CJ in the plasma tail behind the Chelyabinsk asteroid, was≈ 1.5 s.* These phenomena occur when the energetic threshold is reached. In the case of the Chelyabinsk asteroid, its energy was sufficient to form CJ that fragmented the asteroid when it hit from behind using a Coulomb explosion. We have calculated the velocities of meteoroids and asteroids necessary to generate such processes. We have proved that the virial theorem is performed in this process: half of the asteroid's total kinetic energy (converted into capacitor energy) is spent on creating a CJ catching up with the asteroid, and the other half is spent on ejecting positive ions along the plasma tail behind the meteoroid, in the direction opposite to its movement. The process of transforming the kinetic energy of the meteoroid into the energy of a radial capacitor and, during its breakdown, into the electric energy of a polarized electric cord - an analogue of linear lightning - is considered. Electrons escaping from the trail create a positive Coulomb barrier similar to that which occurs in ordinary lightning [1]. This barrier leads to radial self-focusing (cumulation) of the trail.

Based on this, a *new 4D cumulative-dissipative inertial-polarization-wave mechanism for fragmentation of asteroid, meteoroid and comets was proposed and investigated*. This mechanism is based on a similar behavior of electrons in pulsed lightning from negatively charged clouds [1-3]. The formation of a CJ in front of a pulsed lightning was studied in the experiments of Shenland [4]. A explanation for such behavior of lightning was first given in [1]. Based on the model [1] and the results of observations of the Chelyabinsk meteoroid, I developed a theoretical concept that explains all the accompanying processes.

a) Date and methods observations of events near chelyabinsk

On 15 February 2013, NASA scientists reported that an explosion near Chelyabinsk. As is known [5], sensors installed on geostationary satellites operating in

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the interests of the US Department of Defense and Department of Energy can track both airborne nuclear explosions and measure the luminosity curves of fireballs burning up in the atmosphere. On 1 March 2013, NASA became aware of updated data on the total luminosity of the super-bolide, which amounted to E_0 = 3.75 10^{14} J or 90 kt, from which, according to the empirical formula for the total energy of the explosion, follows $E = 8.2508\ E_0^{0.885}$, which is 440 kt. The speed of the fireball according to the same data at the moment of maximum brightness was 18.3 km/s, and the event occurred at an altitude of 23.3 km. The estimated mass and size of the meteoroid at a density of 3.6 t/m^3 were 11,000 tons and a diameter of about 18 meters. NASA estimates that it is the largest known celestial body to hit Earth since the Tunguska meteorite fell in 1908. Where the bulk and energy of the meteoroid went is still a mystery to mechanical astrophysicists.

Only Marat Akhmetvaleev, a nature lover of his region, and another photographer unknown to me managed to photograph and present to the public the unique details of this event (Fig. 1). Based on his photographs and our knowledge of the physics of the Vysikaylo's cumulative dissipative plasma systems (CDS), we will explain where the main part of the meteoroid went and how kinetic energy was dissipated in the atmosphere and ionosphere of the Earth. We detail the pulse-periodic mode of execution of the virial theorem.

Fig. 1: Photographic evidence of plasma cumulation in a meteoroid's wake. This is a photograph (Marat Akhmetvaleev, 2013) of the Coulomb explosion (see [3] for more details)

In photo 1 we see that the length of the plasma tail (L) significantly, by 1.5 times, exceeds the explosion height of 23 km, i.e. the length $L \approx$ 30 km. This indicates the existence of plasma for ~1.5 seconds after the passage of the meteoroid. The plasma does not dissipate as a neutral medium, but is focused by the forces of cylindrical cumulation, as in the case of linear cylindrical lightning. Of particular interest is the behavior of the meteoroid fragments (photo 1). They fly apart not only in different directions from the meteoroid, but also forward, accelerated by some force acting behind the meteoroid. This clearly indicates a new mechanism of meteoroid fragmentation. The speed of the meteoroid at the moment of its destruction is 18.3 km/s. This significantly exceeds the speed of any detonation waves of any explosives known to mankind. Therefore, such speeds can only occur in electron beams accelerating in an electric field following a meteoroid! These phenomena and interactions occur at the speed of light or close to this speed with an increase in the characteristic dimensions of positively charged Vysikaylo's cumulative-dissipative systems (+CDS) [1-3].

Several dozen witnesses reported that during the passage of the meteoroid, several minutes before the arrival of the shock wave, they heard a hissing sound similar to the sound of burning sparklers. This means that we are talking about the phenomenon of "electrophone ball lightning". This phenomenon can only be explained by the electromagnetic interaction of polarized charged system or the runaway electrons from +CDS such as lightning [1,3] (Fig. 1). These phenomena and interactions occur at the speed of light or close to it as the characteristic dimensions of these system increase.

A few days after the fall of the Chelyabinsk meteorite, there were reports of observations of anomalous noctilucent clouds at altitudes of 75-80 km. A similar phenomenon was observed in 1908 after the fall of the Tunguska meteorite. This time, ground observations of noctilucent clouds were confirmed by satellite data. Mechanical models cannot explain the release of water vapor from the meteoroid to such an altitude. As a result of the search for the remains of the meteorite, a mass was discovered that did not exceed 1 ton (~0.01% of the total mass of the meteoroid).

According to RIA News 03/21/2013, the Chelyabinsk fireball caused magnetic storms in the Earth's ionosphere, similar to storms that occur when solar wind penetrates into the Earth's ionosphere. According to IZMIRAN RF, the disturbances affected almost the entire ionosphere. Thus, fluctuations in the concentration of electrons in the F2 ionospheric layer (about 250 kilometers high) were recorded 5.5 h after the explosion at the ionospheric station in Yekaterinburg (V_a = 10 m/s), 6 h later in Rostov-on-Don (V_a = 79 m/s) and 7 h later in Moscow (V_a = 60 m/s). The speed of longitudinal propagation of plasma disturbance along the trajectory of the meteoroid in the direction of Moscow (it was flying from Omsk) after its destruction is equal to 1,500 km/7 hours = 214 km/hour = 60 m/s. This speed is more than 4 times less than the speed of sound at altitudes from 20 to 500 km. This velocity corresponds well to the possible *velocity of ambipolar drift* in gas-plasma in breakdown fields [1].

The disturbance zone was local—it was a long "tongue" moving westward, the width of which in the Yekaterinburg region was about 100 km, and on the Moscow-Rostov meridian was about 500-600

kilometers. Without considering the violation of electrical neutrality and the formation of cumulative oppositely directed jets of electrons and positive ions, none of the astrophysicists for 12 years could explain all these phenomena. *I prove that flows of charged particles in the atmosphere and ionosphere are created by electric fields. The influence of magnetic fields is small compared to electric fields* (*by the parameter v*/c).

II. Mechanical Models and their Problems in Explaining the Phenomena of Meteoroid Destruction

The problem of the asteroid-comet threat has received considerable attention (in words). Scientific conferences are held, hundreds of articles and a number of books have been published see [6-13].

The state of the question of mechanical destruction of cosmic bodies upon entering the atmosphere in the times before the Chelyabinsk meteoroid was presented by the mechanic S.S. Grigoryan (Institute of Mechanics, Lomonosov Moscow State University, Moscow) in [10-12]. He made quantitative estimates of all the effects accompanying the motion of bodies in the atmosphere at cosmic speeds.

According to Bronshten [13]: "we still have a poor understanding of how the fragmentation process itself occurs. To clarify this issue, special experiments are needed...." And so we are presented with experiments of nature in the form of the Chelyabinsk meteoroid (Fig. 1).

Mechanics still do not have clear explanations for all the phenomena that were observed when the Chelyabinsk asteroid entered the Earth's atmosphere. My research is based on electrical phenomena.

Comparison of Grigoryan's model (Fig. 2) with the photograph in Fig. 1 shows that:

1) When a meteoroid disintegrates, its parts gain additional acceleration not only in the direction perpendicular to its velocity vector, but also in the direction of its motion. The meteoroid's velocity is 18.3 km/s. The propagation speed of detonation waves in explosives is significantly lower (less than 10 km/s). Within the framework of the mechanical model (Fig. 2), such behavior of the meteoroid explosion (Fig. 1) is inexplicable! To explain such behavior of the meteoroid's parts, something must be moving behind the meteoroid at speeds significantly exceeding the meteoroid's velocity (18.3 km/s). Only electrons can be such particles due to their low mass;
2) The plasma tail (train) of the meteoroid in Fig. 1 clearly does not correspond to Grigoryan's mechanical model with an expanding tail (Fig. 2). All mechanical models fail to explain the clearly observed phenomenon of plasma cumulation in the meteoroid tail over 1.5 s (Fig. 1). According to the mechanical model, the characteristic size of the meteoroid tail should increase with the speed of the Mach shock wave (Fig. 2).
3) Grigoryan's model does not take into account or discuss the virial theorem. According to this theorem, half of the meteoroid's potential energy should return to the region of its arrival. We describe this process in detail in the section "Introduction of asteroids and meteoroid bodies into the planet's atmosphere".

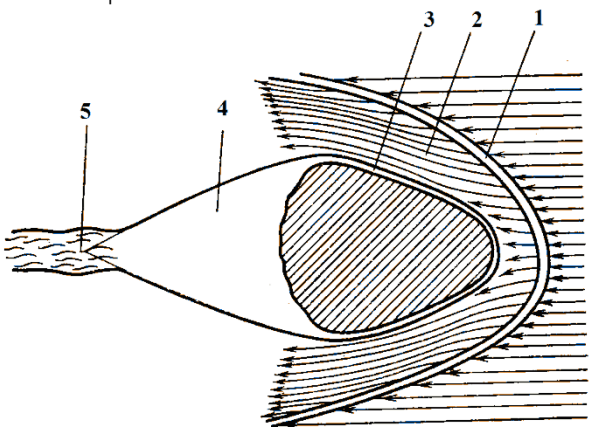

Fig. 2: General 3D diagram of shock wave elements: 1 – shock wave front, 2 – shock (compressed) layer, 3 – boundary layer, 4 – stagnant zone, 5 – trail

Comparison of photograph 1 with Fig. 2 shows the inadequacy of the Grigoryan's mechanical model to explain the photograph. Other modifications of his theory, including those made by Chernogor for other meteoroids [14,15], do not deserve close attention. His research led to the conclusion: "The role of the dust component of the plasma was insignificant" [15]. In his works, only Mach shock waves are considered. Mach shock waves compress bodies penetrating the Earth's atmosphere (Fig. 2), and thus destroy this body, acting on it from the front.

The author draws attention to the formation of Vysikaylo'sshock waves of the electric field, leading to the action of CJ on such bodies from behind!

III. Vysikaylo's Classification of Shock Waves

In the modern world, there are three types of shock waves:

1. Mach'sshock waves, also known as parameter jumps, in the field of gas dynamics. Their study began with his work of in 1881.
2. Magnetic field shock waves were described by R.Z. Sagdeev;
3. Shock waves of the electric field, described theoretically and experimentally in detail in (https://ieeexplore.ieee.org/document/10875031).

Based on theoretical and experimental works on the study of Vysikaylo's shock waves of the electric field in gases, in this work we will formulate a model of Vysikaylo's incongruent shock waves in electronegative gases (air). These waves surrounded the plasma tail behind the Chelyabinsk asteroid and limited the radial expansion of the plasma and thus lead to the formation of a CJ, spraying the asteroid with a Coulomb explosion. This is how the virial theorem in the Earth's atmosphere is solved according to the Vysikaylo's model.

IV. General Analysis of the Chelyabinsk's 2013 Meteoroid Phenomenon

According to NASA calculations, the Chelyabinsk meteoroid, about 18 meters in diameter and weighing 11,000 tons, entered the Earth's atmosphere at a speed of about 18.3 km/s and almost completely disappeared in the Earth's electronegative (air) atmosphere. The kinetic energy of the meteoroid is $W_M \approx 2 \cdot 10^{15}$ J. How was all this energy and mass of the meteoroid focused and where did they go? The destruction was a series of phenomena accompanied by the spread of shock waves and crackling sounds, creating the impression that someone was shooting at the meteoroid. This is also indicated by the features of the dispersion of the meteoroid parts in Fig. 1. The entire "West" does not have effective anti-missile defense against Russian supersonic missiles, the speed of which is only 2.7 km/s. And here the speed is 7 times higher (18.3 km/s). This is fast hypersonic (12.3 ÷ 30.7 km/s). Neither Russia nor Iran have achieved such speeds yet. This paper proposes a new mechanism for such missiles with 50% efficiency, but the author hopes that it will not be implemented for special purposes for another 20-30 years. During this time, the elites in the United States will realize Hegel's law of the unity and struggle of opposites (and their mutual development, not destruction).

According to NASA estimates, 20% of the total energy of the meteoroid goes to radiation - 90 kt. This means that the energy of the meteoroid is used to destroy itself. The plasma tail not only wags the meteoroid (the dog), but also participates in its destruction. The mechanical model, in principle, cannot explain this phenomenon. The total energy received by air molecules due to collisions with a meteoroid during the entire flight of the meteoroid (before its destruction) does not exceed $8 \cdot 10^6$ J. Moreover, the energy received by one air molecule during a collision with a meteoroid is about 50 eV. This energy is sufficient for complete ionization and dissociation of all air molecules in the meteoroid's wake. In this case, the temperature of the electrons in the plasma tail of the meteoroid will be about 50-25 = 25 eV or 250÷300 thousand degrees. At this temperature, electrons leave the area of collision of air molecules with a meteoroid in a microsecond. Wake polarization occurs, in which a significant portion of the plasma energy in the wake of the meteoroid is retained in the form of potential Coulomb energy. Due to the polarization of the plasma in the meteoroid's wake, dynamic Coulomb surface tension is generated. This tension localizes energy in the plasma tail. This creates a cylindrically symmetrical tube of fully ionized plasma behind the meteoroid. The potential energy of a meteoroid at a small angle of entry into the Earth's gravitational field is no more than 10^{10} J. All these energies are significantly less than the kinetic energy of the meteoroid $2 \cdot 10^{15}$ J and the radiation energy recorded by NASA - $4 \cdot 10^{14}$ J. This means that the energy external to the meteoroid is not enough for such a glow, observed at the moment of its spraying. Thus, we, on the basis of the photograph in Fig. 1, have proven that, according to the law of conservation of energy and the directions of explosion fragments in Fig. 1, the mechanical model (Fig. 2) in principle cannot explain such a spray of a meteoroid in all directions (at a speed greater than the speed of the meteoroid) (Fig. 1).

V. General Analysis of Phenomena and Criticism of the Mechanical Model

We will consider in detail the problems of electrical phenomena indicated in [8]. In [8], many errors were made in the explanation, which we will dwell on in detail:

1. The appearance of noctilucent clouds at a height of 75 - 80 km after the destruction of the meteoroid was ignored in [8]. This was due to the lack of a decent model in mechanics for the cumulative transfer of positively charged ions to the upper layers of the atmosphere through a cylindrical plasma channel (Fig. 1). According to my model, they are dropped through a huge pipe that radially focuses the flows of positive ions to an altitude of 75-80 km;
2. The mechanism of obtaining an additional "mysterious" impulse by a number of meteoroid fragments in [8] is not explained. The additional "mysterious" impulse does not lead to the deceleration of all possible fragments in accordance with the action of the shock wave according to (Fig. 2), but to their powerful acceleration (see Fig. 1). The detonation velocity of octogen alone is 9.1 km/s, but this velocity is many times less than the meteoroid velocity. In plasma, only electrons have a velocity of more than 18 km/s. The author proves that it is the accelerating (runaway) electrons, which are formed into cumulative jets, overtaking the meteoroid by inertia, that cause all the recorded "mysterious" phenomena (Fig. 1);

3. In [8] it is not explained (ignored) the nature of the explosion that scattered parts of the meteoroid in different directions with enormous speeds, clearly exceeding the initial speed of the meteoroid as a whole (Fig. 1). Within the framework of the classical mechanical model, the meteoroid is compressed by the main shock wave from the front and sides (Fig. 2), and is not accelerated by it from behind! Such scattering of meteoroid fragments, as observed in Fig. 1, in principle cannot occur only due to compression of the meteoroid by the shock wave. To explain such an explosion (see Fig. 1), we formulated a new model of Coulomb initiation of fragmentation of the rear part of the meteoroid;
4. In [8] the characteristic time intervals are given: formation of turbulence (10^{-2} - 10^{-1} s), attachment of electrons to oxygen molecules and recombination with meteoric ions (10^{-2} - 10^{-1} s). The frequency of electron attachment to oxygen molecules is dissociative and is 4 orders of magnitude greater than that indicated in [8] and about 10^{-6} s. The lifetime of plasma in the meteoroid tail is 1.5 s. This clearly indicates the presence of not only dissipative (scattering) processes from the plasma tail, but also cumulative flows into the plasma tail, which cumulate energy, mass, momentum and angular momentum. The solution to this paradox is given in the section "Vysikaylo's incongruent shock wave of the electric field in the Earth's atmosphere and Vysikaylo-Poisson's turbulence".
5. In [8] the discussion of sudden, sometimes pulsating, local increase in the brightness of the bolide is ignored. I will quote the text from [16] in full: "At present, there is no gas-dynamic model of a bolide flare... Perhaps one of the causes of flares is fragmentation... The question of the nature of the flare can be resolved only by the joint efforts of observers and specialists in mathematical modeling."

The answers to these questions are based on the cumulation (self-focusing) of plasma flows and the formation of CJ [1-3]). Here, a new cumulative-dissipative plasma-beam mechanism of Coulomb initiation and maintenance of cascade fragmentation of large meteoroids is proposed. The feedback mechanism is based on the phenomenon of coherence of de Broglie waves of electrons and ions in positively charged plasmoids in the electronegative atmosphere of the Earth. As a result of these phenomena, a beam of high-energy "runaway" electrons is formed, penetrating the meteoroid from behind. This leads to a Coulomb explosion of a part of the meteoroid. At the first moment when electrons in CJ hit the meteoroid, it is weakly fragmented, since the energy concentrated in the air is insufficient. When the mechanism of acceleration of small parts of the meteoroid by CJ is turned on, they can move faster than the main meteoroid (Fig. 1). The cumulation of all the kinetic energy of powerful explosions of small meteoroid particles and its transformation into the energy of electrons falling into the meteoroid closes the feedback loop in the process of Coulomb fragmentation. This energy already corresponds to the density of the meteoroid and is ~ 200 eV per meteoroid atom. This leads to a catastrophic fragmentation of the meteoroid. Its parts explode and are completely ionized. By the virial theorem, ½ of the potential and internal energy of the plasma trail returns to the meteoroid, and the other half is ejected into the upper layers of the atmosphere through a channel with plasma self-focusing.

The presence of explosions of small fragments behind the meteoroid and the transformation of their energy into the energy of CJ electrons contributes to the further destruction of the meteoroid, changes in its trajectory and even the acceleration of its fall. According to this scheme, a self-organizing pulsed plasma jet engine with an efficiency of 50%, sparkling with radiation (Fig. 1), is formed behind the fast-moving object, dropping mass due to the fragmentation of the back side of the meteoroid;

6. In [8] the mechanisms that ensure the fulfillment of the virial theorem or Newton's third law in a continuous medium (air) when a meteoroid penetrates at a speed of about 10 km/s - 70 km/s into the Earth's atmosphere and "mysteriously" disappears before reaching the surface of the Earth have not been studied;
7. In explaining the electrophonic effect in [8], Gauss's theorem in 3D space is ignored.

I am detailing point 7). The electrophonic effect is understood as the audibility of crackling sounds by a person at large distances from the meteoroid and long before the acoustic disturbance created by the body's movement reaches the observer. It is believed that the theory of this three-dimensional phenomenon, occurring at a speed close to the speed of light, has not been developed in detail [8]. The basics of this theory are presented in the work [3], based on coherent phenomena in the case of a violation of electrical neutrality in the meteoroid's trail. According to the erroneous ideas in [8] (based mainly on the mechanical model), there are two (I and II) probable mechanisms that can qualitatively explain the electrophonic effect that was observed by several eyewitnesses of the phenomenon in Chelyabinsk in 2013.

1) According to [8], when a cosmic body falls in the atmosphere, it becomes electrified. This causes a charge of the opposite sign to flow down from the Earth's surface. The process is accompanied by an acoustic effect. According to estimates in [8], the charge leakage begins at a field strength of about several kV/m, and in the case of the Chelyabinsk meteorite, the intensity reached 0.5–5 MV/m.

In this mechanism, the author [8] does not take into account that fields with an intensity of 0.5–5 MV/m are formed quasi-stationary only in the meteoroid area. I note that these fields at an altitude of 20 km are 50 times higher than the breakdown fields. Even with nanosecond discharges, the breakdown values of the *E/N* parameter can only be increased by 2 times to 150 Td. At distances *L* of about 20 km or more from the meteoroid, the electric fields from the meteoroid become negligibly small due to the geometric reduction coefficient following from the Gauss theorem, $\xi = (R/L)^2 \approx 10^{-6}$.There will be no "chirping" from these fields at distances $L \sim 23$ km (or more). In Moscow, there is the Lenin Institute of Higher Power Engineering, which has a setup that imitates lightning. There the electric field strength is of the same order (~3 MV/m), and its dimensions are about 10 m, but Moscow residents, even on the next street, do not experience any "chirping" in their ears.

2) According to [8]: "Electromagnetic waves of the sound range are transformed into sound due to the piezoelectric effect in objects surrounding the observer or in the person himself. At a frequency of f ~ 1 kHz, the electric field strength should be no less than hundreds of V/m. Such fields arise on the surface of the earth with a current strength in the trace of $I = 5*10^4$ A." Here in [8] there is a trace along which "mysterious" currents flow, which in principle cannot be in its initially neutral mechanistic model without consider the electrical imbalance in the trace. Such a sharp transition from a mechanical model to a cylindrical and electrodynamic model with currents looks somewhat strange when explaining the electrophonic effect. In mechanism II, author [8] relies on Tesla's frequency discharge and again sets the necessary condition for "chirping" - more than 100 V/m, which, in principle, is not realized according to the mechanical model at distances more than 23 km from the meteoroid due to the same geometric reduction coefficient $\xi \approx 10^{-6}$. And in this case, author [8] does not take into account the size of the plasma *positively charged tail* of about 30 km, observed in Fig. 1.

During the Chelyabinsk meteorite, the electrophonic effect was observed at a distance of more than 23 kilometers. Two mechanisms proposed in [8] based on the neutral mechanical model do not explain the observed phenomenon due to the small spatial coefficient $\xi \approx 10^{-6}$.

All two mechanisms of the electrophonic effect proposed by the author in [8] do not stand up to criticism. This always happens when the researcher does not understand the essence of the main phenomenon. Therefore, all the phenomena in 8 are not collected into a single picture. The author of [8] is forced to throw out some of the phenomena. He does not discuss and does not understand the phenomenon of periodic powerful fragmentation of the meteoroid, which is accompanied by explosions (as if someone is shooting at the meteoroid with a machine gun) and a simultaneous pulsed increase in the brightness of the glow of the fireball. In the work [8], the author does not mention this main problem of all mechanical models. They cannot explain the main pulse phenomena caused by detonation (shock) waves of electron gas in plasma in a positively charged trace of the meteoroid at 30 km. The speed of detonation waves of electron gas is several times greater than the speed of the meteoroid.

With the "arrival" of such amateurs of their region as Marat Akhmetvaleev (https://uraloved.ru/foto-marata-ahmetvaleeva?ysclid=lpig4qi5dl786130180) and others in the research field, the current state of the problem of the destruction of large cosmic bodies upon entering the Earth's atmosphere has shone with renewed vigor (Fig. 1). This completely new phenomenon falls outside the framework of the mechanical model. To describe the photographically recorded phenomena, we need to use synergetics (coherent processes) in plasma dynamics in the tail of meteoroids, see [3].

VI. Coulomb Self-Focusing of A Plasma Trail

If the speed of the asteroid reaches 20 km/s, then the energy that the air molecules receive is approximately 50 eV.An energy of 50 eV per molecule is sufficient for complete dissociation and ionization of molecules and atoms. About 20 eV remain for each electron. The air (in the form of a plume) becomes an electropositive gas in which electrons are not attached to atoms. Electrons, as a more mobile gas, leave the plasma plume faster than positive ions. This is how the plasma is polarized behind the meteoroid and a potential Coulomb radial barrier for electrons is formed (Fig. 3). The radial potential blocking the movement of electrons in the radial direction increases logarithmically depending on the effective length of the cylindrical positively charged plasmoid. Outside the plasma trail, the electrons lose energy and stick to oxygen molecules. In this case, a layer of negative ions is formed, which move into the positively charged plasma trail at a significantly lower speed. Negative ions cumulate enteringinto the plasma trail with excited plasma are destroyed and electrons are released. This leads to the cumulation of the plasma tail. These electrons are affected by the 3D electric field of a positively charged cylindrical column. The radial component cumulates the electrons to the center of cumulation, and the longitudinal field behind the meteoroid accelerates them to catch up with the meteoroid. This further cumulates plasma in the tail behind the meteoroid. In the area limited by the positively charged cylindrical radial barrier with the

Coulomb potential, not only all the kinetic energy received by the air molecules is concentrated, but also the kinetic energy of the meteoroid's parts during its gradual and then catastrophic destruction. The self-focusing plasma column with high conductivity participates in the 4D scattering of all the kinetic energy of the meteoroid. (The return of negative ions to the plasma tail of the meteoroid is carried out at the speed of the negative ions). Self-focusing of highly conductive plasma structures allows to extend relaxation processes hundreds of times (up to 1.5 seconds) and return half of the kinetic energy of the entire meteorite through a cylindrical plasma channel to the upper layers of the atmosphere and ionosphere. This explains the influence of the meteoroid tail on the parameters of the ionosphere and demonstrates a three-dimensional structural implementation of the virial theorem in a pulse-periodic process.

Coulomb self-focusing is observed in various plasma formations, from atoms and molecules to electric arcs, lightning, meteor trails and intergalactic lightning. In cylindrical systems, transverse electric fields effectively cumulate electrons toward the center. Longitudinal electric fields, although weaker but longer, form and accelerate cumulative flows in the plasma trail along the trajectory of the meteoroid. In a gas discharge or linear lightning, electrons move toward the anode by a similar principle. In a plasmoid limited by the Coulomb potential, electrons collide during complete ionization of atoms, transferring energy to the tail of the velocity distribution. The high energy of electrons leaving the plasmoid causes electrophonic effects when meteoroids enter the Earth's atmosphere.

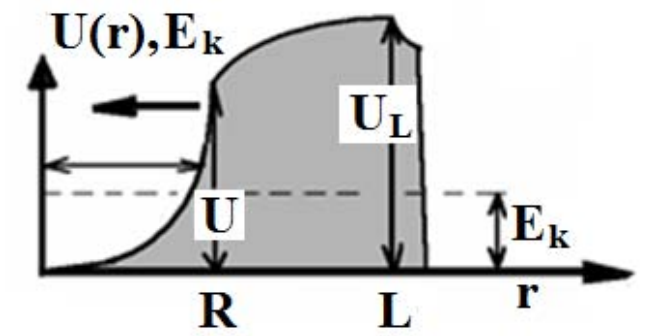

Fig. 3: This is a potential barrier $U(r)$ for electrons in a cylindrical plasmoid with a positive charge. The characteristic transverse size of the potential well in this case is greater than the radius of the system and is determined by its length ($\approx L$), and not by the radius (R)

VII. Coulomb Mechanism of Meteoroid (Asteroid) Fragmentation

The plasma tail behind the meteoroid transmutes the kinetic energy of the asteroid into the electric energy of the cylindrical capacitor. The positively charged cylindrical polarized tail grows linearly with the velocity of the asteroid. The radial capacitor is therefore broken through by a CJ. CJ behaves coherently, like laser radiation. Electrons catching up with the meteoroid periodically explode it and accelerate parts, including the asteroid itself. We estimated the parameters of the electron beam for lightning (~5 MeV) and the plasma tail of the Chelyabinsk asteroid (~100 GeV).

1/2 of the kinetic energy of the asteroid is spent on acceleration and destruction of fragments by the CJ, the other ½ is spent on the emission of positive ions into the upper layers of the atmosphere (up to 70-80 km) along the cylindrical trail. Our research explains all the phenomena observed during the destruction of the Chelyabinsk asteroid at an altitude of 23 km.

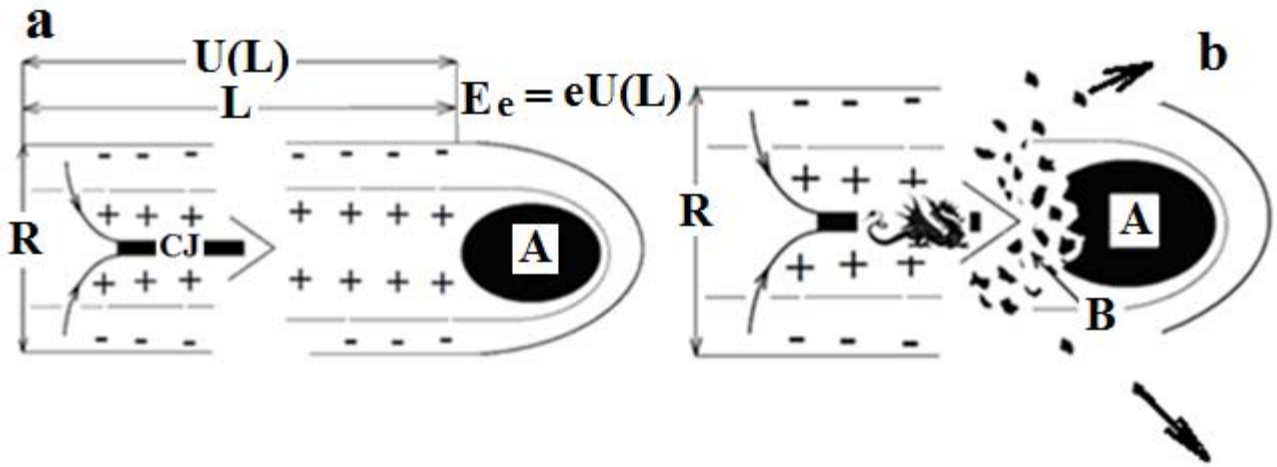

Fig. 4: 2D diagram

a) In Vysikaylo's gun, the spatial charge (polarization) of the plasma behind a fast-moving object – A in the medium is divided. This division is indicated by the signs "+" and "-". A positively charged plasma column forms a CJ, transforming the energy of polarization (the energy of the asteroid) into the energy of the CJ;

b) A new method of destruction of meteoric bodies based on the cumulative plasma mechanism of fractal fragmentation. This mechanism is triggered by Coulomb explosions. B - these are fragments that explode and create a jet thrust behind object A, simultaneously destroying it from behind.

VIII. Cumulative-Dissipative Systems

In nature, convective cumulation (focusing) processes were discovered long ago. Gravitational cumulation processes were studied by Newton, Kepler, Euler (1767), Lagrange (1772), Besant (1858), Rayleigh (1917), Guderli (1942, compression shock wave), Zababakhin (1965) and others. We are most interested in the studies of unlimited cumulation processes in the works of E I Zababakhin [18]. In the conclusion of this book, the authors (V A Simonenko) say that "despite the instability of cumulation in continuous media, it remains a very useful idealization that allows one to find exact solutions and indicates how to approach it in practice, without relying, however, on self-focusing" [17,18]. And now, more than 36 years have passed, and we are successfully solving the problems of self-focusing (cumulation) of electrons de Broglie waves in quantum resonators in the most "subtle experiments", both at the level of nanometer sizes, and also in the mesoworld of huge plasma trails behind meteorites penetrating the Earth's atmosphere. Atomism and the associated size limit indicated in the works of Zababakhin are already coming to the forefront and have even been overcome in nuclear physics (https://ojs.acad-pub.com/index.php/N-C/article/view/1297). But the definition given by Ya.B. Zeldovich to the concept of cumulation for continuous media remains a very useful and fairly general definition of this phenomenon, observed from the fem to world of atomic nuclei to the world of stars and galaxies. "Cumulation, that is, the concentration of force, energy or other physical quantity in a small volume, is the most important phenomenon of nature," asserted Ya. B. Zeldovich in his preface to the book "Phenomena of Unlimited Cumulation" [17]. The definition of cumulation given by Ya. B. Zeldovich is the most successful, clear and at the same time quite complete definition of the phenomenon of self-focusing in natural, physical, social, political, economic and other phenomena and the Vysikaylo'sCDSformed by them, which differ significantly from the dissipative structures of Prigogine-Turing-Kolmogorov-Fisher [3].

E.I. Zababakhin was the closest to the discovery of cumulative-dissipative systems (CDS), which differ significantly from Prigogine's dissipative structures (PDS). PDS are formed by diffusion and birth processes. CDS are formed by convective and diffusion processes of self-focusing of energy, mass and momentum flows. During cumulation, new degrees of freedom are excited: 1) rotation, 2) violation of electroneutrality and 3) generation of electromagnetic fields. CDS exist as a result of structural dissipation of a certain energy source and therefore belong to a new class of dissipative systems discovered by Vysikaylo [1-3].

IX. Architecture and Super-Properties of the Vysikaylo's Cumulative-Dissipative Systems

CDS have long been observed in nature (Fig. 5). However, these phenomena were considered paradoxical, since they had no explanation. The basic provisions of the theory of gravitational structures were presented in the works of Euler, Lagrange, Roche (Fig. 6). The Kepler problem has long been solved in the general case for the Coulomb and gravitational

potentials. However, the discovery of cumulation and libration points in plasma between positively charged systems (Fig. 5) was discovered by me in 2009. Here we will analyze the architecture of the cumulation and dissipation processes in Vysikaylo's CDS based on Fig. 6. To do this, we will mentally fill the Roche lobe of the Sun and Jupiter (Fig. 6) with ordinary dust and hit the dust (in the Roche lobe) to the left of the Sun with a large palm. The dust will move in the direction of the Roche lobe of Jupiter. After passing the dust particles through the region of the Sun, the equipotential will focus at the cumulation point L_1. This means that the points discovered by Euler (1767) are not libration (Lagrange) points, but are in fact Euler's cumulation points [2]. After passing the cumulation point L_1, dust flows from the solar Roche lobe penetrate into the Roche region of Jupiter and expand there.

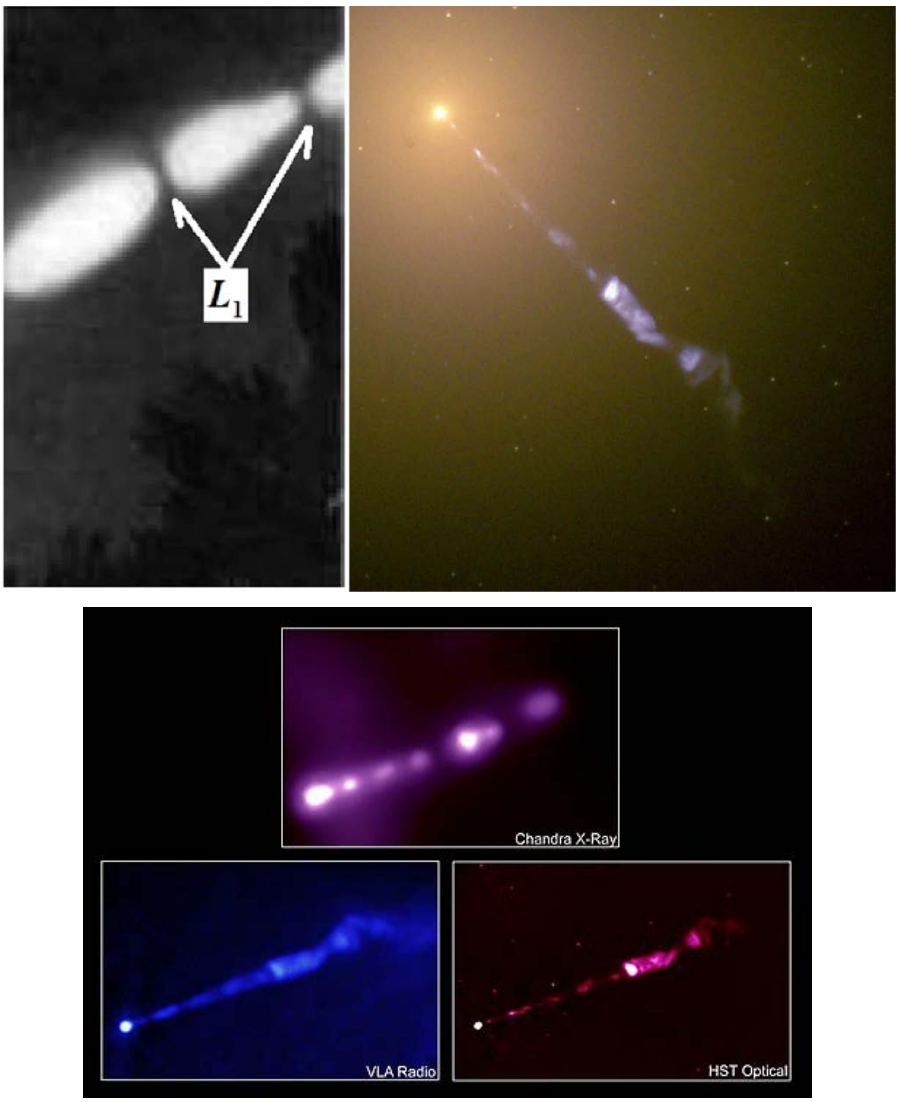

Fig. 5: Photo of energy cumulation due to dynamic surface tension in plasmoids:

a) Dotted lightning in the electronegative Earth's atmosphere. L_1– cumulation points [2,3].

b) The central region of the M 87 galaxy with an active nucleus. Jet size ~ 1.5 kpc. Hubble Telescope (NASA). We observe jet stratification and formation of cumulation regions

The formation of Vysikaylo's bicyclones, discovered in [1-3], can also be explained based on the Euler-Vysikaylo's model (Fig. 6). To do this, it is necessary to simultaneously hit the dust with large "palms" from opposite sides on the Roche lobes. In this case, dust from the Roche lobe of the Sun will penetrate into the Roche lobe of Jupiter, and dust from the Roche lobe of Jupiter will tend to get into the Roche lobe of the Sun. This problem of the frontal collision of dust flows from the Roche lobe of the Sun and Jupiter at the cumulation point L_1 is solved in 4D space-time by generating rotation of these flows in opposite directions. Such bicyclones with constrictions in L_1 are complete analogues of Cooper pairs discovered in the nanoworld, so the author called such bicyclones quasi-Cooper bicyclones. The idea of the joint organization of Cooper

pairs led to the discovery of quasi-Cooper cyclones or Vysikaylo's bicyclones in the micro-, meso- and macroworlds. On this basis, the joint co-organization of cyclonic and anticyclonic flows into a single system, a bicyclone, was discovered. Double currents enhance each other's rotation and transform any kinetic and potential energy into rotation, distributing these energies equally between cyclonic and anticyclonic movements. The idea of such a joint organization of double convective (not diffusion) flows made it possible to discover Vysikaylo's structural turbulence and to explain and describe analytically all the phenomena observed during the formation of tropical cyclones [1-3] (these phenomena observed in nature are collected in the works of Erokhin and Artekha).

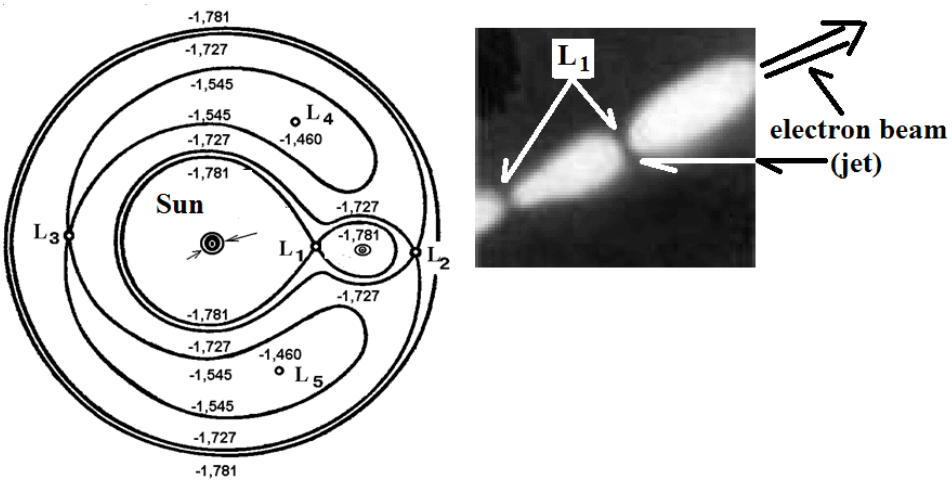

Fig. 6: This is a 2D cross-sectional diagram of equipotential surface profiles (3D Roche' cavities) surrounding:

a) The gravitating system of two attractors (Sun and Jupiter), taking into account the centrifugal potential in the Euler problem of linear cumulation points $L_{1\text{-}3}$ and triangular Lagrange libration points $L_{4,5.}$,

b) This is the formation of Vysikaylo's cumulation points in a beaded lightning between the luminous positively charged cumulative-dissipative Vysikaylo's systems.

Similar phenomena of structural cumulation are observed at the libration point L_1 when ordinary stars are consumed by quantum stars in stellar pairs [2] (the phenomena and paradoxes that arise are described in [19,20]. They still don't understand Vysikaylo's structural turbulence). The main achievement within the framework of the Vysikaylo's structural turbulence model was the description of the eye (eye) of a tropical cyclone, which is not described in the Rossby's models and other, as AAVlasov said, inferior models. The second discovered property of structural turbulence or bicyclones is an increase in the cumulation of such a structure with an increase in rotation and an increase in rotation during cumulation [1-3].

X. Cumulation and Libration Points for Electrons between Positively Charged Systems

Euler was the first to think about the interaction of gravitational and centrifugal potentials when he analyzed the two-dimensional motions of a small third body in the plane of rotation of two massive objects. His idea of cumulation points L_1, which was already known to Newton, and the discovery of three linear cumulation points $L_{1\text{-}3}$, arising from the influence of the centrifugal potential, were the result of the analysis on the line connecting the two massive bodies. Lagrange, developing this idea, derived the results of the analysis in the plane of rotation of Jupiter around the Sun, which led to the discovery of two triangular points L_4 and L_5. These classical discoveries allowed me to discover the libration and cumulation points of electrons around positively charged Coulomb centers.

The study of flows in 4D space-time revealed to me that the gradients of potentials: 1) gravitational, 2) Coulomb and 3) pressure form flows of energy, mass and momentum in a similar way. This allowed me to classify the points discovered by Euler in 1767 as cumulation points, and the points discovered by Lagrange in 1772 as libration points [2].Generalization of the works of Euler, Lagrange, Roche and other researchers of the system of gravitational attractors allowed me to explain a number of "puzzling" experiments, for example, the pulsed propagation of lightning in the experiments of Schonland (1937) (jets are formed in the same way, Figs. 3-6) and other paradoxes in gas-discharge plasma in laboratories, the ionosphere, the heliosphere and galaxies.

Research [1-3] led me to the creation of the generalized mathematical transposition method

(GMTM). This method allows the transfer of mathematical models from well-studied areas of science to less explored areas. With the help of GMTM, knowledge of gravitational systems can be used to describe electrodynamic processes with violation of electrical neutrality, and vice versa. This opened up new possibilities for testing general theories in the natural sciences and making discoveries. The method is also applicable to hydrodynamic and quantum-mechanical phenomena. Thus, within the framework of synergetics, the science of the interaction of many elements, a new section devoted to CDS appeared [1-3].

XI. Vysikaylo's Perturbation Theory for Describing Phenomena in Plasma with Current

We have already explained all the phenomena that occurred when the Chelyabinsk meteoroid entered the Earth's atmosphere, based on experiments with lightning and plasma systems. When air molecules collide with a meteoroid, plasma is formed - a gas consisting of positive ions and electrons. We have developed a mathematical model to describe the transition layers in a non-uniform plasma with current. However, numerical modeling of such plasma causes difficulties due to the lack of experimental data on the rate of processes of plasma particle generation and transfer from the parameter E/N. According to Vysikaylo's perturbation theory, in the system of Poisson equations for the electric field and the transfer of ions and electrons, one can obtain one four-dimensional equation for the transfer of plasma parameters. This equation takes into account the smallness of the current of positive ions compared to the current of electrons:

$$\partial n_e/\partial t - \partial[(l_{E0}/\mu_e)\nabla](\mu_e n_e)/\partial t + (j/e)\nabla(\mu_{+0}/\mu_{e0}) - \nabla\{(\mu_{+0}E_0/\mu_{e0})(l_{E0}\cdot\nabla)(\mu_{e0}n_e)\} = I_{+0} - R_{+0}, \quad (1)$$

Herein the zeroth approximation of our perturbation theory, the drift velocity of electrons and ions is described by the relations: $V_{e0} = \mu_{e0}E_0$, $V_{+0} = \mu_{+0}E_0$, here are the mobility of electrons – μ_{e0} and ions – μ_{+0}, respectively, $l_{E0} = E_0/(4\pi e n_e)$ *vectorized characteristic size of electric field strength change*. Since the plasma in the trail is completely ionized, the length of the violation of electrical neutrality is small and a sharp jump is formed along the entire boundary of the luminous plasma trail (Vysikaylo's shock wave of the electric field) [1-3]. The four-dimensional Vysikaylo's equation is derived from the ion concentration equation $\partial n_+/\partial t + \mathrm{div}(n_+ V_i) = I_+ - R_+$, where the n_+ is replaced by $n_e - (l_{E0}\nabla)(n_e \mu_{e0})/\mu_{e0}$. This change takes into account the violation of electroneutrality described by the Poisson equation for the electric field. The second term in the equation, containing mixed derivatives with respect to time and space, has no analogues in hydrodynamics. The fourth term is similar to the diffusion one. In hydrodynamics, a similar transition from convective to diffusion transport is observed during the formation of shock waves discovered by Mach. The term due to the violation of electrical neutrality suggests the presence of shock waves of the electric field in the plasma. These waves form the dynamic surface tension of plasmoids ranging in size from 10 cm to 1.5 kpc (Fig.5). Shock waves of the electric field in a gas discharge were discovered and visualized by Vysikaylo and his colleagues in 1985-1987. The second and fourth terms of the equation with mixed derivatives allow us to describe stationary and traveling shock waves of the electric field - strata (parameter E/N) both in a conventional gas discharge plasma and in the ionosphere and heliosphere, where global currents flow.

During discharge in pure nitrogen, the ambipolar drift in the positive plasma column reaches 70 m/s. It moves from areas with low values of the E/N parameter to high ones. This drift promotes plasma cumulation in the centers or lines [1-3]. In air, the ambipolar drift can exceed 100 m/s. As a result, the plasma self-focuses behind the meteoroid, causing disturbances to spread in the ionosphere at a speed of V_a(according to RIA News 03/21/2013).

When a meteoroid moves through the atmosphere, it leaves behind a plasma trail. Highly energetic electrons leaving this trail create a positively charged column with electric forces acting on the positive ions moving away from the meteoroid and on the electrons moving toward the meteoroid. The radial Coulomb barrier (Fig. 3 and 4) prevents the flow of electrons from the plasma cylinder and thus focuses it radially. This plasma system, 30 to 80 kilometers in size, sprays the meteoroid substance, including water vapor, into the upper layers of the atmosphere in the form of positive ions. One of the indications of cylindrical plasma cumulation in the trail is the registration of noctilucent clouds at altitudes of up to 75 kilometers.

XII. Discussion of Results

In this section we argue that the cylindrically symmetric plasma system (hose behind the meteoroid (Fig. 1)) is formed by the processes of ambipolar drift (the third term in (1)). According to our theoretical and experimental studies, this type of ambipolar drift (caused by different dependences of the electron and positive ion mobilities) is directed from small values of the parameter E/N to the region of large values of this parameter. In the case of a limited (droplet model) plasma positively charged system, the ambipolar drift is directed toward the self-forming boundary of the plasmoid (Fig. 7). Thus, plasma disturbances are directed toward the boundaries of the plasmoid and such solutions are stitched together by the formation of Vysikaylo's shock wave of the electric field with a characteristic size l_E [3].

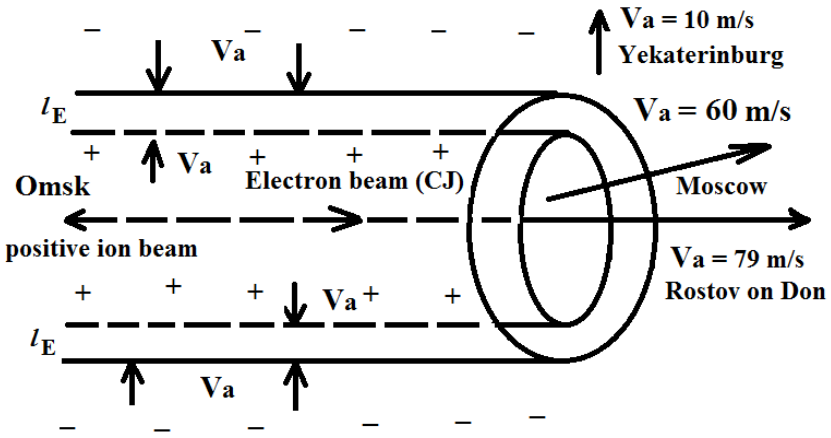

Fig. 7: 3D schemes: formation of the Vysikaylo's laser-gun by ambipolar drifts directed towards the boundaries of the plasma system and the propagation of plasma disturbances in the ionosphere at the speed of ambipolar drift V_a(these are analogs of Mach's shock waves) of plasma disturbances after the destruction of the meteoroid according to the Vysikaylo's fragmentation scheme

Fig. 7 shows the formation scheme of a partially open in the direction of the asteroid motion (closed from the sides) cumulative-dissipative polarized Vysikaylo's systems. All the kinetic energy of the meteoroid and ionized air molecules is converted into the energy of a cylindrical electric capacitor, limited by a Coulomb cylindrical barrier (Fig. 7). When the capacitor energy reaches a critical value, it is broken down by CJ. The introduction of CJ into the meteoroid leads to a Coulomb explosion and fragmentation of the meteoroid from behind according to the Vysikaylo model (Fig. 4*b*). Limitation of the radial propagation of the plasma disturbance occurs due to converging waves of ambipolar drift (the third term in (1)), directed to the boundaries of the self-forming cylindrically symmetric plasmoid. This occurs in complete analogy with the formation scheme of ordinary linear lightning and other Vysikaylo's positively charged cumulative-dissipative systems(+CDS) [1-3]. At the boundary of the plasmoid, a Vysikaylo's shock wave of the electric field is formed, compressing +CDS.

After the final Coulomb fragmentation of the meteoroid (to ions and electrons) according to the Vysikaylo's scheme (Fig. 4*b*), as shown by the experimental data presented to RIA News 03/21/2013, the electron beam pulse continues its movement in the form of plasma ambipolar waves with different velocities V_a, depending on their direction of movement. Such a dependence of the propagation speed of disturbances clearly indicates the ambipolar nature of the momentum transfer in the direction of the meteoroid movement. This once again proves the electrical nature of the effect of +CDS (Fig. 4,7) on the entire ionosphere and atmosphere of the Earth. According to the diagram (Fig. 4*b*, 7), the virial theorem may be fulfilled earlier than the meteoroid collides with the Earth's surface. This occurs when the Vysikaylo's +CDS is broken through by a cumulative electron jet in a pulse-periodic mode, which corresponds to the meteoroid being periodically shot (destruction) by its tail.

XIII. Vysikaylo's Incongruent Shock Wave of the Electric field and Vysikaylo-Poisson's Turbulence

Air (the Earth's atmosphere) is an electronegative gas. In electronegative gases, along with ionization processes (the creation of free electrons and positive ions), there is an intensive creation of negatively charged ions. Negative ions in the air are formed as a result of two processes: 1) dissciative attachment of a free electron to an oxygen molecule. Here, the O^- ion is formed. The O^- ion can be modified into the O_3^- ion; 2) three-body attachment of a free

electron to an electronegative oxygen molecule. Here, the O_2^- ion is formed. The O_2^- ion can be modified into the O_4^- ion.At an altitude of 23 km, the number density of molecules is 24 times lower than at sea level. This means that the frequency of three-body electron attachment is less by more than 500 times. Therefore, the main negative ion outside the plasma tail behind the asteroid can be considered the O^- ion. The speed of the O^- ion return to the positively charged cylinder - the plasma tail behind the asteroid is about 10^5 cm/s. This corresponds to characteristic times of $9[m]/10^{-3}[m/s] \approx 10^{-2}$ s.The negative ion returning to the plasma tail is destroyed in collisions with any excited particle and turns into a free electron, which gains energy in electron-electron collisions in the plasma tail and again escapes from the plasma tail of the asteroid. And again, with dissociative attachment to an oxygen molecule, it turns into a negative ion. Thus, one electron can form a negative ion up to 10^2 times. This is how *Vysikaylo-Poisson's turbulence* is formed at the boundary of the plasma tail behind the Chelyabinsk asteroid.Not only ionized air particles but also asteroid particles transformed into nanodust by a beam of highly excited electrons via a Coulomb explosion take part in the formation of this *structural turbulence* (Fig.7).

The electrons and negative ions returning to the center (of the positively charged tail) hold the positively charged ions in a cylindrical plasmoid behind the asteroid with their pressure. Their pressure leads to the preservation of the characteristic radial size of the plasma tail behind the Chelyabinsk asteroid at 30 km (Fig. 1).

All kinetic energy received by air molecules (during the collision with the Chelyabinsk asteroid) is spent on their destruction into ions, and then its remains at the level of 25 eV (in the electric field of positive ions) flow into the energy of electrons. Electrons have a small mass compared to ions and therefore leave the plasma tail of the meteoroid faster. This is how a dynamic capacitor is formed behind the meteoroid. All the energy remaining after the destruction of molecules flows into this dynamic cylindrical capacitor.

The frequency of dissociative attachment of electrons to an oxygen molecule ν_a for electrons with an energy of 25 eV is of the order of $(10^{-11}x10^{17})$ [32] 10^6 s^{-1}. The speed of electrons (V_e) with an energy of ≈ 25 eV in air is of the order of $3{\cdot}10^7$ cm/s. Where does the characteristic radial size of the plasma tail increment in the mode of destruction of air molecules only come from: $L \sim V_e/\nu_a \approx 0.3$ m.

This means that the radius of the plasma systems where the plasma with the particle energy of 25 eV is concentrated is about the radius of the Chelyabinsk meteoroid ~ 9+0.3≈ 9 m.

At the boundary of this capacitor, free electrons leave the plasma tail behind the Chelyabinsk asteroid, as a result of dissociative adhesion to oxygen molecules they turn into O^-. The O^- ion returns back to the positively charged tail at a speed hundreds of times less than the speed of electrons.

Fig. 7 shows a diagram of the implementation of a cylindrically symmetric electric field shock wave surrounding the plasma in the tail of a meteoroid (asteroid). According to the diagram, the shock wave separates the plasma with negative ions and the plasma where these ions are destroyed in collisions with excited particles and thus turned into atoms, positive ions and free electrons, capable of being accelerated by the electric field in +CDS (in a positively charged electric cord) more quickly than negative ions.

The presence of plasmas with different contents of negative ions at the boundary of the shock wave allows us to classify such shock waves as incongruent jumps of plasma parameters.

In Fig. 7, we detailed how the Le Chatelier – Brown's principle is implemented in such jumps: the medium is polarized, forms a capacitor, which, when destroyed, fragments the disturber of the equilibrium of the medium and throws off its remains in the form of positive ions in the direction opposite to the direction of its movement (Fig. 7).

The movement of positive ions in their own electric field (Fig. 7) (in the opposite direction to the movement of the Chelyabinsk asteroid) solves in a pulse-periodic mode (periodic breakdown of a cylindrical capacitor by CJ the problem of fulfilling the virial theorem during the complete destruction of the asteroid in the upper layers of the atmosphere.

XIV. Conclusion

The Chelyabinsk meteoroid of 2013 showed the fragility of our civilization, which is not yet able to understand, comprehend and apply in practice all the phenomena recorded on video cameras by amateurs in their region. "Classical" science was unable to explain all the observed effects. The press suggested that we are being protected by some higher intelligence that is shooting at the Chelyabinsk meteoroid.

Having analyzed these visualized phenomena, I come to the understanding that these: photographs (Fig. 1); data presented by NASA on all the parameters of the explosion (in particular, the transition of a significant part of all the kinetic energy of the asteroid into electromagnetic radiation); data on the spread of plasma disturbances at the speed of ambipolar drift, presented by RIA News 03/21/2013 and all the videos and eyewitness accounts of the event collected on the Internet, are undoubtedly worthy of the highest awards and praise, since they completely overturn the "classical" mechanical ideas about many natural phenomena (Fig. 1,5). These data allow me to claim that I have created for the first time a model of meteoroid and asteroid fragmentation that takes into account their

destruction into dust down to electrons and positive ions. This model explains how a flow of energy in the form of CJ can carry out this fragmentation and direct half of the kinetic energy of a celestial body after it for its further destruction.

We were the first to propose a model of the Coulomb explosion of a meteoroid based on the model of ordinary linear lightning. We were the first to propose a model of the Coulomb explosion of asteroid, meteoroid - its fragmentation and described in detail how such fundamental principles as the Le Chatelier-Brown principle and the virial theorem, formulated in 1870 by Clausius for gravitating systems, Fock for quantum physics, are fulfilled in this process.

Our pulse-periodic mechanism that destroys meteoroids solves the problem of fulfilling the virial theorem for any meteoroid speeds - from 10 km/s to 70 km/s and more - even before their collision with the Earth's surface.

In the case of a positively charged plasmoid (see Fig. 1), the analogue of a fully reflecting mirror is the end of its tail, which is located at a distance of approximately 30 kilometers from the meteoroid.

The analogue of a transparent mirror is the area near the asteroid, the movement and destruction of which generates a new element of the positively charged plasmoid (Fig. 4b). All the kinetic energy of the asteroid initially passes into the electrical energy of the radial capacitor (Fig. 7), and when it is broken down by CJ, into the electrical energy of a highly conductive line polarized in the longitudinal motion of the meteoroid (Fig. 7). All this is accompanied by bright explosions and radiation.

Within the framework of mechanical models alone [6-16, 21-33] or the charging of the meteoroid alone [34,35], it is impossible to explain the entire spectrum of amazing phenomena that occurred during the penetration of the Chelyabinsk meteoroid in 2013 into the electronegative atmosphere of the Earth (Fig. 1). As for the libration (cumulation) points L_1 between binary stars, in modern works the structural Vysikaylo-Poisson'sturbulence is taken into account at all [3].The results [1-3] are useful for making discoveries that were previously not possible, resolving controversies, and creating innovative technologies such as the use of a plasma tail or an external combustion engine.

Our research proves the validity of the further development of Louis de Broglie's hypothesis: "particles behave like waves" and can form their flows similarly to electromagnetic waves in a conventional laser (in the plasma tail of an asteroid or meteoroid). In this case, the role of Vysikaylo's incongruent shock waves of the electric field restraining the radial expansion of the plasma tail behind the asteroid is significant.

The mechanism we proposed [1-3] explains all the observed phenomena during the propagation of electric arcs, lightning, and the 2013 Chelyabinsk meteorite entering the Earth's atmosphere, and proves that de Broglie electron-wave lasers with a resonator length of 10 cm to 30 km and a diameter of about 18 m are realized in nature and can be described theoretically. This gives us grounds to use this mechanism to explain the joint organization of opposite proton jets from black holes [3] and electrons into black holes. These laser-like jets have already been observed in Hubble-type telescopes and have a length of up to 1.5 kpc (Fig. 5). Thus, our cumulative-reactive mechanism is capable of explaining the increased velocities of active neutron stars. We have described in detail for the first time the chemical kinetics of nanoparticles in incongruent Vysikaylo's shock waves of electric field for protecting the Earth from asteroids and explained in detail the pure transmutation of the kinetic energy of the asteroid into opposite jets of charged particles by analogy with ordinary lightning.

In this paper, we present a new interdisciplinary approach that combines plasma physics, quantum theory, and atmospheric observations. Our model, based on cumulative-dissipative systems and the application of Vysikaylo's mechanisms for co-organization of cumulation and dissipation processes of energy-mass-momentum flows (EMMF), offers an innovative view of meteoroid fragmentation and observed phenomena associated with the Chelyabinsk event.

To prove the correctness of our approach, we provide the necessary detailed theoretical explanations and references to historical and recent observational data. Analogies drawn between lightning discharge mechanisms, astrophysical jets, and plasma behavior in laboratory conditions help us convincingly unite various physical phenomena and thus prove that the world from femto-structures to the world of galaxies is governed by fairly general laws of cumulation and dissipation of EMMF [36].

Despite the richness and technical component of the article, the presentation retains the clarity of the main scientific arguments.

Readers with experience in plasma dynamics and field theory will likely find our ideas interesting and thought-provoking.

The author believes that this paper will make a significant contribution to the ongoing debate about natural high-energy atmospheric events and the mechanisms that protect planet Earth.

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General Theory of Black Holes (Preliminary Draft)

By Stuart Edward Boehmer

Abstract- We discuss corrections to the mainstream theory of black holes and stars.

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Strictly as per the compliance and regulations of:

General Theory of Black Holes (Preliminary Draft)

Stuart Edward Boehmer

Abstract- We discuss corrections to the mainstream theory of black holes and stars.

I. Introduction: Two-Dimensional Riemann Geometry

a) Euclidean Space

The distance between two points separated in the Cartesian coordinates, (X,Y), by (dX,dY) is,

$$\delta s^2 = dX^2 + dY^2.$$

Transforming to curvilinear coordinates, (u,v), we have,

$$\delta s^2 = \left[\left(\frac{\partial X}{\partial u}\right)^2 + \left(\frac{\partial Y}{\partial u}\right)^2\right] du^2 + 2\left[\frac{\partial X}{\partial u}\frac{\partial X}{\partial v} + \frac{\partial Y}{\partial u}\frac{\partial Y}{\partial v}\right] dudv + \left[\left(\frac{\partial X}{\partial v}\right)^2 + \left(\frac{\partial Y}{\partial v}\right)^2\right] dv^2$$

$$\coloneqq g_{mn} du^m du^n.$$

b) Non-Euclidean Space

Generally speaking, where we call the X^r_m the tetrads, defining the directions δX^r, where now the δX^r are differential forms and not, as in the Euclidean case, exact differentials of quantities, X^r, where,

$$\delta s^2 = \delta X^2 + \delta Y^2 = \delta_{rs} X^r_m X^s_n du^m du^n \coloneqq g_{mn} du^m du^n.$$

The boundary conditions on a real two-dimensional Riemannian space is that the coordinates, (u,v) and the tetrads be real and nonsingular functions, and that g_{mn} be of full rank (rank two).

Moreover, the conditions on the space being extended into a certain region is that the gmn have signature (+1,+1), that is, they are given by the expression implied by the above relation.

Therefore, if we solve the eigenvalue problem, $g_{mn}U^n = \begin{bmatrix}\lambda_1 & 0\\ 0 & \lambda_2\end{bmatrix}\boldsymbol{U}$, and either of the eigenvalues, λn, equals zero, and g_{mn} is of rank one. The corresponding point is a pole of the coordinate system.

For example, in polar coordinates in Euclidean space, $\delta s^2 = dr^2 + r^2 d\theta^2$, and the eigenvalues of gmn are 1 and r^2. When $r^2=0$ (or $r=0$), that is the origin of coordinates is a pole of the coordinate system. No one has ever suggested that the space could be extended into regions below $r=0$ where r was imaginary and the signature of gmn was (+1,-1) and θ was in some sense time-like. No one has ever even suggested that regions where r was real and < 0 exist (even though the signature of g_{mn} would remain (+1,+1)). *Any* pole of the coordinate system—defined by one of the eigenvalues being zero—is similar to this elementary pole: it represents a terminus of the coordinate system. (By the way, of course we are *not* using the word "pole" in the sense of the theory of functions of a complex variable, that is, as an infinity of a function asymptotically equal to some negative integral power of z, but in the sense of "the North Pole.") Some coordinate systems (exempli gratia, Cartesian coordinates in a Euclidean space) do not have any poles, while others (polar coordinate system on a Euclidean plane or the axis of spherical polar coordinates in Euclidean space or the latitude-longitude coordinate system on a spherical surface) do. Everyone understands this in the context of ordinary geometry, but the mainstream scientific community seems to be confused about this in the context of general relativity and space-time geometry, as we will examine at greater length below.

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By the way: the resolution, $\delta s^2=\delta X^2+\delta Y^2$, for a general Riemannian space is correct, because Riemann assumed that at any point, g_{mn} could be locally transformed to the form δ_{mn} by a coordinate transformation.

Note: in this paper, our practice is to denote exact differentials by the symbol "d" and differential forms by the symbol "δ." Thus, an exact differential, df, can be integrated to give a well-defined function of the coordinates, f(u,v), which is not path-dependent, while integrating a differential form, δf, would generally yield a result dependent upon the path, C, between the endpoints $(u_0,v_0),(u_1,v_1)$. Thus, for example, we denote the spatial distance differential by δs rather than ds because the distance between two points was proven by Euclid to be path dependent: the distance between two vertices, A, B, of a triangle ABC is always shorter if we go directly along the line connecting A and B than if we take the route from A to B through C—something that Epicurus said Euclid hadn't needed to "prove" because this fact was known already to an ass. Place an ass at point A, some fodder at point B, and when the ass becomes hungry, he will not proceed along the route through C!

c) Relativistic Space-Time

Here, we must have the space-time metric, $G_{\mu\nu}$, resolvable into the form $\eta_{\rho\sigma}X^{\rho}_{\mu}X^{\sigma}_{\nu}$, where the tetrads, X^{ρ}_{μ}, and the coordinates, u^{μ}, are real and non-singular, and,

$$\eta_{\rho\sigma} := \begin{bmatrix} -\delta_{mn} & 0 \\ 0 & c^2 \end{bmatrix},$$

that is, $G_{\mu\nu}$ must possess signature (-1,-1,-1,+1), and points where its signature degenerates into, for example, (-1,-1,-1,0) (where one of the eigenvalues of $G_{\mu\nu}$ becomes zero) are poles of the coordinate system, not regions of transition to realms in which $G_{\mu\nu}$ has the signature, for example, (-1,-1,-1,-1) and the time variable becomes somehow spacelike, or signature (-1-1,+1,-1), where the rôles of space and time are mysteriously reversed and exotic physical effects occur.

II. Schwarzschild Point Mass Solution
[Schwarzschild, *Sitzungsberichte*, 1916, p. 313]

The space-time line element is given as,

$$\delta\sigma^2 = c^2(1-2GM/c^2\hat{r})(du^0)^2 - \frac{d\hat{r}^2}{1-2GM/c^2\hat{r}} - \hat{r}^2d\theta^2 - \hat{r}^2sin^2\theta d\varphi^2,$$

where we have denoted by the symbol $\hat{r}$ what Schwarzschild denoted by r, reserving the symbol r for the radial distance from the point mass singularity at the origin,

$$r = \int \frac{d\hat{r}}{\sqrt{1-2GM/c^2\hat{r}}} = \int \frac{\sqrt{\hat{r}}d\hat{r}}{\sqrt{\hat{r}-2GM/c^2}},$$

which is an elementary quadrature that can be looked up in standard tables.

One eigenvalue of $G_{\mu\nu}$ is G_{00}, which equals zero when $r*=2GMc^2$. This is therefore a pole of the coordinate system, the origin of coordinates, and not a surface at some remove from the physical mass-point singularity at the origin, but coincident with it. There is no space-time in the region $\hat{r}<2GMc^2$ - no baby universes, time warps, multiverse or any other such stupidities. The point $\hat{r}=2GMc^2$ is a pole of the coordinate system coincident with and identical with the point $r=0$. The relationship between $\hat{r}$ and r is that of a coordinate transformation. There is no region in real space-time corresponding to $0\leq\hat{r}\leq2GMc^2$, nothing lying below the point $\hat{r}=2GMc^2$ any more than there is a region $r<0$ below the pole of the polar coordinates of the ordinary two-dimensional Euclidean plane. I appear to be the first person with a clear understanding of this trivial fact, amazingly enough, after 109 years of research by supposedly brilliant minds.

There are other poles at $\hat{r}^2=0$ and $\hat{r}^2sin^2\theta=0$; that is, $\hat{r}=0$ and $\theta=0,\pi$. The one at $\hat{r}=0$ is superceded by the one at $\hat{r}=2GMc^2$; that is, it is never realized because there is no space below the pole at $\hat{r}=2GMc^2$.

Writing,

$$r = \int_{2GM/c^2}^{\hat{r}} \frac{\sqrt{r'}dr'}{\sqrt{r'-2GM/c^2}},$$

we see that the point $\hat{r}=2GMc^2$ is coincident with the origin, r = 0—just another coordinate representation of the origin.

The function r(r̂), or its inverse r̂(r), defined by the relation (1) is just a coordinate transformation between r and r̂ and the point a the origin can be equivalently represented by the equation r = 0 or r̂ = $2GMc^2$—it is the same point, just by two different names.

Moreover, interpreting the equation of motion of a particle subject only to gravity,

$$\ddot{u}^{\mu} + \Gamma^{\mu}_{\rho\sigma}\dot{u}^{\rho}\dot{u}^{\sigma} = 0,$$

we see that it is appropriate to define the gravitational field strength as $g^m = -\Gamma^m_{00}$, which in this case leads to $g^1 = -\frac{c^2\partial G_{00}/\partial r}{2G_{00}}$. This can be seen to lead to the correct Newtonian Limit ($c\to\infty$). Then at the point where G_{00}=0 we see that the gravitational field strength becomes infinite—another impossibility.

Moreover, there is the following curious effect of the singularities at the origin, r = 0, r̂ = 2GM/c^2:-

The radius of the point is zero, but the equatorial circumference, $\int_0^{2\pi}\hat{r}d\varphi = 4GM/c^2$, is finite. Not only is there a singularity in the gravitational field strength here, but—more relevantly, there is a singularity in the spatial Ricci curvature, a singularity in the structure of space itself (this is due to the fact that the density is a Dirac delta function, infinite at the origin and zero everywhere else; calculations of my own indicate that the spatial Ricci curvature of a static, rotationally symmetric solution of the Einstein Field Equations is $16\pi G\rho/c^2$. This calculation is confirmed by Schwarzschild's result that the spatial radius of curvature of the distributed mass solution [dicussed in section III, below. It corresponds to the section of a hypersphere.] is $R=\sqrt{3c^2/8\pi G\rho}$, while the Ricci curvature [the contraction of the spatial Ricci tensor, that is the Ricci tensor calculated with the spatial metric rather than the space-time metric] is $6/R^2$).

Point particles simply cannot occur in Nature—not only do they introduce infinities in the gravitational and electromagnetic field strengths, but, as we see here, they also introduce singularities into the very structure of space. And, any particle has a gravitational field, described by general relativity, even if it may be of small enough magnitude that it may be ignored in practical calculations.

It is well known, for example, that if we attribute a finite, non-zero radius to the electron, the renormalization infinities appearing in quantum electrodynamics disappear because it introduces an upper energy cutoff (caused by the uncertainty principle: a small, nonzero, Δr leads to a large Δp_r in the momentum, and therefore a related one in the energy) in the relevant energy integrals.

Point particles do not occur in Nature, categorically. End of story. They exist only as mathematical abstractions, and even that leads to difficulties, as we see here. Let us therefore banish the use of them from fundamental theories! This means that even elementary quantum mechanics needs to be repurposed (the particles are point particles; it is only their probability distribution, $|\psi(\boldsymbol{x},t)|^2$, that has a finite Δx).

Therefore, the mainstream picture of what a point-mass black hole is has been completely transformed with a few strokes of the pen, and much of what has been written on this subject has been shown to be rubbish. There are no event horizons, baby universes, time warps or multiverse. The eminent scientists who promulgated this sort of garbage (and we know who their names are!), really should have exhibited a little more common sense. I always have—I have been posting articles online for years stating my suspicions that there are no true black holes in Nature. It is only now that I can defend my opinions against those with the most esteemed of credentials with rigorous theoretical arguments.

III. Schwarzschild Distributed Mass Black Hole or Star [Schwarzschild, *Sitzungsberichte*, 1916, p. 424].

Introduction:

Of course, there are no point masses or singularities in Nature, so rather than the theory of § II, we must use for a more realistic model of a star a distributed mass of finite density and size that contains no singularities.

In 1916, Schwarzschild found such a solution of the Einstein Field Equations corresponding to the section of a hypersphere of radius of curvature $R=\sqrt{3c^2/8\pi G\rho}$ (where ρ is the density of a star, taken to be, for the purposes of modeling, which is at least qualitatively valid, an incompressible perfect fluid) of radius r_a.

The space-time line element for this solution is,

$$\delta\sigma^2 = c^2\left(\frac{3cos\chi_a - cos\chi}{2}\right)^2 - R^2d\chi^2 - R^2sin^2\chi d\theta^2 - R^2sin^2\chi sin^2\theta d\varphi^2,$$

where χ_a is a parameter defining the surface of the star.

The poles of the hypersphere are defined by $sin^2\chi$=0 and $sin^2\theta$=0, or χ=0,π; θ=0,π.

In this case, from $dr=Rd\chi$, we have, $r=R\chi$ and $r_a=R\chi_a$.

Therefore, in this case, we have the following picture: the star is represented by density ρ on the "polecap" of the hypersphere of radius R (actually, πR; that is, more precisely, because $r=R\chi$ and χ extends from 0 to π, r extends from 0 to πR) from $\chi=0$ to $\chi=\chi_a:=r_a/R$, while the outer vacuum solution is found by fitting this solution to the appropriate Schwarzschild vacuum solution (point mass solution outside the ball $r\geq r_a$, with M appropriately chosen to satisfy the boundary conditions [in general, *not* the mass of the star]).

If $\chi a=cos^{-1}(1/3)$ then $G_{00}=0$ at $\chi=0$, which is the pole of the coordinate system. It is also a point where the gravitational field strength $\left(-\frac{c^2\partial G_{00}/\partial r}{2G_{00}}\right)$ becomes infinite. This can never occur; therefore, we have the restriction $cos\chi_a>1/3$, or $\chi_a<cos^{1}(1/3)\sim1.23$, which is a *strict* inequality.

This much was completely understood by Schwarzschild in 1916. His only error was his interpretation of the point mass solution, which I have corrected above.

The mystique vis-á-vis "black holes" remains—to this day—centered on Schwarzschild's incorrect interpretation of the point mass solution. I repeat: there are no event horizons or black holes in the original sense of the term (as something possessing an event horizon). What was imaged in 2019 would, more properly, be called a supermassive dead star.

IV. The Kerr Problem: Rotating Stars. [Reference: Mike Guidry, "Modern General Relativity," Cambridge University Press (2019)]

Many authors (including Guidry) make the erroneous assumption that $g_{mn}=-G_{mn}$, but according to a formula of Tolman ["Relativity, Thermodynamics and Cosmology," Clarendon Press, 1934],

$$g_{mn}=-G_{mn}+\frac{G_{0m}G_{0n}}{G_{00}}.$$

If, based upon this formula applied to the Kerr space-time metric, we calculate the eigenvalues of $G_{\mu\nu}$, we find that they are $(-g_{mn}, G_{00})$.

The pole that we are principally interested in is represented by $G_{00}=0$, the ergosphere. Nothing lies below this point (it is a point, not a surface, just as is the case for the point $r*=2GM/c^2$ in the Schwarzschild point mass solution—and it is unattainable, the gravitational field strength being infinite there by very reason of $G_{00}=0$).

Calculating g_{33} on the ergosphere, we find that it is infinite: the radius of this point is zero, but its equatorial circumference is infinite, while its polar circumference is finite and non-zero! Certainly, a curious mix!

Of course, this represents an unphysical singularity in the structure of space, indicating once again that point particles do not occur in Nature, nor even in an acceptable fundamental theory.

What we need is, of course, a distributed mass, rotating star solution. This remains unavailable to this day.

I think that it is a fair bet that if an analytic solution to this problem existed, it would have already been found—it's been about 62 years since Kerr found his solution.

Therefore, numerical methods/machine computation is probably a necessary approach for this problem, and with that, a solution would be trivial and should be forthcoming shortly (if anyone cares to follow my advice).

Because all supermassive dead stars observed to date have been rotating, this calculation would give refined values of the estimates of their masses.

V. Conclusion

I have been studying black hole theory for many years, finding irregularities now and then, here and there along the way. This month what happened was that I began to understand what I had been doing in bits and pieces, but now I understood it all comprehensively—and a new gestalt formed in my mind. That is what has been accomplished in this paper: the description of a new gestalt, replacing the one that Schwarzschild (erroneously) formed in 1916.

I now understand consciously what I had been saying all along: that there are no event horizons or black holes (in the sense of an object possessing an event horizon), just supermassive dead black stars. No baby universes, time warps, multiverse—in short, no psychotic fantasies.

It took many years to form this gestalt, but when it came together at last, it formed suddenly—like a bolt from the blue. But this was a process having roots going back some thirty years (that is when I first began to seriously investigate the nature of *time* in relativity. My explicit study of black hole theory, motivated by this investigation, began many years later.)

The most difficult object of the subconscious to disinter is an assumption that we do not even realize we are making—a subliminal assumption, as it were—particularly when its truth is being asserted by all the leading authorities. Who was an ordinary mortal such as myself to go against all *that*?

Psychological experiments have shown that, when presented with two straight lines of obviously unequal length, an individual, who has heard everyone else in the room assert that they are of equal length, will very likely affirm that, yes, they are of equal length, and not merely affirm it, but in fact *perceive* it.

It took me thirty years to come to my senses, and today I shout the obvious: "The Emperor has no clothes!"

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Quantum Effect and Negative Energy and Mass Defect in Gravitational Field

By Gang Lee

Abstract- In this paper, we calculated the quantum superposition between states of the gravitational fields by Feynman path integration and concluded that in general, the quantum effects can be interpreted as the negative energy in gravitational field, it will lead to gravitational mass defect.

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Quantum Effect and Negative Energy and Mass Defect in Gravitational Field

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Abstract- In this paper, we calculated the quantum superposition between states of the gravitational fields by Feynman path integration and concluded that in general, the quantum effects can be interpreted as the negative energy in gravitational field, it will lead to gravitational mass defect.

I. Introduction

In section 2, we briefly reviewed noncommutative quantum gravity. This theory is classically equivalent to general theory of relativity. We have provided some computational results of this theory and its interpretation of dark matter. In section 3, we calculated the quantum superposition effect of states between gravitational fields by Feynman path integration. In general, the quantum effects will lead to negative energy in gravitational field, which will cause the mass defect of the gravitational sources.

II. A Brief Review of Noncommutative Quantum Gravity

In the paper [1] and [2], we introduce the theory of noncommutative quantum gravity. In this theory, we give the fundamental field variables of gravity. It is a semiclassical graviton. Its form is a Dirac-δ function as follows

$$\xi^i(x,r) = \begin{cases} \xi^r = r + C^r(x)\exp(-\frac{r}{l_P}) \\ \xi^\theta = \theta(x) \\ \xi^\phi = \phi(x) \\ \xi^t = t + C^t(x)\exp(-\frac{|t|}{t_P}) \end{cases} \tag{2.1}$$

The Lagrangian density is

$$\mathscr{L} = -\frac{\eta^{\mu\nu}}{2}\frac{\partial\xi^i(x,r)}{\partial x^\mu}\frac{\partial\xi^j(x,r)}{\partial x^\nu}\eta_{ij} \tag{2.2}$$

The energy-momentum tensor is

$$\begin{aligned} T_{\mu\nu} &= \eta_{\mu\nu}\mathscr{L} - \frac{\partial\mathscr{L}}{\partial(\partial^\mu\xi^i)}\partial_\nu\xi^i \\ &= -\frac{\eta_{\mu\nu}}{2}\partial^\lambda\xi^i\partial_\lambda\xi^j\eta_{ij} + \partial_\mu\xi^i\partial_\nu\xi^j\eta_{ij} \end{aligned} \tag{2.3}$$

The free field equation is a wave equation

$$\partial^\mu\partial_\mu\xi^i = 0 \tag{2.4}$$

The Green's function can be written as

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$$\tilde{G}^i(k) = \begin{cases} \tilde{G}^r(k) = -\frac{1}{(k^r)^2} \cdot \delta\Big(k^r - \frac{i}{l_P}\Big) \\ \tilde{G}^\theta(k) = -\frac{1}{(k^\theta)^2} \\ \tilde{G}^\phi(k) = -\frac{1}{(k^\phi)^2} \\ \tilde{G}^t(k) = -\frac{1}{\omega^2} \cdot \delta\Big(\omega - \frac{i}{t_P}\Big) \end{cases} \tag{2.5}$$

In the paper [2], we proved that the d'Alembert operator is invariant in noncommutative quantum gravitational field. Therefore the Klein-Gordon equation is invariant noncommutative quantum gravitational field.
In the general theory of relativity, the energy-momentum tensor of gravitational field itself is:

$$\begin{aligned} t_{\mu\nu} &= \frac{1}{8\pi G}\left(\frac{1}{2}\eta_{\mu\nu}R^{(1)} - R^{(1)}_{\mu\nu}\right) \\ &= \frac{1}{8\pi G \cdot C}\left(\frac{1}{2}\eta_{\mu\nu}\frac{\partial\xi^i}{\partial x^\kappa}\frac{\partial\xi_i}{\partial x_\kappa} - \frac{\partial\xi^i}{\partial x^\mu}\frac{\partial\xi_i}{\partial x^\nu}\right) \end{aligned} \tag{2.6}$$

Up to a factor of a constant, it is equal to Eq.[2.3]. It is a strong evidence to prove that the quantum field theory constructed in the paper [1] and paper [2] is classically equivalent to the general theory of relativity.

In the paper [3] [4] [5] and [6], we can see that the self-interaction effects in noncommutative quantum gravity may provide an alternative explanation for dark matter-like gravitational phenomena, potentially offering a simpler theoretical framework. The metric $g_{\mu\nu}$ of the general static isotropic gravitational field with self-interaction can be written as follows

$$\begin{aligned} ds^2 &= (1+\Delta_r)^2 \cdot \left[1 - \frac{2MG}{r}\right]^{-1} dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2 \\ &- (1+\Delta_t)^2 \cdot \left[1 - \frac{2MG}{r}\right] dt^2 \end{aligned} \tag{2.7}$$

where

$$\Delta_r \equiv F_r(r,M) \cdot \left[1 - \frac{2MG}{r}\right]^{1/2}$$

$$F_r(r,M) = KMG\cdot$$

$$\ln \frac{\left(\sqrt{r^2+r} - \sqrt{(2MG)^2+2MG}\right) + \left(\sqrt{r(1+2MG)} - \sqrt{2MG(1+r)}\right)}{\left(\sqrt{r^2+r} - \sqrt{(2MG)^2+2MG}\right) - \left(\sqrt{r(1+2MG)} - \sqrt{2MG(1+r)}\right)} \tag{2.8}$$

The self-interaction of noncommutative quantum gravity of the static spherically symmetric metric we calculated in Paper paper [6] is shown in Fig.1

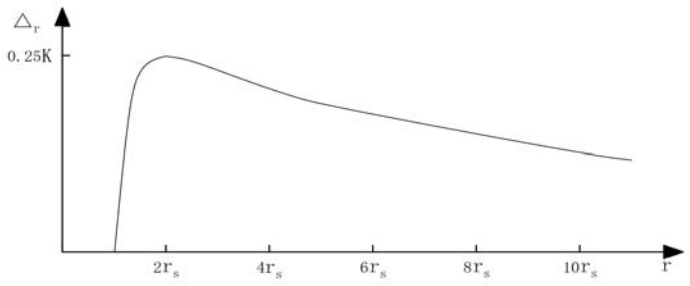

Figure 1: function Δ_r

It is consistent with the distribution of dark matter halo in galaxies.

III. Quantum Effect of the Noncommutative Quantum Gravity

In the paper [1] we introduce the locally inertial system $\xi(x,r)$ as Eq.[2.1]. It is a wave packet approximate to the Dirac δ-function which can be explained as a semiclassical graviton. The dynamic variables of the locally inertial system are $C^i(x) = \big(C^r(x), \theta(x), \phi(x), C^t(x)\big)$. Quantization only quantizes the dynamic variable $C^i(x)$. Therefore, for simplicity, in this paper we directly consider $C^i(x)$ as the fundamental state function of gravitational field.

Let the gravitational source of $C^i_{(1)}(x)$ and $C^i_{(2)}(x)$ are $j^\mu_{(1)}$ and $j^\mu_{(2)}$, respectively. If these two gravitational sources are independent of each other, there is no interaction between sources $j^\mu_{(1)}$ and $j^\mu_{(2)}$. The Feynman path integral of the initial state $C^i_{(1)}(x)$ and $C^i_{(2)}(x)$ can be written as follows

$$K_{(1)} = \int \mathscr{D}\big[C^i_{(1)}\big]\, e^{iS[C^i_{(1)}]/\hbar}$$

$$K_{(2)} = \int \mathscr{D}\big[C^i_{(2)}\big]\, e^{iS[C^i_{(2)}]/\hbar} \tag{3.1}$$

Denote $\tilde{C}^i(x)$ as the final state of $C^i(x)$. Then the final states are

$$\tilde{C}^i_{(1)}(x) = \int d^4x\, K_{(1)} \cdot C^i_{(1)}(x)$$

$$\tilde{C}^i_{(2)}(x) = \int d^4x\, K_{(2)} \cdot C^i_{(2)}(x) \tag{3.2}$$

Merge these two gravitational sources $j^\mu_{(1)}$ and $j^\mu_{(2)}$. This means that the two sources must be considered together. Let's study the gravitational field $C^i_{(1+2)}(x)$ excited by merge of sources $j^\mu_{(1)} + j^\mu_{(2)}$. The initial state is

$$C^i_{(1+2)} = C^i_{(1)} + C^i_{(2)} \tag{3.3}$$

The joint propagator $K_{(1+2)}$ of $C^i_{(1+2)}$ is

$$\begin{aligned} K_{(1+2)} &= K_{(1)} \otimes K_{(2)} \\ &= \int \mathscr{D}\big[C^i_{(1)} + C^i_{(2)}\big]\, e^{i\left(S[C^i_{(1)}]+S[C^i_{(2)}]\right)/\hbar} \\ &= \int \mathscr{D}\big[C^i_{(1)} + C^i_{(2)}\big] \left(e^{iS[C^i_{(1)}]/\hbar} \cdot e^{iS[C^i_{(2)}]/\hbar}\right) \end{aligned} \tag{3.4}$$

If $C^i_{(2)} = k \cdot C^i_{(1)}$, $k \in R$, for the Lagrangian density [2.2], we have

$$S[C_{(2)}] = k^2 \cdot S[C_{(1)}] \tag{3.5}$$

Then

$$K_{(1+2)} = \int \mathscr{D}\left[C^i_{(1)} + C^i_{(2)}\right] \left(e^{iS[C^i_{(1)}]/\hbar} \cdot e^{iS[C^i_{(2)}]/\hbar}\right)$$

$$= \int \mathscr{D}\left[C^i_{(1)} + C^i_{(2)}\right] \left(e^{i(1+k^2)S[C^i_{(1)}]/\hbar}\right) \tag{3.6}$$

Not considering the quantum superposition of the states $C^i_{(1)}$ and $C^i_{(2)}$, the final state $\tilde{C}^i_{(1+2)}$ is

$$\tilde{C}^i_{(1+2)} = \int d^4x \, K_{(1+2)} \cdot \left(C^i_{(1)} + C^i_{(2)}\right) \tag{3.7}$$

Considering the quantum effects of the gravitational field. The quantum effects can cause the quantum superposition between the states $C^i_{(1)}(x)$ and $C^i_{(2)}(x)$. In this case, the Feynman path integral should be written as follows

$$K_{(1\oplus 2)} = \int \mathscr{D}\left[C^i_{(1)} + C^i_{(2)}\right] \left(e^{iS[C^i_{(1)} + C^i_{(2)}]/\hbar}\right) \tag{3.8}$$

where $\oplus$ denote the quantum superposition of states.

For the Lagrangian density [2.2], if $C^i_{(2)} = k \cdot C^i_{(1)}$, we have

$$S[C^i_{(1)} + C^i_{(2)}] = (1+k)^2 \cdot S[C^i_{(1)}] \tag{3.9}$$

Then Eq.[3.8] can be written as follows

$$K_{(1\oplus 2)} = \int \mathscr{D}\left[C^i_{(1)} + C^i_{(2)}\right] \left(e^{iS[C^i_{(1)} + C^i_{(2)}]/\hbar}\right)$$

$$= \int \mathscr{D}\left[C^i_{(1)} + C^i_{(2)}\right] \left(e^{i(1+k)^2 S[C^i_{(1)}]/\hbar}\right) \tag{3.10}$$

The final state $\tilde{C}^i_{(1\oplus 2)}(x)$ is

$$\tilde{C}^i_{(1\oplus 2)}(x) = \int d^4x \, K_{(1\oplus 2)} \cdot \left(C^i_{(1)}(x) + C^i_{(2)}(x)\right) \tag{3.11}$$

If $K_{(1\oplus 2)} = K_{(1+2)}$, there are no effects of quantum superposition of states, then we have $\tilde{C}^i_{(1\oplus 2)} = \tilde{C}^i_{(1+2)}$. In this case, the following two equations should be equal

$$\tilde{C}^i_{(1\oplus 2)} = \int d^4x \left(\int \mathscr{D}\left[C^i_{(1)} + C^i_{(2)}\right] \left(e^{iS[C^i_{(1)} + C^i_{(2)}]/\hbar}\right) \cdot \left(C^i_{(1)} + C^i_{(2)}\right)\right)$$

$$\tilde{C}^i_{(1+2)} = \int d^4x \left(\int \mathscr{D}\left[C^i_{(1)} + C^i_{(2)}\right] \left(e^{i\left(S[C^i_{(1)}] + S[C^i_{(2)}]\right)/\hbar}\right) \cdot \left(C^i_{(1)} + C^i_{(2)}\right)\right) \tag{3.12}$$

If $C^i_{(2)} = k \cdot C^i_{(1)}$, it can be written as follows

$$\left(e^{iS[C^i_{(1)}]/\hbar}\right)^{(1+k)^2} = \left(e^{iS[C^i_{(1)}]/\hbar}\right)^{(1+k^2)} \tag{3.13}$$

The solution of Eq.[3.13] is:

$$e^{iS[C^\mu_{(1)}(x)]/\hbar} = 1 \tag{3.14}$$

Then the action of $C^i_{(1)}(x)$ is

$$S[C^i_{(1)}(x)] = 2n\pi\hbar,\ n \in Z \tag{3.15}$$

Therefore the action of $C^i_{(2)}(x)$ is

$$\begin{aligned} S[C^i_{(2)}(x)] &= S[k \cdot C^i_{(1)}(x)] \\ &= k^2 \cdot S[C^i_{(1)}(x)] \\ &= 2nk^2\pi\hbar,\ n \in Z \end{aligned} \tag{3.16}$$

where k must satisfy the condition of quantization of the action.

Only in the case of that the gravitational field $C^i_{(1)}$ and $C^i_{(2)}$ excited by the sources $j^\mu_{(1)}$ and $j^\mu_{(2)}$ satisfy the solution [3.15] and [3.16], we have

$$\tilde{C}^i_{(1\oplus 2)} = \tilde{C}^i_{(1+2)} \tag{3.17}$$

Then we can deduce the gravitational source from the gravitational field in reverse by Eq.[3.17]:

$$j^\mu_{(1\oplus 2)} = j^\mu_{(1+2)} \tag{3.18}$$

In other cases, the propagator $K_{(1\oplus 2)}$ is different to $K_{(1+2)}$

$$K_{(1\oplus 2)} \neq K_{(1)} \otimes K_{(2)} \tag{3.19}$$

Then the final states will be different

$$\tilde{C}^i_{(1\oplus 2)} \neq \tilde{C}^i_{(1+2)} \tag{3.20}$$

Therefore the sources will be different

$$j^\mu_{(1\oplus 2)} \neq j^\mu_{(1+2)} \tag{3.21}$$

Obviously, Eq.[3.19] Eq.[3.20] and Eq.[3.21] represents the general case, while E.[3.17] and Eq.[3.18] is a special case. The change in gravitational field in Eq. [3.20] means a change in the energy of gravitational field itself.

We can also deduce that this will change the gravitational source $j^{\mu}_{(1+2)}$ of the final states to become $j^{\mu}_{(1\oplus 2)}$. If energy cannot be absorbed from the outside, Eq.[3.20] can only causing it to lose energy. Therefore, in general, when the gravitational sources merge, the effects of quantum superposition can be interpreted as negative energy in gravitational field. This negative energy does not depend on the choice of the zero point of energy and therefore different from the negative gravitational potential energy. Eq.[3.21] indicates that the effects of quantum superposition can lead to the mass defect of the gravitational sources caused by negative energy in the gravitational field. This is consistent with the conclusions of the general theory of relativity, but differs in that it doesn't originate from the energy conversion of kinetic and potential energy during the kinetic merger of gravitational sources, just caused by the quantum superposition of the states of gravitational fields.

IV. Conclusion

Since the fundamental field and the Lagrangian action of gravity are given in paper [1], we can calculate the quantum superposition between the gravitational fields by Feynman path integration. The calculation results indicate that in general, the quantum effects will generate negative energy in gravitational field, leading to the mass defect of the gravitational sources. Its origin is different from the origin of the mass defect in general theory of relativity. There will be no quantum superposition effect only when the actions of the gravitational sources satisfy specific conditions.

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Production and Decay of Higgs Boson, From God Particle H to Heaven Particle Π

By ShaoXu Ren
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Abstract- *This paper suggests an interesting idea:* Based on quark genera $(t, b), (c, s), (u, d)$ harmony flavor symmetry and Mass Principle $Q^2(\xi) - \xi^2 = Q^2$, Heaven particle Π with $M(\Pi) = 692$ *Gev* should instead of God particle H with $M(H) = 125$ *Gev*. $M(\Pi)$ as four times as heavy as ground state $Q^2(t)$ of t top quark.

Keywords: *god particle H, heaven particle Π, production and decay, mass principle, deep neural networks.*

GJSFR-A Classification: *LCC Code: QC793.5.H53*

Strictly as per the compliance and regulations of:

Production and Decay of Higgs Boson, From God Particle H to Heaven Particle Π

ShaoXu Ren

Abstract-

This paper suggests an interesting idea: Based on quark genera $(t,b),(c,s),(u,d)$ harmony flavor symmetry and Mass Principle $\mathbf{Q}^2(\xi)-\xi^2=\mathbf{Q}^2$, Heaven particle Π with $M(\Pi)=692\,Gev$ should instead of God particle H with $M(H)=125\,Gev$. $M(\Pi)$ as four times as heavy as ground state $\mathbf{Q}^2(t)$ of t top quark.

Keywords: God particle H, Heaven particle Π, Production and Decay, Mass Principle, deep neural networks.

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Introduction

• Both Higgs production modes and Higgs decay branching ratio are related to Higgs boson mass. For examples: Associated production with a pair of heavy quarks ($t\tilde{t}H, b\tilde{b}H$), Dominant decay branching ratio for bottom pair ($H \rightarrow b\tilde{b}$, BR $\sim 58\%$) with $M(H) = 125\ Gev$.

An amazing phenomenon, since quark genera $(t,b),(c,s),(u,d)$ are attributed to the same flavor symmetry, the decay $H \rightarrow q\tilde{q}$ for $q= c,u,d,s,b,$ are observed, BUT up to now the species t is still excluded from decay $H \rightarrow t\tilde{t}$? Why ?

God particle H may be not the perfect boson that as we wanted, expected before. A possible heavier zero spin particle named as *Heaven particle* Π boson, Π instead of H ?

This paper aims to discuss the above questions.

• In the analysis of physics experimental data, *deep neural networks* of artificial intelligence are operating on the masses of particles. Specially on searching for a new particle X of unknown mass by the parameterized neural networks [1].

In dealing with the production and decay of this hypothetical particle X, Pierre, Peter and Daniel " In order to test how well a parameterized neural network generalizes to new parameter values, ", they used three samples, then the " three different training data sets with $m_X = 500, 750, 1000, 1250, 1500\ Gev$ " were put into Feynman diagrams of particle physics. The mass distributions of m_X is relevent to the production and decay of X particle in the processes of $q\tilde{q}, gg \rightarrow X \rightarrow t\tilde{t} \rightarrow W^+bW^-\tilde{b}$.

At the time of introducing the postulation *Mass Principle* [2], we found an eccentric scalar product $\mathbf{Q}^2 = \frac{692Gev}{0\,511}$, as four times as heavy as ground state $\mathbf{Q}^2(t)$ of t top quark, that always wandering around our calculations related to the origin of Higgs mechanism, which could ensure the processes of "pure production" and "pure decay" *for all the six flavor quarks* $q = t, c, u, d, s, b.$ Now this mass $692\ Gev$ looks like an interesting parameter value for m_X in *the deep neural network* mentioned above.

• This paper includes three parts:

Part A endeavors to depict a story about a boson $\mathbb{B}$ and a color-pair of quark q & a antiquark $\tilde{q}$. Their color representations are given by $\mathbf{Q}(\mathbb{B}, \xi(\mathbb{B})) + i\boldsymbol{\xi}(\mathbb{B})$ and $\mathbf{Q}(q, \xi) + i\boldsymbol{\xi}(q)$ & $\mathbf{Q}(\tilde{q}, \tilde{\xi}) + i\tilde{\boldsymbol{\xi}}(\tilde{q})$ respectively.

Part B aims at explaining why, $\mathbb{B} = H \rightarrow t\tilde{t}$, the decay process of *God particle* H, has not be observed, and why can't be happened. Because the mass principle $\mathbf{Q}^2(H) - \boldsymbol{\xi}^2(H,t) = \mathbf{Q}^2(H)\ (\frac{M(H)}{0.511})$ is violated. Due to the value of $\boldsymbol{\xi}^2(H,t)$, the arithmetic square, is less than zero.

Part C gives the minimum critical value of $\mathbf{Q}^2(\mathbb{B}= \Pi)= 4\mathbf{Q}^2(t) - \frac{16}{3} = \frac{691997.2746666668}{0.511} Mev$ of *Heaven particle* Π, as $\boldsymbol{\xi}^2(\Pi, t)= 0.$

Part A Color Relation Formula bwteen Color Boson $\mathbf{Q}(\mathbb{B})$ ***and Fermion Color-Pair*** $\mathbf{Q}(q,\xi)+i\boldsymbol{\xi}(q)$ ***and*** $\mathbf{Q}(\tilde{q},\tilde{\xi})+i\tilde{\boldsymbol{\xi}}(\tilde{q})$

Relation Formula $\mathbf{Q}(\mathbb{B})=\mathbf{Q}(\mathrm{F}\bar{\mathrm{F}})$ [2] between a Boson $\mathbb{B}$ and a Quark q & an Antiquark $\tilde{q}$ could be written more detailedly as below

Boson $\mathbb{B}$, that be consisten with a color-pair quark q and a color-pair antiquark $\tilde{q}$ in complex field $\mathbb{C}$

$$\underline{\mathbf{Q}(\mathbb{B},\xi(\mathbb{B}))+i\boldsymbol{\xi}(\mathbb{B})}=\underline{\mathbf{Q}(q,\xi)+i\boldsymbol{\xi}(q)}+\underline{\mathbf{Q}(\tilde{q},\tilde{\xi})+i\tilde{\boldsymbol{\xi}}(\tilde{q})} \tag{0}$$

Here: $\mathbb{B}$ boson and $q,\tilde{q}$ fermions are required to satisfy the following Mass Principles

$$\mathbf{Q}^2(\mathbb{B},\xi(\mathbb{B}))-\boldsymbol{\xi}^2(\mathbb{B})=\mathbf{Q}^2(\mathbb{B})=\frac{M(\mathbb{B})}{0.511} \tag{0.1}$$

$$\mathbf{Q}^2(q,\xi)-\boldsymbol{\xi}^2(q)=\mathbf{Q}^2(q)=\frac{M(q)}{0.511} \tag{0.2}$$

$$\mathbf{Q}^2(\tilde{q},\tilde{\xi})-\tilde{\boldsymbol{\xi}}^2(\tilde{q})=\mathbf{Q}^2(\tilde{q})=\frac{M(\tilde{q})}{0.511} \tag{0.3}$$

Where the above, $\mathbf{Q}^2(q)$ & $\mathbf{Q}^2(\tilde{q})$ are the mass of ground states of quarks & antiquarks that are shown following

$$\mathbf{Q}^2(t)=\mathbf{Q}^2(\tilde{t})=338,551.859\ 099\ 8043=\frac{173000.000\ 000\ 0000}{0.511} \tag{1}$$

$$\mathbf{Q}^2(c)=\mathbf{Q}^2(\tilde{c})=2,504.892\ 367\ 9061=\frac{1280.000\ 000\ 0000}{0.511} \tag{2}$$

$$\mathbf{Q}^2(u)=\mathbf{Q}^2(\tilde{u})=4.500\ 978\ 4736=\frac{2.300\ 000\ 0000}{0.511} \tag{3}$$

$$\mathbf{Q}^2(d)=\mathbf{Q}^2(\tilde{d})=9.393\ 346\ 3796=\frac{4.800\ 000\ 0000}{0.511} \tag{4}$$

$$\mathbf{Q}^2(s)=\mathbf{Q}^2(\tilde{s})=185.909\ 980\ 4305=\frac{95.000\ 000\ 0000}{0.511} \tag{5}$$

$$\mathbf{Q}^2(b)=\mathbf{Q}^2(\tilde{b})=9,197.651\ 663\ 4051=\frac{4700.000\ 000\ 0000}{0.511} \tag{6}$$

Back to (0), and decomposes it into Real part **Q** and Imaginary part ξ respectively below

【 **Real part Q** 】 $$\mathbf{Q}(\mathbb{B}, \xi(\mathbb{B})) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi}) \equiv \mathbf{Q}(q\tilde{q}, \xi\tilde{\xi}) \tag{0.4}$$

【 **Imaginary part ξ** 】 $$\xi(\mathbb{B}) = \xi(q) + \tilde{\xi}(\tilde{q}) \equiv \xi(q\tilde{q}) \tag{0.5}$$

Here imaginary part (0.5) takes (0.6)

$$\tilde{\xi}(\tilde{q}) = -\xi(q) \tag{0.6}$$

yield

$$\xi(\mathbb{B}) = \xi(q\tilde{q}) = 0 \tag{0.7}$$

In case of (0.7), Color Relation Formula (0) becomes to (7) and (8) below

$$\mathbf{Q}(\mathbb{B}) = \mathbf{Q}(q, \xi) + i\xi(q) + \mathbf{Q}(\tilde{q}, \tilde{\xi}) + i\tilde{\xi}(\tilde{q}) \tag{7}$$

$$\mathbf{Q}(\mathbb{B}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi}) \tag{8}$$

Following we explore formulas (7) and (8) respevtively.

【 discussion of (7) 】

- In left hand in (7), the color representation of $\mathbf{Q}(\mathbb{B})$ is given below

$$\mathbf{Q}(\mathbb{B}) = \left(\frac{X}{3}, \frac{X}{3}, \frac{-2X}{3}\right) \tag{9}$$

- FROM (9), obtain

$$\mathbf{Q}^2(\mathbb{B}) = \left(\frac{X}{3}, \frac{X}{3}, \frac{-2X}{3}\right)^2 = \frac{1}{9}(6X^2) = \frac{2}{3}X^2$$

obtain

$$X = X_{\pm} = \pm\sqrt{\frac{3}{2}\mathbf{Q}^2(\mathbb{B})} \tag{10}$$

- In right hand in (7), the color representation of $\mathbf{Q}(q,\xi) + i\boldsymbol{\xi}(q)$, $\mathbf{Q}(\widetilde{q},\xi) + i\boldsymbol{\xi}(\widetilde{q})$ are given below

$$q = t, c, u \qquad \mathbf{Q}(q,\xi) + i\boldsymbol{\xi}(q) = \left(\frac{x(\xi)}{3}, \frac{x(\xi)}{3}, \frac{-2x(\xi)+6}{3}\right) + i\left(\frac{\xi(q)}{3}, \frac{\xi(q)}{3}, \frac{-2\xi(q)}{3}\right) \tag{11.1}$$

$$\widetilde{q} = \widetilde{t}, \widetilde{c}, \widetilde{u} \qquad \mathbf{Q}(\widetilde{q},\xi) + i\boldsymbol{\xi}(\widetilde{q}) = \left(\frac{\alpha(\xi)}{3}, \frac{\alpha(\xi)}{3}, \frac{-2\alpha(\xi)-6}{3}\right) - i\left(\frac{\xi(q)}{3}, \frac{\xi(q)}{3}, \frac{-2\xi(q)}{3}\right) \tag{11.2}$$

$$q = d, s, b \qquad \mathbf{Q}(q,\xi) + i\boldsymbol{\xi}(q) = \left(\frac{x(\xi)}{3}, \frac{x(\xi)}{3}, \frac{-2x(\xi)-3}{3}\right) + i\left(\frac{\xi(q)}{3}, \frac{\xi(q)}{3}, \frac{-2\xi(q)}{3}\right) \tag{12.1}$$

$$\widetilde{q} = \widetilde{d}, \widetilde{s}, \widetilde{b} \qquad \mathbf{Q}(\widetilde{q},\xi) + i\boldsymbol{\xi}(\widetilde{q}) = \left(\frac{\alpha(\xi)}{3}, \frac{\alpha(\xi)}{3}, \frac{-2\alpha(\xi)+3}{3}\right) - i\left(\frac{\xi(q)}{3}, \frac{\xi(q)}{3}, \frac{-2\xi(q)}{3}\right) \tag{12.2}$$

Where

$$\boldsymbol{\xi}(q) = \left(\frac{\xi(q)}{3}, \frac{\xi(q)}{3}, \frac{-2\xi(q)}{3}\right) = -\boldsymbol{\xi}(\widetilde{q}) \tag{13}$$

Base on Mass Principles (0.2) (0.3), obtain color-scalar equations (14.1) (14.2) & (15.1) (15.2) of color (11.1) (11.2) & color (12.1) (12.2) following

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$$x^2 - 4x - \tfrac{3}{2}(\mathbf{Q}^2(q,\xi) - 4) = 0 \quad (14.1)$$

$$\alpha^2 + 4\alpha - \tfrac{3}{2}(\mathbf{Q}^2(\tilde{q},\xi) - 4) = 0 \quad (14.2)$$

$$x^2 + 2x - \tfrac{3}{2}(\mathbf{Q}^2(q,\xi) - 1) = 0 \quad (15.1)$$

$$\alpha^2 - 2\alpha - \tfrac{3}{2}(\mathbf{Q}^2(\tilde{q},\xi) - 1) = 0 \quad (15.2)$$

AND (16) (17) the solutions of the above equation are given below

- for $q = t, c, u$ (14.1), $\tilde{q} = \tilde{t}, \tilde{c}, \tilde{u}$ (14.2)

$$x(q,\xi) = +2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - 2} \quad (16.1)$$

$$\alpha(\tilde{q},\tilde{\xi}) = -2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - 2} \quad (16,2)$$

$$x_{\pm}(q,\xi) + \alpha_{\pm}(\tilde{q},\xi) = \pm 2\sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - 2} \quad (16.3)$$

- for $q = d, s, b$ (15.1), $\tilde{q} = \tilde{d}, \tilde{s}, \tilde{b}$ (15.2)

$$x(q,\xi) = -1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - \tfrac{1}{2}} \quad (17.1)$$

$$\alpha(\tilde{q},\tilde{\xi}) = +1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - \tfrac{1}{2}} \quad (17,2)$$

$$x_{\pm}(q,\xi) + \alpha_{\pm}(\tilde{q},\xi) = \pm 2\sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - \tfrac{1}{2}} \quad (17.3)$$

【 discussion of (8) 】

From previous formulas (11.1) (11.2) and (12.1) (12.2) we have

$$q = t, c, u \qquad \mathbf{Q}(q, \xi) = \left(\frac{x(\xi)}{3}, \frac{x(\xi)}{3}, \frac{-2x(\xi)+6}{3}\right) \tag{18.1}$$

$$\tilde{q} = \tilde{t}, \tilde{c}, \tilde{u} \qquad \mathbf{Q}(\tilde{q}, \xi) = \left(\frac{\alpha(\xi)}{3}, \frac{\alpha(\xi)}{3}, \frac{-2\alpha(\xi)-6}{3}\right) \tag{18.2}$$

$$q = d, s, b \qquad \mathbf{Q}(q, \xi) = \left(\frac{x(\xi)}{3}, \frac{x(\xi)}{3}, \frac{-2x(\xi)-3}{3}\right) \tag{19.1}$$

$$\tilde{q} = \tilde{d}, \tilde{s}, \tilde{b} \qquad \mathbf{Q}(\tilde{q}, \xi) = \left(\frac{\alpha(\xi)}{3}, \frac{\alpha(\xi)}{3}, \frac{-2\alpha(\xi)+3}{3}\right) \tag{19.2}$$

THEN (18.1) plus (18.2) and (19.1) plus (19.2), finally formula (8) could be rewritten as (20). And then obtain (21) below

$$\mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \xi) = \left(\frac{x(\xi)+\alpha(\xi)}{3}, \frac{x(\xi)+\alpha(\xi)}{3}, \frac{-2(x(\xi)+\alpha(\xi))}{3}\right) \tag{20}$$

$$\mathbf{Q}(\mathbb{B}) = \left(\frac{X}{3}, \frac{X}{3}, \frac{-2X}{3}\right) \tag{9}$$

$$x(\xi) + \alpha(\xi) = X \tag{21}$$

Because of (21) (10), the left hands of (16.3) and (17.3) could be rewritten as (22) and (23) respectively

$$q = t, c, u \qquad 2\sqrt{\tfrac{3}{2}\mathbf{Q}^2(q, \xi) - 2} = \sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B})} \tag{22}$$

$$q = d, s, b \qquad 2\sqrt{\tfrac{3}{2}\mathbf{Q}^2(q, \xi) - \tfrac{1}{2}} = \sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B})} \tag{23}$$

After square of (22) and (23), and use (0.2) (0.3),

$$\mathbf{Q}^2(q, \xi) - \xi^2(q) = \mathbf{Q}^2(q) \tag{0.2}$$

$$\mathbf{Q}^2(\tilde{q}, \tilde{\xi}) - \tilde{\xi}^2(\tilde{q}) = \mathbf{Q}^2(\tilde{q}) \tag{0.3}$$

LAST Yielding $\mathbf{Q}^2$ (24) (25) and ξ^2 (26) (27) below

$$q = t, c, u \qquad \mathbf{Q}^2(q, \xi) = \mathbf{Q}^2(q) + \xi^2(q) = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}) + \tfrac{4}{3} \tag{24}$$

$$q = d, s, b \qquad \mathbf{Q}^2(q, \xi) = \mathbf{Q}^2(q) + \xi^2(q) = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}) + \tfrac{1}{3} \tag{25}$$

$$q = t, c, u \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}) - \mathbf{Q}^2(q) + \tfrac{4}{3} \tag{26}$$

$$q = d, s, b \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}) - \mathbf{Q}^2(q) + \tfrac{1}{3} \tag{27}$$

After Substitute (24) (25) back into (16.1) (16.2) and (17.1) (17.2) respectively, we get solutons x, α of color representation (28) (29) below

- $q = t, c, u, \quad \tilde{q} = \tilde{t}, \tilde{c}, \tilde{u}$

$$x(q, \xi) = +2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q, \xi)^2 - 2} = +2 \pm \tfrac{1}{2}\sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B})} \tag{28.1}$$

$$\alpha(\tilde{q}, \tilde{\xi}) = -2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q, \xi) - 2} = -2 \pm \sqrt{\tfrac{3}{8}\mathbf{Q}^2(\mathbb{B})} \tag{28,2}$$

- $q = d, s, b, \quad \tilde{q} = \tilde{d}, \tilde{s}, \tilde{b}$

$$x(q, \xi) = -1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q, \xi) - \tfrac{1}{2}} = -1 \pm \tfrac{1}{2}\sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B})} \tag{29.1}$$

$$\alpha(\tilde{q}, \tilde{\xi}) = +1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q, \xi) - \tfrac{1}{2}} = +1 \pm \sqrt{\tfrac{3}{8}\mathbf{Q}^2(\mathbb{B})} \tag{29.2}$$

Next part, we will search for production $q\tilde{q} \to H$ and decay $H \to q\tilde{q}$, base on the above logistic background of between Boson $\mathbb{B}$, a color-pair quark q, a color-pair antiquark $q\tilde{}$

Part B $\mathbb{B} = H$

- In case of $\mathbb{B}=H$, (8) turns to

$$\mathbf{Q}(H) = \mathbf{Q}(q,\xi) + \mathbf{Q}(\tilde{q},\tilde{\xi}) \tag{30}$$

AND (28.1) (28.2) and (29.1) (29.2) become (31.1) (31.2) and (32.1) (32.2) respectively

$$x(q,\xi) = +2 \pm \tfrac{1}{2}\sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B}=H)} \tag{31.1}$$

$$\alpha(\tilde{q},\tilde{\xi}) = -2 \pm \tfrac{1}{2}\sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B}=H)} \tag{31.2}$$

$$x(q,\xi) = -1 \pm \tfrac{1}{2}\sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B}=H)} \tag{32.1}$$

$$\alpha(\tilde{q},\tilde{\xi}) = +1 \pm \tfrac{1}{2}\sqrt{\tfrac{3}{2}\mathbf{Q}^2(\mathbb{B}=H)} \tag{32.2}$$

Where

$$\mathbf{Q}^2(H) = 244618.\,395\;\;303\;\;3268 = \frac{125000}{0.511} \tag{33}$$

$$\tfrac{1}{2}\sqrt{\tfrac{3}{2}\mathbf{Q}^2(H)} = \pm 302.\,872\;\;742\;\;6474 \tag{34}$$

THEN (31.1) (31.2) and (32.1) (32.2) offer following results:

$$x(q,\xi) = +2 \pm 302.\,872\;\;742\;\;6474 = (\,+304.\,8727426474,\;\; -300.\,8727426474\,) \tag{35.1}$$

$$\alpha(\tilde{q},\tilde{\xi}) = -2 \pm 302.\,872\;\;742\;\;6474 = (\,+300.\,8727426474,\;\; -304.\,8727426474\,) \tag{35.2}$$

$$x(q,\xi) = -1 \pm 302.\,872\;\;742\;\;6474 = (\,+301.\,8727426474,\;\; -303.\,8727426474\,) \tag{36.1}$$

$$\alpha(\tilde{q},\tilde{\xi}) = +1 \pm 302.\,872\;\;742\;\;6474 = (\,+303.\,8727426474,\;\; -301.\,8727426474\,) \tag{36.2}$$

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AND further

$$q = t, c, u \qquad \frac{x(q,\xi)}{3} = (+101.6242475491, \ -100.2909142158) \tag{37.1}$$

$$\tilde{q} = \tilde{t}, \tilde{c}, \tilde{u} \qquad \frac{x(\tilde{q},\tilde{\xi})}{3} = (+100.2909142158, \ -101.6242475491) \tag{37.2}$$

$$q = d, s, b \qquad \frac{x(q,\xi)}{3} = (+100.6242475491, \ -101.2909142158) \tag{38.1}$$

$$\tilde{q} = \tilde{d}, \tilde{s}, \tilde{b} \qquad \frac{x(\tilde{q},\tilde{\xi})}{3} = (+101.2909142158, \ -100.6242475491) \tag{38.2}$$

Put (37.1) (37.2) and (38.1) (38.2) into (18.1) (18.2) (19.1) (19.2), then obtain two groups of color representations of $\mathbf{Q}(q, \xi)$ and $\mathbf{Q}(\tilde{q}, \tilde{\xi})$ (notice (30)) below :

Group ▲

$q = t, c, u$

▲ $$\mathbf{Q}(q, \xi) = (+101.6242475491, \ +101.6242475491, \ -201.2484950982) \tag{39.1}$$

▲ $$\mathbf{Q}(\tilde{q}, \tilde{\xi}) = (+100.2909142158, \ +100.2909142158 \ -202.5818284316) \tag{39.2}$$

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi})$$

$$= (+201.9151617649, \ +201.9151617649, \ -403.8303235298) = \mathbf{Q}_{+}(H) \tag{39.3}$$

$q = d, s, b$

▲ $$\mathbf{Q}(q, \xi) = (+100.6242475491, \ +100.6242475491, \ -202.2484950982) \tag{40.1}$$

▲ $$\mathbf{Q}(\tilde{q}, \tilde{\xi}) = (+101.2909142158, \ +101.2909142158, \ -201.5818284316) \tag{40.2}$$

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi})$$

$$= (+201.9151617649, \ +201.9151617649, \ -403.8303235298) = \mathbf{Q}_{+}(H) \tag{40.3}$$

AND Group ▼

$q = t, c, u$

▼ $$\mathbf{Q}(q, \xi) = (-100.2909142158,\ -100.2909142158,\ +202.5818284316) \quad (41.1)$$

▼ $$\mathbf{Q}(\tilde{q}, \tilde{\xi}) = (-101.6242475491,\ -101.6242475491\ \ +201.2484950982) \quad (41.2)$$

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi})$$

$$= (-201.9151617649,\ -201.9151617649,\ +403.8303235298) = \mathbf{Q}_{-}(H) \quad (41.3)$$

$q = d, s, b$

▼ $$\mathbf{Q}(q, \xi) = (-101.2909142158,\ -101.2909142158,\ +201.5818284316) \quad (42.2)$$

▼ $$\mathbf{Q}(\tilde{q}, \tilde{\xi}) = (-100.6242475491,\ -100.6242475491,\ +202.2484950982) \quad (42.2)$$

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi})$$

$$= (-201.9151617649,\ -201.9151617649,\ +403.8303235298) = \mathbf{Q}_{-}(H) \quad (42.3)$$

Square of (39.3) (40.3) (41.3) (42.3)

$$\mathbf{Q}_{\pm}^{2}(H) = (\pm 201.9151617649,\ \pm 201.9151617649,\ \mp 403.8303235298)^{2} = 244618.3953032742 = \frac{12499.9999999731}{0.511} \quad (43)$$

Then compare (43) with Higgs boson theoretical value (44)

$$\mathbf{Q}_{Theo}^{2}(H) = 244618.3953033268 = \frac{125000}{0.511} \quad (44)$$

We see: $\mathbf{Q}_{\pm}^{2}(H) = \mathbf{Q}_{Theo}^{2}(H)$ means the above color representations of $\mathbf{Q}_{\pm}(H)$ and $\mathbf{Q}(q, \xi)$ $\mathbf{Q}(\tilde{q}, \tilde{\xi})$ satify relationship (30).

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Following discussions will lead to throw doubt on *God particle* H.

- In case of $\mathbb{B}=H$, (26) (27) turn to

$$q = t, c, u \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}=H) - \mathbf{Q}^2(q) + \tfrac{4}{3} \tag{45}$$

$$q = d, s, b \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}=H) - \mathbf{Q}^2(q) + \tfrac{1}{3} \tag{46}$$

AS the left hand of (45) (46)

$$\xi^2(q) > 0 \tag{47}$$

The right hand of (45) (46) should be greater than zero too

$$q = t, c, u \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(q) + \tfrac{4}{3} > 0 \tag{48}$$

$$q = d, s, b \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(q) + \tfrac{1}{3} > 0 \tag{49}$$

HOWEVER, the following calculations show: quarks c, u satisfy (48) (see (53.2) (53.3)), quarks d, s, b satisfy (49) (see (54.1) (54.2) (54.3)). BUT ONLY TOP QUARK, $q = t$ CONFLICTS WITH formula (48) ! (see (53.1))

Using (44) and (50)

$$\mathbf{Q}^2(H) = 244618.3953033268 = \frac{125000}{0.511} \tag{44}$$

$$\tfrac{1}{4}\mathbf{Q}^2(H) = 61154.5988248317 = \frac{31250}{0.511} \tag{50}$$

Obtain

$$q = t \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(t) + \tfrac{4}{3} = 61154.5988248317 - 338551.8590998043 + \tfrac{4}{3} \tag{51.1}$$

$$q = c \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(c) + \tfrac{4}{3} = 61154.5988248317 - 2504.8923679061 + \tfrac{4}{3} \tag{51.2}$$

$$q = u \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(u) + \tfrac{4}{3} = 61154.5988248317 - 4.5009784736 + \tfrac{4}{3} \tag{51.3}$$

$$q = d \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(d) + \tfrac{1}{3} = 61154.5988248317 - 9.3933463796 + \tfrac{1}{3} \tag{52.1}$$

$$q = s \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(s) + \tfrac{1}{3} = 61154.5988248317 - 185.9099804305 + \tfrac{1}{3} \tag{52.2}$$

$$q = b \qquad \tfrac{1}{4}\mathbf{Q}^2(H) - \mathbf{Q}^2(b) + \tfrac{1}{3} = 61154.5988248317 - 9197.6516634051 + \tfrac{1}{3} \tag{52.3}$$

OR

$$\xi^2(H,t) = \xi^2(t) = \tfrac{1}{4}\mathbf{Q}^2(h) - \mathbf{Q}^2(t) + \tfrac{4}{3} = -277395.9269406393 < 0 \tag{53.1}$$

$$\xi^2(H,c) = \xi^2(c) = \tfrac{1}{4}\mathbf{Q}^2(h) - \mathbf{Q}^2(c) + \tfrac{4}{3} = +58651.0397912589 > 0 \tag{53.2}$$

$$\xi^2(H,u) = \xi^2(u) = \tfrac{1}{4}\mathbf{Q}^2(h) - \mathbf{Q}^2(u) + \tfrac{4}{3} = +61151.4311806914 > 0 \tag{53.2}$$

$$\xi^2(H,d) = \xi^2(d) = \tfrac{1}{4}\mathbf{Q}^2(h) - \mathbf{Q}^2(d) + \tfrac{1}{3} = +61145.5388127854 > 0 \tag{54.1}$$

$$\xi^2(H,s) = \xi^2(s) = \tfrac{1}{4}\mathbf{Q}^2(h) - \mathbf{Q}^2(s) + \tfrac{1}{3} = +61145.5388127854 > 0 \tag{54.2}$$

$$\xi^2(H,b) = \xi^2(b) = \tfrac{1}{4}\mathbf{Q}^2(h) - \mathbf{Q}^2(b) + \tfrac{1}{3} = +51957.2804957599 > 0 \tag{54.3}$$

It is obviously for *God particle* H, $\mathbf{Q}^2(H) = \frac{125000}{0.511}$, ($\frac{1}{4}\mathbf{Q}^2(h)$ (50)) is too small to hold $\xi^2(t)$ to be greater than zero (see (53.1)) ! This is why the phenomenons, " pure production " $i\tilde{t} \to H$ and " pure decay " $H \to t\tilde{t}$, have not been observed up to now [3],[4],[5],[6]. Next part the boson Π debuts.

Part C $\mathbb{B} = \Pi$

Instead of working at *God particle* H (45) (46), we looking for a new boson Π, named *Heaven particle* (55) (56)

$$q = t, c, u \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}=\Pi) - \mathbf{Q}^2(q) + \tfrac{4}{3} \tag{55}$$

$$q = d, s, b \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\mathbb{B}=\Pi) - \mathbf{Q}^2(q) + \tfrac{1}{3} \tag{56}$$

(55) (56) are required to guarantee physical modes $q\tilde{q} \to \Pi$ production and $\Pi \to q\tilde{q}$ decay for all the six flavor quarks, specially for the heaviest quark, *top quark*, $t\tilde{t} \to \Pi$ production and $\Pi \to t\tilde{t}$ decay. Our aim at this paper is to find out the minimum critical values of $\mathbf{Q}^2(\mathbb{B}=\Pi)$ (or $\frac{M(\mathbb{B}=\Pi)}{0.511}$).

- Following suppose (57) in formula (55), then (55) becomes (58)

$$q = t \qquad \underline{\xi^2(q=t)} = 0 \tag{57}$$

$$\underline{\xi^2(t)} = \tfrac{1}{4}\mathbf{Q}^2(\Pi) - \mathbf{Q}^2(t) + \tfrac{4}{3} = 0 \tag{58}$$

From (58), have relations (59) (60) below.

$$\tfrac{1}{4}\mathbf{Q}^2(\Pi) = \mathbf{Q}^2(t) - \tfrac{4}{3} \tag{59}$$

$$\mathbf{Q}^2(\Pi) = 4\mathbf{Q}^2(t) - \tfrac{16}{3} \tag{60}$$ ★1

Substitute (59) back to (55) (56), using $\mathbf{Q}^2(t) - \frac{4}{3}$ to replace $\frac{1}{4}\mathbf{Q}^2(\Pi)$. YIELDING two key relation expressions (61) (62) and (63) (64) below

$$q = t, c, u \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\Pi) - \mathbf{Q}^2(q) + \tfrac{4}{3} = \mathbf{Q}^2(t) - \tfrac{4}{3} - \mathbf{Q}^2(q) + \tfrac{4}{3} = \mathbf{Q}^2(t) - \mathbf{Q}^2(q)$$

$$q = d, s, b \qquad \underline{\xi^2(q)} = \tfrac{1}{4}\mathbf{Q}^2(\Pi) - \mathbf{Q}^2(q) + \tfrac{1}{3} = \mathbf{Q}^2(t) - \tfrac{4}{3} - \mathbf{Q}^2(q) + \tfrac{1}{3} = \mathbf{Q}^2(t) - \mathbf{Q}^2(q) - 1$$

OR

$$q = t, c, u \qquad \xi^2(q) = \mathbf{Q}^2(t) - \mathbf{Q}^2(q) \qquad (61) \quad \bigstar 2$$

$$q = d, s, b \qquad \xi^2(q) = \mathbf{Q}^2(t) - \mathbf{Q}^2(q) - 1 \qquad (62) \quad \bigstar 3$$

AND

$$q = t, c, u \qquad \mathbf{Q}^2(q, \xi) = \mathbf{Q}^2(q) + \xi^2(q) = \mathbf{Q}^2(t) \qquad (63) \quad \bigstar 4$$

$$q = d, s, b \qquad \mathbf{Q}^2(q, \xi) = \mathbf{Q}^2(q) + \xi^2(q) = \mathbf{Q}^2(t) - 1 \qquad (64) \quad \bigstar 5$$

NOTICE: Both $\mathbf{Q}^2(q, \xi)$, $\xi^2(q)$ and $\mathbf{Q}^2(\Pi)$ are the functions of $\mathbf{Q}^2(t)$.

- Base on (60) $\bigstar 1$

$$4\mathbf{Q}^2(t) = 4(\ 338,551.859\ 099\ 8043\ ) = 1354207.4363992172 = \frac{692000}{0.511} \qquad (65)$$

$$(60)\ \bigstar 0 \qquad \mathbf{Q}^2(\Pi) = 4\mathbf{Q}^2(t) - \frac{16}{3} = 1354207.4363992172 - \frac{16}{3}$$

$$= 1354202.1030658840 = \frac{691997.2746666668}{0.511} \qquad (66)$$

(66) (65) shows: Msss $M(\Pi) = 692000\,Mev$ of the new boson Π is about four times of $M(t) = 173000 Mev$ top quark !

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AND

t, H, Π Data compared below

$$M(\Pi) - M(t) = 692000 - 173000 = 456000\ Mev \tag{67}$$

$$\frac{M(\Pi)}{M(t)} = \frac{692000}{173000} = 4 \tag{68}$$

$$M(\Pi) - M(H) = 692000 - 125000 = 567000\ Mev \tag{69}$$

$$\frac{M(\Pi)}{M(H)} = \frac{692000}{125000} = 5.536 \tag{70}$$

- More details about $\xi^2(q)$ (61) ★2 and (62) ★3 below

$q = t$ $\quad \xi^2(t) = \mathbf{Q}^2(t) - \mathbf{Q}^2(t) = 338551.8590998043 - 338551.8590998043 = 0$ (71.1)

$q = c$ $\quad \xi^2(c) = \mathbf{Q}^2(t) - \mathbf{Q}^2(c) = 338551.8590998043 - 2504.8923679061 = 336046.9667318982 > 0$ (71.2)

$q = u$ $\quad \xi^2(u) = \mathbf{Q}^2(t) - \mathbf{Q}^2(c) = 338551.8590998043 - 4.5009784736 = 338547.3581213307 > 0$ (71.3)

$q = d$ $\quad \xi^2(d) = \mathbf{Q}^2(t) - \mathbf{Q}^2(d) - 1 = 338551.8590998043 - 9.3933463796 - 1 = 338541.4657534247 > 0$ (72.1)

$q = s$ $\quad \xi^2(s) = \mathbf{Q}^2(t) - \mathbf{Q}^2(s) - 1 = 338551.8590998043 - 185.9099804305 - 1 = 338364.9491193738 > 0$ (72.2)

$q = b$ $\quad \xi^2(b) = \mathbf{Q}^2(t) - \mathbf{Q}^2(b) - 1 = 338551.8590998043 - 9197.6516634051 - 1 = 329353.2074363992 > 0$ (72.3)

- More details about $\mathbf{Q}^2(q,\xi)$ (63) ★4 and (64) ★5, then create a table below

Table: $\mathbf{Q}^2(q,\xi)$

$\mathbf{Q}^2(q,\xi)$	338551. 8590998043	338551. 8590998043	338551. 8590998043	338550. 8590998043	338550. 8590998043	338550. 8590998043
$\mathbf{Q}^2(q)$	338551. 8590998043	2504. 8923679061	4. 5009784736	9. 3933463796	185. 9099804305	9197. 6516634051
	$\mathbf{Q}^2(t)$	$\mathbf{Q}^2(c)$	$\mathbf{Q}^2(u)$	$\mathbf{Q}^2(d)$	$\mathbf{Q}^2(s)$	$\mathbf{Q}^2(b)$
$\boldsymbol{\xi}^2(q)$	0	+336046. 9667318982	+338547. 3581213307	+338541. 4657534247	+338364. 9491193738	+329353. 2074363992
$\frac{3}{2}\xi^2(q)$						
$\xi^2(q)$	0	504070. 4500978473	507821. 0371819960	507812. 1986301371	507547. 4236790607	494029. 8111545988
$\xi(q)$	0	709. 9791899048	712. 6156307449	712. 6094292318	712. 4236265587	702. 8725426097
$\sqrt{\frac{3}{2}\boldsymbol{\xi}^2(q)}$						
$\frac{1}{3}\xi(q)$	$\frac{0}{3}$	$\frac{709.9791899048}{3}$	$\frac{712.6156307449}{3}$	$\frac{712.6094292318}{3}$	$\frac{712.4236265587}{3}$	$\frac{702.8725426097}{3}$
$\sqrt{\frac{1}{6}\boldsymbol{\xi}^2(q)}$	0	236. 6597299683	237. 5385435816	237. 5364764106	237. 4745421862	234. 2908475366

NEXT search for $x(q,\xi)\ \alpha(\tilde{q},\tilde{\xi})$. In case of $\mathbb{B} = \Pi$. PUT (60) ★0 into (28.1) (28.2) and (29.1) (29.2), Having (74.1) (74.2) and (75.1) (75.2) below

$$\mathbf{Q}^2(\Pi) = 4\mathbf{Q}^2(t) - \tfrac{16}{3} \qquad (60) \quad ★0$$

$$\sqrt{\tfrac{3}{8}\mathbf{Q}^2(\Pi)} = \sqrt{\tfrac{3}{8}(4\mathbf{Q}^2(t) - \tfrac{16}{3})} = \sqrt{\tfrac{3}{2}\mathbf{Q}^2(t) - 2}$$

$$\sqrt{\tfrac{3}{8}\mathbf{Q}^2(\Pi)} = \sqrt{\tfrac{3}{2}\mathbf{Q}^2(t) - 2} \qquad (73)$$

- $q = t, c, u, \quad \tilde{q} = \tilde{t}, \tilde{c}, \tilde{u}$

$$x(q,\xi) = +2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi)^2 - 2} = +2 \pm \sqrt{\tfrac{3}{8}\mathbf{Q}^2(\mathbb{B}=\Pi)} = +2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(t) - 2} \qquad (74.1)$$

$$\alpha(\tilde{q},\tilde{\xi}) = -2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - 2} = -2 \pm \sqrt{\tfrac{3}{8}\mathbf{Q}^2(\mathbb{B}=\Pi)} = -2 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(t) - 2} \qquad (74,2)$$

- $q = d, s, b, \quad \tilde{q} = \tilde{d}, \tilde{s}, \tilde{b}$

$$x(q,\xi) = -1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - \tfrac{1}{2}} = -1 \pm \sqrt{\tfrac{3}{8}\mathbf{Q}^2(\mathbb{B}=\Pi)} = -1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(t) - 2} \qquad (75.1)$$

$$\alpha(\tilde{q},\tilde{\xi}) = +1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(q,\xi) - \tfrac{1}{2}} = +1 \pm \sqrt{\tfrac{3}{8}\mathbf{Q}^2(\mathbb{B}=\Pi)} = +1 \pm \sqrt{\tfrac{3}{2}\mathbf{Q}^2(t) - 2} \qquad (75.2)$$

AS (76)

$$\mathbf{Q}^2(t) = 338,551.859\ 099\ 8043 = \frac{173000.000\ 000\ 0000}{0.511} \qquad (1)$$

$$\tfrac{3}{2}\mathbf{Q}^2(t) = \tfrac{3}{2}(338,551.8590998043) = 507,827.7886497065$$

$$\tfrac{3}{2}\mathbf{Q}^2(t) - 2 = 507825.7886497065$$

$$\sqrt{\tfrac{3}{2}\mathbf{Q}^2(t) - 2} = \sqrt{507825.7886497065} = \pm 712.6189645594 \qquad (76)$$

PUT (76) back to (74.1) (74.2) and (75.1) (75.2), Consequently obtain (77.1) (77.2) and (78.1) (78.2) following

- $$x(q,\xi) = +2 \pm 712.6189645594 = (+714.6189645594, \quad -710.6189645594) \tag{77.1}$$
- $$\alpha(\tilde{q},\tilde{\xi}) = -2 \pm 712.6189645594 = (+710.6189645594, \quad -714.6189645594) \tag{77,2}$$
- $$x(q,\xi) = -1 \pm 712.6189645594 = (+711.6189645594, \quad -713.6189645594) \tag{78.1}$$
- $$\alpha(\tilde{q},\tilde{\xi}) = +1 \pm 712.6189645594 = (+713.6189645594, \quad -711.6189645594) \tag{78.2}$$

Further obtain following expressions

$$q = t, c, u \qquad \frac{x(q,\xi)}{3} = (+238.2063215198, \quad -236.8729881865) \tag{79.1}$$

$$\tilde{q} = \tilde{t}, \tilde{c}, \tilde{u} \qquad \frac{x(\tilde{q},\tilde{\xi})}{3} = (+236.8729881865, \quad -238.2063215198) \tag{79.2}$$

$$q = d, s, b \qquad \frac{x(q,\xi)}{3} = (+237.2063215198, \quad -237.8729881865) \tag{80.1}$$

$$\tilde{q} = \tilde{d}, \tilde{s}, \tilde{b} \qquad \frac{x(\tilde{q},\tilde{\xi})}{3} = (+237.8729881865, \quad -237.2063215198) \tag{80.2}$$

Each of the above four formulas has two groups (▲ and ▼) of quark color representations for *Heaven particle* Π, which similar to that for *God particle* H appeared in **Part B** previously. The relevant formulas for these quark color representations (▲ and ▼) are given below

- For $q = t, c, u$ and $\tilde{q} = \tilde{t}, \tilde{c}, \tilde{u}$

▲ $$\mathbf{Q}(t, \xi) = \mathbf{Q}(c, \xi) = \mathbf{Q}(u, \xi) = (+238.2063215198,\ +238.2063215198,\ -474.4126430396) \quad (81.1)$$

▲ $$\mathbf{Q}(\tilde{t}, \tilde{\xi}) = \mathbf{Q}(\tilde{c}, \tilde{\xi}) = \mathbf{Q}(\tilde{u}, \tilde{\xi}) = (+236.8729881865,\ +236.8729881865\ -475.7459763730) \quad (81.2)$$

PLUS

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi}) = (+475.0793097063,\ +475.0793097063,\ -950.1586194126) = \mathbf{Q}_{+}(\Pi) \quad (81.3)$$

▼ $$\mathbf{Q}(t, \xi) = \mathbf{Q}(c, \xi) = \mathbf{Q}(u, \xi) = (-236.8729881865,\ -236.8729881865,\ +475.7459763730) \quad (82.1)$$

▼ $$\mathbf{Q}(\tilde{t}, \tilde{\xi}) = \mathbf{Q}(\tilde{c}, \tilde{\xi}) = \mathbf{Q}(\tilde{u}, \tilde{\xi}) = (-238.2063215198,\ -238.2063215198\ +474.4126430396) \quad (82.2)$$

PLUS

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi}) = (-475.0793097063,\ -475.0793097063,\ +950.1586194126) = \mathbf{Q}_{-}(\Pi) \quad (82.3)$$

- For d, s, b and $\tilde{d}, \tilde{s}, \tilde{b}$

▲ $$\mathbf{Q}(d, \xi) = \mathbf{Q}(s, \xi) = \mathbf{Q}(b, \xi) = (+237.2063215198,\ +237.2063215198,\ -475.4126430396) \quad (83.1)$$

▲ $$\mathbf{Q}(\tilde{d}, \tilde{\xi}) = \mathbf{Q}(\tilde{s}, \tilde{\xi}) = \mathbf{Q}(\tilde{b}, \tilde{\xi}) = (+237.8729881865,\ +237.8729881865,\ -474.7459763730) \quad (83.2)$$

PLUS

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi}) = (+475.0793097063,\ +475.0793097063,\ -950.1586194126) = \mathbf{Q}_{+}(\Pi) \quad (83.3)$$

▼ $$\mathbf{Q}(d, \xi) = \mathbf{Q}(s, \xi) = \mathbf{Q}(b, \xi) = (-237.8729881865,\ -237.8729881865,\ +474.7459763730) \quad (84.2)$$

▼ $$\mathbf{Q}(\tilde{d}, \tilde{\xi}) = \mathbf{Q}(\tilde{s}, \tilde{\xi}) = \mathbf{Q}(\tilde{b}, \tilde{\xi}) = (-237.2063215198,\ -237.2063215198,\ +475.4126430396) \quad (84.2)$$

PLUS

$$\mathbf{Q}(q\tilde{q}, \tilde{\xi}) = \mathbf{Q}(q, \xi) + \mathbf{Q}(\tilde{q}, \tilde{\xi}) = (-475.0793097063,\ -475.0793097063,\ +950.1586194126) = \mathbf{Q}_{-}(\Pi) \quad (84.3)$$

OR

$$\mathbf{Q}(q\tilde{q},\tilde{\xi}) = \mathbf{Q}(q,\xi) + \mathbf{Q}(\tilde{q},\tilde{\xi}) = (\pm 475.0793097063,\ \pm 475.0793097063,\ \mp 950.1586194126) = \mathbf{Q}_{\pm}(\Pi) \quad (85)$$

• • SUBSEQUENT corlor representations of t top quark and $\tilde{t}$ anti-top quark, that correspond to $\mathbf{Q}_{+}(\Pi)$ (or $\mathbf{Q}_{-}(\Pi)$) above, are given by (86) (87)

$$\mathbf{Q}(t) = (+238.206\ 321\ 5198,\ +238.206\ 321\ 5198,\ -474.412\ 643\ 0396) \quad (86)$$

$$\mathbf{Q}(\tilde{t}) = (+236.872\ 988\ 1865,\ +236.872\ 988\ 1865,\ -475.745\ 976\ 3730) \quad (87)$$

LAST OBTAIN (88)

$$\mathbf{Q}(t\bar{t}) = \mathbf{Q}(t) + \mathbf{Q}(\bar{t}) = \mathbf{Q}(q,\xi) + \mathbf{Q}(\tilde{q},\tilde{\xi}) = \mathbf{Q}_{+}(\Pi) \quad (88)$$

Square of the above expression

$$\mathbf{Q}_{+}^{2}(\Pi) = \mathbf{Q}^{2}(t\bar{t}) = 1354,202.1030660877 = \frac{691997.2746667708}{0.511} \quad (89)$$

Notice: Compare (89) with *Heaven particle* Π theoretical value (66) and (65)

$$\mathbf{Q}_{Theo}^{2}(\Pi) = 4\mathbf{Q}^{2}(t) - \frac{16}{3} = 1354202.1030658840 = \frac{691997.2746666668}{0.511} \quad (66)$$

$$4\mathbf{Q}^{2}(t) = 1354207.4363992172 = \frac{692000}{0.511} \quad (65)$$

Epilogue

The relationship (88) and (89) are the portrail of *Heaven particle* boson relevant to production and decay of Π boson. Eagerly looking forward to probing into the excistence of *Heaven particle*, Hoping for experimentalists.

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Financial

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Associates are authorized to organize symposium/seminar/conference on behalf of Global Journal Incorporation (USA). They can also participate in the same organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent. Additionally, they get free research conferences (and others) alerts.

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We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from https://globaljournals.org/Template.zip

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Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

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It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Tips for Writing a Good Quality Science Frontier Research Paper

Techniques for writing a good quality Science Frontier Research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of science frontier then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
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- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

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Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

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References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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