the general science journal

A Proposal for a New Ultra-Light Element: Electronium and a New Elementary Particle: nullitron

>Research Paper<

Abstract

This research paper proposes a new interpretation regarding the relationship between families of particles with similar masses, specifically protons and electrons.

The proton family consists of four particles with comparable masses: protons antiprotons neutrons and antineutrons. In contrast, the family of electrons comprises only two particles with similar mass: electrons and positrons (anti-electrons). This discrepancy suggests that an additional two particles may exist in the electron family: a neutral electron and a neutral anti-electron (or a neutral positron). Such additions would complete the quartet of leptons analogously to the four baryons: proton, antiproton, neutron and anti-neutron.

If these particles do exist, it is highly likely they can form structures classified as ultra-light elements.

This paper examines such possibilities.

Keywords: electron, positron, positronium, electron-hole, neutron, proton, neutrino, Cooper pairs, superconductivity, semiconductor, charge carrier, bubble chamber, annihilation, pair production, gamma ray.

Introduction

This article presents a hypothesis regarding a new ultra-light element based on reinterpretations of well-known facts and datasets. In addition to Positronium, I propose the new ultra-light element called **Electronium (El)**. This proposal is built upon the existence of two new proposed subatomic constituents: the neutral electron, referred to as the **nullitron (n^0)**, and its antiparticle, combined with a positively charged component called the **holetron (h^+).**

The holetron consists of the well-known elementary particle positron and the newly proposed nullitron. The holetron acts as the positive nucleus of Electronium, with one electron orbiting around it. The formation of the holetron occurs through the ionization of Electronium, which involves stripping the electron from it.

This ultra-light element exhibits characteristics analogous to those of deuterium. Just as the deuteron consists of one proton and one neutron, the holetron serves as the positive nucleus of Electronium.

The relevance of this proposal for new subatomic particles and the ultra-light element will be explored further in the following sections.

Proper Interpretation of Physical Processes and Quantities

The exploration of the structure of matter and the fundamental components of the universe, including its constituents, forces, and interactions, has been supported by modern physical theories such as field theories, quantum mechanics, the theory of relativity, gauge theories, supersymmetry theories, supergravity theories, and superstring theory.

The aim of these theories is to explain and describe reality.

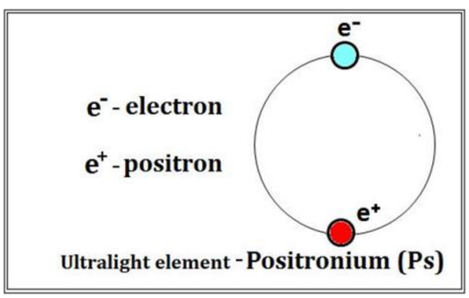
Therefore, a proper interpretation and understanding of experimental and observational data regarding physical processes and quantities are essential for any valid theory. This need is particularly significant in the subatomic realm, where the characteristics and interactions of elementary particles can be difficult to uncover, especially when dealing with neutral particles. Given the complexities involved in identifying the main properties of neutral particles compared to charged particles, the risk of misinterpreting experimental data is greater.

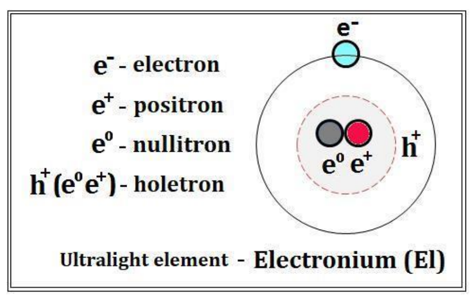
To explore this possibility and its consequences, we will examine electron-positron pair production.

Electron positron pair production

Before delving further into this proposal, images of positronium and the newly proposed ultra-light element Electronium, along with its essential constituents, will be presented.

Proposed Physical Properties of the New Elementary Particle and Element.





In the following sections, the proposed physical properties of the new elementary particle and the ultra-light element will be examined.

Electron-Positron Pair Production

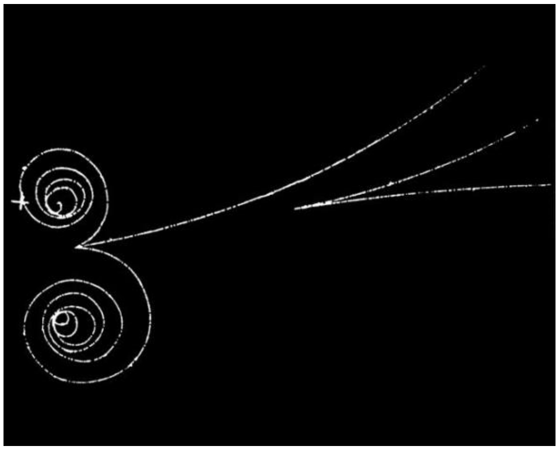
All known particles, according to current theories, possess corresponding antiparticles. These antiparticles share the same physical characteristics but differ primarily in charge for charged particles or in other identifying marks for neutral particles.

The positron was the first antiparticle to be identified, with its theoretical prediction made by the well-known physicist P. Dirac in 1931, followed by C. Anderson's experimental discovery in 1932. The elementary particle positron has been observed in numerous experiments. Subsequent discoveries of other antiparticles followed.

In the early days of particle research (1950-1960), the bubble chamber (particle detector) was the primary tool to detect particles. This device contained superheated liquid hydrogen maintained just below its boiling temperature.

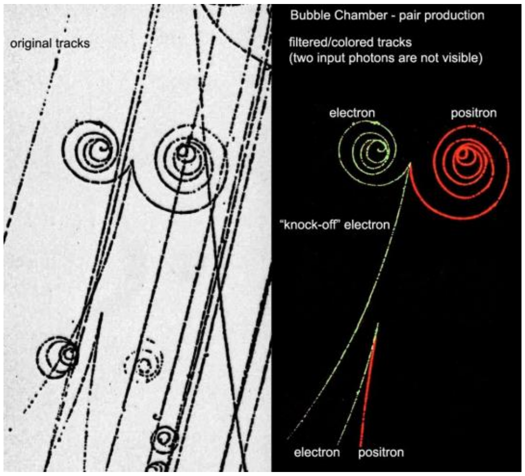
Charged particles passing through the liquid hydrogen in a strong magnetic field would ionize the hydrogen, leaving detectable curved tracks. Neutral particles, on the other hand, did not leave tracks because they don't produce any significant ionization.

In the image below, the creation of particle pairs in the bubble chamber is depicted. Hard gamma ray enter from the left without leaving a trace. When these rays interact with nuclei present in the chamber, they produce an electron-positron pair. These particles are created by high-energy gamma rays exceeding 1.02 MeV. This explanation aligns with the current interpretation of such events observed un bubble chamber experiments.

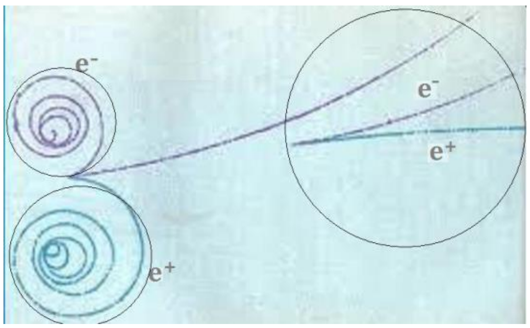


Bubble chamber event. Invisible gamma ray photons produce pairs of electrons and positrons in a bubble chamber at the Lawrence Berkeley National Laboratory. One of the most important results of modern physics, the direct conversion of energy into matter.

Berkeley Lab Photo Archive : XBD201211-01648.tif | Chamber events ...

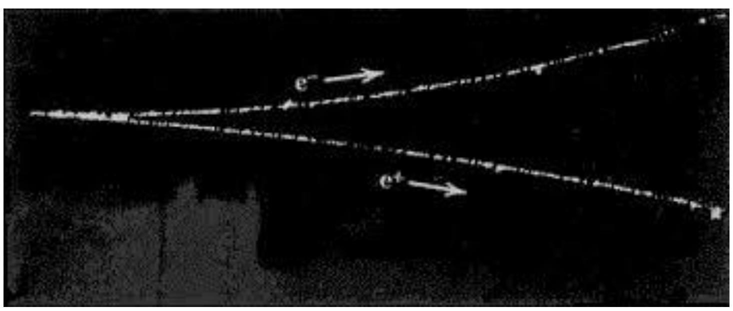


If we analyze the picture from the bubble chamber more carefully, we can observe something interesting: despite having almost the same mass and charge to many decimal places, the trails of the electron and positron differ in size. The radius of the positron's spiral is significantly larger than that of the electron. This discrepancy in spiral sizes indicates that the two observed particles have different fundamental physical characteristics and inner structures. They are not the same.

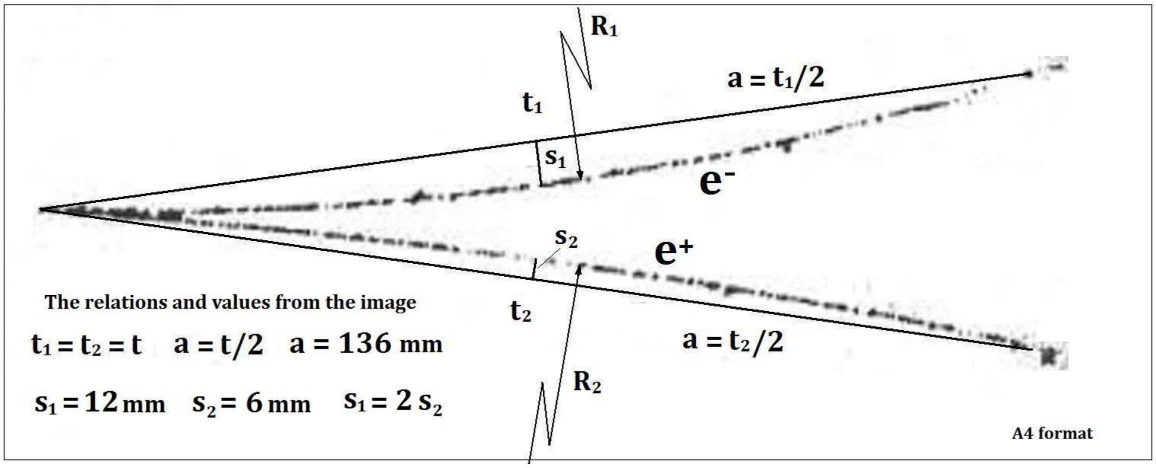


In a second event depicted by a larger circle, we notice the same pattern; the radius of the electron's trajectory is smaller than that of the positron.

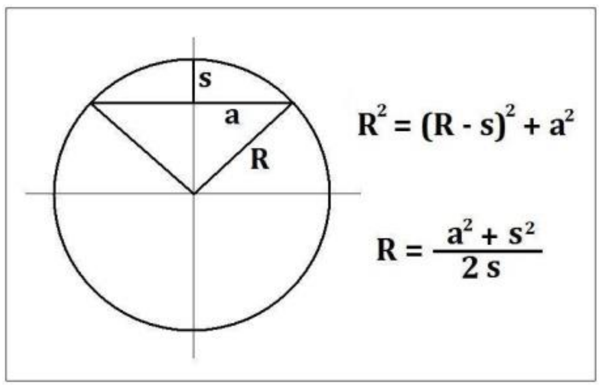
This image will be useful for further calculations.



To provide a clearer view of the necessary details, the bubble chamber's picture has been enlarged to include all essential elements.



To determine the radius of both particles and their relationships, we can use a formula related to circular sections.



For electron: $\mathbf{R_1 = (a_1^2 + s_1^2)/2\,s_1}$

For positron: $\mathbf{R_2 = (a_2^2 + s_2^2)/2\,s_2}$

As $\mathbf{a_1} \gg \mathbf{s_1}$ and $\mathbf{a_2} \gg \mathbf{s_2}$ then $\mathbf{(a_1^2 + s_1^2) \cong a_1^2}$ and $\mathbf{(a_2^2 + s_2^2) \cong a_2^2}$

$$\mathbf{R_1 = a_1^2/2\,s_1}$$

$$\mathbf{R_2 = a_2^2/2\,s_2}$$

$\mathbf{a_1 = a_2 = a}$ and $\mathbf{s_1 = 2\,s_2}$

$$\mathbf{R_1 = a^2/4\,s_2}$$

$$\mathbf{R_2 = a^2/2\,s_2}$$

$$\mathbf{R_2/R_1 = 4/2 = 2}$$

$$R_2 \cong 2R_1$$

The result shows that value of the radius R2 of the positron is nearly double that of the electron R1.

To verify this relationship, we will extract the values for "s" and "a" from the image of the electron-positron pair production, which is formatted in A4.

$$s_1 = 12 \text{ mm}, s_2 = 6 \text{ mm} \text{ and } a = 136 \text{ mm}$$

$$R_1 = (a_1^2 + s_1^2)/2\, s_1$$

$$R_2 = (a_2^2 + s_2^2)/2\, s_2$$

Substituting the appropriate values into the equations will yield significant results:

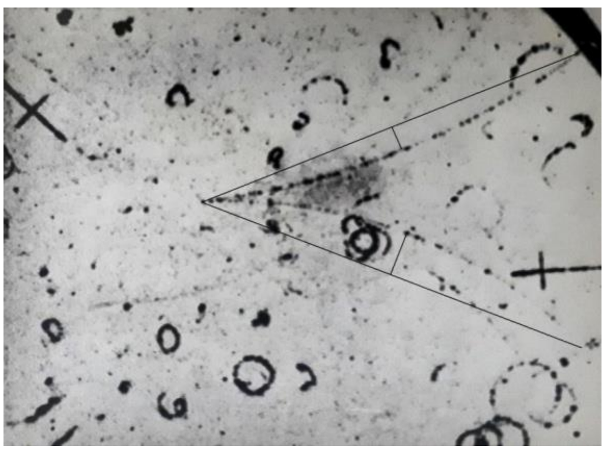
$$R_1 = 776.66 \text{ mm} \text{ and}$$

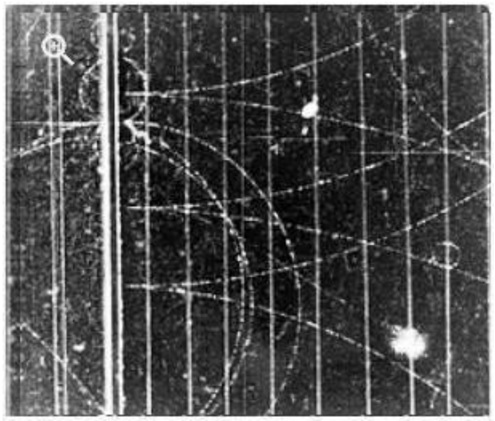
$$R_2 = 1544.33 \text{ mm}$$

This gives the same result:

$$R_2 \cong 2R_1$$

The similar relationships between the radii of the electron and positron pair can be clearly presented in additional images from Wilson's chamber experiments.





Digital Preservation File Name and Format: 434-LB-6-XBD9803-00520.TIF Photographs Documenting Scientists, Special Events, and Nuclear Research Facilities, Instruments, and Projects at the Berkeley Lab

Further similar events with consistent results can also be observed in pictures from the following article:

SPECIAL RELATIVITY IN PARTICLE PHYSICS - dr. Marinela Bitu

Electron-positron Annihilation and Pair Creation.

https://hst-archive.web.cern.ch/archiv/hst2002/bubblech/mbitu/electron-positron.htm

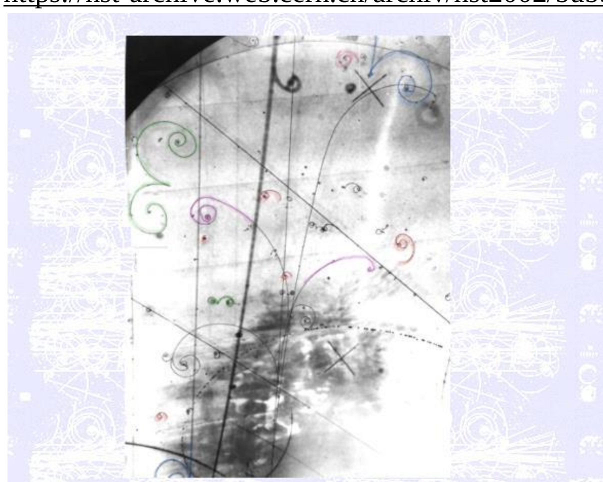


Fig.1 This bubble chamber picture shows some electromagnetic events such as pair creation or materialization delta ray (blue tracks) of high energy photon into an electron-positron pair (green tracks), the Compton effect (red tracks), the emission of electromagnetic radiation by accelerating charges (violet tracks) (bremsstrahlung) and the knock-on electrons or delta ray (blue tracks)

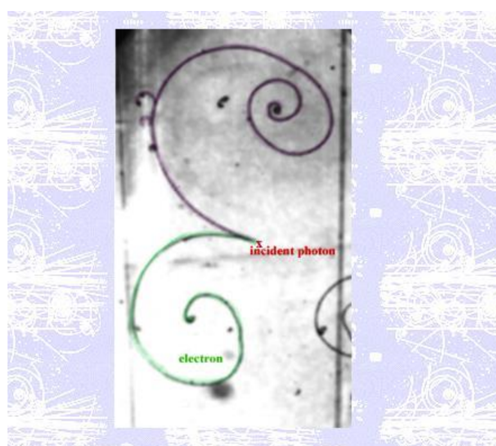
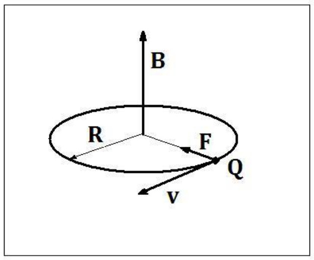


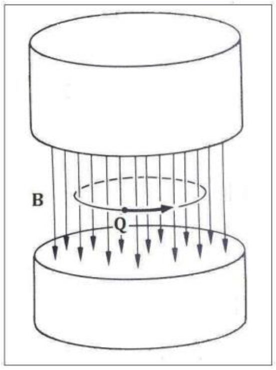
Fig.3 Part of a bubble chamber picture (Fermilab'15 foot Bubble Chamber', found at the University of Birmingham). The curly line which turns to the left is an electron. Positron looks similar but turn to the right The magnetic field is perpendicular to the picture plan

The Difference Between Both Particles

To find the relationships among charge, mass, and radius of both particles, we will examine the behavior of charged particles in a magnetic field.

When a charged particle with charge q and velocity v moves perpendicularly to the lines of a magnetic field with strength B, its trajectory will curve upward or downward, depending on the sign of its charge, plus or minus.





Than the force exerted by the magnetic field B on the particle with velocity v and charge q can be expressed with the following formula:

$$\mathbf{F = qBv\ [N]}$$

This equation is applicable in both relativistic and non-relativistic contexts.

This force F balances with the centrifugal force Fc acting on the particle, which moves in a circular trajectory.

The mass m, velocity v, and radius R of the particle relate to this centrifugal force.

$$\mathbf{F_c = mv^2/R\ [N]}$$

As $\mathbf{F = F_c}$ then

$$\mathbf{qBv = mv^2/R}$$

Rearranging this gives

$$\mathbf{mv = qBR}$$

The momentum of a particle is proportional to its charge, the magnetic field strength, and the radius of its path. Therefore, a charged particle with velocity v moving perpendicularly to a uniform magnetic field will trace a circular path with radius R

$$\mathbf{R = mv/eB}$$

Now, applying these principles to both particles allows us to establish the following relationships

$$\text{For electron: } \mathbf{e_{el}BR_1 = m_{el}v}$$

$$\text{For positron: } \mathbf{e_{pos}BR_2 = m_{pos}v}$$

Since both particles possess the same absolute charge in the same magnetic field B and have similar velocities, dividing the relevant equations will yield useful results.

$$\mathbf{e_{el}BR_1 / e_{pos}BR_2 = m_{el}v / m_{pos}v}$$

$$\mathbf{e_{el}R_1 / e_{pos}R_2 = m_{el} / m_{pos}}$$

By using the established relationship between the radii of both particles in the final calculations, we can derive further insights.

$$\mathbf{R_2 \cong 2R_1}$$

$$\mathbf{e_{el}R_1 / 2e_{pos}R_1 = m_{el} / m_{pos}} \text{ or}$$

So the relations between charges and masses for both particles are as follows:

$$\mathbf{e_{el}/2e_{pos} = m_{el}/m_{pos}}$$

Given that both particles share the same elementary charge value in absolute terms, we arrive at additional conclusions.

$$\mathbf{e_{el} = e_{pos}} \text{ or } \mathbf{q_{el} = q_{pos}}$$

$$\mathbf{e_{el}/2e_{pos} = m_{el}/m_{pos}}$$

$$\mathbf{m_{el}/m_{pos} = 1/2} \text{ or}$$

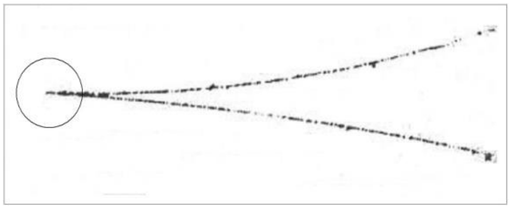
$$\mathbf{m_{pos} \cong 2\ m_{el}}$$

From the results, it is evident that the mass of so-called positron is not the same as that of the electron; it is nearly double the electron's mass. This suggests that there might be an issue with the current explanation of electron-positron pair production in the experiment.

To address this, consider the following suggestion: almost all particles, from electron to mesons and hadrons, have a charge magnitude equal to that of electrons or positrons, in absolute value. Therefore the so told positron, which was anticipated in this experiment, must also have an elementary charge equal to that of the electron or positron, in absolute value.

Given that the positron, as elementary charge, is well-known, it is proposed that the positively charged component of this new complex particle is indeed the positron. The remainder of the mass of this particle likely originates from an unknown neutral particle, with no charge, but with mass similar to that of the electron or positron. As is mentioned in the abstract, this new neutral particle, named as **"nullitron" (n^0)**, or neutral electron, is proposed to have zero or null charge.

Thus, is clear that in this disintegration process, the positron and the nullitron were joined together as a complex particle, having the charge of one electron or positron and mass of two electrons. Before disintegration, this complex particle complex particle and the electron were likely unified as a new ultra light element. This unity can be observed in the bubble chamber images, at the first moment just before disintegration of both particles (as indicated by the track in the circle). The velocities of both particles must be identical at the initial moment of disintegration.



It is proposed that this new complex particle consists of a positron and a nullitron forming the nucleus, around which an electron orbits. These components together create a new ultra-light element

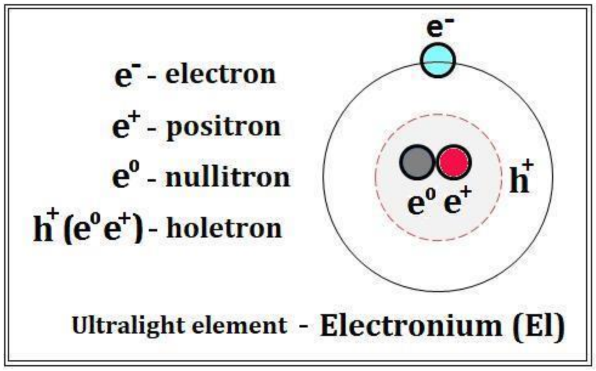
We suggest the name **Electronium (El)** for this ultra-light element, similar to how the electron and positron combine to form Positronium. Electronium, unlike other elements in the Periodic Table, has a distinctive structure where electrons orbit a nucleus composed of a positron and a **nullitron (n^o)** instead of a proton and neutron.

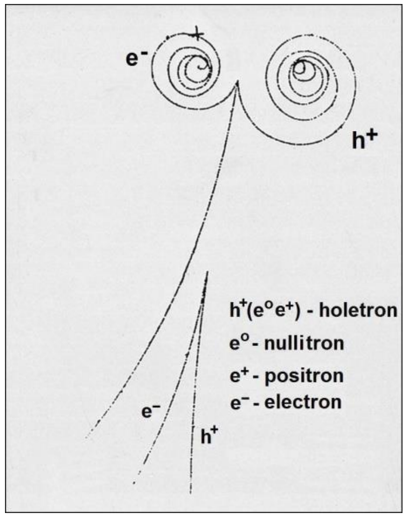
For clarity, we can refer to the nucleus formed by the positron and nullitron as a **holetron (h^+)**. This nucleus is categorized as a boson because both the nullitron and positron exhibit the same spin value of (½). According to Bose-Einstein statistics, this nucleus could exist within materials for potentially extended periods.

Due to the presence of the nullitron in the holetron nucleus, Electronium may remain stable longer than Positronium.

Thus, if such an element exists in nature, it may prompt us to reconsider our understanding of atomic structures.

The position and characteristics of these new particles in the context of electron-positron pair production are illustrated in the accompanying images.





So, the next questions have now emerged:

1. Where does this new ultra-light element, Electronium, come from?
2. How does this ultra-light element align with existing theories?
3. Is this element created from gamma rays or another source?

As usual, multiple hypotheses can be proposed for this phenomenon. Importantly, it is clear that Electronium cannot be produced solely from gamma rays or photons, as both of these particles have different masses, as outlined in the current article.

Before reaching any conclusions, we must consider another important factor. In any such event, besides gamma rays, a heavy atom must also be involved. This is significant for one critical reason: the production of a pair of electrons and positrons can only occur near a more massive object than electrons, such as the nucleus of a heavy atom.

This requirement ensures the conservation of momentum. Without a participating nucleus, the electron-positron pair produced in free space cannot satisfy both energy and momentum conservation laws. In this scenario, the nucleus that participates in the process experiences a recoil in the opposite direction.

The explanation of electron-positron pair production, as presented, is widely accepted as a legitimate process. The same scenario occurs when an electron and a positron annihilate, resulting in the creation of two photons or gamma rays.

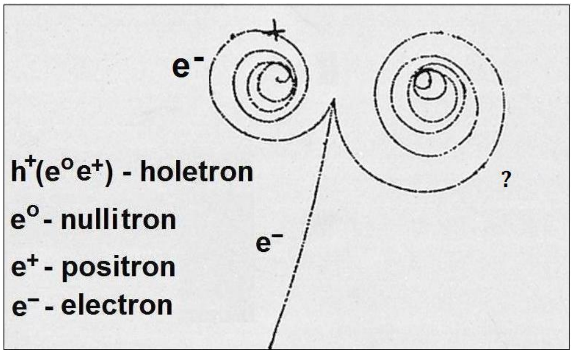
However, we can explain the presence of the required nucleus in electron-positron pair production in a different way.

An alternative hypothesis suggests that the new ultra-light element Electronium and its corresponding atomic nucleus might exist together as a type of molecule, similar to hydrides (such as BH, NH, FH), which we can denote as BEl, NEl, and FEl. In this case, Electronium would orbit around the nucleus of the heavy atom, functioning as a molecule instead of being a standalone electron.

If a high-energy, invisible gamma (γ) ray strikes the nucleus (the "holetron") of this ultra-light element and knocks it out of the atom's cloud, we can substitute or explain this event as the creation of a new electron-holetron instead of an electron-positron pair. This scenario is analogous to the photoelectric effect, where the gamma ray travels in a different direction.

Two Electrons and a Holetron

To further clarify the processes involved in the electron-positron pair production event, we must also explain the production of two electrons and one new particle.



To do this, several assumptions must be made.

To further clarify the processes involved in the electron-positron pair production event, we must also explain the production of two electrons and one new particle.

This event occurs when a gamma-ray photon interacts with an unknown atom with distinct characteristics. The observed image clearly shows that some complex particle or atom disintegrates at one point.

Thus, in addition to the gamma-ray photon, we identify two negative particles and one positive particle, which are components of the knocked atom. The positive particle has a mass greater than that of an electron.

If we accept the proposed existence of the ultra-light element Electronium, we can make the following assertion: such an ultra-light atom can exist only if a round positive nucleus, like the holetron, is accompanied by two negative electrons.

This situation aligns with the occurrence where Electronium is bound to a heavier element as a covalent molecule. In this scenario, there are two negative electrons associated with the positive nucleus (the holetron).

If a high-energy gamma-ray strikes one of the covalent electrons in the Electronium bond, the knocked-out electron will be ejected at high velocity. The remainder of the atom will disintegrate into two particles: one remaining negative covalent electron and one positive Electronium nucleus (or holetron), which will feature a larger spiral in the presented image.

While this scenario may not be as promising as presented, any other proposed scenarios or hypotheses must address the observable information displayed in the bubble chamber image.

Implications of this Proposal in Other Fields

The proposition of the ultra-light Electronium and the new elementary particle, nullitron, as additions to the established atomic and particle framework may have important implications in other areas of physics and chemistry. These implications will be briefly examined in the following five fields:

1. Periodic System of Ultra-Light Elements

2. Space Distribution of Atoms in Molecules

3. Concept of Current Flow in Semiconductors: Electrons and Electron-Holes

4. Superconductivity

5. The neutron decay

1. Periodic System of Ultra-Light Elements

If the new proposed ultra-light element, Electronium, and the newly identified elementary particle, nullitron, are accepted as genuine constituents in the established atomic and particle framework, the following proposition can be made:

Similar to the existing Periodic Table of Elements - where protons and neutrons, along with electrons, serve as the building blocks of all elements - positrons and nullitrons could similarly form a Periodic System of Ultra-Light Elements, in conjunction with electrons. In this scenario, the following Ultra-Light Elements could be formed:

1. Positronium 1.1. Electronium 1.2. Tritionium 2. Helionium 3. Lithionium 4. Beryllionium 5. Boronium 6. Carbonium 7. Nitrogeonium 8. Oxygeonium 9. Fluoronium 10. Neonium 11. Natrionium 12. Magnesionium, and so on.

This series could potentially extend to include the well-known particle, Muon, or Muonium, with a mass equivalent to 207 electron masses (with 82 positrons), (similar to element 82, Pb - Lead, which is the last remnant of the most radioactive series, with an atomic mass of 207). There may be possibilities for the existence of even larger ultra-light elements beyond Muonium; however, these would likely be unstable. Due to the relatively small mass of the Ultra-Light Elements compared to more conventional chemical elements, they may exist in clouds surrounding atomic nuclei rather than within the atomic structure as traditional electrons do.

The presence of these different ultra-light elements in the electron clouds around atomic nuclei may reduce the number of spectral lines resulting from electron transitions between energy levels in an atom. This phenomenon is consistent with observed reality, suggesting that the actual number of spectral lines is smaller than expected. Understanding how these ultra-light elements relate to the existing elements in the Periodic Table will be a subject for further research and investigation, should their existence be confirmed.

2. Space Distribution of Atoms in Molecules

Let's consider the Carbon atom as an example.

It is well known that the spatial electron distribution in a Carbon atom is tetrahedral, containing four valence electrons. This raises an intriguing question: How can these four valence electrons, which orbit the Carbon nucleus according to current theories, maintain such precise tetrahedral positions in various organic and inorganic molecules without any movement or rotation?

Is it possible that electrons do not actually move around the Carbon nucleus but are instead arranged in a fixed tetrahedral configuration? How could this be feasible? Could there be different types of electrons: fast-moving electrons, slow-moving electrons, and even electrons with no kinetic energy?

A potential answer to this question might arise from considering the following suggestion: In some cases, instead of four valence electrons, a Carbon atom could have four ultra-light elements called Electronium arranged in tetrahedral positions. In this scenario, the Carbon atom could essentially be viewed as a distinct molecule - CEl_4. The bonding between Carbon atoms or similar elements would then primarily involve this new ultra-light element, Electronium, serving as a bonding connector between them.

3.The Concept of Current Flow in Semiconductors: Electrons and Electron-Holes

"**One shouldn't work on semiconductors; that is a filthy mess. Who knows if they really exist?**" – Wolfgang Pauli (letter to Rudolph Peierls, 1931), as quoted in "Semiconductors and the Information Revolution" by John Orton.

The current flow in semiconductors is currently understood in terms of two charge carriers: the negatively charged electron and the positively charged quasi-particle known as the electron-hole. The movement of electrons in the conduction band, along with the flow of holes in the valence band, generates current. These charge carriers are produced through processes of generation and recombination. To better understand this concept, we make use of the Fermi level and the Fermi distribution function. This explanation is widely accepted in the field.

In the early days following the discovery of semiconductors, various hypotheses emerged regarding the nature of electron-holes as positive charge carriers. Initial theories proposed that these carriers were real particles, such as positive ions, protons, or positrons. However, after numerous theoretical and experimental investigations, these proposals were rejected as inadequate. As a result, electrons and electron-holes came to be widely accepted as the only charge carriers in semiconductors.

This acceptance came with an important clarification: the proposed positive charge carrier known as the electron-hole is not a real particle but rather a virtual particle with real physical characteristics.

It is well-known that electrons and electron-holes exhibit different physical properties, such as varying masses, with holes having a mass greater than that of electrons ($\mathbf{m_h \geq 2m_e}$), different velocities , with holes moving at half or less of electron velocity ($\mathbf{v_h \leq v_e/2}$), and different mobility, with hole mobility generally lower than that of electrons ($\mathbf{\mu_h \leq \mu_e/2}$).

To this day, there has been no valid alternative proposal to replace this concept of the virtual electron-hole as a positive charge carrier in semiconductors with any new, real elementary particle.

Recently, a new proposal has introduced two hypothetical elementary particles: the nullitron and the holetron. This allows for a fresh perspective on charge flow in semiconductors. In this new framework, current flow in semiconductor materials is represented by the negative particle electron in the conduction band and the positive particle known as the holetron in the valence band, as the sole charge carriers.

Following this premise, some theorized virtual quasiparticles, such as excitons and polaritons - previously thought to exist in semiconducting materials - can now be understood not as configurations of electrons and electron-holes or even as combinations of electrons and photons, but rather as compositions involving electrons and holetrons, akin to hydrogen-like bonding. Thus, these entities can now be seen as having real physical properties.

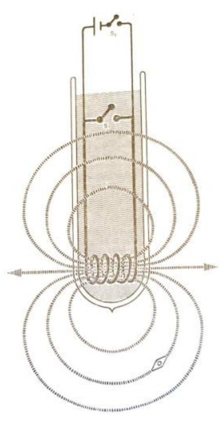
4. Superconductivity

“**Every theory of superconductivity can be disproved**”. This idea is rooted in Felix Bloch's somewhat cynical second theorem from the early 1930s.

Today, well into the 21st century, we still see many scientific publications with titles like - Superconductivity finally solved or Superconducting secrets solved after 30 years (https://phys.org/news/2014-06-superconducting-secrets-years.html#google_vignette).

Yet, a crucial question remains regarding superconducting materials and their resistance-free electrical conductance: How can electrons move through superconducting materials or wires when there is no potential difference between any two points due to zero resistance?

The answer lies within the question itself: electrons do not move through superconducting materials when they are in the superconducting state. From this, we can conclude that there is no current flow in the wire, including the persistent current. The applied current into the material is only responsible, in a different way, for the magnetization of the superconducting coil. In this state, the superconducting coil effectively acts as a magnet. It is important to note that the movement of electrons is not what causes the coil to become magnetized. Similarly, one might wonder about the direction in which the electrical persistent current flows around a superconducting sphere.



Cryostat in which Heike Kamerlingh Onnes and coworkers carried out the 8 April 1911 experiment that first revealed superconductivity

The superconducting state reflects a high ordering of electrons or electron pairs in stripes, resulting in a collective magnetic field without any movement. This behavior is akin to that of natural magnets, where electrons do not exhibit global movement.

The presence of superconducting current is typically noticed using small magnets or coils, not with ammeters. In fact, there is no definitive proof that persistent current in any superconducting material can be measured with an ammeter directly, especially in superconducting spheres. The current can be measured only indirectly through its magnetization. If current is measured in some instances, it demonstrates a lack of zero resistance in the wire.

As of today, there is no practical evidence that a persistent current can flow permanently through wires between two distant points in superconducting states. If electrons flow through wires than the entropy can not be zero, as is in superconducting theory claimed.

This magnetic field produced in superconducting state has various applications, including strong superconducting electromagnets, MRI scanners, maglev trains, particle accelerators, mass spectrometers, tokamaks, wind turbines, magnetic levitation devices and so on. In all these applications, the magnetic field produced by superconducting materials is utilized.

The magnetic field created in superconducting materials differs from that generated by current flow in wires.

This distinction is evident since the magnetic flux in superconducting materials is confined to a thin layer on their surface (Meissner effect) . Importantly, the magnetic flux in superconducting materials is akin to the magnetic field produced by current in wires, evidenced by the fact that the critical magnetic flux, which can disrupt the magnetic field in superconducting materials, is slightly higher than that produced by current in wires.

So, what is the relevance of superconductivity in this discussion?

The key point is the existing theorem regarding Cooper pairs. Proposed by Bardeen, Cooper, and Schrieffer in 1957 (BCS theory), Cooper pairs are considered the main carriers of superconducting current, acting as a super fluid.

In this theory, the binding of the electrons into a coherent state, referred to as Cooper pairs, occurs only in the presence of an attractive potential acting as a glue, no matter how weak is this potential.

This attractive potential arises from the vibrations of the material's lattice, known as phonons. The electron-phonon coupling depends on the intensity of these lattice vibrations.

However, in BCS theory, the formation of Cooper pairs does not necessarily depend on the origin of the attractive interaction.

Therefore, the electron-phonon coupling can be interpreted differently to explain superconductivity

Consider the possibility that the source of the attractive potential in the superconducting state is not phonons from vibrating lattices but rather real positive particles.

These particles could be the positive nuclei of a newly proposed ultra-light element called **Electronium**, referred to as **holetron (h^+)** in this research paper.

In this case, the binding of electrons into Cooper pairs can be explained similarly to the formation of an H_2 molecule. Instead of two hydrogen atoms, we would have two ultra-light Electroniums forming an El_2 molecule.

The distance between the two electrons in the El_2 molecule corresponds or is equal to the superconducting coherence length. These two electrons act like Bose-Einstein particles with total spin equal to 1.

When electrons and holetrons behave like Bose-Einstein particles and are cooled to near absolute zero, they lose kinetic energy and condense into the lowest energy level. At these low temperatures, electrons and holetrons can freely rotate and gather in their bands, creating high order within the crystal structures of superconducting materials. Evidence supporting this theory is found in the quantum flux of the electron, which is measured as h/2e rather than the expected h/e, suggesting the presence of both electrons in the El_2 molecule.

But, as suprise, the key factor for achieving a superconducting state is not merely the presence of Cooper pairs. While Cooper pairs are essential, they do not contribute to the magnetization of superconducting coils. This limitation arises because the magnetic moment of Cooper pairs is zero; the two electrons in a Cooper pair have opposite spin orientations. Many materials can form Cooper pairs as they approach absolute zero, but this alone does not guarantee that they will reach a superconducting state.

The critical aspect for achieving a superconducting state and for the magnetization of superconducting coils lies in the presence of **unpaired electrons**. These unpaired electrons are added into the material when the required current is applied. When the current is excluded, some of these electrons can form stripes of unpaired electrons situated between the stripes of Cooper pairs.

This process generates a strong magnetic field similar to that of natural iron magnets at room temperature.

Achieving high order among electrons is only possible with materials that possess specific crystal structures, allowing electrons to arrange effectively in stripes.

According to this, natural magnets are materials with the high ordered still standing electrons in superconducting state at room temperature.

However, this conclusion could also be disproved according to Felix Bloch's theorem.

5. The neutron decay

The concept of the neutral electron is not new.

When physicist James Chadwick discovered the neutron in 1932, it was found that neutrons are unstable, with a half-life of about 13 minutes. During this time, neutrons can undergo spontaneous disintegration, resulting in the emission of a proton and a beta particle, which is a negatively charged electron.

However, according to the Principle of Conservation of Energy, there is a mass discrepancy in the decay of a neutron, leading to an unbalanced energy equation. This is evident when comparing the masses of protons and neutrons. The mass gap is known to be equivalent to 0.0023055710-27[kg] or 1.29381 MeV, significantly greater than the mass of two electrons.

In light of this, physicist Wolfgang Pauli proposed, and physicist Enrico Fermi accepted, the idea that during a spontaneous neutron decay, three particles are produced: a proton, a negative electron, and a third particle that is electrically neutral and has the same mass and spin as the electron. Initially, this proposition was controversial.

Therefore the widely accepted conclusion became that the third particle should be a neutral particle with a mass smaller than 2 eV and a spin of ½, which was named the neutrino or antineutrino. While this solution addresses some issues in the neutron disintegration process, it does not resolve the mass gap, which remains an unanswered question to this day.

In this article, a new solution is proposed: instead of the neutrino, the third particle in neutron disintegration may be a neutral electron or a neutral anti-electron, referred to as the "nullitron," possessing the same mass and spin as the electron.

Neutrinos in this scenario are not necessary anymore.

This suggestion reaffirms the proposals by physicists Wolfgang Pauli and Enrico Fermi and aims to resolve the mass gap problem. If accepted, the nullitron would become a new addition to the existing table of elementary particles.

However, an important question persists: why has this elementary particle not been observed in numerous experiments?

There are two primary reasons for this. First, being a neutral particle, just like the neutron, its presence can only be indirectly detected. Second, the nullitrons ultra-light mass makes it even more challenging to detect. It's also possible that the nullitron has been detected but simply not recognized.

Conclusion

If the proposal presented in this article, referred to as a research paper on the new ultra-light element "Electronium" and the elementary particle "nullitron," cannot be substantiated by any experiment, the following conclusion remains valid: We are still far from truly understanding the microscopic world, despite the significant progress made over last hundred years. Therefore, the following citation is always relevant.

"The important thing is to never stop questioning"

Albert Einstein

References:

- Electron–positron annihilation. (2024, September 13). In *Wikipedia*. https://en.wikipedia.org/wiki/Electron%E2%80%93positron_annihilation
- Pair production. (2024, September 23). In *Wikipedia*. https://en.wikipedia.org/wiki/Pair_production
- Gamma ray. (2024, October 21). In *Wikipedia*. https://en.wikipedia.org/wiki/Gamma_ray
- Standards for Measurement of the Critical Fields of Superconductors - F. R. Fickett 1984
- Positronium. (2024, September 13). In *Wikipedia*. https://en.wikipedia.org/wiki/Positronium
- Neutrino. (2024, October 23). In *Wikipedia*. https://en.wikipedia.org/wiki/Neutrino
- What on earth is polariton - https://mappingignorance.org/2018/01/25/what-on- earth-is-a-polariton
- Superconducting secrets solved after 30 years https://phys.org/news/2014-06-superconducting-secrets-years.html#google_vignette.
- Lodewijk Johannes Reinders - The Quest for Absolute Zero. Early Historical Developments in Cryogenics

- Superconductivity. (2024, October 21). In *Wikipedia*. https://en.wikipedia.org/wiki/Superconductivity
- The quest for absolute zero: The meaning of low temperature physics – Kurt Mendelssohn 1977
- Meissner effect. (2024, September 28). In *Wikipedia*. https://en.wikipedia.org/wiki/Meissner_effect
- Semiconductor. (2024, November 6). In *Wikipedia*. https://en.wikipedia.org/wiki/Semiconductor
- Cooper pair. (2024, February 6). In *Wikipedia*. https://en.wikipedia.org/wiki/Cooper_pair
- Bubble chamber. (2024, April 24). In *Wikipedia*. https://en.wikipedia.org/wiki/Bubble_chamber
- Neutral electron or Neutrino- Antonio Puccini - Applied Physics Research; Vol. 16, No. 1; 2024 ISSN 1916-9639 E-ISSN 1916-9647 Published by Canadian Center of Science and Education

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